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24-30 August 2018

ICIS Chemical Business

MAKING SENSE OF CHEMICAL PRICES

2017-2018

CHEMICAL PROFILE

Special

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ICIS Chemical Business

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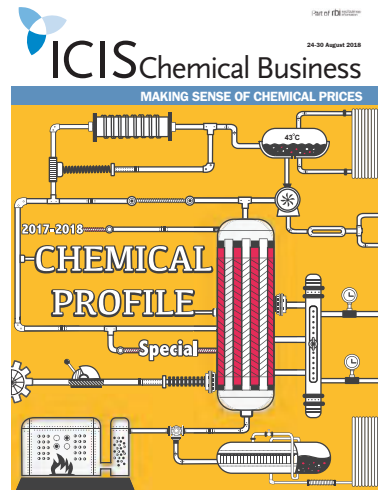
CHEMICAL PROFILES

2017

2018



Zoey Chen/RBI

COVER STORY

This bonus issue of ICIS Chemical Business brings you a complete directory of Chemical Profiles and Value Chains from Jun 2017 to Aug 2018.

ICIS VALUE CHAINS

2017

2018

REGULARS

Welcome to this special bonus issue of ICIS Chemical Business, where we have gathered a complete directory of Chemical Profiles and ICB Value Chains from June 2017 up until August 2018.

The Chemical Profiles – which reader research tells us are highly valued – provide a snapshot of the fundamentals driving individual chemical markets – from olefins, aromatics, intermediates, polymers, inorganics, oleochemicals and other commodity chemicals.

Our Value Chains section takes it a step further, showing the relationships between products in one particular value chain.

From your feedback highlighting the Chemical Profiles as a great value to your subscription, we aim to make this as user friendly as possible.

Profiles are listed in date order. You can also use the search button on the top left of your screen to locate the profiles.

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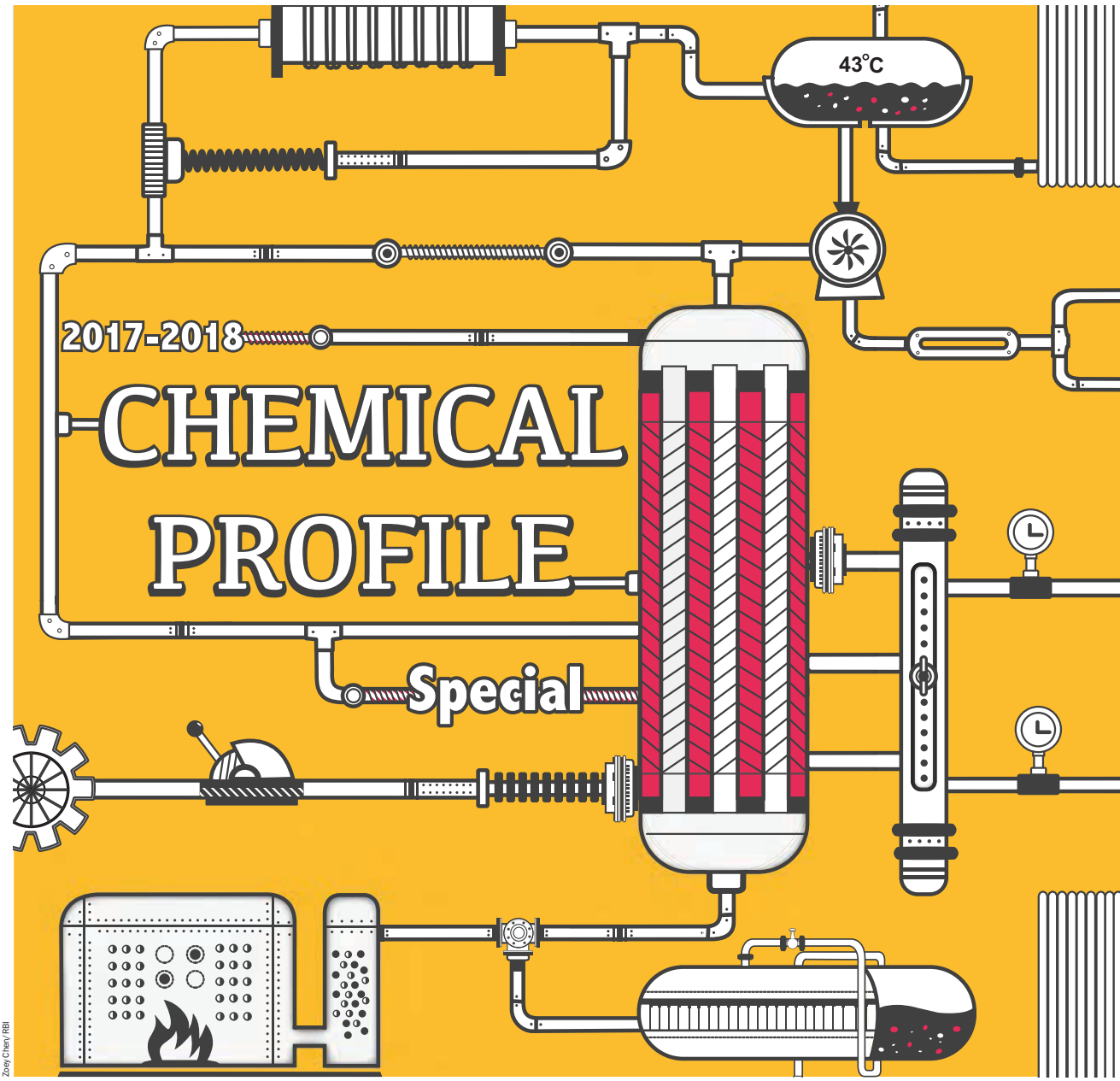
ICIS



Zoey Chen/ RBI

Welcome to the Chemical Profile and Value Chain special issue of ICIS Chemical Business where we have aggregated this content in an easy-to-access format.

Inside, you will find a comprehensive directory of all Chemical Profiles and Value Chains published in the magazine from June 2017 through August 2018. We provide these snapshots of the main commodity chemicals covered by ICIS on a regional basis. Value Chains take a broader look at related products across all the main product areas in commodity chemicals.

We list the articles in date order but the digital magazine is also searchable using the search box in the top left.

There is also an A-Z directory of Chemical Profiles on the ICIS Chemical Business homepage.

IZHAM AHMAD SINGAPORE

LAB

USES

Linear alkylbenzene (LAB) is an organic compound used almost wholly as an intermediate in the production of surfactant linear alkylbenzene sulphonate (LAS), which is also known as linear alkylbenzene sulphonic acid (LABSA).

LAB is an important feedstock for biodegradable detergents and other cleaners.

LAS is used widely for detergents. The common form is as a sodium salt.

SUPPLY/DEMAND

Global LAB demand in 2016 was estimated at 3.68m tonnes, with Asia and the Pacific region accounting for close to 49% of that, at 1.79m tonnes, according to the ICIS Supply-Demand Database.

LAB demand is expected to continue growing in 2017, at an estimated annual rate of around 1.5% from 2016.

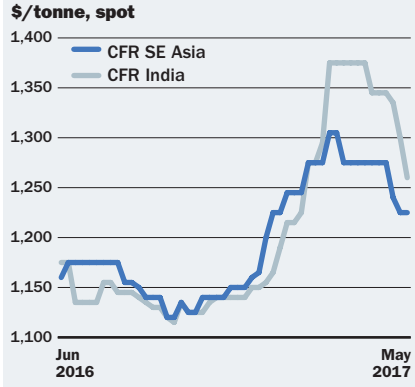
In terms of production, global LAB output was estimated at 3.7m tonnes in 2016 and is forecast at 3.76m for 2017, with production in Asia and the Pacific expected to account for about 47% of that.

Asia capacity exceeds 2.6m tonnes/year, with 13 manufacturers accounting for just over 2.0m tonnes per year.

India is still considered an undersupplied market with production from the four main domestic producers believed to still be insufficient to fully meet the growing demand for LAB and LAS there.

But with many SE Asian economies already well-developed, demand may be plateauing, with consumption growth there expected to be slower.

ASIA LAB



PRICES

Despite the threat of oversupply, LAB prices have made relatively decent gains over the last year, driven largely by higher feedstock costs. In early-March 2017, LAB import prices in India rose to $1,375/tonne CFR India, their highest since June 2015. This was linked to India's plan to impose anti-dumping duties on Qatar, Iran and China, plus higher benzene prices. Prices have now eased but remain around $1,300/tonne CFR India. This is still about 22% higher than in January 2016, when LAB prices hit their lowest levels since ICIS began tracking the data, of around $1,065/tonne CFR India.

TECHNOLOGY

N-paraffin and benzene are the main feedstocks for LAB. High-purity n-paraffin is obtained by hydrotreating jet kerosene. This is then dehydrogenated to form linear olefins, which are then exposed to benzene in the presence of a catalyst to produce LAB.

There are three types of catalysts used in producing LAB: hydrogen fluoride (HF) and aluminium chloride, but this is being phased out. The HF process was seen as the most commercially viable but environmental concerns led its replacement since 1995 by a fixed bed catalyst system – for example, the DETAL process, which does not use HF.

OUTLOOK

LAB markets generally follow feedstock benzene and jet kerosene, which track crude oil. However, LAB supply and demand are also important, as are economic factors. South Asia, particularly India, is a key market for LAB and LAS. India is seen as an undersupplied market, and imports are needed to supplement production by the four main Indian domestic producers. Sources said about 200,000 tonne/year of imports are needed to meet India demand. However, the introduction of anti-dumping duties on Qatar, Iran and China in April 2017 has upset some market fundamentals, though other suppliers could fill any supply gaps.

Saudi Arabia's Farabi Petrochemical is planning to expand its production of LAB and feedstock normal paraffin from a new complex at Yanbu, company sources said.Construction is expected to start soon while commercial operations are due in Q1 of 2020. India is not expected to have LAB for exports but it does continue to export LAS, to Pakistan, Africa and SE Asia.

China is also a key growth region but is believed to be sufficiently supplied. The SE Asia region is adequately supplied with Thai Oil and Japan's Mitsui & Co's 100,000 tonne/year Labix having started production in 2016. ■

ASIA/MIDDLE EAST LAB CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Jin Tung Petrochemical	Nanjing, China	350
Fushun Petrochemical	Fushun, China	280
Sinopec Jinling Petrochemical	Nanjing, China	200
Isu Chemical	Ulsan, South Korea	180
Unggul Indah Cahaya	Merak, Indonesia	180
Gulf Farabi Petrochemical	Jubail, Saudi Arabia	140
Indian Oil	Baroda, India	120
Reliance Industries	Patalganga, India	120
Tamilnadu Petroproducts	Manali, India	120
Iran Chemical Ind. Invst.	Esfahan, Iran	110
Egyptian Linear Alkyl Benzene	Ameriya, Egypt	100
Great Orient Chemical	Taicang, China	100
Labix	Sri Racha, Thailand	100
Nirma	Baroda, India	100
SEEF	Mesaieed, Qatar	100
Formosan Union Chemical	Lin Yuan, Taiwan	90
JX Nippon Oil and Energy	Kawasaki, Japan	80
Reliance Industries	Vadodara, India	60
Bistun Petrochemical	Kermanshah, Iran	55
Amiriya Petroleum Refining	Ameriya, Egypt	50

NOTE: Top 20 listed by capacity

LEELA LANDRESS DE PEREZ HOUSTON

Ethanol

USES

In Brazil, the ethanol-use mandate has been mandatory since 1977 when the legislation required a 4.5% blend of ethanol to gasoline. According to the legislation, the ethanol blend can vary from 18% to 27.5% and it is currently set at 27% (E27). Ethanol is also widely used in pharmaceutical and food and beverage applications, such as hand sanitizers and vodka.

SUPPLY/DEMAND

Total Brazilian ethanol production for 2016 was estimated at 30.372bn litres, similar to levels seen in 2015. Total 2016 ethanol for fuels production was estimated at 28.022bn litres, up 2% from the previous year. Sugar-ethanol mills are expected to divert less sugarcane to ethanol production in the current crop – approximately 55% of the sugarcane volume as opposed to 59% in 2015/16, due to favourable sugar prices in the international and domestic markets favoured by the world deficit in sugar supply.

Ethanol installed industrial capacity depends on annual decisions made by individual plants to produce sugar and/or ethanol.

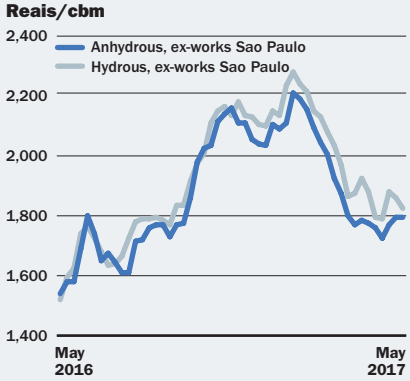
The industry responds to the theoretical ratio of 40:60 to switch between sugar to ethanol production or vice versa from harvest to harvest.

Once producing units adjust their plants to produce a set ratio of sugar/ethanol in a given year, there is much less flexibility to change it during the crushing season. According to industry sources, sugarcane represents between 60-70% of the cost of producing ethanol.

On the demand side, total domestic demand for ethanol for calendar year 2017 is forecast at 27.7bn litres/year, up 277m litres relative to the revised figure for 2016. Brazil is an important user of ethanol for fuel consumption. Total ethanol consumption for use as fuel was estimated at 25.723bn litres/year for 2016, down 3.07bn litres compared to the previous year.

Brazilian drivers, many of whom own flex-fuel vehicles (FFVs) which allow switching from gasoline to ethanol, would only pick the latter if its price is less than 70% that of gasoline.

BRAZIL ETHANOL



PRICING

Ethanol pricing in Brazil is generally seasonal. As the harvest/crush begins in April every year prices decline on rising supply. As the harvest/crush winds down in November and December every year prices rise. This year, prices have dropped from highs seen at the end of the previous harvest/crush.

TECHNOLOGY

Ethanol is an alcohol made by fermenting sugar components of plant materials such as corn and wheat starch, sugarcane, sugar beet, sorghum and cassava. Sugarcane is virtually the sole source of feedstock for ethanol production in Brazil. Ethanol can be produced either by chemical or microbiological processes. The chemical route is based on ethylene hydration, while the microbiological process is chiefly carried out by yeast Saccharomyces cerevisiae. Currently, the main industrial route globally is the microbiological process.

OUTLOOK

Hydrous ethanol has been uncompetitive with gasoline since the end of 2016 and with Brazil's state-controlled oil company, Petrobras, lowering prices for diesel and gasoline at its domestic refineries, expectations are that sugar cane mills will prolong their preference for sugar production over ethanol.

Petrobras adjusts domestic gasoline and diesel prices on a monthly basis to keep them in line with international levels.

Anhydrous ethanol has seen lower pricing in recent months as large volumes of imported product are hitting Brazilian shores.

Ethanol imports into Brazil hit record levels the first three months of this year, reaching an estimated 600,000 cubic meters (cbm) and causing upheaval in the sector as prices were uncharacteristically low for the time between the yearly harvest season.

In response to the high volume of imports in the first quarter, industry players have met with the Ministry of Agriculture, Blairo Maggi, to push for the reinstatement of the 20% import tax on ethanol. The government has begun the process to reinstate the import tax, but a fixed start date has not been announced. Brazil eliminated the import tax in 2010, in a measure the government called a goodwill action to foster greater global biofuel trade. ■

TOP BRAZIL ETHANOL PLANTS CUBIC METRES/DAY

Company	Location	Capacity
Agro Energia Santa Luzia	Nova Alvorada Do Sul	3,700
BP Bioenergia Tropical	Edeia	3,700
Brenco - Companhia Brasileira De Energia Renovavel	Alto Taquari	3,300
Brenco - Companhia Brasileira De Energia Renovavel	Mineiros	3,200
Rio Claro Agroindustrial	Cacu	3,000
Pedra Agroindustrial	Buritizal	2,900
Cerradinho Bioenergia	Chapadao Do Ceu	2,800
Iaco Agricola	Chapadao Do Sul	2,750
Renuka Do Brasil	Promissao	2,520
Sjc Bioenergia Ltda	Cachoeira Dourada	2,480
Acucar E Alcool Oswaldo Ribeiro De Mendonca	Guaira	2,470
Usina Eldorado	Rio Brilhante	2,450
Coplasa - Açucar E Alcool	Planalto	2,400
Central Energetica Moreno Acucar E Alcool	Luis Antonio	2,400
Adecoagro Vale Do Ivinhema	Angelica	2,400
Pedro Afonso Acucar E Bioenergia	Pedro Afonso	2,250

NOTE: Top 16 plants listed by capacity
SOURCE: National Petroleum Agency (ANP)

MELISSA HURLEY LONDON

POM, PBT

USES

Polyacetal, also known as polyoxymethylene (POM), is a versatile thermoplastic used in precision parts that require high stiffness, low friction and excellent dimensional stability. It has been particularly successful in replacing metal parts. The automotive industry is the largest end-user. Other major outlets include consumer and office appliances and electronics. Uses are varied and include gear drives, pumps, conveyor belts, bathroom fittings, hand tools, toys, construction equipment, watch parts and medical devices.

Polybutylene terephthalate (PBT), a heat-resistant plastic which shrinks very little during forming, is primarily used in the automotive, electronics and housing sectors. It is used to make items like car dashboards, rear view mirrors, showerheads and computer keyboards. Although it is stretchy, it has less stretch than some other polyesters like Lycra, making PBT a stiffer alternative.

SUPPLY/DEMAND

Downstream PBT demand remains healthy with the key automotive sector continuing to perform well. Butanediol (BDO) feedstock supply has been restricted so far in 2017. The higher feedstock prices remains the main driver for the upward PBT pricing pressure, with supply and demand also playing a role.

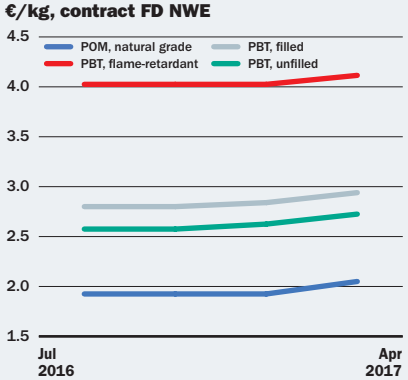
In the POM market, feedstock price movements are the central driver of rises in POM quarterly contract prices rather than demand and supply dynamics. Conditions have remained relatively stable in 2017 and demand and supply levels are largely balanced. Some market players view the market as lengthy.

BASF will close its European POM facility and move production to South Korea at the end of 2018. BASF's current POM facility at Ludwigshafen, Germany has a nameplate capacity of 55,000 tonnes/year according to ICIS data.

This follows the announcement that BASF will establish a joint venture (JV) with South Korea-based Kolon Plastics, to produce 70,000 tonnes/year of POM in Gimcheon, South Korea. The 50:50 joint venture, named Kolon BASF innoPOM, will be located at the existing manufacturing site of Kolon Plastics in Gimcheon that already includes a POM production facility.

EUROPE ENGINEERING PLASTICS

€/kg, contract FD NWE



PRICES

PBT quarterly contract prices increased in the first two quarters of 2017. Contract discussions were delayed in some cases with key feedstock BDO applying price pressure on the downstream PBT market. Second quarter BDO contracts settled at a significant increases, driven by a global tightening of supply, higher feedstock prices and solid demand.

After some pricing stability in quarterly POM contracts at the start of 2017, second-quarter POM contracts settled at an increase. This was largely driven by the firming of key feedstock methanol since mid-2016. Methanol contract prices started on an upward trajectory in the middle of 2016, with POM prices remaining stable throughout that period. The large increase in the first-quarter methanol contract intensified the upward pricing pressure in the POM market. The increase in raw material prices were not widely passed on to customers at the start of 2017, which compressed POM margins for producers.

TECHNOLOGY

POM resins are made by the polymerisation of formaldehyde to produce the homopolymer. Copolymers are made by incorporating other monomers. The process is capital intensive. The resin is highly crystalline and the polymer chains have to be stabilised to prevent the resin breaking down during processing at elevated temperatures.

PBT is produced by the polycondensation of BDO with purified terephthalic acid (PTA) or dimethyl terephthalate (DMT). Some firms are trying to modernise the production of PBT by using bio-based BDO, which is made from renewable feedstocks rather than petroleum.

EUROPE ENGINEERING PLASTICS '000 TONNES/YEAR

Company	Location	Capacity
Ticona	Frankfurt, Germany	140*
DuPont de Nemours (Nederland)	Dordrecht, Netherlands	95*
BASF	Ludwigshafen, Germany	55*
Ultraform (BASF)	Ludwigshafen, Germany	38*
Grupa Azoty	Tarnow, Poland	14*
BASF Schwarzheide	Schwarzheide, Germany	100**
Lanxess/DuPont	Hamm-Uentrop, Germany	80**
DSM Engineering Plastics Emmen	Emmen, Netherlands	30**

NOTE: *Polyacetal **Polybutylene terephthalate

OUTLOOK

The POM market is widely thought to remain balanced. However, some expect changes in production location, such as BASF moving their production facility out of Europe, to impact the European market.

The European PBT market is expected to be influenced by upstream BDO market dynamics, which are particularly strong at the moment. With the BDO market experiencing tightness in 2017, significant price increases have been filtered downstream to the PBT market.

Some PBT producers have experience tightness in upstream BDO supply. The BDO spot market has been particularly tight. However, the majority of producers have been covered by contracted volumes and imported material.

Demand for PBT remains healthy with strong levels of demand from the automotive and construction sectors. If this downstream demand continues and upstream BDO supply remains tight, the PBT market will continue to be firm. ■

Additional reporting by Nick Cleeve

LARRY TERRY HOUSTON

Butyl acetate

USES

Butyl acetate (butac) is a colourless, flammable liquid, mostly used as an industrial solvent. Nearly 90% of this is used as a lacquer solvent in automotive paint and surface coatings for wood furniture, and in a variety of coating resins including epoxies, urethanes, cellulosics, acrylics and vinyls because it provides good flow and brush-resistance when used with these resins.

Butac is also used as a synthetic fruit flavouring in food products such as candy, ice cream, cheeses and baked goods, and as an odour enhancer in perfumes and pharmaceuticals. It has also been used on a limited basis as a gasoline additive to boost octane levels.

SUPPLY/DEMAND

Major US butac suppliers include Dow Chemical, Eastman Chemical and Oxea, which have seen supply snug during the early part of 2017 and continuing into the second quarter.

So far in 2017, butac demand has been healthy – stronger than during the first quarter of 2016, but not robust, however.

Sources in the major downstream paint and coatings markets have said demand has improved by an average of 5% compared with the same time last year, with profits even more improved at about 7.5% year-on-year.

Beyond the primary downstream architectural coatings sector are automotive coatings. The major automakers recently reported weaker-than-expected April sales; however, at declines ranging mostly from 1.5% to 7.1%. Even with declines, though, industry sources suggested demand for automobiles is still at the high end of typical US auto sales.

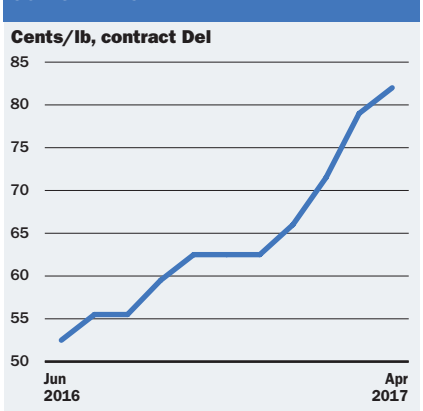
On the import and export front, the most recent data from the US International Trade Commission's (ITC) indicated March butac exports increased by 4.2% compared with the same month one year ago.

March butac export volumes also were higher from the previous month, rising by 11.2% from February.

The top destination for US butac in March was Mexico, which took more than half of the month's export volume, followed by significantly smaller volumes to Canada, Brazil and South Africa, the ITC data indicated.

Fractionally smaller March import volumes were higher by 36% compared with March one year ago.

US BUTYL ACETATE



PRICES

Some butac contract values ended May at rollovers, but most weakened from the April range of 81-83 cents/lb ($1,786-1,830/tonne), after a strong first-quarter run-up in contract and spot ranges driven principally by upstream propylene and n-butanol (NBA).

Propylene increased sharply in January, February and March, pushing butac and most other derivatives prices sharply higher. But April saw a propylene decline of 6 cents/lb, which pushed May butac prices lower.

The previous month's propylene contract movement – absent extenuating market conditions – typically heavily influences butac price movement.

But sources have said the domestic butac market has been driven as much or more by supply-demand fundamentals than by cost factors.

In mid-April, only one of the three major US producers proposed a May butac increase of 3 cents/lb, but sources said that effort was not successful.

Price stability in May has surprised buyers, but some sources say broadly snug supply persists, partly because of continued strong seasonal demand.

Weaker butac pricing, however, is likely in June and beyond on the May propylene contract drop of 7.5 cents/lb. Upstream weakness could continue amid lengthening propylene supply and some derivative maintenance that has softened propylene demand. Upstream NBA free-market prices also weakened by 2-5 cents/lb for May, mostly on downward pressure from propylene.

US BUTYL ACETATE CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Oxea	Bay City, Texas	100
Dow Chemical	Texas City, Texas	70
Eastman Chemical	Kingsport, Tennessee	70

TECHNOLOGY

Butac is produced commercially by the esterification of acetic acid with propylene derivative NBA in the presence of sulphuric acid, which acts as a catalyst.

The acetic acid, butanol and sulphuric acid are heated in a reactor to 89°C (192°F).

Vapours containing butac, butanol and water are removed and condensed. The top layer is fed to a low boiler column, where unreacted alcohol is flashed off and recycled to the reactor.

Capacities are highly flexible, meaning other acetate esters can be produced in the same units, depending on market need.

Capacities could be rated significantly higher if equipment were devoted solely to butac production.

OUTLOOK

US butac is a mature market that generally tracks GDP growth and is expected to track forecast economic growth between 2% and 3% during 2017.

Sources say current spring coatings demand is higher compared with the spring of 2016 on steady fair weather patterns in the pivotal northeast US.

Through the end of the year, butac demand is expected to diminish gradually after peak seasonal demand from the US paint and coatings markets this spring and summer.

Buying interest typically slows in the last quarter of the year. ■

PETER GERRARD LONDON

Polycarbonate

USES

Polycarbonate (PC) resins are tough thermoplastics with uses in optical media, the electrical, electronic and automotive industries and in glazing and sheet products.

They are available in different grades and can be extruded, blow- and injection-moulded. PC is also used in compounds or blended with other resins such as acrylonitrile-butadiene-styrene (ABS) or polybutylene terephthalate (PBT).

SUPPLY/DEMAND

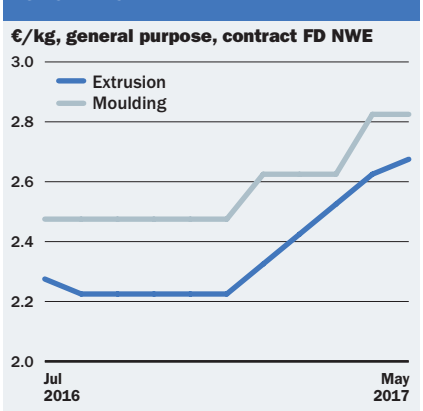
By early 2016, there were signs that consumers were becoming more confident, and that the condition of the European economy appeared to be decidedly healthier than for some time.

On the other hand, the European theatre is part of the global scene and the PC markets looked over-supplied. As far as possible producers would try to shunt material around to where they might be able to obtain the highest prices.

As the year progressed, demand was viewed on both sides of the market as generally quite good across most sectors and regions, especially evident in the automotive sector, with indications of continued growth for sales into that industry. Nevertheless, there was a readiness on the part of some suppliers to ensure volumes as a priority, supporting the belief that there was still over-capacity in the industry.

In the first half of 2017, things began to change. Production and logistics issues featured and a stronger dollar meant European PC producers might find more attractive opportunities for exporting. Also, some suppliers were experiencing very strong demand. This resulted in a tight market, with some converters struggling to acquire all the material they needed as supply became snugger.

EUROPE PC



PRICES

In the second quarter of 2016 it was very much a story of price stability and it became clear that supply was not sufficiently tight to bring about higher values for either extrusion or moulding grades. Subsequently, extrusion grade prices slipped down a little in the last three months of 2016, although moulding grade prices rolled over. The market lacked any imbalance that could impart impetus to attempts to raise prices.

In 2017, because of the marked tightening of the market, initially prompted by supply, both quarterly moulding grade and monthly extrusion grade numbers started to firm.

As the year continued, healthy demand also contributed to the upward pressure on prices, reflected in a sustained climb in extrusion grade values in each of the first five months of the year. Moulding contracts increased by an estimated average of €0.15/kg for the first quarter of the year, with an estimated increase of roughly €0.20/kg in the second quarter.

TECHNOLOGY

There are two processes to make PC: interfacial and melt technology. In interfacial polymerization, alkali salts of BPA in aqueous solution are phosgenated in the presence of an inert solvent. Environmental and cost issues have forced producers to seek non-phosgene routes.

All take the same approach - where polymerisation relies on the transesterification of diphenyl carbonate with BPA. This is the melt process, as the two-stage polymerisation takes place without solvents. The melt process has accounted for most of the new capacity in the past five years - about 80% of melt-process plants are in Asia and the Middle East.

Development work is focusing on a new route, involving the copolymerisation of carbon dioxide (CO_2) and propylene oxide (PO) or other epoxides through catalytic reaction to aliphatic PC. This route has already been commercialised on a limited scale in China.

EUROPE PC CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Covestro	Krefeld-Uerdingen, Germany	330
SABIC	Bergen op Zoom, Netherlands	260
SABIC	Cartagena, Spain	260
Covestro	Antwerp, Belgium	240
Trinseo	Stade, Germany	145
Kazanorgsintez JSC (KOS)	Kazan, Russia	65

OUTLOOK

Looking ahead, many players in the PC market view the prospects for demand quite positively. Recovery in the European economy has continued, bringing more confidence back into industry and perhaps supporting more optimistic assumptions concerning forward plans.

This outlook is dependent on specific sectors, with some such as water dispensers experiencing something of a gentle decline, while the consumption of PC in other sectors may owe more to its comparative price against competitive, alternative materials. The automotive industry continues to offer perhaps the greatest scope for increased consumption because of PC's weight, strength and heat properties.

In the short term, the tightness of the market is expected by some to last until at least the end of the summer of 2017. A little further out, consumption growth at an approximate annual rate 5% might imply a lack of capacity in the medium term. One producer suggests that this could amount to around 200,000 tonnes globally, in contrast to a situation of over-capacity that dogged the industry only very recently. Regardless of activity within the European theatre, the Chinese economy still probably is among the most significant factors for Europe. There is an export surplus from EU producers, and the appetite for their output in China can influence how tight or long will be the European market. ■

LANE KELLEY HOUSTON

MEK

USES

Methyl ethyl ketone (MEK) is primarily used as a low-boiling solvent for nitrocellulose, acrylic and vinyl surface coatings. Printing inks are the major application of MEK, due to its use as a solvent. Paint thinners and resins are used as solvents in the pharmaceutical industry. More than 60% of global MEK demand comes from the paints and coatings industry.

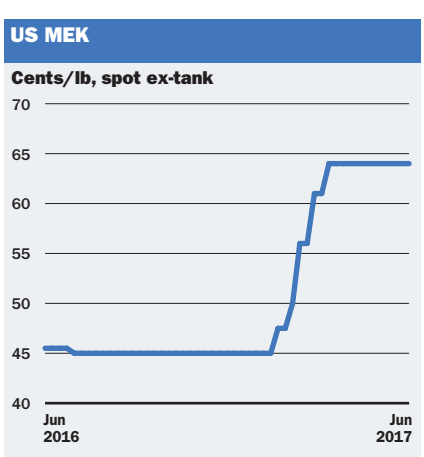
MEK also can be used in rubber-based industrial cements and printing inks and is a required solvent for the polymerisation of polystyrene (PS), acrylonitrile butadiene styrene (ABS) and styrene butadiene rubber (SBR).

A derivative, methyl ethyl ketone peroxide, is used as a hardening agent in reinforced polyester fibre glass.

SUPPLY/DEMAND

Supply in the US remains somewhat tight, although there have been no price increase announcements. Market sources say there is no MEK made in the US – that all of US demand is supplied by imports. ExxonMobil ceased production of MEK at its plant in Baton Rouge, Louisiana, in 2014, sources said. ExxonMobil said it has the capability to make MEK at the plant, but market sources say the unit is off line. The company declined to comment on the plant's status.

Major MEK suppliers include ExxonMobil, Sasol and Shell, which ship material to the US from plants in Europe and South Africa.



April 2017 imports of MEK rose 6.4% year on year, according to the most recent data from the US International Trade Commission (ITC). The increase stemmed from shipments from the Netherlands that more than doubled year on year – from about 1,500 tonnes, to almost 3,100 tonnes. Imports from two other top sources fell year on year, with shipments from the UK dropping 32% and from South Africa by 10%.

Shipments from the top three sources – the UK, Netherlands and South Africa – accounted for 77% of all MEK imports in April.

Imports from those three countries increased about 9% year on year through the first four months of 2017. Through April, the UK has shipped 32% of all imports, South Africa 25% and the Netherlands 23%. So far this year, US MEK imports have increased by 12%.

Meanwhile, US exports of MEK, almost doubled year on year, though the actual gain was just 300 tonnes. Exports fell by 47% from March with almost all of that drop stemming from fewer shipments to Mexico. So far this year, US exports have declined 23%.

Talk earlier this year that buyers have begun importing more material from Asia has proven true, mainly because MEK from Japan has jumped 84% in the first four months this year. Imports from China and Taiwan have declined, though the actual numbers are insignificant.

In the bigger picture, the total US MEK market appears to be growing slightly, despite import totals in 2016 that were the lowest in five years and exports barely half of what they were in 2012. Yet the net US market size (imports minus exports) was the highest in five years in 2016, showing a gain of 9.5% over the total US market in 2012.

PRICES

US MEK prices began the year at their lowest levels since 2009. Multiple price hikes implemented by several producers in March continue to hold.

Supply tightened throughout Q1, which participants speculated was partially due to ongoing production issues in Europe.

The market is waiting to see whether demand will get a boost from the paints and coatings sector in the warmer months, as the US enters its peak period for construction activity. Demand has been healthy in the US paint and coatings season so far, though sources say it has not been robust. Paint volumes are said to be higher this year by about 5% compared with the spring of 2016.

TECHNOLOGY

MEK's main commercial route is the dehydrogenation of secondary butanol. Some companies make secondary butanol by hydration of n-butene with sulphuric acid.

The alcohol vapor is fed into a multi-tubular reactor containing zinc or copper oxides as catalysts. The reaction takes place at 400-500˚C (752-932˚F) and pressures of less than 4 bar. In Europe, liquid-phase technology is also employed using Raney nickel or copper chromate at 150˚C reaction temperature. Hydrogen is flashed off and the condensate is dehydrated by fractionation. The MEK separates from the resulting water-ketone azeotrope that is obtained, and the MEK is then distilled.

A newer technology involves direct oxidation of n-butene in solution with palladium and cupric chlorides as catalysts. In addition, MEK can be made as a by-product in acetic acid manufacture from butane.

Shell has also developed a phenol process from which MEK could become available, along with acetone, as by-products. The process offers the potential to change the acetone/MEK ratio within reasonable limits to meet varying market demands.

OUTLOOK

A recent report from HEXA Research projects that increasing demand from construction and automotive sectors in Asia Pacific and Latin America will fuel MEK market growth through 2024 at an annual rate of 4.6%. The report states that the global market now is primarily driven by demand of paints and coatings by the home furnishing, infrastructure, and automotive sectors.

The global MEK market is expected to reach $3.26bn by 2020, according to a report by Grand View Research. ■

NOTE – there are no MEK plants in the US

AMY TAN SINGAPORE

Maleic anhydride

USES

Maleic anhydride (MA) occurs as colourless or white crystalline flakes with strong acrid (pungent) odour. It is mostly used to make unsaturated polyester resins (UPR), which are used in a wide range of applications including bathroom fixtures and automobiles.

The second largest outlet for MA is 1,4 butanediol (BDO). Other uses are in derivatives tetrahydrofuran (THF) and gamma-butyrolactone (GBL), plasticizers, surface coatings, agrochemicals, lubricants, fumaric acid and malic acid.

MA is available as liquid (molten) or solid (flake) – the liquid form dominates and accounts for around 90-95% of the market. However, it is not easily transportable.

SUPPLY/DEMAND

There were no significant plant start-ups or closures in recent months. In Asia, excluding China, the bulk of MA facilities are butane-based. Only two producers in Asia outside of China – Japan's Nippon Shokubai and Indonesia's Justus Sakti Raya – produce MA using benzene as feedstock. Both account for approximately 11% of the total MA nameplate capacity in Asia outside China, according to ICIS data.

Demand in China is largely stable with most China-based producers focusing on the domestic market instead of exporting.

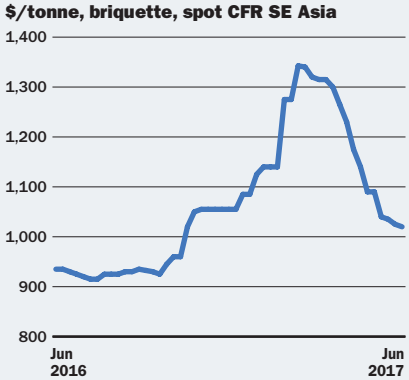
There is currently an oversupply of MA in southeast Asia. This is largely due to weak demand from downstream UPR. Buyers in southeast Asia who typically procure cargoes monthly are now acquiring cargoes on a need-to basis.

Buyers had been stockpiling cargoes in Q4 2016 in anticipation of higher feedstock butane prices during the winter months. However, buyers were not expecting weak demand for downstream UPR. As such, many found themselves overstocked with cargoes.

Additionally, Malaysian and Indonesian UPR producers have scaled down their production during the recent Ramadan period. Consequently, demand for MA in the region is expected to be weak.

ASIA MALEIC ANHYDRIDE

$/tonne, briquette, spot CFR SE Asia



PRICES

Since the start of 2017, Asia's MA prices were heard at a wide range amid uncertainty in feedstock butane prices and weak downstream demand.

Even as MA demand is expected to remain subdued, the price for MA has gained some 11% since the year-low of $915/tonne CFR SE Asia (mid-range) in 29 July, according to ICIS data. This gain is largely supported by feedstock butane prices. Consequently, MA producers and suppliers are reluctant to lower their offers to entice buyers. Instead, they have largely maintained offers at above $1,000/tonne CFR SE Asia.

Meanwhile, buyers continue to reiterate buying indications at below $1,000/tonne CFR SE Asia as they are sitting on comfortable inventories.

MA is produced commercially by the oxidation of benzene or butane. The butane-based process is considered to have superior economics and is the preferred route used by most producers.

Butane-based MA production can be done by either the fixed-bed or fluidized-bed processes. The fluid-bed process has some advantages over the fixed-bed route, such as lower air-to-hydrocarbon concentration in the feedstock and no need for pre-mixing. The disadvantages include abrasion of the catalyst, conversion rates and by-product formation.

In the fixed-bed route, air is mixed with superheated butane and fed to a reactor containing a catalyst that consists of vanadium phosphorous oxide supported on silica.

OUTLOOK

Demand for MA is closely linked to the production and usage of UPR. This is in turn dependent on the construction industry and traditional manufacturing sectors such as pipe production, transportation (aerospace and automotive) and footwear.

There are also some applications in the wind energy industry, which is said to be experiencing good growth in China. These industries are closely linked to the general economy in the region. Prices of feedstocks benzene and butane are expected to be stable in the near term. ■

ASIA MALEIC ANHYDRIDE CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Changzhou Yabang Chemical	Changzhou, China	125
Shanxi Taiyuan Qiaoyou Chemical	Taiyuan, China	125
Zibo Qixiang Tengda Chemical	Zibo, China	100
Zhejiang Jiangshan Chemical	Ningbo, China	80
Jiangsu Zhongchao New Material Technology	Danyang, China	75
Nan Ya Plastics	Mailiao, Taiwan	60
Tangshan Baotie Coal	Tangshan, China	60
Tianjin Bohua Zhonghe Chemical	Tianjin, China	60
Shanxi Gaoyi Hengyu Chemical	Xingjiang, China	50
Shanxi Hengyu Chemical	Xingjiang, China	50
Shanxi Hongdong Haoxin Chemical	Hongdong, China	50
Shengyuan Petrochemical	Puyang, China	50
Yunnan Yunwei Group	Qujing, China	50
Shanxi Taiming Chemical Industry	Shanxi Taigu County, China	46
Huanghua Hongcheng Business	Huanghua, China	40
Jiangsu Jiangyin Shunfei Fine Chemical	Jianyin, China	40
Kelamayi Jinyuan Chemical	Karamay, China	40

NOTE: Top 17 plants listed by capacity

CHRIS BARKER LONDON

MIBK

USES

Methyl isobutyl ketone (MIBK) is used in solvent applications, primarily for surface coatings. It is also widely used as an anti-ozonant in tyres, helping prevent or slow down degradation due to ozone exposure.

It is also used in rare-metal extraction, as a process solvent for pharmaceuticals and adhesives, and as a chemical intermediate. MIBK's dewaxing and separating properties can be used to purify pharmaceuticals, mineral oils, tall oil, stearic acid and butanol.

MIBK is very useful in developing high-solid coatings. It is also used in the manufacture of germicides, fungicides, pharmaceuticals, electroplating solutions, and as a denaturant in many ethanol formulations.

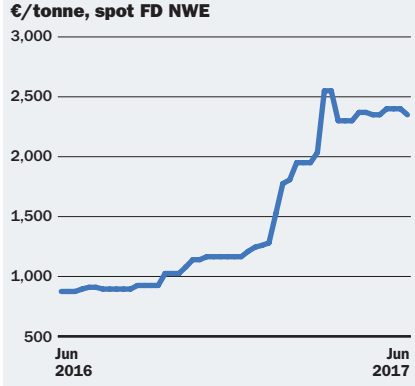
SUPPLY AND DEMAND

For most of 2016, European MIBK was balanced or balanced-to-long with producers' attempted spot price increases failing to materialize despite the steady upward trend in feedstock prices throughout the year.

However, the market tightened slightly in Q3 2016 and then severely from Q4 2016-Q1 2017 onwards because of limited supply at Shell, according to sources, combined with a rebound in domestic demand.

MIBK has a very limited number of suppliers in Europe, with only two major domestic producers and one other major source in South Africa. As a result, the product is very vulnerable to supply shocks.

EUROPE MIBK



On the contract market, sources see supply as available at normal levels, with the tightness mostly confined to the spot market.

The MIBK spot market remained tight in mid-June 2017, with sufficient demand for material to maintain prices at generally high levels.

PRICES

European MIBK prices were mostly stable in early-to-mid 2016. Several producers introduced small price increases to compensate for higher feedstock prices, but larger increases mostly failed to materialize due to the balanced-to-long market and structurally weak spot demand.

However, towards the beginning Q3 prices began to rise as the market became somewhat tighter, before spiking from mid-Q4 2016 to early 2017 due to limited availability from Shell, the largest European producer.

Prices continued to rise in Q1-Q2 2017, although the range widened in late Q2/early Q3 with at least one European producer offering numbers in the mid-to-high €2,000s/tonne FD, but material was also available in the low €2,000s/tonne FD.

TECHNOLOGY

There are two main routes to produce MIBK. One is a three-step process via acetone condensation, which gives diacetone alcohol that readily dehydrates to give mesityl oxide, which is then hydrogenated to MIBK.

MIBK is also produced from isopropanol (IPA) in a mixed ketones process with diisobutyl ketone (DIBK) and acetone as co-products. Methyl isobutyl carbinol, DIBK and mesityl oxide are coproduced or recovered during the process.

OUTLOOK

The European MIBK spot market is structurally quiet because the majority of sales are carried out via the contract market. Prices are also high above their average level for 2016, which has led to some sources to suggest that they have reached a peak and are likely to decline.

However, any price reductions have only been minimal so far with average prices in mid-June down only about 8% from their peak in late May.

Prices will be strongly affected by feedstock trends, with Brent crude oil prices falling to below $50/barrel for most of June. This is likely to have a knock-on effect on feedstock propylene and acetone prices, with both of the contract prices for these products trending downwards for June. Feedstock IPA prices have also decreased month-on-month.

Demand will see conflicting trends over the summer period, with an increase in downstream activity in the construction and paints and coatings sectors likely to be counterbalanced by lower activity and holidays in southern European countries from July-August onwards. ■

GLOBAL MIBK CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Sasol Solvents	Sasolburg, South Africa	60
Kumho P&B Chemicals	Yeosu, South Korea	55
Celanese Mexicana	La Cangrejera, Mexico	50
Shell Nederland Chemie	Pernis, Netherlands	45
Dow Chemical	Institute, US	35
Dongying Yimeide Chemicals	Dongying, China	30
Jilin Chemical Group Fine Chemicals	Jilin, China	30
Mitsui Chemicals	Iwakuni, Japan	30
Rhodia Brasil	Paulinia, Brazil	25
Zhenjiang LCY General Chemical	Zhenjiang, China	24
LCY Chemical	Lin Yuan, Taiwan	20
Mitsubishi Chemical	Mizushima, Japan	20
Arkema	La Chambre, France	15
KH Neochem	Yokkaichi, Japan	15
Ningbo Zhenyang	Ningbo, China	15
Taizhou Petrochemical	Taizhou, China	15
Jiande Xinhua Chemical	Hangzhou, China	10
Eastman Chemical	Kingsport, US	9
Carboclor	Campana, Argentina	8.5

TARUN RAIZADA HOUSTON

MEG

USES

In the US, monoethylene glycol (MEG) is mainly used in the production of polyethylene terephthalate (PET) bottle resin and in antifreeze/coolant. Unlike in Asia, use of MEG in the production of polyester is only a small outlet in the US market.

Additional applications for co-products diethylene glycol (DEG) and triethylene glycol (TEG) include de-icing fluids, surface coatings, unsaturated polyester resins (UPR), polyester polyols and natural gas dehydrogenation.

SUPPLY/DEMAND

US MEG supply was tight in the first quarter of 2017 as high prices in Asia created an export opportunity, drawing down domestic supply. There was also increased demand in the antifreeze sector during the winter season, along with some turnaround activity.

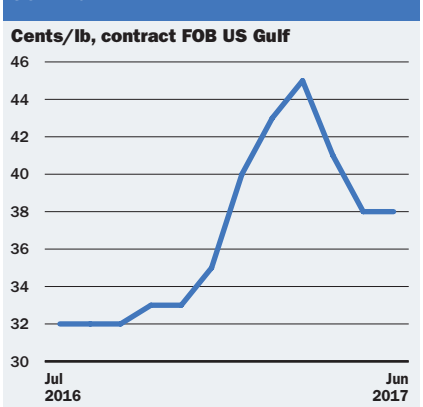
Significant volumes of MEG were exported to China for the first four months this year. Over 36,000 tonnes of MEG were exported to China in the period from January to April 2017, according to data from the US International Trade Commission (ITC).

Exports have also gone up to Mexico this year as sources have spoken of a producer there having problems with their upstream ethylene oxide (EO) unit, which has impacted glycols production. The market continues to remain tight and is likely to remain dependent on imports in the near future to fill in any supply gaps.

The supply situation did improve in the second quarter of 2017 due to two factors. First, prices in Asia fell sharply, closing the window for US exports to the region. Second, demand decreased as MEG entered a lull period. The peak season for antifreeze wound down, while the PET sector was in its off-season.

MEG demand is expected to increase when Mossi & Ghisolfi (M&G Chemicals) starts running its PET resin plant at Corpus Christi, Texas later this year. The plant will manufacture over 1m tonnes/year of PET resin.

US MEG



US MEG CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Shell Chemical	Geismar, Louisiana	400
Indorama Ventures	Clear Lake, Texas	358
Formosa Plastics	Point Comfort, Texas	300
Dow Chemical	Seadrift, Texas	285
LyondellBasell	Bayport, Texas	265
Huntsman	Port Neches, Texas	255
Eastman Chemical	Longview, Texas	105

PRICES

MEG contract prices decreased in May from April on the back of a softer US market and a bearish Asian market, and then rolled over in June. US MEG pricing often takes direction from price trends in the Asian MEG market.

The US MEG contract price saw four consecutive months of increases, before falling for two months in a row starting in April. The US May MEG contract price was assessed at 35-41 cents/lb ($772-904/tonne) free on board (FOB), a decrease of 3 cents/lb from the previous month.

There has been no notable increase in demand in June from the PET sector, despite the peak summer drink season being underway. Also, PET production may be getting affected somewhat by high isophthalic acid prices, according to participants. Isophthalic acid is a co-monomer used in the production of PET. Normally, it makes up just a small portion of the total production cost of PET, but large price increases can impact margins.

Meanwhile, co-product US DEG contract prices have seen seven consecutive months of increases. The DEG markets have remained bullish this year due to snug-to-tight supply stemming from turnaround activity and exports, along with delayed and seasonal demand from UPR in the construction industry and from polyurethanes. The US May DEG contract price was assessed at 43-51 cents/lb FOB, an increase of 2 cents/lb. June prices rose 1 cent/lb.

Co-product TEG markets have largely been flat, although there has been a pickup in demand from the oilfield sector, which has performed well this year. Prices have also gotten some upward momentum from the rise in co-product DEG prices, as some of the TEG is produced on-purpose from EO and DEG. US May TEG contract prices were assessed at 57-72 cents/lb FOB and prices rolled over in June.

TECHNOLOGY

Commercial production of EG is by the oxidation of ethylene in the presence of oxygen (or air) and a silver oxide catalyst to produce EO, the feedstock for EG. A crude EG mixture is then produced by the hydrolysis of ethylene oxide with water under pressure.

A typical production mix is 90% MEG, 9% DEG and 1% TEG. Fractional distillation under vacuum is used to separate the MEG from the higher glycols.

OUTLOOK

Demand for MEG is expected to be strong for the next couple of months. Summer is the peak season for the PET market and PET demand is expected to pick up due to increased bottled beverage consumption.

US MEG prices could increase during the peak season, although Asian MEG pricing trends will continue to have an influence.

US exports to Asia will hinge on MEG prices in the region, although recent prices there have not been high enough to encourage exports.

Huntsman is planning to conduct a maintenance turnaround at its EO/EG plant in Port Neches, Texas, during the second half of the year. The company conducts the maintenance once every four years and this round should last for two months, with the cash cost being $50m. ■

LINDA NAYLOR LONDON

LLDPE

USES/PRICES

Linear low density polyethylene (LLDPE) is a thermoplastic polymer used mainly in the film sector. More than 80% of global LLDPE is used as film for food and non-food packaging. Stretch film is used for industrial packaging and LLDPE can be used for a wide range of other applications.

LLDPE is manufactured by adding alpha-olefin co-monomers (butene, hexene or octene) during ethylene polymerisation to produce a number of different products with a range of densities depending upon the amount of co-monomer added. This results in a very wide range of final products with improved performance compared to traditional low density polyethylene (LDPE) as a result of the more linear structure.

Solution, slurry or gas-phase processes are used to produce LLDPE and many processes can produce products with densities lower than LDPE and into the high density polyethylene (HDPE) range. Usually, production plants tend to be focused on either LLDPE or HDPE but retain this inherent flexibility and often produce campaigns of either product. The introduction of metallocene catalysts has enabled the production of resins with narrow molecular weight distribution resulting in improved product quality (performance) sometimes at the expense of the easy processability of traditional LDPE.

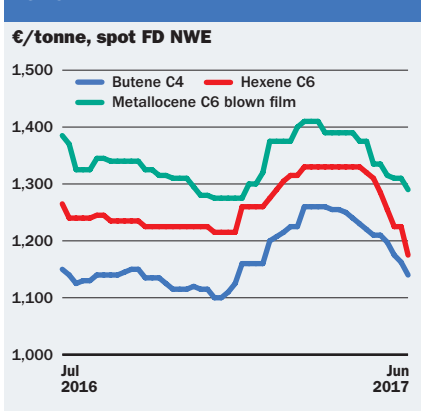
LLDPE prices have been falling significantly during the second quarter of 2017, on lower feedstock costs and subdued demand following a period of strong buying in the first quarter, when buyers built inventory.

In spite of some loss of spread between the ethylene contract price and LLDPE pricing, integrated producers still have good margins.

Most LLDPE special grades- such as hexene-based (C6) and octene-based (C8) LLDPE- are home-grown in Europe, but new C8 metallocene linear low density polyethylene (MLLDPE) production in South Korea is being offered, with many buyers saying prices would have to be on the level of C6 MLLDPE or even below for it to gain ground under current circumstances.

MLLDPE spot prices were lower again in the week ending 23 June, even though spot activity was muted as sources waited for the settlement of the July ethylene monomer contract. The upstream contract was widely expected to be lower, mainly on lower naphtha costs. Monthly MLLDPE prices are also down by more than the €35/tonne drop in the June ethylene contract, along with most of the wider polyethylene (PE) market. There was discrepancy between buyers and sellers over how much prices would finally fall by when retroactive settlements were done the following week.

EUROPE LLDPE



SUPPLY/DEMAND

LLDPE in Europe is currently in oversupply (June 2017). Increased capacity of MLLDPE in Europe and elsewhere is leading to competitive offers of both C6 and C8 MLLDPE, as well as new volumes of standard LLDPE grades globally – either already on line or imminent.

In India, Reliance's 350,000 tonne/year new MLLDPE plant was expected to start up in the second quarter 2017, and Chevron Phillips will bring on stream a 500,000 tonne/year MLLDPE plant ahead of the fourth-quarter 2017 cracker, to run on purchased ethylene.

Butene based (C4) LLDPE has long been a net imported product into Europe, with little locally produced volume remaining. Some high density polyethylene (HDPE) has been converted to MLLDPE, as well as some C4 LLDPE standard grade LLDPE. MLLDPE demand is growing rapidly, as downgauging becomes increasingly important, but supply is outstripping demand, and C8 MLLDPE sellers in particular are finding it hard to place volumes.

Regular standard C8 LLDPE has an established position in Europe, and C6 MLLDPE grades are well ensconced, leaving spare C8 MLLDPE volumes looking for a home.

An increasing number of annual contracts are being made between importers and large buyers, as shortages in 2015 continued to have their effect on the market, but European producers continue to hold the lion's share of non-commodity volumes in the LLDPE sector. Most sources expect imports to move in to Europe as Asian markets falter and new capacities start.

EUROPE LLDPE CAPACITIES '000 TONNES/YEAR

Company	Location	Capacity
Dow	Ternuezen, Netherlands	610
Dow	Tarragona, Spain	490
ExxonMobil	Notre Dame de Gravenchon, France	420
SABIC	Gelsenkirchen, Germany	350
INEOS	Grangemouth, UK	330
Nizhnekamskneftekhim (NKNK)	Nizhnekamsk, Russia	230
Dow	Schkopau, Germany	210
INEOS	Cologne, Germany	230
Versalis	Dunkirk, France	140
Uzbekneftgas	Shurtan, Uzbekistan	120
Borealis*	Stenungsund, Sweden	145
Borealis	Beek, Netherlands	120
Borealis**	Porvoo, Finland	120

*thought to be swing
**thought to be plastomers
NOTE: the above capacities are estimates and not always confirmed by the producer concerned

OUTLOOK

New capacity coming on stream in North America an d India is expected to keep supply plentiful. Competition between grades and sellers is expected to put a cap on pricing. EU producers have moved towards specialities in the LLDPE sector, minimising C4 LLDPE, but imports are expected to be moving towards Europe in the coming months. Many of the new capacities are based on ethylene from shale gas ethane, but the drop in naphtha has made Europe more competitive on feedstocks. ■

PATRICK HAN SINGAPORE

VCM

USES

Vinyl chloride monomer (VCM) is a colourless gas with a characteristic mild, sweet odour. Almost 98% of VCM is used exclusively in the manufacture of polyvinyl chloride (PVC). The remainder is consumed in PVC and chlorinated solvents. Rigid PVC resins provide the most growth.

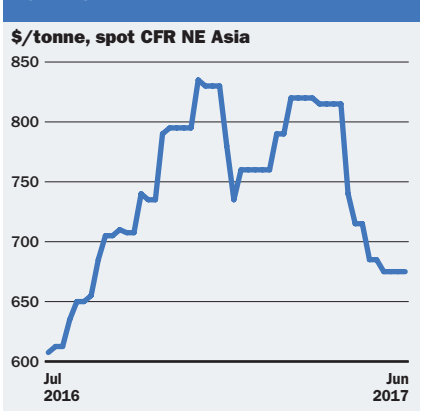
SUPPLY/DEMAND

In Asia, increased supply in the past 12 months has come mainly from Taiwan, China and Indonesia. Taiwan VCM Corp has increased its capacity to 450,000 tonnes/year from 420,000 tonnes/year after a debottleneck. Indonesia's Asahimas Chemical has increased its production from 400,000 tonnes/year to 800,000 tonnes/year by adding another production line. In China, Qingdao Haijing opened its new VCM production line of 400,000 tonnes/year at the end of 2016.

However, VCM import and export is limited as a component of total production. Trade is challenging as VCM is difficult to transport. More vinyls producers have become integrated players which produce VCM for their own PVC operations. Demand will be closely linked with PVC demand. PVC demand is expected to be stable in the coming months, thus the demand for VCM as well. Price increases will be difficult as supply is sufficient in this region, according to various sources.

VCM prices were on a roller-coaster ride in the first half of 2017, with prices peaking at $810/tonne CFR NE Asia in March before declining to $670/tonne CFR NE Asia in mid-June as buying interest in major markets such as India and China weaker. VCM prices moved in tandem with PVC prices.

ASIA VCM



TECHNOLOGY

Commercial production of VCM started in the 1920s, based on the catalytic hydrochlorination of acetylene. However, that route suffered from high energy costs and has become obsolete, except in China.

Nearly all production outside China is now based on ethylene. Ethylene is first reacted with chlorine to make ethylene dichloride (EDC). There are two routes commonly used to make the necessary EDC – direct chlorination using pure chlorine and ethylene; and oxychlorination, in which the ethylene reacts with chlorine in hydrogen chloride. The EDC is then converted to VCM by thermal cracking, and the hydrogen chloride byproduct can be recycled to an oxychlorination plant to make more EDC.

Many EDC/VCM complexes use an integrated chlorination-oxychlorination process for economic reasons. This process happens in three stages: (1) the chlorination of ethylene in the liquid or vapour phase to make EDC; (2) the thermal cracking of EDC to form VCM and hydrogen chloride; and (3) the oxychlorination of ethylene with recycled hydrogen chloride to make more EDC.

INEOS Vinyls (formerly EVC International) made a breakthrough a few years ago with its catalytic process for generating VCM directly from ethane, following tests at a pilot plant at Wilhelmshaven, Germany. The company claims a 20-30% reduction in production costs across the PVC chain for the process, which decouples VCM/PVC production from the cracker.

OUTLOOK

Looking ahead, there are no new VCM facilities coming on in the next year which means supply in Asia should be stable. As more vinyl producers become more integrated, spot trades of VCM are expected to be thin in Asia.

Some market players believe that with stable supply of upstream EDC to Asia, the price spread between EDC and VCM would widen as EDC prices soften on increased supply while VCM prices remain stable.

On the demand side, PVC demand will determine the demand for VCM and will also be the most crucial price driver. PVC prices are expected to remain stable or fall slightly in the coming months in Asia due to monsoon season and the newly implemented good and services tax (GST) in India, as well as lacklustre buying interest in China due to high inventory levels of buyers. ■

ASIA VCM CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Formosa Plastics	Jen-Wu, Taiwan	1,865
Beiyuan Chemical Industry	Shenmu, China	1,600
CNSG Changzhou Chemical	Changzhou & Chenzhou, China	1,234
Anhui Chlor-Alkali Chemical Group	Hefei, China	1,160
Anhui Huasu	Dingyuan, China	1,100
Fangda Jinhua Chemical	Huludao, China	1,060
Anlong Heavy Chemical	Anlong, China	1,000
Baotou Sea Level Polymer	Baotou, China	800
Befar Group	Binzhou, China	800
Benxi Dongfang Chlor-Alkali	Benxi, China	800
PT Asahimas Chemical	Cilegon, Indonesia	800
Hanwha Chemical	Ulsan, South Korea	800
Haohua Yuhang Chemical	Jiaozuo & Qinyang, China	800
Hebei Shenghua Chemical Industry	Zhangjiakou, China	800
Binzhou Ocean Chemicals	Zouping, China	780
Chemplast Sanmar	Karaikal, India	780
Chengdu Huarong Chemical	Pengxian, China	750
Dezhou Shihua Chemical	Dezhou, China	560
Finolex Industries	Ratnagiri, India	480
Gansu Xinchuan Chemical	Jinchang, China	450
Guangxi Liuzhou Dongfeng Chemical	Liuzhou, China	450
Taiwan VCM	Lin Yuan, Taiwan	450

ANGELINE SOH SINGAPORE

Isopropanol

Isopropanol (IPA) is a solvent that has usages in both industrial and personal care sectors. The major industrial outlets include adhesive, de-icers, inks, paints and coatings and pharmaceuticals. The personal care sectors include the hygiene products and cosmetics.

For the de-icers, its usage is in cleaning and drying during the manufacture of electronic parts and metals. For the pharmaceuticals, it is used as an aerosol solvent in medical and veterinary products.

IPA is also used in the extraction and purification of natural products, such as vegetable and animal oils and fats.

SUPPLY/DEMAND

In Asia, the total capacity is more than 1.5 million tonnes per year. In northeast Asia, the capacity per annum is at nearly 1.4 million tonnes while yearly capacities in southeast Asia and India are at 75,000 tonnes and 70,000 tonnes respectively.

The yearly demand in northeast Asia is estimated at 540,000 tonnes. In southeast Asia, the yearly demand is more than 85,000 tonnes while Indian's demand per annum is at 110,000 tonnes.

PRICES

Spot IPA prices in Asia were assessed as stable in the week ended 30 June. In southeast Asia, the prices were rolled over as the momentum was slow during Eid ul-fitr in the week in particular in Malaysia and Indonesia, which have predominantly Muslim populations. There was also a deal heard done within the range of assessment in the week ended 30 June for July arrival. Market players expected the momentum to speed up in July, when the restocking activities are expected to pick up after the Eid holidays. Meanwhile, in the domestic China market, prices were on the downtrend because there was weak demand amid the seasonal lull.

Looking back, prices were on the climb in the first quarter of the year, in tandem with feedstock acetone and propylene prices. Prices on a FOB NE Asia basis peaked at $1,010/tonne FOB NE Asia in H1 February. Prices on a CFR China basis peaked at $970/tonne CFR SE Asia in H2 March. Prices on a CFR SE Asia basis peaked at $1,015/tonne CFR SE Asia in H1 March.

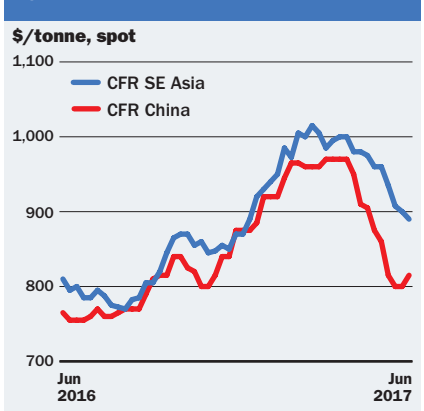
As the IPA prices lost its pillar of support from the upstream markets, they moved downwards in Q2 onwards. This is against the historical trend of Q2 being the peak season due to the conducive weather for production and downstream paint and coating usage.

Spot IPA prices were mixed amid thin trades in recent weeks. With feedstock prices on the rise, China preferred to sell domestically as more lucrative deals could be made, compared to exporting. Regional Asian producers also directed their attention to other markets as the Chinese import price indications were still deemed unattractive.

Southeast Asia spot offers, including cost and freight, were on the downtrend amid ample supply in the market. In northeast Asia, prices, on a free on board basis, rose because of the increase in feedstock acetone prices in China. Market players, monitoring both the acetone and propylene market closely, were optimistic that IPA prices will be stable in the coming weeks.

In the meantime, sellers continued to work on spot opportunities and negotiations were already underway for the coming months. Some sellers went further infield, seeking out possible deals in India and arbitrages available in the Middle East, and US Gulf markets.

ASIA IPA



TECHNOLOGY

Commercial production has been generally reliant on the following three routes:

- Direct hydration of chemical grade (90-99%) propylene, where there is no need for sulphuric acid
- Hydrogenation of acetone in the liquid phase
- Indirect hydration of refinery-grade propylene using sulphuric acid to form isopropyl sulphate, which is then hydrolysed with steam to form sulphuric acid and IPA. The crude IPA is distilled to the desired purity.

ASIA IPA CAPACITIES '000 TONNES/YEAR

Company	Location	Capacity
Kellin Chemical	Zhangjiagang, China	196
LG Chem	Yeosu, South Korea	150
Zhejiang Xinhua Chemical	Hangzhou, China	100
CNPC Jinzhou Petrochemical	Jinzhou, China	100
LCY Chemical	Lin Yuan, Taiwan	100
Super Chemical	Shouguang, China	100
Mitsui Chemicals	Takaishi, Japan	88
JX Nippon Oil and Energy	Kawasaki, Japan	85
Chang Chun Plastics	Panjin, China	84
Dongying Hi-Tech Spring Chemical Industry	Dongying, China	80
Shell Eastern Petroleum	Bukom, Singapore	75
Deepak Fertilisers and Petrochemicals	Taloja, India	70
Tokuyama	Tokuyama, Japan	70
Isu Chemical	Ulsan, South Korea	60
Dezhou Detain Chemical	Dezhou, China	50
Jiande Xinhua Chemical	Yancheng, China	50
Super Chemical	Yancheng, China	50
Tasco Chemical	Lin Yuan, Taiwan	30
Taixing Jianye	Taixing, China	30

OUTLOOK

H2 2017 is cautiously stable to weak. The pessimistic upstream outlook continues to weigh on IPA prices. Meanwhile, prices typically hit southwards in Q3 on the back of poor weather and slew of public holidays in the Asian region. As prices did not hit its peak in Q2, some players said the peak could manifest in Q3. ■

ZACHARY MOORE HOUSTON

Nylon

USES

The two major forms of nylon (polyamide) are type 6 and type 6,6. Nylon 6 is made from caprolactam (capro), which can be produced from benzene via cyclohexane or phenol.

Approximately 24% of nylon 6 is consumed in engineering resins, while the rest is used in nylon fibres.

Nylon fibres are made into textile, carpet and industrial yarns. Nylon resins are used in engineering plastics, with applications in automotive, fabric, carpeting, sportswear, recreational equipment, electronics and industrial components, as well as films for food packaging.

Nylon 6,6 is made from adipic acid and hexamethylene diamine (HMDA), which can be produced from adiponitrile (ADN) made from butadiene (BD) or, less often, propylene.

Nylon 6,6 is used predominately in the engineering plastics sector because it is tough and has good electrical insulating properties and noise dampening characteristics. That is why it is widely used for automotive applications.

SUPPLY/DEMAND

Nylon demand continues to grow because of its widespread use in the textiles, electronics, packaging and automotive industries. Additionally, the push for vehicles to be more fuel-efficient and environmentally friendly is expected to continue driving nylon demand.

Nylon consumption is expected to rise by around 2.5-3.5% by volume over the next few years. Specialty grades for niche applications may see even higher rates of growth.

Global nylon operating rates on average are said to be between 70-80%, suggesting that little additional capacity will be needed over the next few years.

On the supply side, availability of feedstock capro is said to be tight, which may result in some limitations on nylon 6 availability. However, no major supply disruptions have been heard in the US recently.

The nylon 6,6 market is more balanced, with sources stating that supply and demand balances are likely to remain balanced through the second half.

PRICES

Prices in the freely negotiated nylon 6 and nylon 6,6 markets witnessed considerable increases in the first half of 2017, tracking sharp upward movements in feedstock costs for benzene, butadiene and propylene.

Although some fresh increase announcements were recently announced for nylon 6, most participants are expecting freely negotiated prices for nylon 6 and nylon 6,6 to hold steady over the next few months now that feedstock costs have begun to change direction.

One participant stated that domestic prices in the US are likely to remain steady in the next few months while sellers looking to export to Asia may implement some reductions on their prices to maintain competitiveness in their target export markets.

The ICIS cost-plus methodology is mostly determined by monthly contract price movements of raw materials.

TECHNOLOGY

Nylon 6 is made from reacting capro with water and a molecular mass regulator, such as ethanoic acid. These elements are poured into a reaction vessel and heated under nitrogen at 500°K (227°C). An intermediate, aminocaproic acid, is produced. The process then undergoes condensation to polymerise the molecules.

For nylon 6,6 production, ADN is made from BD or propylene and then converted to HMDA.

Then, HMDA is mixed with adipic acid, which is made from benzene, to form a salt. Ethanoic acid is mixed into a solution with the salt, and the mixture is heated to about 500°K. As pressure develops, the temperature is raised to 540°K, and the steam bled off. The pressure is reduced, and the polymer is extruded under nitrogen to yield a lace, which is then granulated.

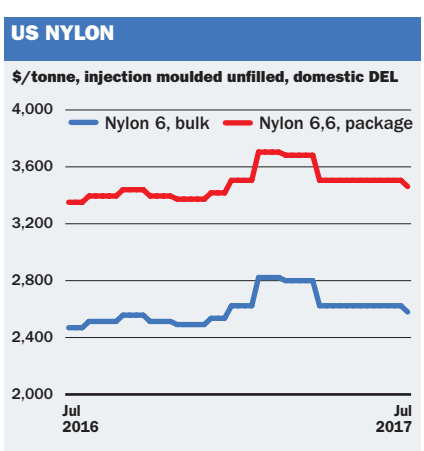
OUTLOOK

Nylon demand is expected to remain largely steady into the second half of the year in the US.

The construction market has been robust throughout 2017, although this has been partially offset by a year-on-year slowdown in automotive demand.

Participants, especially those looking to export material, will continue to track developments in Asia to get an idea of the global demand for nylon.

Inventories for nylon chip and yarn in Asia were heard to be balanced at the start of the third quarter while participants added that feedstock caprolactam supply may lengthen during the third quarter owing to some capacity expansion plans. ■



US NYLON 6 CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
AdvanSix	Hopewell, Virginia	204
BASF	Freeport, Texas	60
DSM	Augusta, Georgia	15
Custom Resins	Henderson, Nevada	13.5
Nylon Corp of America	Manchester, New Hapmshire	12
EMS-Grivory	Sumter, South Carolina	5

US NYLON 6,6 CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Ascend Performance Materials	Pensacola, Florida	95
DuPont	Richmond, Virginia	50
DuPont	Chattanooga, Tennessee	25

ANGELINE SOH SINGAPORE

MIBK

USES

Methyl isobutyl ketone (MIBK) is a colourless solvent, with low density, medium evaporation rate and high solvent activity.

Its main usages are for rubber tyre production, which is commonly seen in China; and for the painting and coating sectors, particularly in the marine industry in southeast Asia.

MIBK can also be used as an extraction agent in the dewaxing and deoiling of petroleum products, as well as in gold, silver and other precious metals from cyanide solutions.

It is used in synthetic resins including cellulosics, vinyl copolymers, acrylics, alkyds, polyesters, and epoxies. Other applications include electroplating solutions, fungicides, germicides, pharmaceuticals, and as a denaturant in ethanol formulations.

SUPPLY/DEMAND

The capacity in Asia Pacific stands at more than 260,000 tonnes/year. Of this figure, China leads the highest contribution at more than 100,000 tonnes/year, followed by Japan at 65,000 tonnes/year and Korea at 55,000 tonnes/year. There is no capacity in southeast Asia.

On the annual demand front in northeast Asia, China takes up more than 50% at 100,000 tonnes; Japan, 17% at 30,000 tonnes; South Korea, 14% at 26,000 tonnes and Taiwan, 13% at 24,000 tonnes.

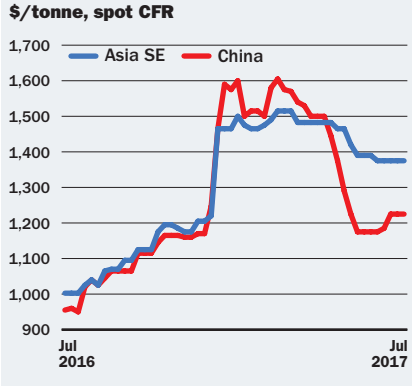
In south and southeast Asia, India has the highest annual demand, 42% at 12,000 tonnes; Thailand, 17% at 5,000 tonnes; Singapore and Malaysia, 14% at 4,000 tonnes; and Indonesia, 10% at 3,000 tonnes. Annual demand has been slowing down.

For instance, in China, Asia's biggest market, demand has been reduced from 150,000 tonnes in 2010, to 110,000 tonnes in 2013 to 90,000-100,000 tonnes in 2016.

This is largely due to the slowdown in global economies, which reduced the usage in downstream rubber tyre production and marine coatings.

Many users expressed their inclination to buy cheaper alternatives like butyl acetate whenever possible. Whilst the projections for China's economy are strong in 2017, many market players are unconvinced the optimism could trickle down to the MIBK sector.

ASIA MIBK



PRICES

Spot MIBK prices in both China and southeast Asia started off 2017 at their highest levels since December 2014, but volatile movements through Q1 soon gave way to a stable-to-soft Q2 in southeast Asia and a weaker first half of Q2 in China, in line with similar trends in feedstock acetone.

MIBK prices in China were largely stable-to-firm in the second half of Q2, but ample supply in the domestic Chinese markets have largely curtailed spot trade and resulted in limited price movements towards the end of Q2. Going forward, there are concerns that the commencement of commercial operations at Petro Rabigh's phenol/acetone project in Rabigh, Saudi Arabia, which has an acetone nameplate capacity of 160,000 tonnes/year, could weigh on acetone prices and also downstream MIBK prices as a result.

Spot prices for MIBK in Asia were assessed as stable in the week ended 11 July. Prices in China had been unchanged since late June while prices in southeast Asia had been rolled over since early June. Market players attributed the standstill in prices to balanced demand and supply fundamentals.

TECHNOLOGY

There are two ways to manufacture MIBK. It can be manufactured from acetone via a three-step process. Acetone undergoes aldol condensation to give diacetone alcohol, which dehydrates to give mesityl oxide. Mesityl oxide is then hydrogenated to produce MIBK.

ASIA MIBK CAPACITIES '000 TONNES/YEAR

Company	Location	Capacity
Dongying Yimeide Chemicals	Dongying, China	30
Jilin Chemical Group Fine Chemicals	Jilin, China	30
Zhenjiang LCY General Chemical	Zhenjiang, China	24
Ningbo Zhenyang	Ningbo, China	15
Taizhou Petrochemical	Taizhou, China	15
Jiande Xinhua Chemical	Hangzhou, China	10
Mitsui Chemicals	Iwakuni, Japan	30
Mitsubishi Chemical	Mizushima, Japan	20
KH Neochem	Yokkaichi, Japan	15
Kumho P&B Chemicals	Yeosu, South Korea	55
LCY Chemical	Lin Yuan, Taiwan	20

It can also be made from isopropanol (IPA) in a mixed ketones process with di-isobutyl ketone (DIBK) and acetone as coproducts.

OUTLOOK

The outlook for 2017 is cautiously pessimistic, due to recent dwindling usage.

In addition, the ongoing anti-dumping investigations for south Korean, Japanese and south African exports going to China are likely to further weigh on trade flows within northeast Asia.

Producers were noted to be seeking alternative markets, including southeast Asia and India, where the emerging markets could likely absorb the surplus.

However, these markets were unlikely to match the trade activity of China, hence resulting in an overall negative mood in 2017.

Beyond 2020, MIBK consumption for anti-ozonants is forecast to grow at a double digit rate in the Asia-Pacific region for both production and demand, as market players quoted from recent research. ■

PAVLE POPOVIC LONDON

Polyols

USES

Polyols are one of the components used to make polyurethanes, the other being an isocyanate. There are two main types of polyols: polyether polyols and polyester polyols.

Polyether polyols are the most widely used with the main applications being rigid and flexible polyurethane foams. Rigid foams are used mainly in insulation, refrigeration, packaging and construction while flexible foams have applications such as upholstery, mattresses and seats. Polyols can also be used in elastomers, adhesives, coatings and fibres.

Polyester polyols compete with polyether polyols but may be preferred in some rigid foam applications because of their low cost and improved flame retardant properties. Additionally, they can provide improved wear resistance, heat aging and chemical resistance in elastomers, coatings, sealants and adhesives.

SUPPLY/DEMAND

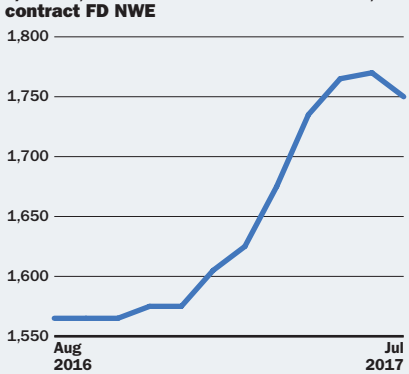
Polyols supply and demand can be affected by trends in the toluene di-isocyanate (TDI) market. As flexible polyols combine with TDI to make flex foam, which is used in furniture, bedding and transportation, trends in both markets can be interconnected.

The TDI market became tight at times in Europe in 2016 due to multiple planned maintenance works and German producer Covestro's force majeure in Europe on its TDI operations. The force majeure was declared in October 2016, although Covestro recommenced European TDI production in December. Supply in the market was also affected by the long-delayed opening of German producer BASF's Ludwigshafen TDI plant. The 300,000 tonne/year German facility began production in September 2016 only to be taken offline in November before coming back online in May 2017.

In the meantime, polyols producers found it difficult to sell volumes as customers were only willing to buy a limited amount while TDI was tight. Consequently, the polyols market in 2016 had periods of oversupply. In December 2016 a force majeure by Covestro on polyester polyols production across Europe, which ended in the same month, passed without creating availability issues. By January 2017, TDI supply difficulties eased allowing polyols sellers to sell more stock.

EUROPE POLYOLS

€/tonne, flexible slabstock conventional, contract FD NWE



PRICES

Towards the end of 2016, polyols prices were affected by feedstock propylene movements and the shortage of TDI. These price drivers led to the value of polyols remaining stable from August 2016 to the end of the year apart from one price increase in November.

In January 2017, polyols suppliers said that TDI availability issues had eased, therefore, they could increase prices. As polyols producers had been under upwards propylene pressure for most of 2016, they looked to regain margins at the start of 2017. A subsequent upwards trend for the polyols price midpoint occurred in the first half of 2017.

TECHNOLOGY

Polyether polyols are produced by the catalysed addition of epoxides, mainly propylene oxide or ethylene oxide, to an initiator having active hydrogens. The most common catalyst is potassium hydroxide. The reaction is carried out by a discontinuous batch process at raised temperatures and pressures under an inert atmosphere.

After polymerisation, the catalyst is neutralised and removed by filtration. The polyol is then purified. The choice of epoxides, initiator, reaction conditions and catalyst determines the physical properties of the polyol, which can range from low-molecular-weight polyglycols to high-molecular-weight resins.

OUTLOOK

The opening of Sadara Chemical Company's plant in Jubail, Saudi Arabia will add new capacity to the global polyols market. Sadara is a joint venture between the US's Dow Chemical and Saudi Arabia's Saudi Aramco.

There will be a 400,000 tonne/year polyether polyols unit at the plant with a 390,000 tonne/year capacity for feedstock propylene oxide (PO) at the facility too. Propylene oxide output at the Sadara site is, however, expected to only be used for captive use.

Sources said that any polyols material from the Sadara facility will not arrive to Europe, but instead will leave for regions such as the Middle East, Africa and Asia.

Subsequently, they said less exports will leave Europe resulting in increased domestic supply. The polyols unit was originally expected to open in mid-2017. However, at the beginning of July 2017, Sadara Chemical Company did not provide a status update on the polyols unit. ■

EUROPE POLYOLS CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Dow Chemical	Teureuzen, The Netherlands	530
Shell Chemicals	Pernis, The Netherlands	300
Covestro	Antwerp, Belgium	270
Covestro	Dormagen, Germany	250
BASF	Antwerp, Belgium	170
BASF	Schwarzheide, Germany	150
Repsol Quimica	Tarragona, Spain	150
Covestro	Fos, France	130
PCC Rokita	Brzeg Dolny, Poland	110
Oltchim	Rimnicu Vilcea, Romania	110
Dow Chemical	Tarragona, Spain	90
Huntsman International	Rozenburg, The Netherlands	86
Repsol Quimica	Puertollano, Spain	70
Polyol Belgium	Tertre, Belgium	55
Dow Chemical	Antwerp, Belgium	36

ROBBIE WILCOX HOUSTON

Orthoxylene

USES

Orthoxylene (OX) is the second largest of three commercial isomers of xylene. Nearly all OX output is consumed in the manufacture of phthalic anhydride (PA). PA has three major applications – as phthalate plasticizers used in compounding polyvinyl chloride (PVC), in unsaturated polyester resins (UPRs) for glass-reinforced thermoset engineering applications and in alkyd resins used for surface coatings.

Smaller outlets for OX are in solvents, though that is declining, and in bactericides, soybean herbicides and lube oil additives. A newer outlet is in the production of polyethylene naphthalate (PEN) polymer.

SUPPLY/DEMAND

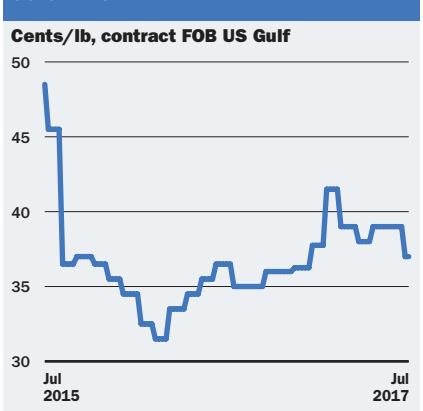
Supply and demand for OX has been said to be balanced so far this year. Buyers have not been heard to have had trouble procuring needed supplies of OX, while sellers have not been heard having had trouble selling OX.

Upstream, OX is tied to mixed xylenes (MX) as its major feedstock. Demand for MX was said to be steady heading into the traditional summer high season for many MX derivatives. Demand for gasoline in the US was disappointing during the second quarter due to the summer driving season in the US. Downstream, OX demand is strongly tied to PA, and PA consumption is largest in the downstream PVC market, whose major outlets include US housing and construction and the automobile industry.

US housing starts rebounded in June 2017 with an 8.3% jump from May. The June rise follows three consecutive months of declines, according to US Census Bureau data. Housing starts were up 2.1% from June 2016.

US new auto sales in June 2017 fell 3.0% from June 2016. June sales of new vehicles fell for the sixth consecutive month, according to AutoData. June sales of passenger vehicles plunged by 13% from June 2016. Major OX producers in North America include BP Chemicals, Chevron Phillips, ExxonMobil, and Flint Hills.

US ORTHOXYLENE



PRICES

OX monthly contract prices in the US market have been up and down since January 2017 and have risen only 0.75 cents/lb through July 2017. Prices have generally followed feedstock MX, which peaked with OX in February 2017.

The driver for this trend has been falling MX spot prices, which is driven by the North America gasoline market. MX traded at a discount to toluene for most of the second quarter before regaining a premium over toluene late in the quarter. The US market typically bases its OX price negotiations on trends in Asia, and OX contract price settlements drive downstream PA contract settlements.

In July, northeast Asia orthoxylene (OX) import prices continue to climb on the back of higher local Chinese prices and improvements in downstream PA market conditions, a trend likely to continue through September.

PA domestic prices in Asia had firmed on higher demand from the derivative markets that comprise phthalate plasticizers such as dioctyl terephthalate (DOP) and diisononyl phthalate (DINP). Encouraged by the healthy margins, some PA makers in Asia were looking to buy additional raw material to maintain stable operations, leading to an improvement in trading liquidity.

Asia OX supply is expected to remain tight as key producers in South Korea and Japan are undergoing maintenance and will not have any spot cargoes until mid-August.

Other OX makers are focusing production on the more lucrative co-product paraxylene (PX) and have no additional cargoes after meeting contractual and captive requirements.

TECHNOLOGY

OX comes from the production of mixed xylenes, which involves the high-severity catalytic reforming of naphtha. From this, a C8 stream contains ortho-, meta-, and PX, as well as ethylbenzene (EB). Xylenes are also obtained from the pyrolysis gasoline stream in a naphtha steam cracker and by toluene disproportionation (TDP). The xylenes are passed through a splitter, and the bottom stream, which contains a targeted amount of OX, is sent to an OX distillation column to produce high-purity product.

AMERICAS OX CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Flint Hills Resources	Corpus Christi, Texas, US	185
ExxonMobil Chemical	Baytown, Texas, US	130
LyondellBasell	Houston, Texas, US	120
Braskem	Camacari, Brazil	62
Braskem	Capuava, Brazil	50
Petroquimica de Venezuela	El Palito, Venezuela	48

OUTLOOK

Since OX comes out of the refining process with MX, it is affected by price movements in that market along with US crude oil prices.

Price movements of toluene and benzene also affect OX, as they come out of the gasoline stream with MX. OX contract price settlements will follow US spot MX prices, which may see some firmness at the start of the third quarter given the narrow spread between feedstock reformate. MX availability is likely to remain sufficient into the third quarter as most US refineries operated at high rates throughout the second quarter even while this year's summer gasoline season has been disappointing.

The supply of OX through the rest of this year is expected to be robust according to market participants. No major outages for OX plants are expected this year. Downstream, as PA demand declines with the move away from phthalate plasticizers, so would demand for OX. ■

Additional contribution from Hazel Kumari in Singapore

LINDA NAYLOR LONDON

Polypropylene

USES

Polypropylene (PP) is used in a wide range of consumer and industrial products with applications in packaging, fibres and automotive parts.

TECHNOLOGY

Main process licenses of PP technology in Europe include Innovene and LyondellBasell. The Innovene process employs gas-phase technology in its PP process. LyondellBasell's licensing process technology is called Spheripol; which combines bulk-phase polymerisation in a tubular loop reactor with gas-phase polymerisation for the production of block copolymers. The company has also developed multizone circulating reactor, called Spherizone, which can generate different materials and extend the range of properties of the PP produced.

In addition to this, Austria-headquartered Borealis has adapted its Borstar bimodal polyethylene (PE) process to make PP.

SUPPLY AND DEMAND

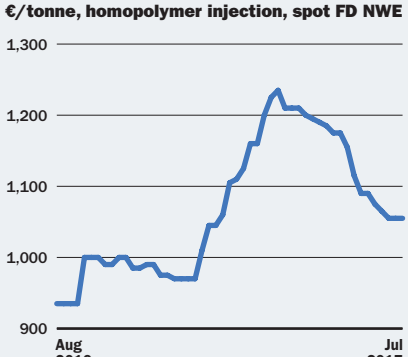
Supply and demand in Europe are well balanced, with some grades now depending on imports. Most imports are brought into Europe by producers that already have installed capacity within Europe, with less coming from traders with product from the Middle East and Asia.

South Korean imports continue to benefit from 0% import duty into Europe, while most Asian countries and all GCC (Gulf Cooperation Council) countries have a 6.5% duty applied. Indian PP has a 3% import duty applicable into the European Union (EU). New capacity in the PP sector has come mainly from China and India in recent months, with most new North American capacity being concentrated on PE. Some PP capacities initially planned for North America have been shelved, while a large swathe of PE output is imminent.

Czech producer Unipetrol is preparing the commissioning of an expansion at its Litvinov PP plant to bring annual capacity to 350,000 tonnes/year. The company said it had invested Czech koruny (Kc) 100m ($4.54m) to modernise its existing 275,000 tonne/year installation in order to add a further 75,000 tonnes/year. Most sources expect supply and demand to remain relatively balanced in in Europe.

EUROPE PP

€/tonne, homopolymer injection, spot FD NWE



PRICES

PP prices have been following movements in the upstream propylene contract sector pretty closely in the past months, and the spread has been fairly steady in 2017, with no change in the past three months as PP pricing has followed the propylene contract. Naphtha has softened so propylene and subsequently PP pricing have followed.

The UK PP sector has been impacted by the pound sterling which has had a rocky ride since the Brexit referendum in June 2016, when a small majority voted to exit the EU, and this is still continuing. On 1 June 2016, the pound was worth around €1.30, but the average for July was at €1.129, with the average for August already lower.

In recent months, UK buyers have faced more volatility than their European counterparts because of currency changes, and this could continue further, said sources.

Europe integrated domestic PP margins fell during the week ended 28 July on higher feedstock costs, the ICIS margin report showed on 31 July. Integrated PP margins for naphtha fell by 6.6% as feedstock costs rose by virtually the same percentage. New suppliers continue to see Asia as their preferred destination to sell to, and with European prices remaining relatively unattractive in global terms, this balance is expected to continue in the short-to-mid term.

OUTLOOK

With most new polyolefin capacity coming on stream in 2017 and 2018 and beyond dedicated to PE, and not PP, supply and demand are expected to remain in balance in Europe.

New suppliers continue to see Asia as their preferred destination to sell to, and with European prices remaining relatively unattractive in global terms, this balance is expected to continue in the short-to-mid term.

New PDH units in Europe are expected between 2019 (Grupa Azoty) and the early 2020s (Borealis and INEOS), and while PP investment remains on the back burner for most, as ethane-based PE continues to grab the attention of most, a new PP unit is being considered by Grupa Azoty, to be installed alongside the new PDH unit. The decision will be made during the fourth quarter of 2017. ■

Lane Kelley and Will Conroy contributed

EUROPE PP CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Total Petrochemicals	Feluy, Belgium	900
SABIC	Geleen, Netherlands	600
Borealis	Burghausen, Gemrnay	560
SABIC	Gelsenkirchen, Germany	510
LyondellBasell	Brindisi, Italy	445
Borealis	Schwechat, Austria	435
Repsol	Tarragona, Spain	390
Borealis	Beringen, Belguim	385
LyondellBasell	Berre, France	350
LyondellBasell	Wesseling, Germany	350
LyondellBasell	Tarragona, Spain	340
Braskem	Schkopau, Germany	320
INEOS Olefins and Polymers	Geel, Belgium	310
Borealis	Kallo, Belgium	300
Appryl (Total and INEOS)	Lavera, France	300
INEOS Olefins and Polymers	Grangemouth, UK	285
ExxonMobil	Lillebonne, France	270
LyondellBasell	Knapsack, Germany	250
Polychim	Dunkirk, France	230
Total Petrochemicals	Gonfreville, France	230
Braskem	Wesseling, France	225

TRIXIE YAP SINGAPORE

MTBE

USES

At least 90% of methyl tertiary butyl ether (MTBE) produced in Asia goes to the gasoline blending pool to boost octane levels – for example blending RON88 to 92 or RON92 to 95.

Up to 3-5% of the market uses it as a blending component for some end products.

The remainder of MTBE usage is to produce methyl methacrylate (MMA) – this is particularly prevalent in northeast Asia.

MTBE can also be used to manufacture pure isobutene by back-cracking, and this product is in turn used to make isobutylene isoprene rubber.

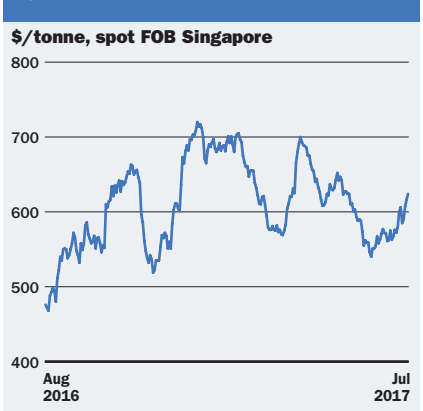
SUPPLY/DEMAND

Changes in the supply of MTBE have mainly been dictated by the new start-ups in China, since the market is relatively mature in the rest of Asia. Supply has been increasing since the start of 2017, with at least two new plants coming up in China with a combined capacity of more than 800,000 tonnes/year. Production rates of some plants were not as high as expected because of the lack of raffinate 1 or raffinate 2 feedstock and squeezed margins – a situation particularly prevalent in China.

On the demand front, the usage of MTBE continues to be focused on two types of gasoline blending – for higher RON95 or RON97 or for lower RON88-92, which is mainly used together with naphtha.

From the upstream gasoline perspective, demand to fulfil higher-RON gasoline is still mainly from Malaysia, the Middle East and Indonesia. The Vietnamese market could open for blenders because of the new taxation policies on gasoline cargoes loading from southeast Asia.

ASIA MTBE



PRICES

Asia's MTBE prices are assessed in tandem with RON92 FOB Singapore gasoline prices. The correlation between the two has remained high since the first half of 2017 and is expected to continue until the end of the year.

Prices have been persistently volatile amid mixed gasoline supply and demand fundamentals for the first half of 2017. On the other hand, the MTBE factor, which is a measurement of MTBE prices relative to RON92 FOB Singapore gasoline prices, has been between 1.12-1.25 for the first half of the year. This translates to a relatively stable market trend despite the volatility in gasoline prices.

Some upside pressures on both FOB Singapore prices and the MTBE factor were the opened arbitrage window for exports to China; stable buying activities in the key Singapore import market; and the lack of exports from China. Downside pressures were weak gasoline fundamentals in southeast Asia since the early year.

TECHNOLOGY

The key process for producing MTBE in Asia is the reaction between isobutene and methanol over a catalyst bed in either a liquid phase or mixed gas-liquid phase reactor.

Sulphuric acid is sometimes used as the catalyst in these reactions.

The dehydration of tert-butyl alcohol, which is produced as a by-product in the making of propylene oxide (PO), is the second way of producing MTBE. This technology, however, is limited within Asia to a few producers such as Hunstman Jinling and Wanhua Chemical.

OUTLOOK

Supply is likely to remain long until 2018, as several projects are still expected to start up in the last quarter of 2017 and first half 2018 within northeast Asia, especially in China and South Korea. The start-up of the new S Oil PO/MTBE swing plant in early 2018 is expected to be a game changer for northeast Asia, as South Korea is expected to switch from a net importer to a net exporter because of ample supply and the slow growth rate expected in the domestic gasoline sector.

In addition, government-led structural changes to the domestic gasoline market in China are likely to dictate its import-export position. The likelihood of the government limiting gasoline export quotas is high going into 2018 and there is the potential of China being more dependent on local production, instead of buying imported material.

Lastly, the Singapore market is not expected to see large fundamental shifts as it continues to remain a blending hub within southeast Asia, with MTBE trade flows still likely to be mainly from the Middle East. ■

ASIA, MIDDLE EAST MTBE CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
SABIC	Al-Jubail, Saudi Arabia	1,700
Wanhua Chemical	Shandong, China	780
Nanjing Jinling Huntsman New Materials	Jiangsu, China	750
Qatar Fuel Additives	Mesaieed Industrial Estate, Qatar	610
Lijin Petrochemical	Shandong, China	530
Shandong Yuhuang Chemical	Shandong, Chna	500
Emirates National Oil Company	Jebel Ali, Dubai	500
Yousen Technology	Guangdong, China	450
Panjin Heyun Industrial Group	Liaoning, China	450
Heilongjiang Anruijia Petrochemical	Heilongjiang, China	410
Shandong Shenchi Chemical	Shandong, China	400
Shandong Shouguang Luqing Petrochemical	Shandong, China	380
Shandong Dong Ming Petrochemical	Shandong, China	350
Dongying Boyuan Liquefied Petroleum/Jiahao Chemical	Shandong, China	350

NOTE: Top 14 sites

Click here to explore an interactive map of methyl tertiary butyl ether (MTBE) plants in Asia and the Middle East

MATTHEW CHONG SINGAPORE

TDI

USES

Toluene di-isocyanate (TDI) is used in flexible polyurethane (PU) foam, which has outlets in upholstery, mattresses and automotive seats.

Other uses include rigid foams and adhesives, paints, concrete sealers and as a crosslinking agent for nylon 6 and intermediates in PU coatings and elastomers.

SUPPLY/DEMAND

The spike in China domestic prices since early July was due to a sudden tightening of supply as availability of domestic cargoes was limited, market participants in China said.

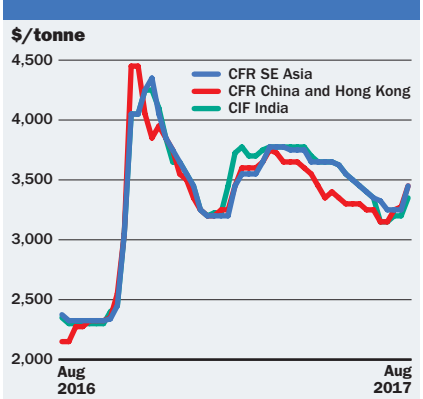
This was despite the fact that most producers were running their plants normally, except for Gansu Yinguang's plant located in northern China, which was shut for a turnaround from mid-July to early August.

Overall import availability from other northeast Asian TDI producing countries outside China, namely Japan and South Korea, was deemed ample although a South Korean producer has been short of cargoes in recent weeks.

Buyers had little choice but to accept suppliers' price hikes as their TDI stock inventories were low. These buyers have been purchasing TDI cargoes on a need-to-basis before the hikes as prices were on a gradual downtrend for most part of the year. Local producers said they have limited supply of cargoes despite that there are no major plant shutdowns in China, market participants in China said.

Downstream demand has been especially weak this year and there has not been any significant pick up in demand to justify the sharp increase in prices, the participants said.

ASIA TDI



PRICES

Domestic TDI prices in China skyrocketed by a cumulative 40% in the short span of four weeks to hit a 2017-high in early August amid tight local supply.

In early August, average domestic TDI prices in east China stood at yuan (CNY) 31,250/tonne DEL (delivered), according to ICIS data.

Before the price surge, average prices were at CNY22,550/tonne DEL east China in early July, ICIS data showed.

In the Asia spot import market, the extent of the price increases was much more subdued relative to China domestic prices. Buying interest remained muted, with buyers seemingly not tempted to stock up on cargoes despite the sudden rise in China domestic prices.

TECHNOLOGY

The main route is the nitration of toluene to dinitrotoluene, followed by catalytic hydrogenation to toluene diamine (TDA), which is dissolved in an inert solvent and reacted with phosgene to produce a crude TDI solution. TDI can also be produced directly from dinitrotoluene by liquid phase carbonylation with o-dichlorobenzene.

Germany's Covestro, formerly Bayer MaterialScience, developed a route that carries out phosgenation in the gas rather than the liquid phase. The technology was already commercialised at its world-scale 250,000 tonne/year TDI plant in Shanghai, China.

Covestro has also been running a 30,000 tonne/year pilot plant since 2004 and is thought to have used this technology in its new 300,000 tonne/year TDI plant in Dormagen, Germany, which came on stream in late 2014.

OUTLOOK

Asia TDI prices are expected to strengthen for the remainder of the third quarter, tracking the surge in China domestic prices in July and August, while the onset of the traditional peak demand season in September will also provide further support to prices.

China domestic prices will likely hit a ceiling in August/September and then begin to retreat as buying interest for higher priced cargoes had started to wane, with current supply-demand fundamentals unable to justify the sudden and sharp increase in prices. Asia import prices look set to stabilise in the fourth quarter and may soften if Sadara's 200,000 tonne/year TDI start-up in Saudi Arabia were to achieve on-spec production within this year. Sadara's TDI unit is expected to come on stream around October, market sources said. Sadara is a joint venture between Dow Chemical and Saudi Aramco.

Looking further ahead to 2018, prices will likely be on a downtrend as BASF's 300,000 tonne/year TDI unit in Ludwigshafen, Germany, is expected to be ramped up to full capacity next year. The Ludwigshafen unit, which was officially inaugurated in late 2015, has been running at low rates for most of 2017 due to technical trouble. ■

ASIA TDI CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Covestro	Caojing, China	250
Shanghai BASF Polyurethane Co (SBPC)	Caojing, China	160
BASF	Yeosu, South Korea	160
Cangzhou Dahua	Cangzhou, China	150
Hanwha Chemical	Yeosu, South Korea	150
Mitsui Chemicals & SKC Polyurethanes Inc (MCNS)	Omuta, Japan	120
Fujian Southeast Electrochemical Co	Fuqing, China	100
Gansu Yinguang	Baiyin, China	100
Yantai Juli	Yantai, China	80
Beifang Jinhua	Huludao, China	50
OCI	Kunshan, South Korea	50
Gujarat Narmada Valley Fertilizers Co (GNFC)	Dahej, India	50
Karoon Petrochemical	Bandar Mahshahr, Iran	40
Tosoh Corp	Nanyo, Japan	25
Gujarat Narmada Valley Fertilizers Co (GNFC)	Bharuch, India	17

Click here to see an interactive map of plant locations

GEORGE MARTIN HOUSTON

HDPE

USES

The major use for high density polyethylene (HDPE) is in blow-moulded products such as milk bottles, packaging containers, drums, car fuel tanks, toys and household goods. Film and sheet are widely used in wrapping, refuse sacks, carrier bags and industrial liners. Injection-moulded products include crates, pallets, packaging containers, housewares and toys. Extrusion grades are used in pipes and conduit.

SUPPLY/DEMAND

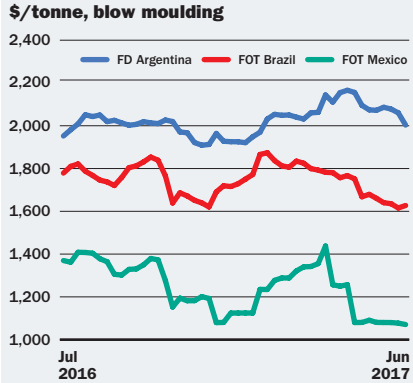
Even with the start of the worldscale Braskem Idesa plant in Mexico, Latin America demand for HDPE outstrips regional production. This situation has attracted imports from the US, and from other regions of the world. Asian products have frequently reached the Pacific coast of South America and products from the Middle East are competing to gain market share, too.

Venezuela's production of HDPE has encountered difficulties related to operational issues, lack of spare parts for industrial equipment, etc.

Uneven economic development in the region, political turmoil, inflation, corruption and lack of expertise have played a part in the regional slowdown. Demand for HDPE and other plastic resins has been steady despite the difficulties, and has even managed to grow with the demographic gains of the region.

However, projected ethylene and PE supply increases in the US Gulf are expected to fill the PE needs of Latin America, and other places. US domestic demand will not be enough to consume the volumes generated in the first wave of plants, much less the second wave of crackers and plants, expected in the early to mid 2020s.

LATIN AMERICA HDPE



PRICES

The major changes for HDPE in recent months come from the capacity addition that Braskem Idesa did in Mexico, starting in 2016.

Pemex does not have enough ethane/ethylene for its plants since Braskem Idesa started operations. This has caused a change in Mexico's PE market share conditions. Pemex has practically stopped the HDPE injection plant, running only the HDPE blow moulding plant when enough ethylene is on hand.

PEMEX's 300,000 tonne/year LDPE plant frequently runs with only two out of three production trains. The company gives priority to running the 300,000 tonne/year Morelos swing plant, used only for production of LLDPE, the only product that competitor Braskem Idesa does not produce. Braskem Idesa is also the reason for the decline of US exports to Mexico.

Prices in Argentina and Brazil are protected by high import tariffs, and as such, HDPE prices are much higher than those of Chile or Peru – two countries that have no local production, therefore no need for import tariffs.

Countries on the Pacific coast do not have industry to protect and allow imports from most places to enter the country unrestricted. Prices in those countries are very competitive, aligned with international prices.

The overall trend is expected to be a gradual decline as production grows in the US, together with the need to export higher volumes.

TECHNOLOGY

HDPE is produced by the catalytic polymerisation of ethylene in either slurry (suspension) solution or gas-phase reactors. Some processes can switch to produce LLDPE.

The choice of catalyst and/or the use of bimodal processes is used to modulate the quality of the output. The development of metallocene catalysts also allows slurry-loop operators to enter the LLDPE sector. Bimodal processes claim to produce resins competitive with those from metallocene.

OUTLOOK

Globally, the HDPE market is expected to grow at 6.3% annually through 2022, with demand rising in developing countries such as China, India and Brazil, according to market research by Mordor Intelligence. The Asia Pacific region should continue to lead global demand for HDPE, with North America's share at 23% and Europe at 20%.

Inexpensive shale gas in North America has spawned a boom in new US PE plants and this, in turn, has caused many of the PE projects planned in Latin America to cancel, with the realisation that the US products may have an insurmountable cost advantage.

The next potential PE project could materialise in Argentina, considering that the alliance between Dow and YPF could increase natural gas production in the Vaca Muerta shale gas play, but it is not clear what grade of PE will have production priority when that gas is available.

The eternal problem in Latin America has been the lack of resources such as ethylene and propylene.

A second wave of new PE units in the US is coming, also expected to raise capacity by double-digit percentages. Most of those volumes will be exported and this will continue to discourage the construction of new PE plants in Latin America.

With the new supply outstripping regional demand, HDPE prices will be under pressure in the next 18 months as US producers compete to place volumes. Some producers are still refusing to compete on price, but may change their minds when their market share starts shrinking. ■

LATIN AMERICA HDPE CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Braskem/Idesa	Coatzacoalcos, Mexico	750
Braskem	Triunfo, Brazil	400
Dow Chemical	Bahia Blanca, Argentina	270
Pemex Petrochemical	Morelos, Mexico	180
Braskem	Camacari, Brazil	160
Poliolefinas Internacionales (Polinter)	El Tablazo, Venezeula	160

Click here to see a more detailed version of this profile

VASILIKI PARAPOULI LONDON

Polystyrene

USES

Polystyrene (PS) is used in a variety of consumer and commercial products with major applications in domestic appliances, construction, electronics, toys and food packaging. Included in food packaging are food and dairy containers, closures, lids, produce baskets, vending cups and fast food containers.

Two main types of PS are produced: crystal or general purpose polystyrene (GPPS), which is a clear, amorphous resin with good stiffness and electrical properties but it is brittle; and medium and high impact polystyrene (HIPS), which contains varying levels of polybutadiene to improve toughness and impact resistance.

SUPPLY/DEMAND

The beginning of 2017 proved to be particularly difficult for the European PS industry due to the dramatic price movements of the European feedstock styrene barge contract, which was under upward pressure for nearly six months, since November 2016.

The volatility and the price level of styrene caused some serious headaches for European PS producers who faced big difficulties when trying to pass on the consecutive feedstock increases to their customers, while their demand was falling.

Moreover, the PS market had to fight on another front as well and that was the competition against other materials such as polypropylene or polyethylene terephthalate (PET), which were more affordable and reliable to the eyes of customers against PS.

Some buyers did manage to swap some volumes to these materials and reduce their cost, although some argued that the switch process was not easy in technical terms.

A ray of light in PS demand only started being obvious from late April onwards after the significant drops in feedstock styrene contract price that brought buying appetite back to the market as customers had been keeping their stock levels very low for several months.

Volumes were looking quite reasonable in June and July while producers were firm in their pricing, although customers still were not buying material to rebuild stock levels.

Ahead of the summer break for the southern part of the region, order books were looking busier before the traditional slowdown in August with key markets like Italy likely to be on holiday for the whole month.

PRICES

The European PS market followed the strong upward movement of feedstock styrene at the start of 2017 that took prices to historically record levels. Buyers had to change their strategy and purchase strictly on a "need-to" basis as it proved particularly difficult to pass on the increases to their customers.

The second quarter saw buying appetite coming back to the market as PS prices were decreasing tracking the downward correction of the styrene market. Nevertheless, producers remained quite firm with their pricing as inventories had been low for quite some time and buyers were then in real need of material.

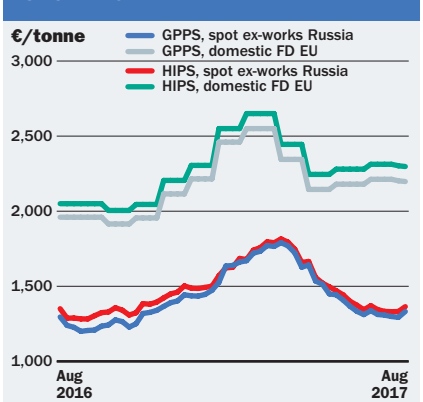
Import activity was quite subdued with only a few Asian offers seen in the market. Players, however, were reluctant to commit to any volumes that would not be arriving until September, given the volatility of the styrene market.

TECHNOLOGY

Three types of process are generally used: suspension, solution and mass polymerisation. PS was first commercially produced by the polymerisation of styrene feedstock in the 1930s. The two main types of polymers produced are a clear, crystal amorphous resin and an impact resin that contains varying levels of polybutadiene.

The solution route has the advantages of producing low residual monomer content and high-purity polymers; the suspension route produces polymers of different molecular weights and can thus make specialist crystal and high-impact grades of PS; and mass (bulk) polymerisation boasts the advantages of clarity and the excellent colour of the resins produced.

EUROPE PS



EUROPE POLYSTYRENE CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Styrolution	Antwerp, Belgium	475
Versalis	Mantova, Italy	285
Trinseo	Tessenderlo, Belgium	265
Styrolution	Wingles, France	180
Total	Carling, France	150
Trinseo	Schkopau, Germany	130
Gazprom	Salavat, Russia	110
Total	El Prat de Llobregat, Spain	110
Synthos	Kralupy, Czech Republic	87
Total	Feluy, Belgium	80
Baser Petrokimya	Yumurtalyk, Turkey	50
Synthos	Oscwiecim, Poland	50
Total	Gonfrevilee, France	50

OUTLOOK

Upstream feedstock styrene price movements will remain the main factor to define European PS values as well as demand for the rest of 2017. Most players appear still cautious in case styrene would turn volatile again as this could put demand in a downward spiral that will be difficult to sustain.

As the third quarter is drawing to a close, supply in the European styrene market remains tightly balanced amid concerns induced by production disruption at a number of facilities. Players were seen to be covering shortages, owing to the fresh declaration of force majeure at Moerdijk, the Ellba POSM plants running low due to the fire at Pernis, talk of a repair at the Maasvlakte site in the Netherlands and US imports being delayed. ■

AMANDA HAY HOUSTON

Soda ash

USES

Half of the world's soda ash is used in glass manufacturing to reduce energy use in production and lower viscosity of molten glass, providing increased flexibility in molding. Flat glass, such as windshields and residential windows, comprises 25% of global demand followed by container glass used for beverages and perfume at 19%.

Other types of glass, such as fibreglass and light bulbs, consume 6%.

Soda ash is also used as a sodium source in the production of chemicals such as sodium phosphates, sodium silicates and sodium bicarbonate (baking soda).

It is used as a raw material for chrome and photographic chemicals. These chemical uses account for about 18% of global soda ash demand. Chemical demand is experiencing steady to slight growth.

Soda ash is also added to powdered household detergents and soaps, functioning as a surfactant carrier and alkali source for pH adjustment as well as a filler. Detergents account for 15% of global soda ash demand, but that is decreasing with greater movement toward liquid detergents.

The remaining demand for soda ash comes from uses in water treatment, flue gas desulfurisation and pulp and paper.

SUPPLY/DEMAND

Because of strong global demand for natural soda ash, particularly from China, US producers are running their plants at full utilisation.

US SODA ASH

US production was 5.82m tonnes for the first half of 2017, up slightly from the same period in 2016. For the year, domestic output is expected to remain flat to 2016's 11.8m tonnes.

Demand-wise, just over 55% of US soda ash is exported. Domestically, demand is expected to increase slightly in 2017 with growth coming from the flat glass, fibreglass and chemicals end markets. Container glass demand is expected to remain flat.

PRICES

In 2017, US soda ash contract prices are down slightly from 2016 to $202-222/short ton. The US market runs on annual contracts, which typically settle around the start of the year.

US prices may increase for 2018 if the market remains steady. Some 2018 price indications have emerged with early initiatives separately seeking price hikes of $6/short ton.

TECHNOLOGY

In the US, natural soda ash is mined from a trona ore deposit in Green River, Wyoming. The four big US producers are Tata, Ciner, Solvay and Tronox. In August 2017, Tronox announced the sale of its soda ash business to Genesis Energy for $1.325bn.

The deal is expecetd to close in the second half of 2017. India-based Nirma owns Searles Valley Minerals.

Trona is mined with a bore miner, and the ore is transported to the surface, where it is converted into usable soda ash.

Natural soda ash accounts for 26% of global capacity, with the US making up 20% of that. Natural soda ash is cost advantaged compared with synthetic soda ash. Synthetic soda ash accounts for 74% of global capacity, with China making up 42% of the world's synthetic capacity.

Synthetic soda ash can be produced via two different processes – Solvay (or Ammonia Soda) or Hou. With Solvay, the major inputs are salt, limestone and thermal energy, and the only major byproduct is calcium chloride, which is sold as road salt.

Calcium chloride is also used to increase the water hardness in swimming pools. Other uses can be found in food, medicine, concrete, additives in plastics and fabric softeners.

In the Hou process, the first few steps are the same as the Solvay process, but ammonium chloride supplants calcium chloride. The byproduct ammonium chloride can be refined, used as a fertilizer and may have greater commercial value than calcium chloride, thus reducing the extent of waste beds.

US SODA ASH CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Tronox	Green River, Wyoming	3,220
CINER Group	Green River, Wyoming	2,950
Solvay	Green River, Wyoming	2,690
Tata Chemicals	Green River, Wyoming	2,540
Nirma (Searles Valley Minerals)	Argus, California	1,320
Tronox	Granger, Wyoming	1,180

OUTLOOK

Demand is strong both domestically and for US exports, particularly in the flat glass end market. Steady to slow growth is expected to continue for the US.

The global market remains tight as demand continues to grow and ineffective capacity has been rationalised because of prohibitive production costs or due to environmental regulation.

Chinese demand reached a record 24m tonnes in 2016 and continues to grow at mid-single-digit rates.

For natural soda ash, US and Turkish product are expected to remain sold out. Ciner's new natural soda ash plant in Turkey, which is expected to come online in September, will be key to the supply outlook.

The Turkish plant will have a total capacity of 2.5m tonnes/year, with product to be sold in the global market.

A Turkish source said it will increase global supply at a time when availability is expected to lessen, especially in Asia.

If start-up of the new capacity is phased in through late 2018, it should be in line with demand growth, a US source said. ■

PAVLE POPOVIC LONDON

PTA

USES

Purified terephthalic acid (PTA) occurs as a white, crystalline powder with a slightly acidic odour. PTA is a low-risk hazard to health but prolonged exposure should be avoided. In addition, PTA dust can be explosive, and it reacts strongly with oxidants. The substance can irritate the eyes and skin. Nearly all PTA is consumed in polyester production including polyester fibre, polyethylene terephthalate (PET) bottle resin and polyester film.

Modern technologies produce PTA by the catalytic liquid phase oxidation of paraxylene (PX) in acetic acid, in the presence of air. The process uses manganese or cobalt acetate as a catalyst.

SUPPLY/DEMAND

The PTA market was disrupted by force majeures in late 2016 and early 2017. In October 2016, Polish energy major PKN ORLEN declared a force majeure on its 600,000 tonne/year Wlocklawek PTA plant, which then restarted in November 2016. At the time, an arbitrage window between Asia and Europe opened in response.

After this, UK energy major BP announced a force majeure in February 2017 at its site in Geel, Belgium, which produces a total capacity of 1.4m tonnes/year. The force majeures were caused by two separate and unconnected machinery failures. The European PTA and downstream PET markets tightened in response with the force majeure lifted in April.

Thai producer Indorama Ventures Ltd (IVL), soon after, in April, began an expansion of its Rotterdam, the Netherlands, facility. It completed the enlargement in July, which allowed the plant to produce 700,000 tonnes/year. The firm said that the plant previously produced 380,000 tonnes/year and that, after the expansion, the company was producing 1m tonnes/year of PTA including its Spanish site.

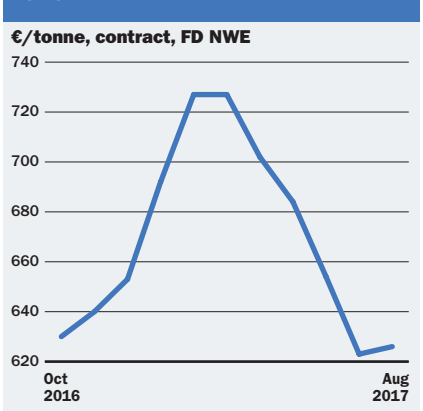
Around the same time in June, anti-dumping investigations into South Korean PTA imports to the EU were terminated with no duties imposed by the European Commission. Sources said in June that South Korean import purchases increased having decreased in April as market participants awaited a decision on the investigation.

Originally, European PTA sources said that they expected the market to tighten if EU anti-dumping duties were imposed on South Korean imports. They anticipated that Mexican imports would fill in any potential gap made by the absence of South Korean material. Mexico has a free trade agreement with the EU. However, it has been mentioned that Mexican companies are not interested in selling PTA to Europe primarily as they instead deal mostly with the Americas. Consequently, Mexican PTA is not as competitive as South Korean PTA in the EU.

Eurostat data in July 2017 showed that terephthalic acid (TA) imports from South Korea increased from March to April 2017 by around 4% but decreased from April to May 2017 by roughly 4% as well.

Furthermore, April 2017 imports from South Korea remained at similar levels year on year while in May, in the same year, they dropped year on year.

EUROPE PTA



PRICES

PTA contract prices are assessed based on the movements of upstream PX. Consequently, between November 2016 to February 2017, PTA prices increased in line with settlements for the raw material. After stabilising in March, the contract softened continuously to July 2017.

TECHNOLOGY

Modern technologies produce PTA by the catalytic liquid-phase oxidation of PX in acetic acid, in the presence of air, using a manganese or cobalt acetate catalyst. The reaction is exothermic, producing water, which is removed in a solvent recovery system. Acetic acid from this is returned to the reactor together with the oxidation catalyst. The resulting PTA is purified in a crystallizer, where the unreacted xylene and water are flashed off. Some plants have been modified to also produce isophthalic acid by substituting metaxylene for PX.

EUROPE PTA CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
BP Chembel	Geel, Belgium	1,400
Artlant PTA	Sines, Portugal	700
Indorama Holdings Rotterdam	Rotterdam, Netherlands	700
PKN Orlen	Wloclawek, Poland	600
Indorama Ventures Quimica	San Roque, Spain	350
Indorama Ventures Quimica	San Roque, Spain	325
OAO Polief	Blagoveshchensk, Russia	272.6
PCK Raffinerie	Schwedt, Germany	85
Petkim Petrokimya Holding	Aliaga, Turkey	70

OUTLOOK

Much market attention will be focused on whether Artlant PTA's 700,000 tonne/year plant in Sines, Portugal will restart having been shut down due to financial difficulties. There was market talk of the situation becoming clearer in October 2017 potentially.

While, the European and Asian PTA markets could also be affected by downstream PET regulatory changes. Japan began an anti-dumping investigation into Chinese PET imports in September 2016.

In August 2017, Japan found that Chinese imports were sold at prices 40.41-53.85% below domestic market rates. A decision on the duties is expected by market sources in late 2017. If duties are imposed on Chinese PET, this could lead to more imports to the European market.

Additionally, EU anti-subsidy duties are set to expire on Indian PET in May 2018, unless an expiry review is initiated. This too, could result in an increase of PET imports to the European market. ■

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HAZEL KUMARI SINGAPORE

Orthoxylene

USES

Orthoxylene (OX) is the second largest of the three commercial isomers of xylene. The majority of OX is used to make phthalic anhydride (PA), to manufacture flexible polyvinyl chloride (PVC) and unsaturated polyester resins and alkyd resins. Minor uses of OX include solvent applications, soya bean herbicides, bactericide lubricant additives and polyethelene naphthalate.

SUPPLY/DEMAND

China, with 34 end-users, is Asia's largest importer of OX. However, the prolonged weakness in the overall plasticizer markets have led some PA producers to cap their long-term plant utilisation rate at around 50%. Thereafter, domestic Chinese producers were facing mounting OX supply amid limited downstream demand.

OX started the year on a strong note as Chinese PA makers were actively seeking feedstock ahead of the Lunar New Year holiday. China's OX imports saw a 91% month-on-month jump in January at 48,484 tonnes.

However, northeast Asian demand slowed as consumption dropped amid lower PA operating rates and government enforced plant closures in China. By June, Chinese OX imports fell to 29,914 tonnes. Most end-users deemed trading conditions in the plasticizer chain as weak. Moreover, Chinese appetite for import cargoes was hampered by consistently high inventories at shore tanks along east China.

Key OX makers in Japan have scaled back rates to limit losses amid expensive feedstock isomer-grade xylene costs. According to a trader, there were no spot cargoes available from Japan as two main producers, JX Nippon and TonenGeneral, were manufacturing just enough OX to meet contractual and domestic obligations because of eroded margins.

In Taiwan, Formosa Chemical and Fibres Corp (FCFC) has ceased exports of spot OX since March due to a turnaround. Similarly, spot supply from South Korea saw a reduction due to a month-long turnaround from SK Global Chemical (SKGC) in June and lowered output from Lotte Petrochemical.

PRICES

Discussions on a CFR NE Asia basis were on an uptrend for most of January and February because of pre and post Lunar New Year restocking activities and strength in the domestic China market.

On 9 July, a bulk carrier Tian Sheng 18 collided with petrochemical tanker Shuang Long Hai, which was transporting 2,580 tonnes of OX, in Changzhou along the Yangtze river, causing a fire at the pipelines and the closure of operations at the jetty. Thereafter, the end-user was purchasing cargoes from the local China market, citing shorter delivery timeframe and limited regional spot availability, pushing domestic discussions higher. However, prices fell by the end of July, weighed by weak demand in China – in part a consequence of the government's crackdown on pollution, as well as softening downstream prices.

TECHNOLOGY

OX comes from the production of mixed xylenes, which involve the high-severity catalytic reforming of naptha. From this comes a C8 stream containing orthoxylenes, methaxylenes and paraxylenes, as well as ethylbenzene.

Xylenes are also obtained from the pyrolysis gasoline stream in a naphtha stream cracker and by toluene disproportionation (TDP). The xylenes are passed through a splitter where the bottom stream, with a targeted amount of OX, is sent to a distillation column to produce high-purity product.

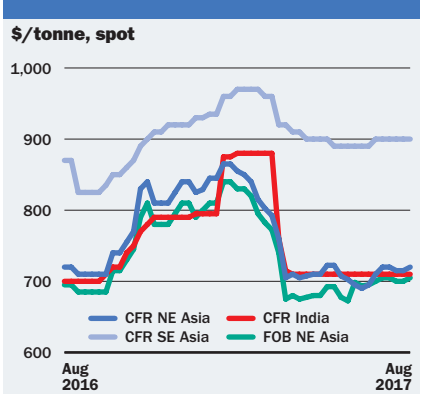
OUTLOOK

Asia OX might strengthen in Q3 on seasonal demand for plasticizer material. However, others expect the price hike to be minimal as Chinese buyers remain cautious amid an uncertain outlook. Some players raised concerns that despite curtailed supply stemming from reduced operating rates and firm co-product paraxylene (PX), end-users are adequately covered by term volumes and will have no spot requirements.

Singapore's Jurong Aromatics was acquired by ExxonMobil which is looking to increase the premiums for August to December term volumes. On that basis, some traders will be holding out for "a certain price".

Outside of China, firm demand for PA from India and the Middle East would encourage end-users to maintain high operating rates. Some suppliers have started stockpiling in anticipation of improving demand. ■

ASIA ORTHOXYLENE



ASIA ORTHOXYLENE CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Reliance Industries	Jamnagar, India	512
Formosa Chemicals and Fibre Corp	Mailiao, Taiwan	475
ExxonMobil Chemical	Jurong Island, Singapore	326
Yangzi Petrochemical Co (YPC)	Nanjing, China	260
Lotte Chemical	Ulsan, South Korea	250
SK Global Chemical	Ulsan, South Korea	200
Zhenhai Refining and Chemical Co (ZRCC)	Ningbo, China	160
Jilin Petrochemicals	Jilin City, China	120
JX Nippon Oil and Energy	Kawasaki, Japan	100
Sinopec Hainan Refining & Chemical	Yangpu, China	100
Dalian Fujia Dahua Petrochemical	Dalian, China	100
Sinopec Jinling Petrochemical	Nanjing, China	100
PTT Aromatics and Refining	Map Ta Phut, Thailand	86
CNOOC-Kings Group	Huizhou, China	80
Liaoyang Petrochemical	Liaoyang, China	60

NOTE: Top 15 plants listed by capacity

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ZACHARY MOORE HOUSTON

TDI

USES

Toluene di-isocyanate (TDI) is used in flexible polyurethane (PU) foam, which has outlets in upholstery, mattresses and automotive seats. Other uses include rigid foams and adhesives, paints, concrete sealers and as a crosslinking agent for nylon 6 and intermediates in PU coatings and elastomers.

SUPPLY/DEMAND

TDI supply has been tight across the globe throughout the past 12 months. BASF's 300,000 tonne/year plant in Ludwigshafen, Germany has either been shut down or running at reduced rates since November 2016. The main reactor at the plant had to be replaced and the company has been running the plant at reduced rates with a smaller reactor for some time.

In addition, Sadara's new 200,000 tonne/year TDI plant in Saudi Arabia started up in August 2017 after an extended delay. Sources said that commercial production from the new plant has yet to be achieved. Supply tightness worsened following the landfall of Hurricane Harvey in the US Gulf Coast, which lead to Covestro declaring force majeure on TDI supplies from its 220,000 tonne/year plant in Baytown, Texas.

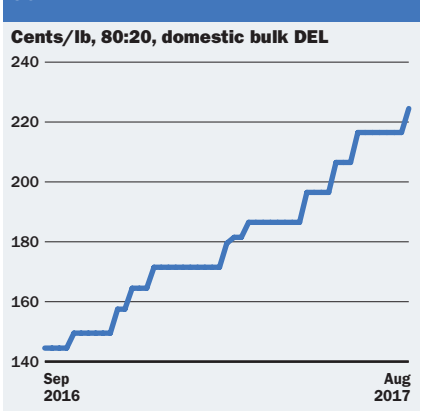
PRICES

Driven by persistent supply tightness, North American TDI prices have increased significantly over the past 12 months. ICIS has raised its TDI assessments by a cumulative 53 cents/lb ($1,168/tonne) since the beginning of 2017 and prices are up by a total of 75 cents/lb since November 2016.

Suppliers have nominated a series of price increases throughout 2017, most of which have seen full or at least partial implementation as supply limitations have left buyers with little room to negotiate, especially given healthy demand for downstream polyurethane systems.

Buyers complain that persistently rising raw material costs have compressed converter margins. Some buyers able to do so have experimented with substituting methyl di-p phenylene isocyanate (MDI) for TDI, although this is not possible in all TDI applications. Additionally, prices for MDI have also shown significant year-on-year price increases.

US TDI



TECHNOLOGY

TDI has two isomers: 2,4-TDI and 2,6-TDI. The most common form of TDI offered commercially is an 80/20 mixture of the 2,4- and 2,6-isomers, but it is also ava ilable as a 65/35 mixture and as a pure 2,4-isomer.

The main route is the nitration of toluene to dinitrotoluene, followed by catalytic hydrogenation to toluene diamine (TDA), which is dissolved in an inert solvent and reacted with phosgene to produce a crude TDI solution. TDI can also be produced directly from dinitrotoluene by liquid phase carbonylation with o-dichlorobenzene.

Germany's Covestro, formerly Bayer MaterialScience, developed a route that carries out phosgenation in the gas rather than the liquid phase. The technology was already commercialised at its worldscale 250,000 tonne/year TDI plant in Shanghai, China. Covestro has also been running a 30,000 tonne/year pilot plant since 2004 and is thought to have used this technology in its new 300,000 tonne/year TDI plant in Dormagen, Germany, which came on stream in late 2014.

OUTLOOK

TDI prices are likely to see further increases over the medium term, but prices may start to move lower in late 2017 or early 2018 as new capacities start to come online while existing plants begin to return to normal operations.

GLOBAL TDI CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Covestro	Dormagen, Germany	375
BASF	Ludwigshafen, Germany	300
Covestro	Caojing, China	250
Covestro	Baytown, Texas, US	220
Sadara	Al Jubail, Saudi Arabia	200
BASF	Yeosu, South Korea	160
BASF	Geismar, Lousiana, US	160
BorsodChem	Kazincbarcika, Hungary	160
Shanghai BASF Polyurethane Co (SBPC)	Caojing, China	160
Cangzhou Dahua Group	Cangzhou, China	150
Vencorex	Pont-de-Claix, France	125
Mitsui Chemicals & SKC Polyurethanes (MCNS)	Kashima, Japan	120
Mitsui Chemicals & SKC Polyurethanes (MCNS)	Omuta, Japan	120
Fujian Southeast Electrochemical (SEEC)	Fuqing City, China	100
Gansu Yinguang TDI	Baiyin, China	100

NOTE: Top 15 companies

As supply normalises, buyers are likely to push for lower prices in an effort to repair margins, which have seen considerable compression in 2017 owing to significant price increases for TDI as well as other polyurethane feedstocks.

TDI demand growth has been healthy in the US for much of 2017, although there has been some slowdown in demand for new vehicles. Clean-up efforts following Hurricane Harvey, which may prove to be the most economically devastating natural disaster in US history, may give a boost to TDI demand in the construction, furnishing and automotive sectors over the next several months. ■

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IZHAM AHMAD SINGAPORE

MDI

USES

About 80% of the global consumption of methyl di-p-phenylene isocyanate (MDI) is used in polyurethane (PU) foams. The largest outlet is in rigid foams used in construction, refrigeration, packaging and insulation. MDI is also used to make binders, elastomers, adhesives, sealants, coatings and fibres. Other outlets include binders and microcellular products.

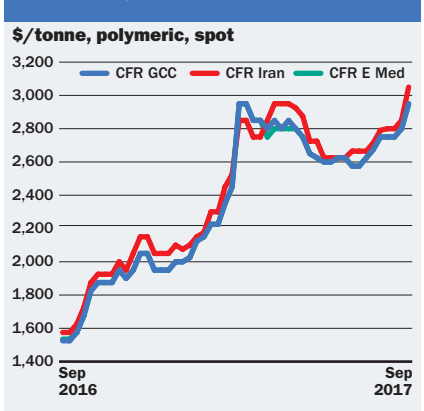
Polymeric MDI (PMDI), when combined with rigid polyols, is used in refrigerators, as well as insulation in the construction sector. Monomeric MDI (MMDI) or pure MDI, when combined with adipic acid, butanediol (BDO) and methyl ethyl ketone (MEK), is used as a pre-polymer for applications in shoe soles, adhesives, thermoplastic polyurethane (TPU) resins, spandex and synthetic leather.

SUPPLY/DEMAND

In the Middle East, demand is believed to be primarily for PMDI, used largely in the construction industry. 2017 has been a roller-coaster year for PMDI so far and possibly more swings are expected over the remainder of the year as supply gets a bump from the entry of Sadara's operations.

Currently over half of the world's PMDI is produced in northeast Asia and the world's major producer is currently China's Wanhua Chemical, which has a total production capacity of 1.8m tonnes/year. Prior to June 2017, Iran's Karoon Petrochemical was the only Middle Eastern PMDI producer, although it produced PMDI mainly for its domestic market from a 40,000 tonne/year installation in its southwestern Mahshahr petrochemical special economic zone. Sadara's PMDI production, which was officially announced in June, will add an additional 400,000 tonnes/year of capacity into the PMDI market.

MIDDLE EAST MDI



PRICES

In the Middle East, PMDI prices started the year on an uptrend and within the first three months, prices had hit their highest levels since ICIS began tracking the pricing data in August 2011.

The trend was mirrored some extent by prices in China and southeast Asia. Since then, prices have eased but are still well above where they had started in 2017.

Taking prices in the Gulf Cooperation Council (GCC) as representative of the broader Middle East region, PMDI prices started the year around $1,950/tonne CFR GCC before rising a full $1,000/tonne to hit $2,950/tonne CFR GCC by around mid-March. GCC prices began to ease from late-March and the decline picked up pace over the April/May period.

In July, CFR GCC prices stayed largely in a $2,525-$2,575/tonne CFR GCC range before rising again in August, to hit a high so far of $2,750/tonne CFR GCC amid talk of tighter supply and as prices in other regions such as Asia rebounded again.

TECHNOLOGY

MDI is made primarily from nitrobenzene, which is produced by the nitration of benzene in a continuous or batch process. Nitrobenzene is then hydrogenated to aniline, which is condensed with formaldehyde to form diphenylmethane diamine. This is reacted with phosgene in solvent to yield an isocyanate mixture, then MMDI is distilled under reduced pressure.

An MDI plant's output is 70-80% PMDI and 20-30% MMDI. This ratio moves within a narrow range and is not easily adjustable, according to industry sources. Sadara's Jubail plant however is believed to be producing only PMDI, industry sources have said.

MIDDLE EAST AND ASIA MDI CAPACITIES '000 TONNES/YEAR

Company	Location	Capacity
Wanhua Chemical	Ningbo, China	1,200
Wanhua Chemical	Yantai, China	600
Bayer MaterialScience	Caojing, China	500
Sadara Chemical	Jubail, Saudi Arabia	400
Tosoh	Nanyo, Japan	400
Kumho Mitsui Chemicals	Yeosu, South Korea	200
Huntsman Polyurethanes Shanghai	Caojing, China	160
Shanghai BASF Polyurethane	Caojing, China	160
Sumika Bayer Urethane	Niihama, Japan	70
Tosoh (Ruian) Polyurethane	Ruian, China	70
Karoon Petrochemical	Bandar Mashahr, Iran	40

OUTLOOK

The outlook for PMDI is somewhat hazy as Sadara is believed to be ramping up production but as yet is not heard to have achieved on-spec output nor have full-scale commercial operations believed to have started.

Tight supply conditions in Europe and the potential for higher prices tend to drive producers to direct cargoes to these regions instead of the Middle East and inadvertently causing Middle East supply to shorten as well.

Northeast Asia and Europe are expected to account for about 68% of global PMDI consumption in 2017, according to the ICIS Supply and Demand Database, while the Middle East is expected to account for just 2% of total global consumption. Sadara is eventually expected to market its PMDI cargoes to the Middle East but for the moment sales efforts led by Dow are believed to be focused on regions such as NE Asia and Europe, according to market sources. Longer-term however, PMDI production is still expected to outpace consumption globally and the Middle East will be no exception. ■

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LARRY TERRY HOUSTON

TiO2

USES

Titanium dioxide (TiO2) is a white powder pigment highly desired for its brightness and high refractive index. It is used in paints and coatings, including glazes and enamels, plastics, paper, inks, fibres, foods, pharmaceuticals and cosmetics.

TiO2 is also resistant to discolouration under ultraviolet light in exposed applications, and is used in plastics and sunscreens. It is also used in photocatalysts, found in light-emitting diodes (LEDs), liquid crystal displays (LCDs) and electrodes for plasma displays. Because the major use of TiO2 is in the mature paints and coatings market, as well as the plastics compounding, paper and paperboard industries, consumption tends to follow general economic trends.

SUPPLY/DEMAND

In North America, supply has been constrained since global capacity rationalisation by some of the US-based producers ensued in Q2 2016, and by increased demand in early 2017.

Among domestic capacity reductions was Chemours' 2016 shutdown of its 150,000 tonne/year Edgemoor plant outside Wilmington, Delaware, US. That and separate measures by other producers were designed to ease chronic oversupply in the domestic TiO2 market. The capacity cuts, combined with improved demand, tightened supply.

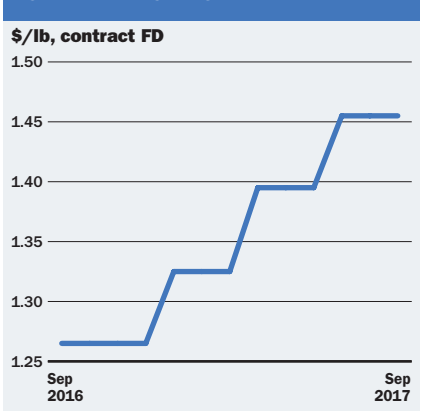
Although peak spring 2017 demand diminished partly on weather conditions as summer began, a producer in the primary downstream paint market said buying interest increased in mid-summer to more typical seasonal levels.

The paint maker attributed that partly to lower-than-usual paint inventory levels and labour shortages among paint contractors that may have spurred some pent-up demand.

While some sources say extenders or opaque polymers that lessen the need for TiO2 are gaining traction, other sources suggest TiO2 prices would have to rise substantially higher for the use of extenders to escalate seriously.

Economic factors that could inhibit TiO2 demand include recent declines in US August auto sales and construction spending, both of which help drive the domestic TiO2 industry.

NORTH AMERICA TIO2



PRICES

Quarterly contract prices have increased from a mid-range of $1.20/lb in Q1 2016 to $1.45/lb in Q3 2017. Prior to that, prices had been falling due to oversupply, competition from imports and plentiful, low-priced raw material ilmenite.

Separate Q4 increase initiatives from four of the five largest domestic producers are as follows:

- Huntsman's spinoff Venator Materials seeks an 8 cent/lb increase, effective 1 June.
- Chemours seeks a gain of 6 cents/lb for its standard TiO2 products, with an effective date of 1 July.
- A Kronos customer said the producer plans to increase its price by 6 cents/lb, effective 1 July.
- A Cristal customer said the producer is seeking a 6 cent/lb ($132/tonne) increase for its regular grades of TiO2, effective 1 July.

Opinions about the success of Q4 price efforts vary. Some sources predict seasonal demand weakness and said steady price gains for more than a year will stymie Q4 price efforts until early 2017 but that the eventual effects of Hurricane Harvey are not yet known.

TECHNOLOGY

TiO2 can be produced from ilmenite ore, rutile or titanium slag. Titanium pigment is extracted by using either sulfuric acid (the sulfate process) or chlorine (the chloride route). The sulfate process employs simpler technology than the chloride route and can use cheaper, lower-grade ores.

However, sulfate-based material is generally more expensive to produce. With the sulfuric acid treatment, a sulfate-route plant is more expensive to build than a chloride-route plant.

TIO2 CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Chemours	New Johnsonville, Tennessee, US	400
Chemours	Altamira, Mexico	360
Chemours	DeLisle, Mississippi, US	400
Tronox	Hamilton, Mississippi, US	225
Cristal	Ashtabula, Ohio, US	245
Louisiana Pigment	Lake Charles, Louisiana, US	156

The chloride process, however, may require the construction of a chlor-alkali unit. The chloride route produces a purer product with a tighter range of particle sizes, and is preferred by North American customers, but anatase pigments (used in acetate fibres, for example) can be produced only via the sulfate route.

Milling and surface treatment of the base pigment can account for up to a third of the cost of a TiO2 plant, but it maximises optical properties, improves durability, reduces yellowing and improves dispersibility.

OUTLOOK

Recovery from Hurricane Harvey will create a spike in North American TiO2 demand, sources on both sides of the market conceded. Some say it may surface unseasonably before the end of the year, but others say it will heighten typically resurgent Q1 buying interest and upward price pressure amid ongoing snug supply.

While the domestic TiO2 market may have been only moderately affected by storm-disrupted logistics, paint and coatings markets will see interest spike from new construction, rebuilds and the need for other items that employ pigment, including tarps, trash bags and window profiles.

But countering that heightened demand will reduce availability – at least short term – as it is expected to take several months for the US Gulf Coast to recover from Harvey. ■

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MELISSA HURLEY LONDON

Ethylene oxide

USES

Nearly all ethylene oxide (EO) produced by the direct oxidisation of ethylene air of oxygen. EO is primarily used as an intermediate. The majority of EO output is used in the production of ethylene glycol.

About 65% of global output is converted to monoethylene glycol (MEG) for polyester fibers, resins and antifreeze formulations and PET film for packaging. More than 7% is used in diethylene glycol (DEG) and triethylene glycol (TEG).

DEG is used in polyols, unsaturated polyester resins and plasticisers. TEG's main use is in natural gas dehydration and as a dehumidifier.

The second largest derivative production is ethoxylates used in applications such as shampoo and kitchen cleaners.

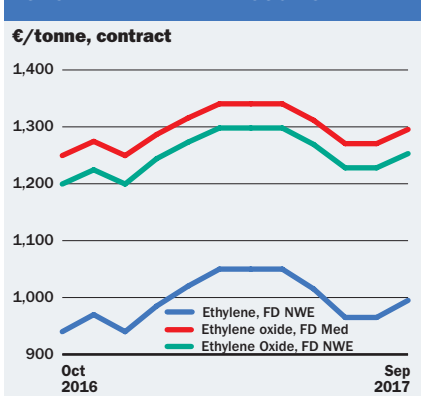
Other derivatives include glycol ethers (used in solvents and fuels), ethanolamines (used in surfactants and personal care products), polyols for polyurethane systems, polyethylene glycol (used in toothpaste and medicines) and polyalkylene glycols (used in antifoam agents and hydraulic lubricants). EO is very explosive and difficult to transport over long distances.

SUPPLY/DEMAND

During the heavier turnaround period at the beginning of summer 2017, supply was viewed as balanced-to-tight. Supply and demand levels are currently in line with expectations; however, supply could tighten with a couple of planned turnarounds happening in Q3/Q4 2017. EO derivative demand was noted to be performing well with a minor dip in demand seen over summer.

Earlier in 2017, Huntsman and Clariant announced a planned merger of equals. HuntsmanClariant, are proceeding as planned with an unchanged closing target for December 2017/January 2018. Earlier in the year, Clariant's CFO conceded that the firm's Care Chemicals division is strong in emerging markets like Brazil or India but has little access to the US market. With Huntsman's presence in that market, the merger also makes sense for Clariant to make an entrance into the US for its products there.

EUROPE ETHYLENE VERSUS EO



PRICES

The vast majority of EO contracts are formula-based, with price movement comprising 80-85% of the change in the monthly ethylene contract price. ICIS uses an average of 82% for the ethylene contract price in its calculations.

The EO price includes a conversion fee over the cost of ethylene, which is negotiated at the beginning of the year. Depending on the terms of individual contracts, the fee can be revised annually or fixed for several years at a time. 2017 adder negotiations took place at the end of last year. Some producers targeted small increases over 2016 levels and the assessed range widened in line with market feedback from players on both sides of the market that suggested a mix of rollovers and slight increases were achieved for 2017 adder levels.

In the first two months of 2017, the European MEG market saw two consecutive triple digit increases in MEG contract prices, while spot prices reached their highest levels since June 2015. MEG contract prices dropped after that but returned to an upward trend during the summer along with spot prices. Several factors such as higher ethylene feedstock costs, climbing prices in Asia and squeezed supply contributed to the latest upward momentum in prices.

TECHNOLOGY

EO is produced by the direct oxidation of ethylene in the presence of oxygen or air over a silver oxide catalyst. A crude EG mixture is then produced by the hydrolysis of EO with water under pressure. Fractional distillation under vacuum separates the MEG from DEG and TEG.

ETHYLENE OXIDE CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
BASF	Antwerp, Belgium	500
INEOS	Antwerp, Belgium	420
BASF	Ludwigshafen, Germany	345
Shell	Moerdijk, Netherlands	305
SIBUR	Dzerzhinsk, Russia	300
INEOS Oxide	Cologne, Germany	290
Nizhnekamskneftekhim	Nizhnekamsk, Russia	270
INEOS	Lavera, France	250
Clariant	Gendorf, Germany	240
Sasol	Marl, Germany	215
Dow	Terneuzen, Netherlands	195
IQOXE	Tarragona, Spain	140
AkzoNobel	Stenungsund, Sweden	100

Japan's Mitsubishi Chemical developed a catalytic process that employs a phosphorus-based catalyst for converting EO to MEG with very little formation of the higher glycols. The UK's Shell Chemicals acquired exclusive rights to this process and licenses a combined EO/MEG technology as an integrated Omega (only MEG advanced) package. In China, a coal-based technology via synthesis gas and oxalic acid has been commercialised.

Eastman Chemical and Johnson Matthey Davy previously developed a two-step MEG process based on synthesis gas and methanol that does not go via an oxalate intermediate.

OUTLOOK

European EO sources do not foresee vast changes from the current dynamics seen in the market and demand is expected to remain at a good level. Despite a couple of turnarounds still set to take place, the year should finish in a balanced state of supply. ■

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HELEN LEE SINGAPORE

VAM

USES

Vinyl acetate monomer (VAM) is used in water-based paints, adhesives, acrylic fibres, paper coatings and nonwoven binder applications. Approximately 47% of VAM production goes into polyvinyl acetate (PVA), which is a primary molecule in paints, adhesives and other coatings. Around 30% of VAM output goes into polyvinyl alcohol (PVOH), which is used in packaging film and glass laminates.

The remaining percentage of VAM volumes goes into ethylene vinyl acetate (EVA) polymers, ethylene vinyl alcohol (EVOH) barrier resins and polyvinyl butyral (PVB), which is used in automobile windows. EVA and EVOH are providing new areas for usage in co-polymers for specialty adhesives and packaging films.

SUPPLY/DEMAND

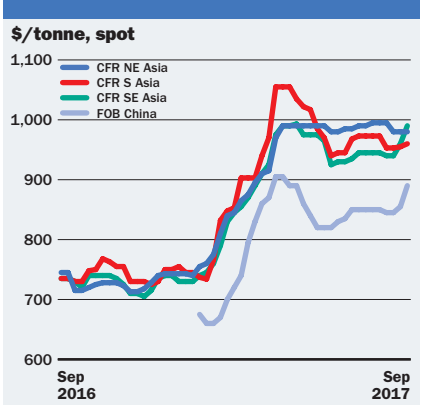
VAM supply in Asia tightened during February-May 2017 as seven out of 13 plant turnarounds scheduled for the year to date occurred during that time. Monthly export volumes from Singapore to Europe, the US and India in Q2 2017 meanwhile registered year-on-year growth in the range of 25-40%.

Concerns about the global supply balance heightened in late August as the impact on VAM production in the US in the aftermath of Hurricane Harvey led to expectations that supplies from Asia would be directed to Europe in light of the shortage of US origin cargoes.

In the longer term, demand growth will stem mainly from the downstream EVA sector in China, which may lead to VAM capacity expansions in the country. Jiangsu Sailboat Petrochemical commenced EVA production at its 300,000 tonne/year EVA/LDPE plant in Lianyungang, Jiangsu province on 12 July 2017. The producer planned to produce EVA grades with vinyl acetate (VA) content of above 18% from the second half of September 2017 onwards.

The new demand along with ongoing production issues at two VAM plants in China, which curtailed the availability of spot lots for export to southeast Asia and India, may continue to bolster the sentiment of suppliers. Demand in Asia outside China is mainly stable.

ASIA VAM



PRICES

Spot prices in Asia were lifted to multi-month highs by late April to May 2017 due to tight supply and escalating prices in the Europe market. Supply was curtailed during Q2 2017 due to plant maintenance shutdowns in Asia and the US, coupled with production issues at the Singapore- and Saudi Arabia-based plants.

The supply of spot VAM cargoes from China was initially limited for May-June due to increased captive consumption for the production of PVOH but this eased by early May. The availability of lower-priced non-ethylene based VAM cargoes from China subsequently weighed on the sentiment of buyers in India and southeast Asia, resulting in reduced discussion levels for July deliveries of ethylene-based VAM.

Firming feedstocks ethylene and acetic acid costs in Q3 prompted a major producer to seek price hikes in mid-August. Several buyers, however, were of the opinion that the current state of supply was sufficient to meet demand in Asia and so they were largely resistant to price hikes.

TECHNOLOGY

VAM is usually produced by the catalysed, vapour phase reaction of acetic acid with ethylene and oxygen in a fixed bed tubular reactor using a supported noble metal catalyst. The VAM is recovered by condensation and scrubbing, and purified by distillation.

OUTLOOK

The demand growth in Asia stems mainly from the downstream EVA sector. There are 11 new EVA projects in the pipeline scheduled to come onstream in China from 2018-2020 and beyond. These EVA projects have combined production capacities of 1.7m tonnes/year. However, it remains to be seen how much of these capacities eventually come through. Challenges posed to the demand side include the price of substitutes such as butyl acrylate for the production of paints. Besides price considerations, butyl acrylate was deemed by downstream paint manufacturers to offer better quality for water-based paints and better performance.

India's VAM import demand grew 13% year on year in 2016. In the first five months of 2017, India imported around 43% of the previous year's total annual import volumes.

In southeast Asia, the import volumes in the first half of 2017 suggested a stable demand outlook. In the first six months of 2017, Thailand has imported around 49% of the previous year's total import volume. ■

ASIA VAM CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Dairen Chemical	Mailiao, Taiwan	650
Sichuan Vinylon Plant	Chongqing, China	500
Sinopec Great Wall Energy and Chemical	Yinchuan, China	450
Inner Mongolia Mengwei Technology	Wulancha, China	450
Dairen Chemical	Jurong Island, Singapore	350
Celanese (Nanjing) Chemical	Nanjing, China	300
Inner Mongolia Shuangxin Chemical	Erdos, China	270
Ningxia Dadi Chemical	Shizuizhan, China	260
Lotte BP Chemical	Ulsan, South Korea	210
Celanese Singapore	Sakra, Singapore	210
Hunan Xiangwei	Dajiangkou, China	200
Beijing Eastern Petrochemical	Beijing, China	180
Nippon Gohsei	Mizushima, Japan	180
Showa Denko KK	Oita City, Japan	175
Anhui Vinylon Plant	Chaohu, China	170
Japan VAM & Poval	Sakai, Japan	150
Dairen Chemical	Tasheh, Taiwan	120

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CHRIS BARKER LONDON

PVC

USES

Polyvinyl chloride (PVC) is available in rigid or flexible form. Rigid has the largest demand, particularly in construction where it is used for pipes and fittings and in window profiles. Flexible PVC, which contains a large amount of plasticizer, has outlets in calendared sheet, wire and cable coating, flooring and furniture.

SUPPLY/DEMAND

The European PVC market has moved in a more balanced direction after being structurally long for most of the decade following the financial crisis. Demand has recovered in parallel with the rosier economic outlook in many areas of the Eurozone including Spain and France.

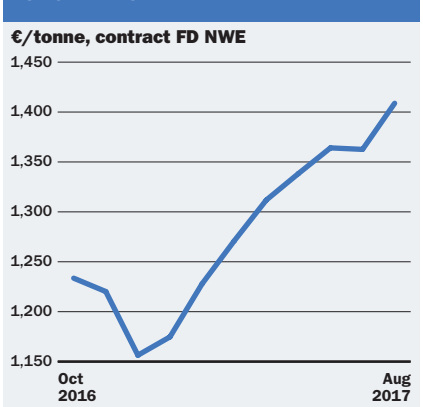
Domestic demand has also been strong in NWE. Germany in particular saw a surge in construction in 2017 due to economic confidence combined with increased profile demand due to greater construction of housing.

Demand in the UK has been lukewarm for the year so far but not strongly affected by uncertainty surrounding Brexit and the economic situation.

Export demand has been weak since approximately 2014 due to economic issues in Turkey, the largest European export market.

Demand in Turkish plastics markets has been structurally weak since 2014 due to the Syrian and Iraqi wars affecting the country's access to export markets, the collapse of the lira against the dollar and political turmoil related to a coup attempt in 2016. Turkish PVC demand has fallen between 10-10% since 2015-2016.

EUROPE PVC



However, consumption appeared to stabilize then increase slightly in the first half of 2017 with notable increases in Russian, South Korean, Hungarian and German imports compared to the previous year.

The global market has tightened in the wake of American and Mexican production issues, following storm damage in the southern USA. This has temporarily tightened European export markets and limited imports into Europe.

PRICES

PVC prices have been generally firm in 2017, with NWE PVC contract price rising overall by slightly more than €90/tonne against the feedstock ethylene cost increase this year.

This was due to healthy demand in the Eurozone combined with strong export prices in H1 2017, as well as limited supply from major European producers during the same period.

For the September contract, the outcome is so far uncertain with producers aiming for a price increase of more than the cost increase for feedstocks.

In the UK, producers also aimed to regain margins due to the depreciation of the pound against the Euro, although the strengthening of the pound in mid-month presents an obstacle for larger price increases.

TECHNOLOGY

Suspension polymerisation is the most common process because the resins are the most versatile.

Emulsion polymerisation is used to form latexes with a fine particle size more suitable for paints, paper, fabric finishes and printing inks.

Mass polymerisation gives a powder resin that produces high-clarity film.

OUTLOOK

European PVC is a mature market with no major changes in capacity announced over the next year.

From 2018 onwards, there is the potential for a bottleneck in PVC feedstock ethylene dichloride (EDC) due to the closure of almost of million tonnes of chlorine capacity in Europe, which combined with ethylene is the major feedstock for EDC.

The global EDC market will become tighter, which could pose a challenge for the remaining capacity in Spain and the central/eastern Europe with no cell basis.

However, possible external sources for EDC are still available in the Middle East and the US.

On a global scale, the Chinese carbide polyvinyl chloride market has tightened in the second half of 2017 due to stronger environmental regulation.

Combined with consistently strong demand growth in India, averaging over 10% per year between 2005-2015, as well as limited capacity expansion in India, this is likely to tighten the overall global market.

However, due to the expansion of US capacity combined with increased integration with ethylene, any European exports would face strong competition. ■

EUROPE PVC CAPACITIES '000 TONNES/YEAR

Company	Location	Capacity
INOVYN	Jemeppe, Belgium	470
Shin-Etsu (CIRES)	Pernis, Netherlands	450
Vestolit	Marl, Germany	430
BorsodChem	Kazincbarcika, Hungary	400
VYNOVA	Wilhelmshaven, Germany	380
Anwil	Wloclawek, Poland	340
INOVYN	Rheinberg, Germany	320
INOVYN	Tavaux, France	320
Kem One	Balan, France	300
INOVYN	Newton Aycliffe, UK	290
Kem One	Berre, France	290
Vinnolit	Burghausen, Germany	260
VYNOVA	Mazingarbe, France	255
INOVYN	Martorell, Spain	240
VYNOVA	Beek, Netherlands	225
Cires	Estarreja, Portugal	215
Kem One	St Fons, France	210
Vinnolit	Cologne, Germany	210
INOVYN	Stenungsund, Sweden	202
Ercros	Vilaseca, Spain	200
Vinnolit	Knapsack, Germany	160
INOVYN	Porsgrunn, Norway	150
Spolana	Neratovice, Czech Republic	135
Vinnolit	Gendorf, Germany	120
KEM ONE	St Auban, France	70

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LANE KELLEY HOUSTON

VAM

USES

Vinyl acetate monomer (VAM) is a chemical building block used in a wide variety of industrial and consumer products. VAM is a key ingredient in emulsion polymers, resins, and intermediates used in paints, adhesives, coatings, textiles, wire and cable polyethylene (PE) compounds, laminated safety glass (used in automotive windshields), packaging, automotive plastic fuel tanks and acrylic fibres. It is also used in furniture glue and chewing gum.

Most end-use markets for VAM are mature, with growth in the largest applications – adhesives, paints, paper coatings and textiles – expected only to track or trail GDP slightly. However, there are strong growth areas for VAM such as ethylene vinyl alcohol (EVOH) barrier resins, ethylene vinyl acetate (EVA) polymers and polyvinyl butyral (PVB).

SUPPLY/DEMAND

Hurricane Harvey struck the Texas coast in late August 2017 and disrupted many chemical markets, including US VAM.

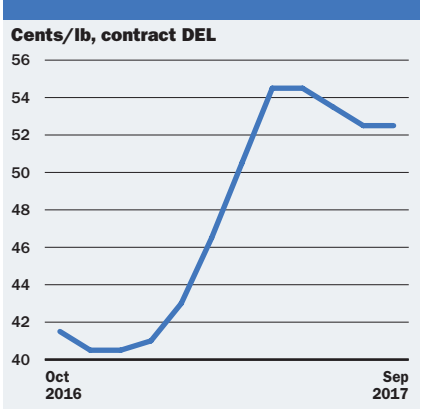
Celanese and LyondellBasell declared force majeure on US VAM because of Harvey, with LyondellBasell also announcing allocations. Dow issued sales control orders on several monomers as well, including VAM. Dow also increased lead times for VAM supplied in North America because of logistics constraints following the storm.

Five US VAM plants – all in the Houston area – account for about 20% of global capacity and have become key suppliers of European imports.

Global VAM plant capacity totals about 8.5m tonnes/year, with more than half of the capacity at plants in the US and China.

US-made VAM has a price advantage over material made in Europe because of the cheaper cost of natural gas.

US VAM



PRICES

US September VAM contracts rolled over from August, largely reflecting market sentiment before Hurricane Harvey hit the US Gulf Coast, because many negotiations for September contracts concluded before the storm struck. Most sources said there had been no change in contract prices for September VAM; one source noted a small increase but it could not be confirmed. But two producers – Dow and Celanese – have separately nominated double-digit price increases for October.

Historically, VAM demand often drops in the third quarter after the end of the US paint season, because it is a key ingredient in architectural coatings.

Latin American VAM prices are expected to rise in October because trade flows have been negatively impacted by limited supply in the US as the year-end peak season in that region begins.

TECHNOLOGY

Acetylene-based technology was used first in the commercial production of VAM with the gas phase process preferred to the liquid phase reaction. Ethylene has now become the preferred feedstock with the gas phase route used due to problems of corrosion and by-product formation when using the liquid phase process. This is why ethylene figures are so prominently in contract formulas.

Acetic acid is catalysed in the gas-phase reaction with ethylene and oxygen in a fixed bed tubular reactor at 175-200˚C (347-392˚F) and 5-9 bar pressure. The VAM is then recovered by condensation and scrubbing, and is purified by distillation.

UK-based BP developed *Leap*, a fluidised bed technology that is said to cut investment costs by 30%. Essentially, the chemistry is the same as the existing technology. The difference is that the catalyst is continuously removed and replenished, which is said to give the process much longer run times compared with the fixed-bed route.

US VAM CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
LyondellBasell	La Porte, Texas	385
DowDuPont	Texas City, Texas	365
Kuraray	La Porte, Texas	335
Celanese	Clear Lake, Texas	310
Celanese	Bay City, Texas	300

Celanese's *VAntage* process is said to raise production efficiency and lower operating costs. The technology is claimed to add production capacity equivalent to a worldscale plant at 10-15% of the cost of building a grassroots unit.

Meanwhile, Praxair received a patent for a technique using 99.95% oxygen to reduce catalyst losses and undesirable reaction by-products, while boosting VAM yields by up to 5%.

OUTLOOK

Looking ahead, domestic demand for VAM from the paints and coatings sector is likely to slow down with the end of the peak paints and coatings season, though production is expected to improve gradually in the fourth quarter as plants come back online from outages caused by Harvey.

However, supply constraints from force majeures and sales allocations could reduce domestic supply over the short term and provide support for what are expected to be significant – if not severe – spot price increases in Q4.

Severe logistical and feedstock challenges stemming from the hurricane could also push prices higher as the VAM market faces extraordinary difficulties in transportation and distribution logistics in the US Gulf Coast region. Market observers expect logistical problems to remain in place during October and into November.

Meanwhile, feedstock ethylene prices have been moving up due to supply issues and strong downstream demand. ■

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JASMINE KHOO SINGAPORE

PBT

USES

Polybutylene terephthalate (PBT) is a semi-crystalline thermoplastic polyester that is classified as a medium performance engineering polymer. It has excellent electrical and chemical resistance properties, and when glass-filled to improve stiffness and strength, probably offers the best overall performance profile for electrical/electronic applications.

Between 80-90% of all PBT sold commercially is compounded with various fillers and additives (UV protection agents, flame retardants) to tune its properties. PBT is also found in various polymer blends, eg with polycarbonate. Typical uses include connectors, capacitors and cable enclosures, and it has become the material of choice for distributor caps, rotors and related under-the-hood ignition components. It is also used for exterior parts such as door handles, wing mirror assemblies and wiper arms. PBT is also used in hot appliances such as kettles and irons.

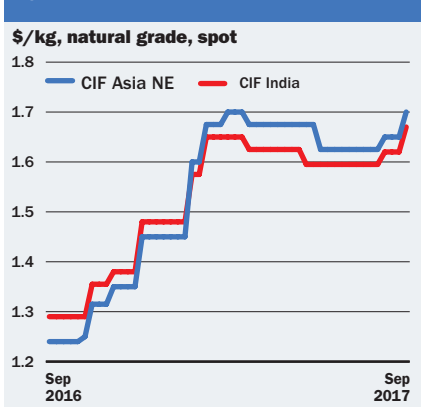
SUPPLY/DEMAND

Going forward in the near term, overall supply and demand conditions in the Asian region are expected to be largely balanced, with demand for PBT spot cargoes improving following the end of the seasonal demand lull period in early September. For the key northeast Asian market, the seasonal slow demand period usually spans from early summer in June to early September.

Spot cargo uptake for October was described by Asian producers as being stronger than September, with some buyers acknowledging that it was likely for spot prices to register gains. However, towards the end of the year, logistical difficulties in transportation due to harsh winter conditions in some areas are typically expected to weigh on trading activity.

Fluctuations in demand patterns are generally not expected as PBT is a monthly-traded product for some, whereas other buyers purchase PBT on a quarterly basis. New start-ups in the next six months are scarce, especially since certain regions in Asia such as China are already seeing supply overhang.

ASIA PBT



PRICES

Spot prices of PBT in the Asian market registered steady hikes in the quarter of 2017, buoyed by surges in upstream 1,4-butanediol (BDO) prices and healthy cargo uptake. Snug spot availability of BDO in the Asian region lent upward support to BDO, which led to increased production costs for Asia-based PBT makers.

However, the steep gains in PBT prices were soon met with increasing resistance from regional buyers, who were said to be struggling with increased costs and squeezed margins for end-user products. As such, prices were mostly stable-to-soft going into April to June, before remaining largely flat throughout June to September. With seasonal demand picking up in September, spot prices once again gained ground, and register gradual increase with firmer offers for October-lifting cargoes.

TECHNOLOGY

PBT is produced in a two-step process. The first step involves the transesterification of dimethyl terephthalate (DMT) with BDO to form hydrobutyl terephthalate (bis-HBT) at a temperature of around 200°C. The second step involves the polycondensation of bis-HBT (and other oligomers) at 250°C to form PBT. Both continuous and batch processes operate today. Purified terephthalic acid (PTA) can be used instead of DMT and has the advantage of not requiring methanol recovery. However, the transesterification reaction must be carefully controlled to avoid BDO losses through conversion to tetrahydrofuran.

OUTLOOK

Long-term growth remains forecasted for PBT in the global market for the next 10 years, with market players saying that the outlook for engineering plastics' growth is one of the strongest among plastic products. Industry sources showed that the expected compound annual growth rate (CAGR) for engineering plastics stand at 5.7% in the forecast period from 2016 to 2026.

End user industries, such as automotive, transportation, and medical industries are expected to drive global demand going forward. One of the largest end user sector would be automotive, with significant growth poised to come from China, India and South Korea.

As for supply, growth is also forecasted close to 10% in terms of global volumes for engineering plastics in the next decade. ■

GLOBAL PBT CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Yingkou Kanghui Petrochemical	Gaizhou, China	120
Sabic Innovative Plastics	Mount Vernon, USA	120
BASF	Schwarzheide, Germany	100
Henan Kaixiang Chemical	Yima, China	100
Lanxess/DuPont	Hamm-Uentrop, Germany	80
Yizheng Chemical Fibre	Yizheng, China	80
Nantong Xingchen Synthetic Material (Blue Star group)	Nantong, China	70
Mitsubishi Chemical	Yokkaichi, Japan	70
Saudi International Petrochemical (Sipchem)	Jubail, Saudi Arabia	63
WinTech Polymer	Matsuyama, Japan	62
Chang Chun Chemical Jiangsu	Changshu, China	60
Chang Chun Plastics	Jen-Wu, Taiwan	60
Jiangyin He Shili	Jiangyin, China	60
Toray BASF PBT Resin	Kuantan, Malaysia	60
Meizhouwan Chloralkali Chemical Industry	Quanzhou, China	60

NOTE: Top 15 companies

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GEORGE MARTIN HOUSTON

Polypropylene

USES

Polypropylene (PP) is used in a wide range of consumer and industrial products. Three forms of PP can be produced: isotactic, syndiotactic and atactic. Isotactic PP is the main form manufactured. The largest outlet is injection moulding applications, which include packaging, parts for electronic and electrical appliances, caps and closures, toys, luggage and a variety of household goods. The second largest outlet is in fibres, where carpet face yarn for carpet backing has been a growth market for PP.

SUPPLY/DEMAND

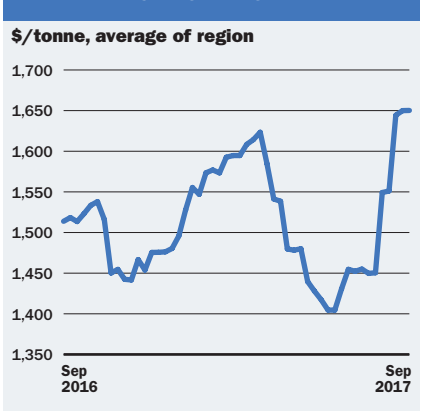
PP supply has been stable in Argentina for many years, with only minor capacity additions in some plants and no new projects. Ownership of some plants has also changed: Petroquimica Cuyo in Argentina bought its competitor Petroken. Brazil's Braskem has absorbed its competitors in the country. The last company purchased was Quattor, which had itself been buying competitors before being acquired by Braskem.

Small capacity additions have happened in Chile and Venezuela. Availability of feedstock propylene is the main obstacle for construction of new plants or expansions of existing ones. There is one project in Bolivia that could start up in the early 2020s with production of propylene and PP. However, the project is encountering some contractual difficulties that may delay construction.

Demand has also run into trouble because of unstable economies in the region. Brazil is slowly coming out of a serious political crisis that started with a corruption investigation that has touched the highest levels of government, including three presidents.

Argentina seems to be in the right track with overall improvements in the economy, but its reputation with investors is still recovering. Another troubled economy is Venezuela's, which is facing diminishing production from lack of feedstocks, recurring power outages, and severely contracted demand in an environment of high inflation. Production has been steady in Chile, Colombia and Mexico.

LATIN AMERICA POLYPROPYLENE



PRICES

PP prices in Latin America come in different flavours. On one side, Argentina and Brazil have very high prices because those are protected markets. A 14% tariff on imports provide enough cushion for local producers to set prices at the import parity, and sometimes higher, knowing that transformers would have a hard time importing product and would be forced to keep larger inventories to protect themselves from delivery delays.

In the second group we find Chile, Peru, Colombia and Mexico which have PP prices quite competitive with international alternatives from Asia, the Middle East and the US. If we average the domestic prices of these countries, we get the result in the graph shown, which depicts the average price for the past five years. The main point to notice is that prices plunged in 2014 when crude oil prices plummeted. From that point, prices have been in gradual decline, with spikes only coming from supply disruptions of feedstock propylene, or PP plant outages.

Venezuela has established PP production with its 144,000 tonne/year plant, but the political and economic crisis in this country is driving supply down, and demand has also plummeted. Venezuelan prices were not included in the graph, because prices are government-controlled and not related to international markets.

TECHNOLOGY

Current bulk technologies, such as the Spheripol process developed in 1982 by Himont (later Basell, now LyondellBasell) and the Borstar bimodal polyethylene (PE) process developed in the mid-1990s by Borealis, replaced the solvent in an older process with liquid propylene. Catalyst activity from the older process was also improved, allowing for the introduction of gas phase technology. Work is underway to develop the use of metallocene catalysts in PP production to improve resin properties.

LATIN AMERICA PP CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Braskem	Triunfo, Brazil	760
Indelpro	Altamira, Mexico	590
ESENTTIA	Cartagena, Colombia	500
Braskem	Maua, Brazil	450
Braskem	Paulinia, Brazil	350
Braskem	Duque de Caxias, Brazil	310
Petroken	Ensenada, Argentina	180
Propilven	El Tablazo, Venezuela	144
Petroquim	Talcahuano, Chile	140
Petroquimica Cuyo	Lujan de Cuyo, Argentina	130
Braskem	Camacari, Brazil	125

OUTLOOK

A new propane dehydrogenation (PDH) plant on the US Gulf Coast – planned to start production in Q4 2017 – paints a bearish outlook for prices towards the end of this year. However, the impact on PP could be less severe than expected for PE markets. The reason for this outlook is that there is no proliferation of PP plants, as producers aim to use existing idle capacity first, before investing in new PP plants.

Formosa has announced a new PP unit in Texas, and Braskem and LyondellBasell have said they are studying building new US plants. There are no additions expected in Latin America, with the exception of the Bolivia project. Besides, other propylene derivatives such as propylene oxide (PO) and solvents will have new plants in the US that will help consume the additional propylene supply from the PDH plants.

PP prices should rise along with oil and polymer-grade propylene (PGP) as crude supply adjusts to the demand rebalance after the end of the summer driving and vacation season. ■

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LUKE MILNER LONDON

R-PET

USES

Recycled polyethylene terephthalate (R-PET) in Europe is used in a range of applications such as fibre and the production of sheets and film for use as insulation, strapping, packaging and for use in industries such as the automotive sector.

R-PET is used for food packaging, including drinks bottles, which is arguably the most high-profile usage of R-PET and the one which places R-PET in the general public's consciousness. However, the use of R-PET is continuing to evolve as international companies launch new schemes, such as the Swedish furniture retailer Ikea's R-PET kitchen unit fronts.

SUPPLY/DEMAND

During 2017, demand in the colourless R-PET flake market has been stronger than in 2016, as investments in the use of R-PET in downstream markets, such as film, have contributed to underlying demand. This demand was largely maintained even during the summer period when holidays and shutdowns traditionally weaken demand.

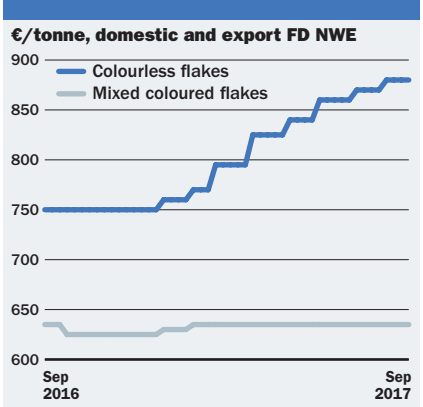
However, while the colourless R-PET flake market has experienced strong demand, with supply remaining tight through much of 2017, the mixed-coloured R-PET flake market has not seen the same imbalance in supply and demand. Demand for mixed-coloured R-PET flake has been steady in Europe in 2017 but not high and mixed-coloured R-PET flake availability has been ample, maintaining availability above demand.

The strength of demand for colourless R-PET flakes has driven demand for post-consumer PET bottles, with supply and demand dynamics dividing market participants' opinions, as some saw better post-consumer PET bottle availability following strong PET bottle consumption in the early summer months. Others in the market contend that post-consumer PET bottle availability failed to meet expectations over the summer.

Although post-consumer PET bottle availability improved, the strength of colourless R-PET flake demand has surprised many in the market. Where buyers of both virgin polyethylene terephthalate (PET) and R-PET have had the ability to switch between products, demand for R-PET has been helped by the strength of virgin PET prices throughout 2017.

R-PET competes directly with virgin PET in certain applications, although depending on cost and application switching between the two is often not possible to avoid short-term price spikes in either market.

EUROPE R-PET



PRICES

Colourless R-PET flake prices strengthened in 2017, following a declining price trend in late 2015 and through much of 2016. However, mixed-coloured R-PET flake prices have seen relative stability in much of 2017 after weakening through 2016. R-PET food grade pellets, much like colourless R-PET flakes, were able to recover ground in 2017 and rise.

Strong virgin PET prices in 2017 have allowed for R-PET prices to rise, without negatively impacting the competitiveness of R-PET. Nevertheless, recyclers still see pressure on margins as post-consumer PET bottle prices have also increased during 2017.

In the days leading up to 9 October, availability issues in the post-consumer PET bottle market resulted in upward pressure on other products such as colourless R-PET flakes. The food grade pellet market has been affected, in part, by virgin PET movements; however, mixed price directions have been revealed by participants so far for October. Some expected that the end of the peak summer season in the virgin PET market would result in quieter demand for the R-PET market eventually. Nonetheless, others argue that consumption will be steady with the end of year holiday season also potentially providing a boost to demand. Softening virgin PET prices, of late, do pose an additional factor to R-PET business. Imports have arrived to the virgin PET market, thereby lessening availability issues experienced in August and September with consumers saying that they have a sufficient amount of material heading into October.

TECHNOLOGY

Bales are created when recycled material is taken to a Materials Recovery Facility. Once at the facility, post-consumer PET is then typically sorted and separated into mixed coloured and colourless and material that is unusable or not recyclable is discarded. The remaining material is condensed into giant bales, which makes it easy to transport. After the bales are sold, they are then used to make flakes. Flakes are created by feeding material into a shredding machine, which then breaks the material into particles.

The flakes are then washed, using either hot or cold water. The flake material with the highest value tends to be hot-washed, as the washing tends to decontaminate the material.

To make pellets, the flakes are then sent to a machine called an extruder, which then melts them. The melted material is then filtered and pushed into a pelletiser. The material is then cut into pellet form. Some producers also create pellets direct from colourless bales.

OUTLOOK

The healthy demand seen in much of 2017 in the R-PET market is expected to continue. Continued interest in recycling and schemes such as Coca-Cola's plans to double the amount of recycled plastic used in its bottles in Great Britain by 2020 are also expected to bolster demand.

However, market participants have also pointed to the need to develop and improve collection schemes in order to improve the quality and quantity of post-consumer PET available for recycling. It remains to be seen whether improved demand can be sustained and whether this will allow for an uncoupling of R-PET and virgin PET's pricing trends, as competition between R-PET and virgin PET in certain applications has led to virgin PET price trends influencing developments in R-PET pricing. ■

ERIC SU SINGAPORE

Polyester

USES

Polyester fibre and filament yarn is used for the manufacturing of textiles for industrial and consumer sectors. Polyester-based fabrics are used extensively in apparel and home furnishing such as shirts, jackets, pants, socks, upholstered furniture and bed sheets. Applications of polyester fibre include electrical insulation, conveyor belts, safety belts and car tyre reinforcement.

SUPPLY/DEMAND

Demand for polyester fibre and filament yarn generally picked up in 2017, maintaining the uptick in 2016 Q4. Polyester producers have managed to maintain a healthy production rate and sales volume largely through 2017. March and April were slower months for polyester sales amid volatility in the China petrochemical markets. Nonetheless, demand picked up in June and was maintained throughout Q3 2017.

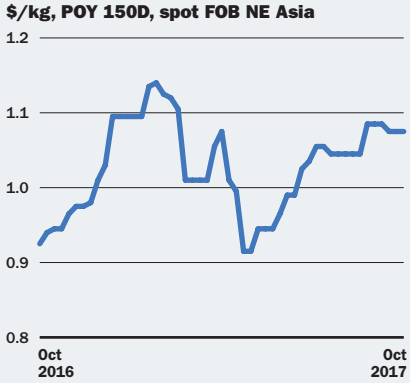
Supply of polyester grew from 2016 to 2017 as production rates for polyester fibre and yarn were generally higher throughout 2017. The increase in supply was generally backed up by improvement in demand as subsequently, demand and supply fundamentals were maintained as balanced. There were also increased capacities as previously idled smaller-scaled polyester plants were acquired by larger polyester producers and restarted.

PRICES

Polyester prices were largely volatile throughout the year, tracking volatility from upstream feedstock prices. Partially oriented yarn (POY) 150D prices were at $1.095/kg FOB NE Asia in end January and climbed to $1.140/kg FOB NE Asia by mid-February. The uptrend was driven by bullish market sentiment stemming from a surge in feedstock prices. Over-procurement of cargoes in January and February led to a slowdown in March and April as prices POY150D prices began to trend down to $1.01/kg FOB NE Asia by end April. Prices were further depressed amid the seasonal lull, falling to $0.915/kg FOB NE Asia in mid-May. Subsequently, recovery of prices began to take place in June and July, driven by a strong uptick in downstream demand and improvement macroeconomic conditions in China. Later, POY 150D prices settled at $1.055/kg FOB NE Asia in end July. In September, another surge in prices took place, with POY150D rising to $1.075/kg FOB NE Asia in end September, prior to the seasonal manufacturing peak period in downstream markets.

ASIA POLYESTER FIBRE

$/kg, POY 150D, spot FOB NE Asia



TECHNOLOGY

Polyester is a synthetic polymer made of purified terephthalic acid (PTA) and monoethylene glycol (MEG). Polyester is manufactured by one of several methods. The one used depends on the form the finished polyester will take.

The four basic forms are filament, staple, tow and fibrefill.

In the filament form, each individual strand of polyester fibre is continuous in length, producing smooth-surfaced fabrics.

In staple form, filaments are cut to short, predetermined lengths. In this form polyester is easier to blend with other fibres.

Tow is a form in which continuous filaments are drawn loosely together. Fibrefill is the voluminous form used in the manufacture of quilts, pillows and outerwear. The two forms used most frequently are filament and staple.

Polyester staple fibre (PSF) is of a short length and is derived either directly from the polymerisation of PTA and MEG or from PET fibre chips.

Polyester filament yarn (PFY) is of a long length and is extruded directly from the polymerisation of PTA and MEG (this becomes spin drawn yarn) or indirectly from fibre chips (which results in fully drawn yarn). POY is derived from melting and spinning fibre chips. POY is then extruded and textured into drawn texturised yarn (DTY).

PSF is spun into yarn then woven into fabric for apparel. Common lengths are 38 mm or 40 mm. It can also be used as stuffing for toys and pillows and as insulation and wadding for bedding and furniture.

This grade is called hollow conjugate fibre, or fibrefill. PFY is spun and knitted into fabric for upholstery and curtains. POY is a feedstock for DTY, which is in turn used for textiles.

ASIA POLYESTER FIBRE PLANTS '000 TONNES/YEAR

Company	Location	Capacity
Tongkun Group	Tongxiang, China	2,000
Jiangsu Shenghong Chemical Fiber	Wujiang, China	1,800
Jiangsu Hengli Chem. Fiber	Wujiang, China	1,403
Sanfangxiang Group	Jiangyin, China	1,200
Reliance	Hazira, India	1,150
Zhejiang Xingfengming Chem. Fibers	Tongxiang, China	1,150
Rongsheng Petrochemical	Hangzhou, China	1,000
Hengyi Petrochemical	Hangzhou, China	970
Jinlun Pc Fiber	Changle, China	850
Reliance Ind.	Patalganga, India	525
Nan Ya Plastics	Linkou, Taiwan	480
Hengyi Petrochemical	Caojing, China	400
Tongkun Group	Jiaxing, China	400
Reliance Ind.	Silvassa, India	390
Reliance Ind.	Dahej, India	290
Jiangsu Hengli Chem. Fiber	Dalian, China	200
Reliance	Hoshiarpur, India	100
Nan Ya Plastics	Kunshan, China	40

OUTLOOK

Expectations by market participants is for demand and supply balance to remain relatively balance in Q3 2017 while late Q4 will see a traditional slowdown of demand because of year-end holidays and festivities. Movement of feedstock prices will likely continue to drive price movement of polyester going forward, market sources said. ■

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DAVID LOVE HOUSTON

ABS

USES

Acrylonitrile butadiene styrene (ABS) is the largest volume engineering thermoplastic resin. ABS exhibits a wide range of properties, which makes it useful in diverse applications. Major uses are in the automotive and electronics sectors.

Other applications include appliances, pipes, fittings and other construction products, as well as recreational items such as boats, mobile phones and games consoles. One particularly demanding application has been the moulding of Lego bricks to a tolerance of five thousandths of a millimetre.

ABS can also be blended with other polymers such as polycarbonate (PC) or polyvinyl chloride (PVC) for use in injection moulding applications.

SUPPLY/DEMAND

Overall supply and demand fundamentals in the domestic market were relatively stable for most of 2015, although suppliers saw a lot of competition because of less expensive imports for much of the year.

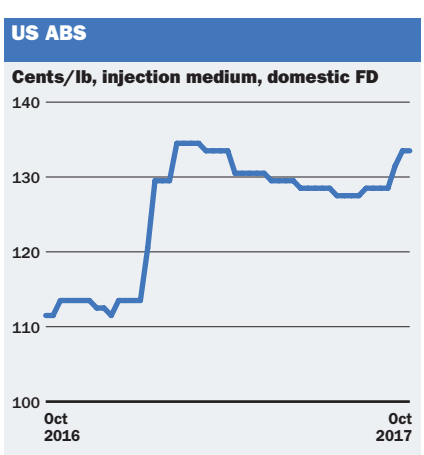
Asian suppliers are seeing demand from China as the reason for the higher Asian ABS prices at the start of the fourth quarter. Asian suppliers are not interested in selling to US customers at lower prices than they can sell into China. Demand in China is very strong.

Late summer turnarounds limited ABS supply in Asia. As a result, some Asian suppliers in August informed US customers that they were sold out on various grades through the end of the year. After a strong 2016 in which US imports jumped by 8.2% year on year, imports remained high in 2017. Imports during the first eight months of 2017 were up by 9% year on year.

During that timespan, imports from South Korea, the largest ABS supplier to the US market, jumped by 13% year on year. Imports from South Korea comprised 44% of total US imports from January through August.

Demand was boosted by reconstruction efforts following the hurricanes that hit Texas and Florida in August and September.

In October, demand was described as balanced, but higher cost import prices will spur domestic demand over the next few months as lower cost inventories are depleted.



PRICES

US ABS prices for freely negotiated business followed the lead of key feedstocks in 2017. Prices during the first quarter were largely affected by the sharp increase on styrene spot prices, which hit historic highs due to tight market conditions.

General purpose ABS prices from 27 January through 3 March jumped by 19%. However, since 3 March, prices moved within a narrow band of 7 cents/lb.

As autumn began, US producers were reluctant to raise prices, despite consistently higher prices for Asian imports. Some higher ABS prices were seen for domestic supply at that time, but there were no formal price increase nominations in the marketplace.

Meanwhile, ICIS price assessments were made based on overall raw material cost changes. Styrene comprises about 60% of ABS, with butadiene (BD) and acrylonitrile (ACN) each at about 20%, but that could change depending on the amount of flexibility needed.

More flexibility would necessitate more BD and less ACN.

TECHNOLOGY

ABS was patented in 1948 and introduced commercially by US-based BorgWarner in 1954. The three main polymerisation processes used are the emulsion process, suspension process and continuous mass process.

NORTH AMERICA ABS CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
SABIC	Ottawa, Illinois, US	215
Styrolution	Addyston, Ohio, US	190
Styrolution	Altamira, Mexico	130
SABIC	Bay St Louis, Mississippi, US	125
Trinseo	Midland, Michigan, US	90
Trinseo	Hanging Rock, Ohio, US	65
A Schulman	Akron, Ohio, US	52.5
Trinseo	Allyn's Point, Connecticut, US	30

The continuous mass process is the preferred route because the reaction does not take place in an aqueous phase. This creates less effluent for disposal and requires less energy.

The emulsion polymerisation process, commonly used in plants built before the mid-1980s, provides more flexibility in its product range.

Batch emulsion is used in the production of high-impact grades.

A hybrid emulsion/mass process has also been developed that permits the production of a wide range of ABS products.

OUTLOOK

Players expect the market in 2018 to be similar to that in 2017. Overall supply and demand fundamentals are expected to remain relatively stable, with plenty of availability and good levels of consumption.

Traditionally, demand in October finishes strong, but sales fall off in November and December due to the holiday shutdowns.

The downstream automotive industry saw strong growth in September after the hurricanes. Automobile sales in September reached the highest level in any single-month in 12 years, but it was unclear how long the uptrend would continue.

The price and availability of ABS imports from Asia will go a long way toward determining how demand for domestic product will look during the fourth quarter of 2017 and during 2018. ■

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LOY KHENG WEE SINGAPORE

PMMA

USES

Polymethyl methacrylate (PMMA) is the most important application for methyl methacrylate (MMA), consuming about half of Asia's MMA output. It is an economical alternative to polycarbonate (PC) when extreme strength is not required. PMMA comes mainly in two grades – general purpose (GP) and optical grade.

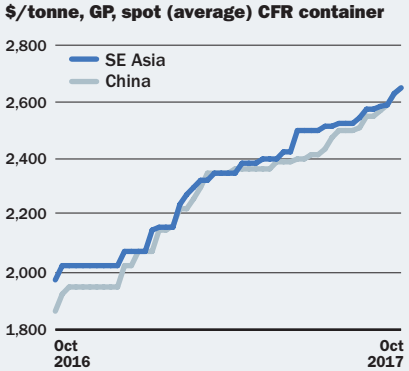
GP-grade PMMA is widely used in many industries and in a large number of everyday/household applications, such as souvenirs, illuminated signs and bathtubs. Its automotive applications include car tail lights and speedometer covers. Optical-grade PMMA is used to make TV screens for large LED (light emitting diode) TVs, light guide panels and computer monitors. It is also found in application screens for smaller electronics items such as mobile phones, and MP3 and media players.

SUPPLY/DEMAND

PMMA supply has stayed tight in Asia throughout 2017, on the back of prolonged supply shortage, high upstream costs, as well as multiple plant outages and scheduled turnarounds in the region. Spot trade for bulk cargoes slowly reduced, as most producers had low inventories and could not offer much spot material on the market. Other disruptions such as Hurricane Harvey in the US caused global spot supply to further constrict in 2017. Price hikes were initiated by key manufacturers such as Sumitomo and Chimei, in order to reflect strong MMA costs and maintain PMMA production levels. Demand for PMMA remained mostly steady for general purpose and optical grades, in view of limited spot supply and rising spot prices. PMMA buyers were largely heard to be under growing pressure, being unable to pass on such strong costs to their customers quickly. As such, most held a cautious approach, purchasing small amounts to fulfil business obligations. China and India are among countries that are net importers of PMMA.

ASIA PMMA

$/tonne, GP, spot (average) CFR container



PRICES

PMMA spot prices have been on the rise since early 2017, tracking upstream MMA prices closely. In October 2017, PMMA prices climbed to a one-year high at $2,630/tonne CFR (cost and freight) China and $2,630/tonne CFR SE (southeast) Asia, rising by 45% and 36% on a year-on-year basis, respectively. Feedstock MMA prices were on an uptrend in the same period, amid tight supply and various plant disruptions. Spot prices increased by 40% year-on-year, closing at $2,610/tonne CFR SE Asia in October 2017. The spread between PMMA and upstream MMA prices climbed above the zero mark in October 2017 and reached a positive level for the first time since March 2017.

TECHNOLOGY

Chemically, PMMA is the synthetic polymer of MMA. PMMA is routinely produced by emulsion polymerisation, solution polymerisation, suspension polymerisation and bulk polymerisation. For glazing, some MMA can be pre-polymerised in a continuous stirred tank reactor and the resulting viscous liquid is fed into a series of flat glass plate-like moulds. This type of batch operation is cumbersome, so continuous polymerisation/cast technologies are also in operation. In belt polymerisation processes, the MMA/PMMA syrup is injected between continuous highly polished metal belts. Continuous and batch processes are also possible. Japan's Mitsubishi Rayon developed a recycling process that produces MMA monomer from waste PMMA using sand as a thermal catalyst. It then produces PMMA from the monomer.

OUTLOOK

The market outlook will largely depend on the availability and costs of feedstock MMA, as well as whether PMMA supply in Asia significantly eases in the near term. With new Middle East plants set to come on stream, most players believe regional supply will increase. One addition is the joint venture between Mitsubishi Rayon and SABIC, which involves an integrated 40,000 tonne/year PMMA plant and a 250,000 tonne/year MMA plant in Saudi Arabia. However, production may be delayed as some facility issues were heard in late Q3 2017.

A new 50,000 tonne/year project is on the horizon in Saudi Arabia. The Petro Rabigh venture between Sumitomo and Saudi Aramco is expected to come on stream in early 2018.

Assuming no further disruptions, existing sellers affected by recent planned and unplanned shutdowns would be able to build up production and inventory levels gradually.

PMMA demand is expected to remain restricted until buyers see that regional supply is more abundant and spot prices are softer. ■

ASIA PMMA CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Chi Mei	Jen-Te, Taiwan	175
Sumitomo Chemical	Jurong Island, Singapore	150
LG MMA	Yeosu, South Korea	123
Lotte MCC	Yeosu, South Korea	110
Kuraray	Nakajo, Japan	60
Mitsubishi Rayon	Nantong, China	60
Altuglas (Arkema)	Jinhae, South Korea	50
Chi Mei	Zhenjiang, China	50
Asahi Kasei	Chiba, Japan	40
Evonik	Caojing, China	40
Evonik	Taichung, Taiwan	40
Mitsubishi Rayon	Toyama, Japan	27.5
Mitsubishi Rayon	Otake, Japan	20
Shanghai Jing Qi Polymer Science	Shanghai, China	20
Heilongjiang Longxin Chemical	Anda, China	15
TPI Polyacrylate	Muang, Thailand	13
Gujarat State Fertilizers & Chemicals - (GSFC)	Baroda, India	2

NOTE: Top 17 plants listed by capacity

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NEL WEDDLE LONDON

Propylene

USES

The primary outlet for propylene is polypropylene (PP), accounting for about two thirds of propylene consumption globally but closer to 57% in Europe. Other important derivatives include propylene oxide (PO) which consumes around 13% in Europe and 8% of cumene, while other derivatives, the oxo alcohols, acrylonitrile (ACN), acrylic acid and isopropyl acetate (IPA) together consume around 22% of European propylene production.

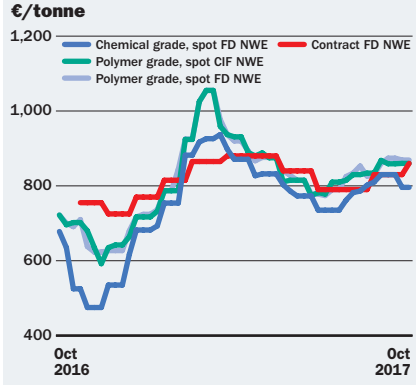
Propylene can also be used to make high octane gasoline blendstocks and can also be blended into propane.

SUPPLY/DEMAND

According to Petrochemicals Europe, in 2015 Western Europe (EU15 + Norway + Turkey) produced just over 10m tonnes of propylene from steam crackers, and about 4m tonnes from refineries. Total propylene output has steadily increased over the past three years from improved operating rates at crackers and refineries with the advent of the low oil price from the latter part of 2014.

Events which shaped the supply/demand picture in 2014-2015 were worked though – the derivative/cracker issue at Moerdijk, the Netherlands in 2014 where Shell's cracker came back online in 2015 and Ellba's PO in Q1 2016. But then other issues emerged – a strike in France impacted refinery and cracker operations in Q2 2016, tightening supply. Then the October 2016 incident at BASF's site in Ludwighafen, Germany destroyed a propylene pipeline and reduced derivatives operations, but left length in inland pockets. The propylene pipeline was back in operation as of August 2017.

EUROPE PROPYLENE



PRICES

Contract prices rollercoastered throughout 2015-2017 in line with feedstocks. Contract prices peaked in June 2015 and then fell hard in July-September 2015 as adjustments were needed to align Europe's derivatives competitiveness with the rest of the world where prices were much lower. After reaching a low in February-March 2016, prices showed a steady increase through the rest of 2016.

Spot prices have shown considerable swings over 2015-2017 – reflecting supply and demand imbalances. Double-digit percentage premiums and discounts to the prevailing contract prices were seen. Spot propylene saw a return to high premiums in the first half of 2017 because of strong demand, planned turnarounds and a series of unexpected events.

TECHNOLOGY

The two main sources of propylene are as a by-product from the steam cracking of liquid feedstocks such as naphtha, and from offgases produced in fluid catalytic cracking (FCC) units in refineries. The remainder is produced using on-purpose technologies such as propane dehydrogenation (PDH) and metathesis.

As demand for propylene (4%/year) continues to outpace that for ethylene (3.6%) and more ethane crackers (which produce no propylene) are being built, on-purpose production is growing. The main on-purpose process is PDH. In September 2016, Borealis announced a feasibility study to build a 740,000 tonne/year PDH plant at Kallo, Belgium, for start-up in 2020. Poland's Grupa Azoty is also developing a 400,000 tonne/year PDH unit with a start date in late 2019. INEOS plans to build a 750,000 tonne/year PDH unit in Europe, with Antwerp, Belgium, as a potential location.

France's Total, working with US-based UOP, has developed an olefin cracking process which takes the heavier olefins from the methanol-to-olefins (MTO) unit and converts them into lighter olefins – in particular propylene.

OUTLOOK

Global propylene demand for 2016 increased by around 4.5%, below the 6.5% growth registered for 2015. PP has led the way with estimated demand growth in 2016 of at least 5.6%. The ACN, butyraldehyde, PO and acrylic acid chains are the other main contributors. Through 2019, global propylene demand growth is expected to continue to increase at more than 4%/year. In Europe (including Turkey), propylene demand for 2016 has been flat following growth of 0.3% and 1.1% in 2015 and 2014, respectively. PP production in Europe declined by 0.3% in 2016 and is likely to grow by 2%/year through 2019 which will imply larger import requirements .

Demand is expected to remain above supply, resulting in a larger imbalance in the propylene market than in the recent past. Production capacity is anticipated to increase by less than 3% from 2016 to 2019 and, at the same time, consumption will rise by about 4.5%. Operating rates are projected to average 87% between 2017 and 2019. ■

EUROPE PROPYLENE CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Total	Antwerp, Belgium	675
INEOS	Cologne, Germany	655
BASF Sonatrach PropanChem SA - (BSP)	Antwerp, Belgium	650
OMV	Burghausen, Germany	560
Naphtachimie	Lavera, France	540
Shell	Moerdijk, Netherlands	500
Versalis	Priolo, Italy	440
SABIC	Wilton, UK	400
Dow	Tarragona, Spain	370
LyondellBasell	Berre, France	360
BASF Sonatrach PropanChem	Tarragona, Spain	350
SABIC	Geleen, Netherlands	350
LyondellBasell	Wesseling, Germany	335
Dow	Terneuzen, Netherlands	325

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HEIDI FINCH LONDON

Propylene oxide

USES

The largest consumer of propylene oxide (PO) is polyether polyols, which are used to make polyurethanes (PU); this sector accounts for 55-60% of PO consumption.

The second largest derivative is monopropylene glycol (MPG) at 25-30%. The remaining 10-20% comprises of propylene glycol ethers, flame retardants, synthetic lubricants, oilfield drilling chemicals, butanediol (BDO), propylene carbonate, allyl alcohol, isopropanolamines, modified starches and textile surfactants.

SUPPLY/DEMAND

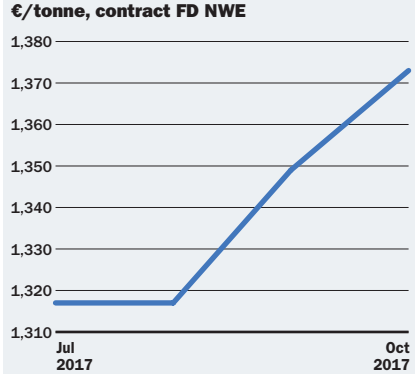
During the first half of 2017, PO supply in Europe was reduced. This was mainly linked to LyondellBasell's planned, albeit lengthy, maintenance turnaround at its Botlek site in the Netherlands during the spring of 2017 and the force majeure on Shell/BASF's joint venture PO/styrene monomer 2 (SM2) unit at Ellba in June/July.

PO supply has not only been impacted by a spate of PO related output issues, but tightness in the upstream propylene market also had a bearing on PO availability.

On top of output constraints, PO demand has been healthy, particularly from the main downstream polyurethanes market, among others, which has further compounded an already tight PO market in the first half of 2017.

By mid September 2017, there were signs the market became more balanced. While there was the Hurricane Harvey impact in the US at this time, which affected PO and derivatives for some players, there was little-to-no direct effect on PO supply in Europe.

EUROPE PO



PRICES

The majority of European PO monthly contract prices are formula related and follow 80% of the upstream propylene monthly contract price movement.

During Q1 2017 and into early Q2 2017, PO contract prices trended up, on the back of firmer upstream propylene contract costs.

In early August, the hybrid PO contract and freely negotiated price assessment was discontinued and replaced by the monthly formula only contract price range, which had been added in July 2017, to reflect the majority of business concluded.

TECHNOLOGY

There are various types of PO production technology. The two older more traditional PO production routes are either by chlorohydrin or by epoxidation. The propylene chlorohydrin route involves converting propylene to propylene chlorohydrin and then the chlorine is removed. This process is highly polluting from a waste perspective and it also uses a significant amount of chlorine.

A main example of the epoxidation process is the PO/styrene monomer (SM) route, but this route often leads to imbalances between these products amid differing rates of growth.

An alternative PO production route uses isobutene, which makes a tertbutyl alcohol (TBA) co-product that can convert to methyl tertiary butyl ether (MTBE)

There are also other newer PO only production methods, which are said to be more efficient. There is the cumene-hydroperoxide based propylene oxidation route, which allows for the recapture of cumene. There is the direct propylene hydro-oxidation with oxygen and hydrogen direct propylene oxidation with oxygen technology and propylene oxidation using hydrogen peroxide, which has no co-products other than water.

OUTLOOK

PO demand in Europe is expected to grow around 3% on average per year, taking into account growth estimates for its main derivatives such as 3-4% for downstream polyols and around 2% for MPG. While there is the new Sadara PO capacity in the Middle East, which started in Q3 2017, and MOL also plans to build some new PO capacity in eastern Europe, these are expected to be for captive downstream polyols and MPG usage.

It is also expected that the Sadara PO volumes are mainly intended for the Asian and Middle East markets rather than for Europe.

While the Sadara capacity is unlikely to have a direct effect on PO supply in Europe, particularly as PO is not easy to transport, there may be an indirect impact on PO supply in Europe through its derivatives.

LyondellBasell plans to build the world's largest PO/tertiary butyl alcohol (TBA) plant in Texas, by mid-2021. This is being driven by rising global demand for urethanes and cleaner-burning oxyfuels.

One company source said that options for this new capacity are being considered, adding that this new capacity is likely to be used to supply PO and derivative customers domestically and in other regions. ■

EUROPE PO CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Dow Chemical	Stade, Germany	630
LyondellBasell Bayer Manufacturing Maasvlakte	Maasvlakte, Netherlands	315
BASF/Dow	Antwerp, Belgium	300
LyondellBasell	Botlek, Netherlands	260
Ellba (Shell/BASF)	Moerdijk, Netherlands	250
Shell	Moerdijk, Netherlands	210
INEOS Oxide	Cologne, Germany	210
LyondellBasell	Fos, France	210
Repsol Chemicals	Tarragona, Spain	200
BASF	Ludwigshafen, Germany	125
Oltchim	Rimnicu Vilcea, Romania	110
PCC Rokita	Brzeg Dolny, Poland	40

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JESSIE WALDHEIM HOUSTON

Ethyl acetate

USES

Ethyl acetate (etac) is used in coating formulations like epoxies, urethanes, cellulosics, acrylics and vinyls, and is also used in solvent applications for inks, pharmaceuticals, food, and herbicides. High-purity etac can be used as a viscosity reducer for resins.

SUPPLY/DEMAND

Etac in North America is supplied by five plants – four in the US are owned by Eastman Chemical and the fifth, in Mexico is owned by Celanese.

According to US import data, the US received about 34,000 tonnes of etac from Mexico in 2016, about 25% of the plant's annual capacity. As of June 2017, the US had received about 16,000 tonnes of etac from Mexico.

However, Sasol's 55,000 tonne/year plant in Secunda, South Africa is also a major supplier to the US market.

US imports from South Africa in 2016 were 14,000 tonnes, also about 25% of the plant's annual capacity. As of June 2017, the US had received about 5,000 tonnes of etac from South Africa.

US etac imports from countries other than Mexico and South Africa in 2016 totalled about 6,000 tonnes, of which most came from Brazil, India and China. In the first six months of 2017, US etac imports from countries other than Mexico and South Africa totalled about 2,500 tonnes.

The US exported about 30,000 tonnes of etac in 2016 and 13,000 tonnes in the first six months of 2017, putting exports at about half the level of imports.

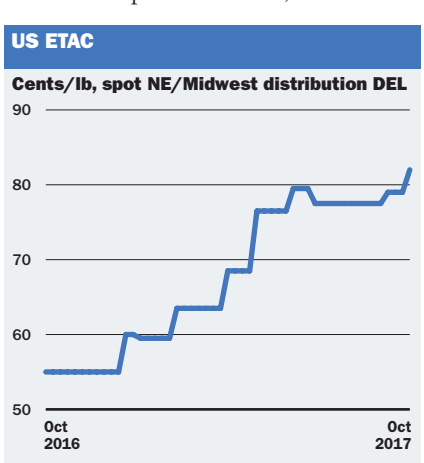
Import levels in the first six months of 2017 had fallen by about 15% from the first six months of 2016, while export levels had fallen by about 18% over the same time period.

More recently, US etac supply has been disrupted by multiple issues.

In late August, Hurricane Harvey impacted the US Gulf coast and caused logistical issues and outages for upstream acetic acid. Both Celanese and Sasol had issued sales controls.

In September, earthquakes in Mexico caused further logistical issues. In early October, a fire at Eastman's facility in Kingsport shut down upstream units at the plant.

On the demand side, etac is used to produce inks, coatings, adhesives and cosmetics. Etac demand is affected by seasonality in the construction sector, which has its strong season in the spring and summer in North America.



PRICES

US etac prices rose throughout the beginning of the year amid tight supply and increasing demand as the downstream construction sector ramped up.

Supply tightened as Celanese scheduled a turnaround at its upstream acetyls units in Clear Lake, Texas in the first half of the year. Additionally, tight upstream ethylene supply had limited production of ethylene-based etac during the second quarter.

Mid-way through 2017, prices were steady to softer as supply levels improved and as the summer peak construction season was under way.

Prices began climbing again in September, following disruptions from Hurricane Harvey. Two producers put customers on tight allocations amid shipping problems and upstream shortages.

Prices are expected to moderate once logistical systems and upstream supplies normalise in the future.

TECHNOLOGY

Etac is mainly produced by the esterification of ethanol or ethylene with acetic acid. Some is produced by the catalytic condensation of acetaldehyde with alkoxides.

In the main esterification process, a mixture of acetic acid and ethanol is preheated with a small amount of sulphuric acid. This is fed to an esterifying column for reflux.

The mixture removed from there goes into a second refluxing column where etac is removed. A third refluxing column is used to remove impurities.

A number of newer technologies have been commercialised in China and South Africa. Sasol, which is based in South Africa, had a process developed by Norwegian engineering and construction company Aker Kvaerner at its 50,000 tonne/year plant in Secunda, South Africa, that uses only ethanol feedstock.

Chinese National Petroleum developed a one-step ethanol process where ethanol is partially oxidized to acetic acid and then esterified with excess ethanol.

AMERICAS ETAC CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Celanese	Cangrejera, Mexico	139
Eastman Chemical	Longview, Texas, US	32
Eastman Chemical	Kingsport, Tennessee, US	27
Eastman Chemical	Springfield, Massachusetts, US	14
Eastman Chemical	Trenton, Michigan, US	11

OUTLOOK

In the coming weeks, etac supply is expected to remain tight as logistical systems and upstream production return to normal following Hurricane Harvey, the Mexico earthquakes and the fore at Eastman Chemical's Kingsport, Tennessee facility. Supply levels should normailse late in 2017.

Meanwhile, demand could remain strong in the coming weeks as the construction sector is bolstered by repairs from several hurricanes and earthquakes.

However, that demand is expected to ease during North American winter, which is the off-peak season for the construction sector. ■

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MATTHEW CHONG SINGAPORE

Polyols

USES

The major use of polyols is in polyurethane (PU) foams, flexible or rigid, which are produced by the reaction of a polyol with an isocyanate, usually toluene di-isocyanate (TDI) or methyl di-p-phenylene isocyanate (MDI).

There are two main types of polyols: polyether polyols and polyester polyols. The price assessments for the ICIS Asia polyols report are for polyether polyols only.

Polyether polyols are the more widely used of the two types of polyols, with the main applications being rigid and flexible polyurethane foams. Rigid foams are used mainly in insulation, refrigeration, packaging and construction, while flexible foams have applications such as upholstery, mattresses and seats. Polyols can also be used in elastomers, adhesives, coatings and fibres.

SUPPLY/DEMAND

The oversupply of polyols in Asia, especially in China, has resulted in the consolidation of the polyurethane (PU) industry, with the closure of smaller standalone polyols plants without their own upstream propylene oxide (PO) feed and a shift away from base flexible polyols production to other specialty polyols grades in the past few years.

Sinopec Shanghai Gaoqiao permanently shut down its 200,000 tonne/year polyether polyols plant in Shanghai in May 2017 due to suppressed margins amid stiff competition.

As for new start-ups in 2017, Juyuan Chemical's 185,000 tonne/year Phase I polyether polyols plant in Jilin province, China, is set to achieve on-spec production in November.

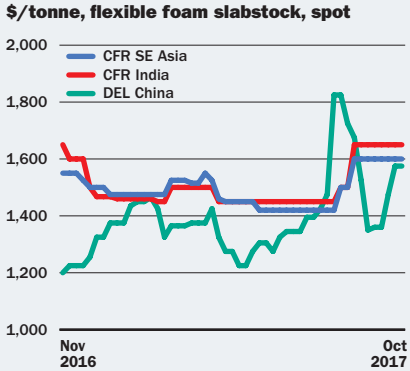
Sadara's 400,000 tonne/year polyether polyols unit in Saudi Arabia came on stream in mid-July and its first batch of flexible polyols cargoes arrived in China in late October.

Meanwhile, the three main South Korean polyols producers, namely KPX, Kumho Petrochemical and Mitsui Chemicals & SKC Polyurethanes (MCNS), have been running their plants at reduced rates since the third quarter because of a shortage of feedstock PO following the surge in PO import prices.

On the demand side, downstream foam makers have been lukewarm in their polyols purchases throughout the year, partly due to the firm prices of other feedstock TDI. Polyols and TDI are the two main components used in the production of PU foam.

ASIA POLYOLS

$/tonne, flexible foam slabstock, spot



PRICES

Polyols prices have been tracking feedstock PO prices closely, with polyols producer margins being tightly squeezed. Prices of US dollar denominated flexible slabstock grade of polyols in China hit a 10-month high in the second half of August 2017, along with a spike in China PO prices, before retreating in September.

Polyols spot import prices in southeast Asia and India were much less volatile and had been generally range-bound in the year, with prices having inched up in August and September on supplier price hikes, amid the rise in feedstock costs and tighter regional supply.

TECHNOLOGY

Polyether polyols are produced by the catalysed addition of epoxides, mainly PO or ethylene oxide (EO), to an initiator having active hydrogens. The most common catalyst is potassium hydroxide. The reaction is carried out by a discontinuous batch process at raised temperatures and pressures in an inert atmosphere.

After polymerisation, the catalyst is neutralised and removed by filtration. The polyol is then purified. The choice of epoxides, initiator, reaction conditions and catalyst determines the physical properties of the polyol, which can range from low-molecular-weight polyglycols to high-molecular-weight resins.

ASIA/MIDDLE EAST POLYOLS CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Jurong Ningwu New Material Development	Jurong, China	400
Sadara	Al Jubail, Saudi Arabia	400
Shell Eastern Petrochem	Pulau Seraya, Singapore	360
Zibo Dexin Lianbang	Zibo, China	350
Shandong Dongda	Zibo, China	300
Wudi Dexin Chemical	Wudi, China	300
CNOOC and Shell Petrochemicals Co (CSPC)	Huizhou, China	280
Wanhua Chemical	Yantai, China	270
Shandong Longhua	Zibo, China	260
KPX	Ulsan, South Korea	230

NOTE: Top 10 listed.

OUTLOOK

The expected influx of Sadara's flexible slabstock polyols into Asia and the Middle East in 2018 will likely weigh on polyols prices, market participants said, although the price movement of feedstock PO will remain an important factor in determining the polyols price direction.

As such, the PU industry looks set to continue on its path of consolidation, with producers operating integrated facilities that produce upstream propylene to downstream polyols taking centre stage.

Polyols consumption in the Middle East is projected to be relatively healthy, as the Sadara start-up will likely provide a boost to the development of the PU value chain in the region, according to the ICIS Supply and Demand Database.

India may also be seen as a bright spot for polyols exporters, with demand for imports set to grow in the coming years, as consumption is expected to continue to outstrip capacity, the ICIS Supply and Demand Database showed. ■

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CIARAN TYLER LONDON

SAN

USES

Styrene-acrylonitrile (SAN) copolymer ranks among the hard engineering plastics. Its properties are influenced both by its molecular weight and by its acrylonitrile (ACN) content. If the two parameters are increased simultaneously, this will raise the strength, rigidity, impact strength, heat resistance and stress cracking resistance.

Key end uses for SAN are household and sanitary applications, office articles, cosmetic packaging, electrical, transparent covers, lighters, medical applications and battery housings.

SUPPLY/DEMAND

In 2017, the European SAN market was healthy in terms of availability, with no plant closures or major outages causing disruption to supply. Routine maintenances and planned turnarounds by some producers in the second-half of the year concluded without any problems and buyers were aware enough of the turnarounds that availability was unhampered in the European market.

Demand levels remained healthy throughout much of 2017, particularly from the producers' point of view. A steadily growing economy in Europe spurred buying appetite in most downstream sectors. Compounding-grade SAN in particular saw strong demand, as industrial compounding players in the downstream acrylonitrile-butadiene-styrene (ABS) market saw high demand in the automotive sector. With the automotive industry continuing to seek weight cuts to improve fuel efficiency for vehicles, compounding grade SAN has seen healthy growth, especially in the second-half of 2017.

Due to the strengthening of the euro against the dollar – it saw a two-and-half year high in August – Asian material started to become more competitive and some buyers in the domestic market sought to purchase greater volumes from parts of Asia. Suppliers in South Korea were particularly prevalent in the domestic market, as South Korea has a free trade agreement with the EU, with zero import duty paid on SAN imports. That, at certain times throughout the year, has allowed South Korean producers to price their material lower than European suppliers.

Although the arbitrage window between Europe and Asia widened slightly amid the strengthening value of the euro, imports into the domestic market have dropped compared with last year through most of 2017 so far. During the first half of the year, imports of SAN into Europe dropped by 21.72%, according to data from Eurostat. August imports of SAN dropped by 17.35% year on year to 1,987 tonnes.

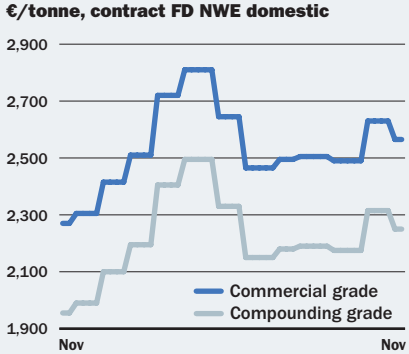
Strong demand in China and rising SAN prices in Asia during the second half of the year contributed to fewer volumes being imported into the European market.

Exports of SAN out of the EU in August, while still small in volume, were the highest monthly total in 2017 so far, growing by 74.51% to 979 tonnes, according to data from Eurostat. The quiet summer season in Europe likely contributed to sellers looking for buyers outside of the region to fulfil order entries for the month.

According to some European producers, demand into 2018 is looking stable, partly driven by falling exports from Asia.

EUROPE SAN

€/tonne, contract FD NWE domestic



PRICES

SAN prices in 2018 are likely to be driven by feedstock and upstream movement, rather than supply and demand fundamentals. Styrene will be the key driver ahead of acrylonitrile, as it makes up roughly 80% of SAN. In turn, the feedstock prices will be influenced by a combination of benzene and naphtha prices, as well as supply and demand dynamics.

Styrene experienced significant volatility throughout 2017, with triple-digit rises in February and March helping to push SAN prices to record levels.

The flooding in Houston, Texas caused by Hurricane Harvey significantly hit the global styrene market, leading to increases of €130-150/tonne for September SAN contracts in Europe.

Players in the European styrene-acrylonitrile (SAN) market expect November contracts to decrease by double digits for the second month in a row, following a fall in the upstream styrene barge contract price by €90/tonne. According to both sides of the market, such a substantial reduction in styrene will put hefty downward pressure on SAN prices, although expected upward movement in the upstream acrylonitrile (ACN) market is likely to mean that the full styrene decrease is not passed through to buyers.

EUROPE SAN CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
ELIX Polymers	Tarragona, Spain	115
INEOS Styrolution	Ludwigshafen, Germany	60
Trinseo Netherlands	Terneuzen, Netherlands	35
Versalis	Mantova, Italy	35

TECHNOLOGY

SAN is made by the polymerisation of styrene with acrylonitrile. It is an optically clear resin which when compared with general-purpose polystyrene (GPPS) has improved toughness and rigidity, better solvent and chemical resistance, and somewhat greater heat resistance.

OUTLOOK

As a mature market, European SAN supply and demand levels are not expected to see any drastic change for the rest of 2017 and into 2018.

The dominant influencing factor will likely continue to be upstream styrene prices. One area of uncertainty will be how suppliers react and adjust to the changing exchange rate and whether Asian imports into Europe will increase if the euro continues to strengthen throughout the rest of the year. ■

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GEORGE MARTIN HOUSTON

Polystyrene

USES

Polystyrene (PS) is one of the world's oldest and most widely used thermoplastic polymers. It can be solid or foam, and it is made from styrene monomer. PS is available in several forms – general purpose (GPPS), medium impact and high impact (HIPS).

PS has good processing properties and is used in many applications, including food packaging, domestic appliances, electronic goods, toys, household items, furniture and foams for construction.

It faces competition from other plastics as substitutes. For example, in food packaging some producers have switched to alternatives such as paper. Polypropylene (PP) is also mounting a challenge. In consumer electronics, other plastics such as acrylonitrile butadiene styrene (ABS) and polycarbonate (PC) have replaced a portion of PS usage.

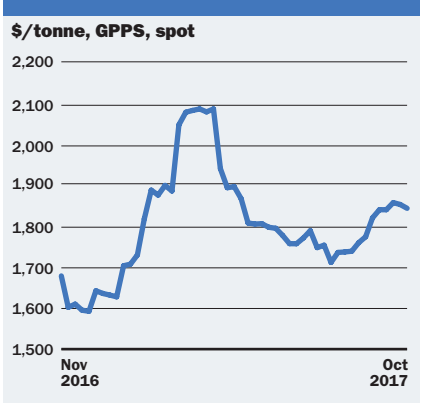
SUPPLY/DEMAND

Peak demand in the Latin America PS market is typically encountered during the summer months, when consumption of disposable packaging for food and beverages grows. However, in several countries demand from appliances has been outstripping demand for disposables in a consistent manner.

In Latin America, only Mexico, Colombia, Venezuela, Brazil and Argentina have domestic PS production. Brazil's producers are Videolar-Innova and Unigel and production outstrips demand by a large margin. When exports are not possible, producers slow down production to avoid oversupply. BASF and Dow sold their Brazilian PS production to local companies. In Argentina, the main local producer is Pampa Energia, which has a 66,000 tonne/year plant in Zarate, Buenos Aires province. Colombia has two producers – America Styrenics and Dexton. The latter consumes most production internally.

Mexico has two large producers in Resirene and INEOS Styrolution, which cater mainly to the local market while exporting some volumes to the US, Central America and the Caribbean. Venezuela's Estirenos del Zulia (Estizulia) has not been operational in 2017 because of raw material shortages.

LATIN AMERICA POLYSTYRENE*



*Average prices across countries in Latin America

PRICES

At the end of August, Hurricane Harvey created new shortages in the US Gulf that sent prices up in Latin America. Prices appear to have peaked at the end of October 2017 and are poised to stabilise or decline gradually.

Usually, prices in Mexico follow the same pattern as those in the US because both markets are connected with the NAFTA treaty. Producers in both countries are forced to compete on price. Prices in Brazil, Colombia and Argentina follow the trends in the US Gulf, but with local variations provided by import tariffs and specific supply/demand issues in each country.

Net importers such as Chile, Peru and Ecuador entertain offers from Asia, in addition to those from the US Gulf or from regional producers.

These importers have no trade barriers and buy frequently on price. PS prices typically follow the direction of US benzene/styrene contract prices closely, but other factors such as supply/demand and status of local economies also help determine prices.

TECHNOLOGY

PS was first commercially produced by polymerisation of styrene in the 1930s. The two main types of polymers produced are a clear, crystal amorphous resin, known as GPPS and an impact resin, known as HIPS, which contains varying levels of polybutadiene rubber.

Three processes generally used are the solution route, with the advantage of producing low residual monomer content and high-purity polymers; the suspension route, which produces polymers of different molecular weights, thus make specialty crystal and high-impact grades; and mass (bulk) polymerisation, the advantages of which are clarity and excellent colour.

LATIN AMERICA PS CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Unigel	Sao Jose dos Campos, Brazil	180
Gaxetas e Perfis do Brasil	Guaruja, Brazil	180
INEOS Styrolution	Altamira, Mexico	175
Resirene	Xicohtzinco, Mexico	150
Videolar-Innova	Triunfo, Brazil	135
Videolar-Innova	Manaus, Brazil	120
Americas Styrenics	Cartagena, Colombia	77
Pampa Energia	Zarate, Argentina	66
Estireno del Zulia	El Tablazo, Venezuela	47
Dexton	Cartagena, Colombia	28
International Plastics	Buenos Aires, Argentina	12
Resinor	Joao Pessoa, Brazil	2

OUTLOOK

A new PS plant is unlikely to be built in Latin America as the main obstacle is availability of raw materials. The same applies to refineries, which are the main source of benzene, used for styrene production. Most countries appear to be content with importing volumes.

US exports have traditionally covered supply gaps in Latin America, but there is also competition from other regions. US exports are expected to continue to climb in order to meet the rising demand from Latin America.

PS recycling is expected to open new growth opportunities for the industry. However, environmental concerns, fluctuating raw material prices and the increased use of substitute materials could bring challenges to the PS industry.

However, expandable polystyrene (EPS) has shown rapid growth in recent years with new applications of the material in the construction and architectural sectors, making good use of the insulating properties and light weight of this material. ■

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HELEN YAN SINGAPORE

PBR

USES

Polybutadiene rubber (PBR) is polymerized butadiene (BD). One of the first types of synthetic elastomer, or rubber, to be invented, it is very similar to natural rubber (NR) polyisoprene.

The main use for PBR is in tyres, with a high proportion of the polymer that is produced going into treads and sidewalls. Its key properties include high elasticity, good wear resistance, excellent abrasion resistance and good flexibility at variable temperatures.

PBR also has a major application as an impact modifier for polystyrene (PS) and acrylonitrile butadiene styrene (ABS) resin.

Apart from tyre treads, belts, hoses, gaskets and other automobile parts are made from PBR as it resists cold temperatures better than other elastomers.

SUPPLY/DEMAND

Demand is expected to strengthen in November and remain strong for the rest of the year in 2017.

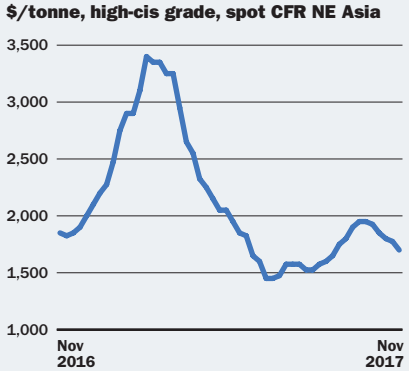
The derivative tyre makers in China tend to run at high rates or build up their tyre inventories towards the end of the year, ahead of the Lunar New Year, which usually falls either in January or February.

Asia is a growing automotive market, with China, India and southeast Asia all witnessing reasonable year-on-year growth in the automotive sector and so growing demand for tyres.

On the supply side, the PBR plants in Asia are running at full rates to meet the strong demand.

ASIA PBR

$/tonne, high-cis grade, spot CFR NE Asia



Deep-sea supplies from Europe and the Middle East are also expected to head to Asia to help meet the strong demand.

PRICES

Asia PBR prices are likely to hold steady-to-firm in December due to limited supplies and strong demand.

However, the upside potential may be capped by the soft natural rubber (NR) price.

Ample supplies of NR had dampened buying sentiment for PBR, with the downstream tyre makers reluctant to accept any significant price hike for PBR in November and December.

NR and PBR are substitute raw materials for the production of tyres in the automotive industry and their prices tend to impact each other.

Another factor that may temper any PBR price increase is the feedstock butadiene (BD) price.

The feedstock BD price had plummeted to around the $1,000/tonne CFR NE Asia level in late October and is expected to bottom out by mid-November.

In light of the anticipated rebound in the feedstock BD price from mid-November, Asian PBR producers are holding out for an upward adjustment for December PBR cargoes.

However, deep-sea supplies from Europe and the Middle East may limit any significant hike in the PBR price.

TECHNOLOGY

PBR is polymerized BD. Polybutadiene forms by linking many 1,3-butadiene monomers to make a much longer polymer chain molecule. In terms of the connectivity of the polymer chain, BD can polymerize in three different ways, called cis, trans and vinyl.

High-cis polybutadiene has a high elasticity and is very popular, whereas the so-called "high trans" is a plastic crystal with few useful applications. The vinyl content of polybutadiene is typically no more than a few percent. In addition to these three kinds of connectivity, polybutadienes differ in terms of their branching and molecular weights.

The catalyst used in the production determines the type of polybutadiene product. Using cobalt gives branched molecules, resulting in a low-viscosity material that is easy to use, but its mechanical strength is low. Neodymium gives the most linear structure (and therefore higher mechanical strength) and a higher percentage of 98% cis. Other less used catalysts include nickel and titanium.

ASIA PBR CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Korea Kumho	Yeosu, South Korea	360
LG Chem	Daesan, South Korea	185
Sinopec	Shanghai, China	180
Huayu Rubber	Haze, China	160
PetroChina	Daqing, China	160
PetroChina	Chengdu, China	150
Sinopec Yanshan	Yanshan, China	150
Lanxess	Singapore	140
SABIC	Al-Jubail, Saudi Arabia	100
Maoming PC	Guangzhou, China	100
Shandong Huamao	Shandong, China	100
Zhejiang Transfar	Zhejiang, China	100
YPC-GPRO	Jiangsu, China	100
Chi Mei	Kaohsiung, Taiwan	90

NOTE: Top 14 plants listed

OUTLOOK

Market players expect the PBR price to rebound in late November or early December, on the back of an uptick in the feedstock BD price.

The feedstock BD price is expected to bottom out in November and rebound in late November or early December.

Demand for PBR is also expected to pick up in December, with the derivative tyre makers in China building up their inventories ahead of the Lunar New Year in February 2018.

Demand for PBR had been sluggish in October due to the National Day and mid-Autumn festive holidays in China and Diwali festive holiday in India.

However, the NR price is also a key factor in determining the price outlook for PBR as both their price movements tend to impact each other. ■

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ZACHARY MOORE HOUSTON

LDPE

USES

Low density polyethylene (LDPE) is used predominantly as a packaging film, either on its own or blended with linear low density polyethylene (LLDPE) to improve mechanical properties.

Films account for more than 60% of total demand. LDPE also is used to make bags of many varieties – for newspapers, dry cleaning and frozen foods, to name a few examples – which rank as the next largest use. LDPE also is used for bottles, tubing and moulded laboratory equipment.

US LDPE shortened significantly in August of 2017 following the impact of Hurricane Harvey on the US Gulf Coast

Blown LDPE film has good processability due to a strain hardening effect of the polymer melt caused by the long-branched, long-chain structure of the polymer.

It can be used in food and medical/pharmaceutical packaging as well as in agricultural film and disposable nappies.

SUPPLY/DEMAND

US LDPE supply shortened significantly in August of 2017 following the impact of Hurricane Harvey on the US Gulf Coast. ICIS estimated that 31% of US PE capacity was shuttered by the hurricane, leading to a large loss of production. Logistics disruptions stemming from the hurricane also impacted the market, with supplies only beginning to normalise again around the month of November.

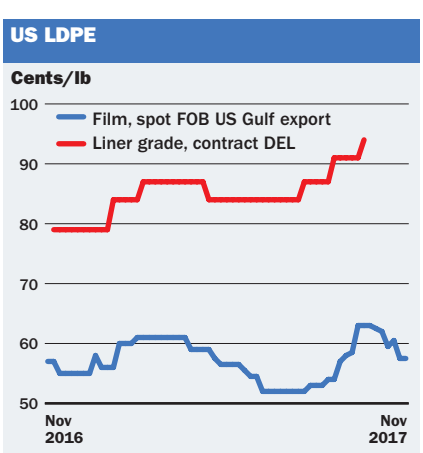
The US is adding additional LDPE capacity as part of the first wave of new crackers and ethylene derivative plants coming online in the region. DowDuPont's new 350,000 tonne/year LDPE plant in Plaquemine, Louisiana, reached mechanical completion in the third quarter of 2017 and is on track for start-up in the first quarter of 2018, according to the company.

In 2018, Formosa is expected to start up a 400,000 tonne/year LDPE plant in Point Comfort, Texas. Sasol intends to start up a new 420,000 tonne/year LDPE plant in Lake Charles, Louisiana, in 2019.

LDPE in the US is considered a mature market and little major domestic demand growth is anticipated over the next several years. As such, the bulk of the new US capacity set to come online over the next few years will need to be exported.

US producers are gearing up to increase their export activities in the coming years, aiming to expand their presence in Asia. They are also aiming to increase their existing domination of the Latin American import market.

Traditionally, the US exported most of its excess LDPE capacity to Latin America, but sellers in the US will need to find some alternative outlets as Latin America is not expected to grow quickly enough to absorb all the new PE capacity coming online in the US.



PRICES

US LDPE contract prices rose throughout most months of the year, rising by a cumulative amount of 15 cents/lb ($331/tonne) between January and October 2017.

Contract prices were anticipated to stabilise heading into the closing months of the year as demand is experiencing a seasonal slowdown while supply concerns are easing as plants come back online post-Harvey.

Export prices, meanwhile, weakened throughout the summer months before spiking sharply following Harvey. Export prices peaked in late September and have since been coming back down as supply concerns ease and US sellers find themselves pressured to reduce their offers in order to move material into overseas markets.

As of the middle of November, export LDPE prices stood around 2.5 cents/lb higher compared with the start of the year.

US LDPE CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
ExxonMobil Chemical	Baton Rouge, Louisiana	431
Westlake Chemical	Lake Charles, Louisiana	385
Westlake Chemical	Longview, Texas	315
Chevron Phillips Chemical	Cedar Bayou, Texas	280
LyondellBasell	Morris, Illinois	275
DowDuPont	Victoria, Texas	250
DowDuPont	Orange, Texas	235
ExxonMobil Chemical	Beaumont, Texas	235
DowDuPont	Seadrift, Texas	225
LyondellBasell	Clinton, Iowa	220
DowDuPont	Freeport, Texas	202
LyondellBasell	La Porte, Texas	200
DowDuPont	Plaquemine, Louisiana	185

TECHNOLOGY

LDPE is a thermoplastic made from the polymerisation of ethylene in autoclave or tubular reactors at very high pressures (up to 50,000 lb/square inch).

The autoclave process is expensive and is being replaced by tubular technology, which is preferred because of its higher ethylene conversion rates. The process can be used to make copolymers with polar comonomers, such as ethylene vinyl acetate (EVA) polymer.

OUTLOOK

US LDPE prices are expected to face downward pressure in 2018 as sellers bringing on additional capacity will have to engage in price competition in order to place volumes.

Export prices will also come under pressure as US sellers will need to be placing larger volumes into overseas markets, therefore, will need to maintain competitive pricing in price sensitive global markets. ■

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HEIDI FINCH LONDON

Titanium dioxide

USES

Titanium dioxide (TiO2) is mainly used as a white powder pigment because of its brightness and high refractive index. It is mainly used in paints and coatings, including glazes and enamels, plastics, papers, inks, fibres, foods, pharmaceuticals and cosmetics and other personal care products such as suncreams and toothpastes.

Close to 60% of TiO2 consumption goes into the paints/coatings sector, around 25% into the downstream plastics sector, 12% in the downstream paper sector and 6% is used in specialty applications, according to TiO2 manufacturers Association (TDMA) data.

SUPPLY/DEMAND

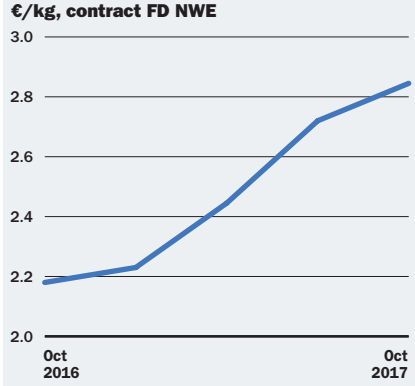
European TiO2 supply became tight in the second quarter of 2016 and this tightness has persisted for well over a year.

Venator's (former Huntsman TiO2 business) extended disruption at its Pori plant in Finland, following a fire in early 2017 also exacerbated an already tight market in Europe.

Demand has been solid, buoyed by some economic recovery in Europe. Demand in Europe has also been boosted by some pre-buying activity over recent months. There has also been some fluctuation in imports from China to Europe during 2017. There was an improvement in import availability from China into Europe during the second half of 2017, driven by the appreciation of the euro against the US dollar and lacklustre demand in China.

While there is still some residual tightness in Europe in Q4 2017, there are initial signs of supply starting to ease in Q4 on the seasonal slowdown from the paints sector.

EUROPE TIO2



PRICES

While there was a significant slide in European TiO2 contract prices between Q4 2014 and Q1 2016, amid a structural global supply glut, European TiO2 contract prices showed a sharp change in direction from Q2 2016 due to a reversal in the supply situation. The latter was due to a series of restructuring measures in Europe and globally and producers' strict inventory management over the past few years.

Europe TiO2 contract prices increased successively by close to 44% on average between Q2 2016 and Q4 2017 amid tight supply, with prices reaching the highest level since the ICIS Quarterly contract began in Q4 2013.

European TiO2 contract prices were assessed in Q4 2017 at €2.74-2.95/kilogram (KG), which typically reflects standard grade TiO2 – that is mainly used in the downstream paints and coatings sectors.

TECHNOLOGY

TiO2 is produced from ilmenite, rutile or titanium slag. Titanium pigment is extracted by using either sulphuric acid (sulphate process) or chlorine (chloride process). The sulphate process employs simpler technology and can use lower-grade, cheaper ores. The chloride route produces rutile-form TiO2, a purer product with a tighter range of particle size using rutile as feedstock ore. The sulphate process tends to use ilmenite as feedstock ore and produces rutile-form or anatase pigments.

RD Titan Group is involved in a 3-year research project on its TiO2 or i-TiO2 pigment process, which is expected to reduce production costs and have practically no waste generation. Argex said it has developed a chloride-based technology allowing for lower-cost production of TiO2 due to energy savings and a flexible feedstock slate.

OUTLOOK

Global TiO2 pigments demand is expected to grow by 4%/year, taking volumes to over 8.8m tonnes by 2025, said consultant Reg Adams from Artikol. He estimates China will account for around 41% of global demand. He also expects the growth to be driven by strong performance from downstream decor and plastics sectors, and solid performance from downstream paints sector. TiO2 players will watch the ramp-up of enator's Pori operations in Finland during 2018. They are also tracking Asia, in view of the China's environmental clampdown on production. China supply is likely to tighten and the industry is likely to consolidate, said Simon Turner, CEO of Venator.

Tronox's proposed acquisition of Cristal's TiO2 business is on track to close by Q1 2018. Tronox interim CEO Peter Johnston expects the tightness in the global TiO2 market to continue into 2018. Argex is expected to start commercial operations of its first 30,000 tonne/year TiO2 train in Canada by 2020. TNG Limited is working on its Mount Peake Vanadium-Titanium and Iron project in Australia, which is expected to produce high quality TiO2 grade product through the chloride process. ■

EUROPE TIO2 CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Cristal	Stallingborough, UK	165
Venator Materials	Greatham, UK	150
Venator Materials	Pori, Finland	130
Venator Materials	Krefeld-Uerdingen, Germany	107
Tronox	Kreieke, Germany	105
Venator Materials	Scarlino, Italy	80
Venator Materials	Huelva, Spain	80
Tronox	Botlek, the Netherlands	76
Kronos	Nordenharom, Germany	60
Kronos	Ghent, Belgium	55
Cristal	Thann, France	32
Kronos	Frederikstad, Norway	31
Precheza	Prerov, Czech Republic	25
Kronos	Leverkusen, Germany	16.5
Venator Materials	Duisburg, Germany	10

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RUTH LOH SINGAPORE

PET

USES

Polyethylene terephthalate (PET) has a crystalline structure; good chemical resistance to mineral oils, acids and solvents; good electrical resistance; low moisture absorption; resists combustion; and is self-extinguishing. It can be recycled for other applications or returned to its constituent monomers.

PET exists both as an amorphous (transparent) and a semi-crystalline (opaque and white) thermoplastic, and can be made into either a resin, fibre or film. The semi-crystalline PET has good strength, stiffness and hardness while the amorphous PET has better ductility.

The largest outlet is for synthetic fibres, followed by bottle resin. PET film is used in electrical applications and packaging.

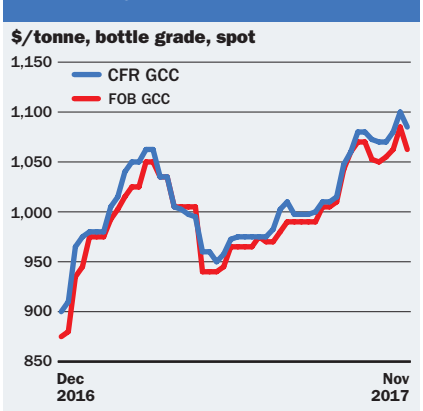
SUPPLY/DEMAND

The Middle East's bottle grade PET capacity decreased this year when SABIC in Yanbu, Saudi Arabia reduced production capacity from 750,000 tonnes/year to a 420,000 tonne/year operating rate for cost optimisation. JBF's 400,000 tonne/year Ras Al Khaimah facility in the UAE stopped production in June for a number of reasons. Octal's production was steady through the year, but the supply crunch meant demand was heightened. Gulf Co-operation Council (GCC) buyers began looking at PET from Asia, namely India and China.

It is expected that when JBF resumes operations – it aims to restart in early 2018 – the extra stock fed into the overall supply stream will regulate the current market situation, stabilising the supply/demand balance that is now heavier on the demand side.

This will alleviate depleted supply and replenish it so the market's supply/demand balance will tilt over into higher supply while demand is not expected to undergo any major changes. This may impact prices.

MIDDLE EAST PET



PRICES

Bottle grade PET is currently experiencing a global supply crunch because of the recent plant production issues in regions such as Europe and the US, forcing western buyers into Asia, including India (a supplier for the Middle East) for material. Bottle grade PET prices are impacted by feedstock prices, namely purified terephthalic acid (PTA) and monoethylene glycol (MEG), along with crude oil prices.

Because of global supply disruptions and feedstock price changes, the prices for bottle grade PET have been volatile in China and other parts of Asia towards the end of 2017. However, Middle Eastern bottle grade PET prices have not been volatile. Towards the end of 2017, prices have stayed stable-to-soft.

Middle East PET prices were assessed lower in the week ended 23 November, with prices dipping to $1,045-1,080/tonne FOB (free on board) GCC and $1,080-1,090/tonne CFR (cost & freight) GCC. Market players said this was because of uncertainty in the crude oil market and weaker MEG prices.

In 2018, with the influx of bottle grade PET resin from JBF, the extra supply from Octal, and the foreseeably stable demand, prices might experience downward pressure and not fluctuate as much on the upside.

TECHNOLOGY

To make PET resins, PTA and MEG are reacted to make a basic ester which is polymerised in a melt phase, polycondensation finishing reactor.

Dimethyl terephthalate (DMT) is an alternative feedstock to PTA, but the PTA route is preferred. The molten polymer is processed either into fibres/filaments or sent to the solid state polycondensation unit to make bottle grade chips.

MIDDLE EAST PET CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
SABIC	Yanbu, Saudi Arabia	750*
Octal	Salalah, Oman	450**
JBF	Ras Al Khaimah, UAE	400***

*SABIC in August 2017 reduced its operating rate to 420,000 tonnes/year

**The Octal site also has 1m tonnes/year of PET bottle sheet and sheet production capacity

***Shut down in June 2017 with plans to reopen for business in January 2018

OUTLOOK

Bottle grade PET prices in the Middle East are likely to hold stable for now, even though producers in areas such as China are selling at much lower prices.

Buyers in the GCC regions will still continue to buy from GCC and Indian producers because the shipping time is much more manageable and this makes inventory management easier. Unless they can afford to wait, they may not buy from China despite the better prices.

Saudi Arabia's SABIC, a major producer, has already dropped operating rates. Oman-based Octal is debottlenecking now to reach 650,000 tonnes/year of PET.

There is talk in the market that JBF in the UAE is hopeful about restarting as soon as possible. When JBF restarts, however, it is possible that the renewed supply might not affect currently operating suppliers as much, at least for the first few months, because current customers may not be willing to entrust their PET needs to JBF until the company has regained their trust in terms of certainty of supply. Thereafter, the extra supply is expected to regulate the market demand/supply balance.

The Middle Eastern PET market in 2018 should not experience any major price fluctuations if the following conditions hold – global and local demand are stable; JBF in Ras Al Khaimah, UAE, opens and begins running its lines again; and Octal debottlenecks successfully to ramp up production capacity to its full 650,000 tonnes/year. ■

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PAVLE POPOVIC LONDON

TDI

USES

Toluene di-isocyanate (TDI) is mainly used in flexible polyurethane (PU) foam, which has outlets in upholstery, mattresses and automotive seats. Other uses include semi-rigid foams and adhesives, paints, concrete sealers and a crosslinking agent in PU coatings and elastomers.

SUPPLY/DEMAND

Availability issues have been persistent in the European TDI market both in 2016, when multiple production difficulties affected supply, and in 2017. Although at the start of 2017 availability levels were said to have lengthened by some, the TDI market continued to have difficulties in sourcing volumes even after BASF brought its Ludwigshafen plant online.

The German supplier originally took the 300,000 tonne/year facility offline in November 2016 due to a damaged reactor, but brought it back online in May 2017. At first, sources had a muted reaction to the development mostly as BASF said that the facility would operate at reduced rates with full repairs finishing in 2018.

The firm added that the plant would run with a back-up reactor in the meantime. What rates the site produced at were, therefore, unclear throughout 2017 and this was said to have caused issues for TDI business. BASF then had further difficulties in October when it informed its customers that a grade of TDI manufactured at its Ludwigshafen plant in August and September may have contained concentrations of dichlorobenzene significantly above its standard impurity levels. This resulted in several polyurethane foam manufacturers temporarily stopping production.

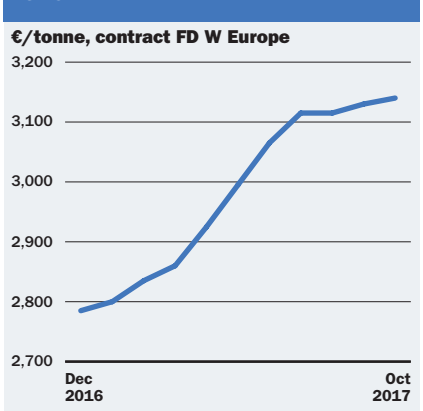
The German supplier eventually took back, at its own cost, some unprocessed TDI still in customers' tanks and changed its production process to prevent further fluctuations in quality.

In October, sources said that details on the issue were too unclear for them to fully comprehend the impact it would have on the market. Some said that, as both products combine to make flex foam, poylols supply might lengthen if there was any TDI tightness due to BASF's difficulties.

Nonetheless, in November, most polyols market participants did not notice any change in conditions, although a few TDI sources said material was scarcer following the BASF news.

Additionally, during this time, between September and November, Hungarian supplier BorsodChem was on strict allocation following planned maintenance at its 160,000 tonne/year Kazincbarcika plant that began in July. In November, a company source said that the firm would complete a stock ramp-up in December.

EUROPE TDI



PRICES

In the TDI market contract price increases were the norm in 2016 and 2017. The price midpoint of TDI firmed every month between March 2016 and August 2017. In 2017, upstream toluene movements were not considered a price driver by sources with supply and demand dynamics playing more of a role in contract negotiations.

As a result, some polyurethane foam manufacturers have spoken about their concerns regarding price increases and mentioned that customers were looking to use cheaper, alternative products. In August, prices rolled over due to the holiday season as participants looked to conclude deals before the summer vacation period began. However, the aforementioned upwards price trend continued once more from September and in October the price midpoint rose to reach €3,140/tonne FD (free delivered) W (west) Europe.

TECHNOLOGY

The main route is the nitration of toluene to dinitrotoluene, followed by catalytic hydrogenation to toluene diamine (TDA), which is dissolved in an inert solvent and reacted with phosgene to produce a crude TDI solution. TDI can also theoretically be produced directly from dinitrotoluene by liquid phase carbonylation with o-dichlorobenzene.

Germany's Bayer MaterialScience (BMS) developed a route that carries out phosgenation in the gas rather than the liquid phase. BMS started a 30,000 tonne/year pilot plant in 2004. The technology was first commercialized at its world-scale 250,000 tonne/year TDI plant in Shanghai, China and it has also used technology in its new 300,000 tonne/year TDI plant in Dormagen, Germany, which came onstream in late 2014. The firm since operates under the name of Covestro for these products.

EUROPE TDI CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
BASF	Ludwigshafen, Germany	300
Covestro	Dormagen, Germany	300
BorsodChem	Kazincbarcika, Hungary	160
Vencorex	Point-de-Claix, France*	125
BASF	Schwarzheide, Germany	80

*Vencorex's Point-De-Claix facility no longer produces T80 TDI. It manufactures, instead, a specialty grade of TDI with operating rates unclear

OUTLOOK

Sadara Chemicals, a joint venture between Dow Chemical and Saudi Aramco, started up a 200,000 tonne/year TDI facility in Jubail, Saudia Arabia in September. In November Middle East sources said material was being sent to customers in Saudi Arabia for testing.

The consensus among European market participants is that volumes from the site will be mostly sent to the Middle East and Africa. Whether this will translate to fewer exports from Europe to those regions and, therefore, increased domestic supply is less agreed upon. The Ludwigshafen plant is more of a focus for sources. Many participants see the eventual full repair of the unit as a factor that could relieve tightness in the TDI market. ■

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JESSIE WALDHEIM HOUSTON

Ethylene

USES

Ethylene is used in the manufacture of polyethylene (PE), polyester, polyvinyl chloride (PVC), polystyrene (PS) and ethylene oxide (EO), as well as fibres and other organic chemicals. PE accounts for 60% of global ethylene demand.

SUPPLY/DEMAND

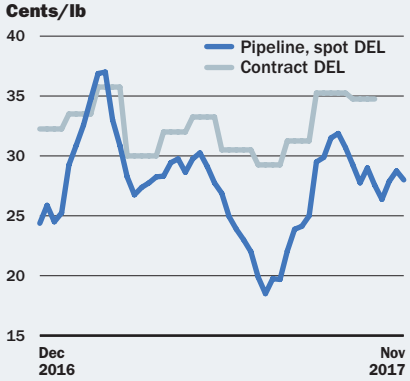
US ethylene supply is expected to tighten late in 2017 as new downstream capacity has come online ahead of expected new ethylene capacity. Three new crackers and one idled cracker had been expected to come online late in 2017. One cracker started up in September, but the others are now expected in early 2018. Some of the companies building these projects cited Hurricane Harvey for the delays.

The hurricane in late August caused ethylene outages along the Texas coast into Louisiana. While most units were back online within weeks, several outages continued into Q4. The hurricane also caused outages in downstream markets, which took some pressure off supply levels during Q3.

Ethylene inventory levels at the close of Q3 had increased from the prior quarter and from the prior year, according to the American Fuel & Petrochemical Manufacturers (AFPM).

Earlier in 2017, ethylene supplies also had tightened due to a combination of offline crackers and strong consumption into PE during Q1 and part of Q2. However, ethylene supplies lengthened in the middle of the year as outages resolved and as PE consumption eased.

US ETHYLENE



PRICES

Prices peaked in 2017 during Q1, amid turnarounds and outages at several US Gulf crackers and strong downstream consumption. In February, spot prices had risen to to a high of 36-38 cents/lb and contract prices to a high of 35.75 cents/lb.

Prices moderated in Q2 as outages resolved and continued falling into the middle of the year as the several expected downstream projects had not started up by mid-year.

Hurricane Harvey in Q3 pushed prices higher, although the post-hurricane high in late September remained below the peak in February.

TECHNOLOGY

Commercial production of ethylene is carried out by steam cracking hydrocarbon feedstocks. Natural gas liquids (NGLs) ethane and propane are the primary feedstocks in the US due to their abundance from shale gas, while oil-based naphtha is the primary feedstock in Europe and Asia.

OUTLOOK

With the delay of several cracker projects into early 2018, ethylene supply is expected to be tight early in the year. While Dow started up its cracker in Freeport, Texas, in September, the start-up of three other projects was postponed. These are:

- ExxonMobil at Baytown, Texas (1.5m tonnes/year expected mid-2018, previously end 2017)
- Chevron Phillips Chemical at Cedar Bayou, Texas (1.5m tonnes/year expected Q1 2018, previously end 2017)
- Indorama at Lake Charles, Louisiana (370,000 tonnes/year expected early 2018, previously end 2017)

As these and other projects come online, supply could move into a more balanced or even a long position. Ethylene capacity is expected to expand by more than five million tonnes/year by mid-2018 with another three million tonnes/year planned by the end of 2018.

Other 2018 ethylene projects include:

- Formosa Plastics at Point Comfort, Texas (1.2m tonnes/year, expected Q2 2018)
- Shintech at Plaquemine, Louisiana (500,000 tonnes/year, expected early 2018)
- Sasol at Lake Charles, Louisiana (1.5m tonnes/year, expected H2 2018)

Supply is not expected to be constrained by feedstock ethane supply, which is expected to remain adequate. However, crude oil values are lower now than when many of these ethylene and related downstream projects were planned, which has narrowed the cost advantage US production receives from using ethane as a feedstock. ■

US ETHYLENE CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
DowDuPont	Freeport, Texas	3,155
ExxonMobil	Baytown, Texas	2,200
Chevron Phillips	Sweeny, Texas	1,966
INEOS	Chocolate Bayou, Texas	1,907
LyondellBasell	Channelview, Texas	1,859
DowDuPont	Plaquemine, Louisiana	1,507
Formosa Plastics	Point Comfort, Texas	1,496
Shell	Norco, Louisiana	1,420
Westlake	Lake Charles, Louisiana	1,356
LyondellBasell	La Porte, Texas	1,152
LyondellBasell	Corpus Christi, Texas	1,134
BASF Total	Port Arthur, Texas	1,040
ExxonMobil	Baton Rouge, Louisiana	1,000
DowDuPont	Taft, Louisiana	990
ExxonMobil	Beaumont, Texas	900
NOVA Chemicals	Geismar, Louisiana	885
Shell	Deer Park, Texas	835
Chevron Phillips	Cedar Bayou, Texas	803
Chevron Phillips	Port Arthur, Texas	803
DowDuPont	Orange, Texas	680
Eastman	Longview, Texas	640
Flint Hills Resources	Port Arthur, Texas	621
LyondellBasell	Morris, Illinois	549
Occidental Chemical/ Mexichem	Ingleside, Texas	544
Sasol	Lake Charles, Louisiana	482

NOTE: Top 25 listed

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JOSON NG SINGAPORE

Plasticizers

USES

Plasticizers – phthalate and non-phthalate-based – are used in flexible polyvinyl chloride (PVC) to provide plasticity or elasticity to PVC film, roofing, flooring and wall coverings. As additives, they increase the flexibility and durability of the products.

Along with its use as a plasticizer, dioctyl phthalate (DOP) can also be used as a hydraulic fluid, a dielectric fluid and a solvent. Dioctyl terephthalate (DOTP) is a non-phthalate plasticizer used in products including plastic films, home flooring and automotive parts, as well as some adhesives, coatings and sealants.

SUPPLY/DEMAND

The supply and demand situation has been largely balanced in northeast Asia during the year, but there were occasional upticks in prices, namely in July, caused by short supply in China. The short supply was attributed to environmental inspections by the authorities as some plants were shut or running at lower operating rates. Supply in the domestic China market was largely snug until the middle of October, when prices started their downtrend in line with the end-of-the-year lull.

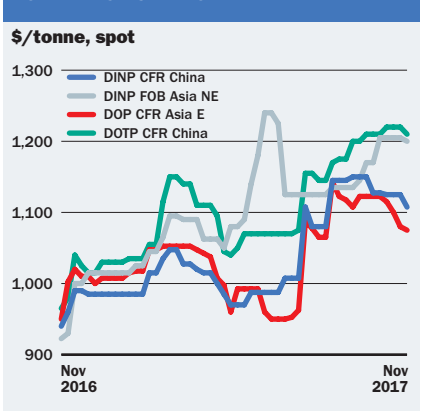
Plasticizers prices were also impacted by developments in Europe and in the US this year. In the middle of the year, Asian exports of diisononyl phthalate (DINP) increased to ease production losses in Europe after Evonik declared force majeure on its plasticizers in Europe after an explosion and fire at its Antwerp facility.

In the third quarter, exports of DINP increased once again, this time to the US in the aftermath of Hurricane Harvey.

Demand from the US has remained healthy from the northeast Asian producers' point of view since then and will continue until the seasonal lull at the end of the year.

One northeast Asian producer of 2-EH decided to bring forward and extend its turnaround, and that may have some impact on DOP and DOTP spot prices

ASIA PLASTICIZERS



PRICES

With the year winding down to a close, plasticizers markets will enter into a traditional lull season. Plasticizers prices in the Chinese domestic market were generally weak since late October as demand from the downstream PVC market fell. Prices in the import market took a hit as well.

DINP and DOTP, however, enjoyed some support at the start of the third quarter as markets in North America show more demand compared to Asian markets.

Late in November, one northeast Asian producer of 2-ethylhexanol (2-EH) decided to bring forward and extend its turnaround, and that may have some impact on DOP and DOTP spot prices.

TECHNOLOGY

DOP and DINP are produced by the esterification reaction of an alcohol with phthalic anhydride (PA), using a catalyst. For DOP, 2-EH is used, while isononyl alcohol is used for DINP. After esterification, excess alcohol is removed and the plasticizer is filtered. This is typically done in a batch reactor.

Regulatory restrictions and evolving consumer preferences have prompted many plasticizers users to remove phthalates from formulations.

Environmental problems with the low molecular weight phthalate-based plasticizers have continued to prompt development of new plasticizers based on renewable resources.

OUTLOOK

Demand in the final quarter is expected to weaken in Asia during the festive season. Looking ahead into 2018, demand for DINP is expected to pick up in Japan from the housing sector.

There is at least one northeast Asian producer looking to purchase more feedstock isononanol (INA) in 2018 to capitalise on this increase in demand.

Meanwhile in Malaysia, one producer is aiming to open a new plasticizer plant with a combined capacity of about 120,000 tonnes/year some time at the start of 2018. The plant is expected to house DINP and DOTP units and one unit producing speciality plasticizers.

Elsewhere, in Turkey antidumping duties (ADDs) on South Korean imports of DOP and DOTP have been imposed.

Imports of these plasticizers will incur a duty of 7.99-12.57% over the cost, insurance and freight (CIF) value, according to sources. While the latest ADD may come as a blow to South Korean producers, they were generally confident that demand from other regions could offset any potential loss of exports to Turkey. ■

ASIA PLASTICIZERS CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Nan Ya Plastics***	Mailiao, Taiwan	350
Shandong Qilu Plasticizers***	Zibo, China	300
Zhenjiang Union Chemical Industrial***	Zhenjiang, China	210-240
Aekyung Petrochemical***	Ulsan, South Korea	200
Shandong Qilu Plasticizers**	Zibo, China	200
Taizhou Union Chemical Industrial*	Taizhou, China	200
Zhuhai Union Chemical Industrial***	Zhuhai, China	190
LG Chem ***	Naju, South Korea	160
Shandong Hongxin***	Shandong, China	150
Zhejiang Qingan***	Zhejiang, China	150

*DINP; **DOTP; ***DOP

Click here to see an interactive plant map

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PETER GERRARD LONDON

Acetic acid

USES

The largest outlet for acetic acid is the manufacture of vinyl acetate monomer (VAM), used principally in paints and coatings. VAM is a mature product with growth of around GDP levels.

The second-largest derivative, purified terephthalic acid (PTA), a precursor for polyethylene terephthalate (PET), is itself used for bottle resins and polyester fibres, although a potentially large European producer of PTA has not found it possible up to now to enter into commercially viable production.

Acetic anhydride and solvents (ethyl acetate, butyl acetate) are the third- and fourth-largest applications, respectively.

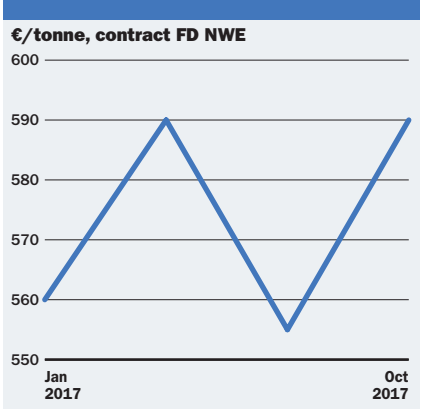
PRICES

European prices have generally risen during 2017, although there was a noticeable softening in the third quarter, principally in contract values, with a more short-lived dip in spot numbers for truck business. The gains made in the first half of 2017 were on the back of higher methanol costs.

Softer prices for the feedstock in quarter three were similarly responsible for a downward inflection in the same period. Hurricane Harvey at the beginning of the autumn triggered a rise in prices and, just as the effects of that event were receding from the market, a major fire in the Eastman plant in the US reinforced the strength of prices.

Larger spot parcels (not specifically assessed by ICIS) were especially subject to higher prices towards the end of the year, and it is expected the Eastman outage will continue to exert pressure on prices in the earlier months of 2018, after which the recent decoupling of acetic acid from methanol prices is likely to disappear.

EUROPE ACETIC ACID



TECHNOLOGY

The dominant process is methanol carbonylation, which accounts for more than 65% of world capacity. Other processes include the oxidation of acetaldehyde and the liquid-phase oxidation of n-butane or naphtha.

One producer uses a different process, making acetic acid from beechwood. This is not a commonly adopted method. It is believed that acetic acid can also be created as a byproduct of a process of acetylation applied to certain woods. This is an innovative technology that may lead to some marginal increase in output, but is unlikely to contribute significantly to overall production.

SUPPLY/DEMAND

The European acetic acid market was fairly balanced for the first half of 2017. There had been an expectation of tightness in the early months of the year because of planned maintenance work, and prices were rising in Asia, specifically China, but the market was not troubled by these events, and there was no shortage of material.

MSK's 100,000 tonne/year plant in Kikinda, Serbia, had come back up, adding to European supply in 2017. However, Russian producer EuroChem kept to its policy of selling only within its own territory.

Data from statistics agency Eurostat revealed there were significantly fewer imports in the first half of the year than in 2016, and the volume began to reach higher levels only from June. The tonnage again fell sharply in September in response to events on the other side of the Atlantic.

Hurricane Harvey had devastating effects, chiefly on logistics, in the main area of production for export of acetic acid from the US. The hurricane occurred at the end of August, and this led to smaller cargoes to Europe in September. Added to that, an explosion at the Eastman acetic acid plant in Kingsport, Tennessee radically affected the global flow of product. Producers prioritised, consistent with contractual obligations, supply to the domestic US market. Any surpluses usually available to European consumers were therefore eliminated, rendering the market untypically tight in the last quarter.

EUROPE ACETIC ACID CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
BP	Hull, UK	532
Azot Severodonetsk	Severodonetsk, Ukraine	150
EuroChem	Nevinnomyssk, Russia	150
Metanolsko-Sircetni Komplex – (MSK)	Kikinda, Serbia	100
Lenzing AG	Lenzing, Austria	25
Sekab	Domsjo, Sweden	23

OUTLOOK

The first part of 2018 will probably continue to be dominated by the fallout from the Eastman outage. While the plant may be in operation again at the beginning of the year, a resumption of full capacity production may take longer and yet more time be required for the producer to replenish normal inventory levels. Normalisation of the world market should not be a protracted process but should take a little longer to be accomplished.

This development aside, participants in the European market do not foresee major events that could effect a significant change from this year. Some feel that it will again become balanced to long, with a concomitant adjustment to prices to bring them back in line with where they were before the crises of autumn 2017.

Others consider that the market will not be subject to deflationary conditions. So far as can be judged, the price of feedstock methanol will be firm, and high input costs and increasingly stringent environmental controls in Asia will militate against substantial imports from that continent. These factors can also be seen against a generally benign economic background.

Acetic acid is expected to move more or less in line with GDP growth. ■

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PATRICK HAN SINGAPORE

Caustic soda

USES

Globally, the largest end use of caustic soda is from the alumina industry followed by the manufacture of pulp and paper and the production of organic and inorganic chemicals, the textiles industry, and manufacture of soaps and detergents.

In 2017, it is the alumina industry's demand for caustic soda which has driven the surge in global prices. Major alumina refiners are concentrated in Asia, with countries such as China, Australia, India, Vietnam and the Philippines all having major alumina producers.

SUPPLY/DEMAND

The top five end-use industries of caustic soda are alumina, organic chemicals production, textiles and detergents, pulp and paper and inorganic chemical production.

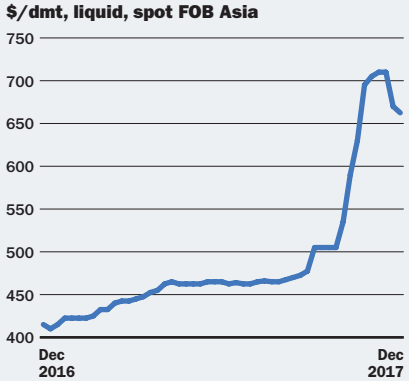
The northeast Asia region is a net exporter to Australia, India, southeast Asia and the US West Coast. Southeast Asia has some local production in Indonesia and Thailand, but overall demand in the region far outweighs its supply, therefore requiring caustic soda users constantly sourcing cargoes from northeast Asia.

Australia has become a prominent buyer of caustic soda due to the presence of multiple alumina refineries. It has been sourcing cargoes both from northeast Asia and the US Gulf.

China has the largest caustic soda production capacity in the world at more than 45% share compared to any other country or region. Currently it has no expansion plans as it consolidates domestic production with integration and closures of smaller plants which do not meet environmental standards.

ASIA CAUSTIC SODA

$/dmt, liquid, spot FOB Asia



PRICES

Prices have gone up dramatically since September 2017 in Asia due to extremely tight supply and booming demand from buyers in the region. Prices in China have largely affected the regional prices. Prices of chlorine, of which caustic soda is the co-product, has been hovering around negative territory for most of the year, which leave chlor-alkali producers in China seeking better returns from caustic soda.

Tight environmental inspections in China from September to October led to low operating rates of producers which further limited supplies in the market.

Producers in Japan and South Korea both reported extremely tight spot situations throughout much of 2017, which saw most of the international spot demand from China. When domestic prices in China were higher than export prices, Chinese producers were very reluctant to spare any volumes for export, which further spiked export prices.

Prices have shown softening signs since the end of November as production cuts of 30% from 15 November to 15 March ordered by the Chinese government on alumina refineries has diminished domestic demand and prices in China, which led producers to soften their export prices too.

TECHNOLOGY

Nearly all caustic soda is generated by the electrolysis of sodium chloride solution using mercury, diaphragm or membrane cells. For every 1 tonne of chlorine, 1.1 tonnes of 100% caustic soda is generated. In Asia, the dominant technology is membrane cells, followed by diaphragm cells and lastly mercury cells.

Membrane cells hold many advantages over the other cells, including being the most cost competitive, one of the most environmentally friendly and having the ability to produce highly concentrated caustic soda. Future chlor-alkali projects in Asia will most likely be of the membrane cell process.

OUTLOOK

Growth in caustic soda demand and trade flow in Asia is, and will, still be led by the alumina industry, which is one of the largest end-users of caustic soda. In Asia, demand from new textile and rayon facilities in southeast Asia and alumina capacities in the Middle East will further increase demand for the cargoes. Supply in Asia is heard to be stable with no major new capacities to be launched in the next year. Therefore tight supply/demand dynamics are likely to continue in Asia, including Australia.

Chinese domestic demand is likely to further increase on integrations of smaller alumina producers with larger state-owned enterprises. And the impact of environmental inspections in China will be closely watched as they impact supply/demand balances of caustic soda in the country, which also influences global prices. ■

ASIA CAUSTIC SODA CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Formosa Plastics	Mailiao, Taiwan	1,330
Xinjiang Zhongtai Chemical Industry	Urumqi, China	1,200
Tosoh	Nanyo, Japan	1,125
Dongying Jinling Chemical Industry	Dongying, China	800
Ciping Xinfa Huayu Alumina	Shandong, China	800
Beiyuan Chemical Industry	Shenmu, China	800
Dongying Huatai Chemical Group	Shandong, China	750
Hanwha Chemical	Yeosu, South Korea	730
Shanghai Chlor-Alkali Chemical (SCAC)	Caojing, China	720
PT Asahimas Chemical	Cilegon, indonesia	700
Shandong Haili Chemical	Zibo, China	640
Tianjin Dagu	Tianjin, China	600
Befar Group	Binzhou, China	600
LG Chem	Yeosu, South Korea	500
Wanhua Chemical	Ningbo, China	500
Ningbo Donggang Electrochemical	Ningbo, China	500
Tokuyama	Tokuyama, Japan	490
Juhua Group	Quzhou, China	460

NOTE: Top 18 sites by capacity

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LEELA LANDRESS PEREZ HOUSTON

Fatty acids

USES

Fatty acids and their chemical derivatives have a place in almost every phase of modern living. Fatty acids are largely used in cosmetics and toiletries such as shampoos, liquid detergents, fabric softeners and body lotions. They are also used as lubricants and plasticizers in rubber and polymer processing as they improve the performance of paints, plastics, lubricants, textiles and rubber products.

Additionally, fatty acids add wanted qualities to foods – mainly to modify other well-known materials.

SUPPLY/DEMAND

The global oleochemicals industry is facing 10 years of overcapacity and supply at about 2m tonnes of excess capacity while fatty alcohols supply is at about 1m tonnes of overcapacity.

In recent years, global fatty acids demand has increased as a result of end-use consumption growth, as well as strong growth of oleochemicals supply (fatty acids, fatty alcohols, glycerine).

PRICES

The tallow-based fatty acids market in the US follows feedstock trends. US C18 tallow-based triple-pressed stearic acid (TPSA) prices were assessed at 46.25-50.25 cents/lb DEL US in early December 2017, down by 1.5 cents/lb from the previous month.

Many formula-based buyers use the renderer-grade bleachable fancy tallow (BFT) or packer-grade BFT average from the previous month and an adder number as a key component for the monthly contract calculation. Some addition of lower-priced choice white grease (CWG) is also being used in the feedstock mix.

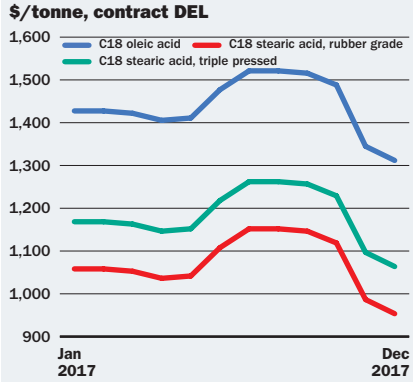
C18 stearic rubber-grade prices on a DEL basis in early December 2017 were assessed at 40.75-45.75 cent/lb, down by 1.5 cents/lb from November. C18:1 oleic fatty acids were at 57.75-61.25 cents/lb DEL for December 2017 business, also down 1.5 cents/lb.

Meanwhile, C16 palmitic fatty acids on a US DEL basis were at 59-63 cents/lb for December 2017, down 1 cent/lb from November. The basis for the C16 palmitic acids on a DEL basis in the US Midwest spread is formed by the FOB southeast Asian prices plus freight and storage.

In Asia, fatty acids suppliers mostly maintained their offers in mid-December even with buyers lowering their buying indications due to further falls in feedstock palm oil prices. Asia palm oil prices have been on a general decline since early November, with lower exports and increased stock in November asserting further downward pressure.

Some suppliers in Asia maintained they were comfortable with their inventories and believed there was little need to adjust their offers with the year-end holiday approaching.

US FATTY ACIDS



FEEDSTOCKS

Fatty acids are derived primarily from vegetable oils such as palm and coconut oil. Most fatty acids production is in southeast Asia, particularly Malaysia, Indonesia and the Philippines. Palm oil is the raw material used in Malaysia and Indonesia, while coconut oil is used in the Philippines.

In North America, fatty acids are produced primarily from tallow fats. The basic acids from this production are the C18 stearic acids.

The production process in the US utilises bleachable fancy tallow (BFT) for the main feedstock, which is rendered from cattle and hog material after slaughter. Glycerine is a co-product of fatty acid production.

OUTLOOK

US tallow-based fatty acids supply is likely to remain long and pricing in line with feedstock price variation through 2018. Overcapacity will remain an issue as rationalisation and new uses both remain distant targets.

The fatty acids market globally likely has about 2m tonnes/year of excess capacity. There is talk about consolidation and shutdowns as the solution to the oversupply. However, some industry experts do not agree as some of the most profitable plants are the oldest.

On the mergers and acquisitions (M&A) front, US-based vertically integrated producer Vantage Specialty Chemicals was acquired by private equity firm H.I.G. Capital in September 2017 from another private equity firm, The Jordan Company. It is H.I.G.'s second time buying Vantage, as it bought Croda's US oleochemicals business in 2008 (forming Vantage), which it then sold to The Jordan Company in 2012.

Another possible solution to overcapacity is new uses, but the sector has not seen any large new uses arise in recent years.

In previous years, the oleochemicals sector looked to demand in China as the solution to overcapacity. However, that scenario looks to have changed. China's economy will continue to grow at slower rates in coming years as it rebalances from a manufacturing model towards consumption and services.

The outlook for oleochemicals also looks bearish as feedstock prices are forecast to remain low. Historically, low feedstock prices also equate to low margins for the sector. Experts believe that fats and oils prices will remain low in the foreseeable future. ■

Additional contribution from Jackie Wong in Singapore and Joseph Chang in New York

US FATTY ACIDS PLANTS

Company	Location
VVF North America	Montgomery, Illinois
Emery Oleochemicals	Cincinnati, Ohio
PMC Biogenix	Memphis, Tennesee
Twin Rivers Technologies	Quincy, Massachusetts
Vantage Oleochemicals	Chicago, Illinois
P&G Chemcials	Cincinnati, Ohio

NOTE: Capacities not available

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NICK CLEEVE LONDON

Butyl acetate

USES

Four butyl acetates exist, but only normal butyl acetate (n-butyl acetate) and iso-butyl acetate are of commercial importance. The major outlet for n-butyl acetate (butac) is as a solvent for lacquers because it gives good flow and brush resistance when used in film-coating resins such as cellulose nitrate, cellulose acetate butyrate, ethyl cellulose, polystyrene (PS) and methyl methacrylate (MMA) resins.

It is also widely used as a solvent in the preparation of artificial leathers, textiles and plastics, as an extractant for oils and pharmaceuticals, and as an ingredient for perfumes and synthetic flavours.

Butac and butanol can be used as a dehydrating agent because they form a ternary azeotrope with water.

SUPPLY/DEMAND

European supply of butac was limited for much of 2017 due to a force majeure declared by BASF in October 2016 following an explosion and shutdown of its plant in Ludwigshafen, Germany.

In addition, OXEA had an unplanned shutdown and declared force majeure in February, following a technical issue at their plant in Marl, Germany. This further tightened European supply.

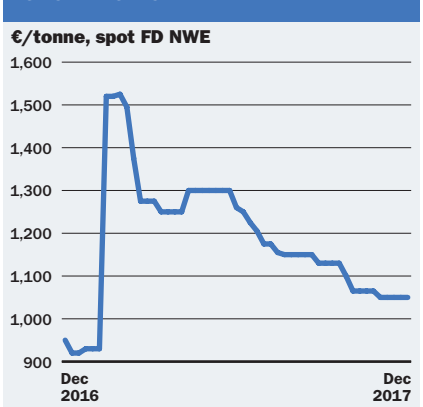
Limited imports, tightness in feedstock n-butanol (NBA) and the absence of BASF kept the market tight until July-August, when seasonally weaker demand allowed supply to return to a balanced situation.

BASF also lifted its almost year-long force majeure in August, though production remained at reduced rates.

Market conditions returned to stability during the fourth quarter, with balanced supply and demand largely within the expectations of market players.

It was confirmed in early December that production of butac at Ludwigshafen had returned to normal rates.

EUROPE BUTAC



PRICES

In February, butac prices surged to their highest levels since ICIS records of its price in euros began in November 1999, on news of OXEA's declaration of force majeure and a subsequent tightening of supply.

Feedstock NBA costs also surged to record levels in the first half of the year on tightness largely caused by BASF declaring force majeure on NBA from Ludwigshafen following the explosion in October 2016. BASF is the largest producer of NBA in Europe. This incentivised producers to sell additional NBA rather than using it to produce butac and supported continued high downstream price levels.

Prices steadily decreased throughout the second half of 2017 as availability of butac and NBA eased, but remained significantly above levels seen in 2016 before BASF declared force majeure.

TECHNOLOGY

Butac is produced by esterifying acetic acid with butanol in the presence of sulphuric acid, which acts as a catalyst. The acetic acid, butanol and sulphuric acid are heated in a reactor to 89°C (192°F).

Vapours containing butac, butanol and water are removed and condensed. The top layer is fed to a low boiler column where unreacted alcohol is flashed off and recycled to the reactor.

The crude ester mixture undergoes a second distillation to separate the butac from other byproducts.

OUTLOOK

BASF's resumption of normal production rates at Ludwigshafen has returned the European butac market to the structurally long situation last seen in September 2016 where the three major European producers (BASF, INEOS and OXEA) are all producing at normal rates.

EUROPE AND RUSSIA BUTAC CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Oxea	Marl, Germany	100
INEOS	Antwerp, Belgium	95
BASF	Ludwigshafen, Germany	90
Dmitrievsky Chemical Plant	Kineshma, Russia	36
Solvent Wistol	Oswiecim, Poland	18
Azot Nevinnomyssk	Nevinnomyssk, Russia	18
Carbohim	Moloma, Russia	6

This situation has the potential to cause supply in Europe to become long, which would put downwards pressure on prices.

The main question for 2018 is whether, despite this lengthening of supply and demand likely to remain stable, prices will remain at levels consistent with 2012-2014 or will fall to the lower levels seen in 2015-2016.

Several sources said that they expect some downward pressure on pricing in early 2018, though they did not believe that prices would return to the levels seen immediately before BASF declared force majeure in 2016.

A buyer said that it expected pressure from its downstream customers to reduce prices now that BASF's force majeure has ended, which would put pressure on the prices it is paying for butac in order to maintain its margins.

The source also said that it expected competition on pricing from Russian and Polish producers, who were more active than usual in northwest Europe during BASF and OXEA's production issues.

However, upstream factors will also be a strong influence, with higher crude oil and propylene prices opposing the downwards pressure caused by the normalised supply situation.

Price movements for key feedstock NBA could also be influential on butac prices. NBA is expected to be stable to soft but supply limitations caused by scheduled shutdowns may limit further price decreases which could be passed through to butac. ■

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YUANLIN KOH SINGAPORE

MEK

USES

Methyl ethyl ketone (MEK) is mainly used as a low-boiling solvent for nitrocellulose, acrylic and vinyl surface coatings. More than half of global demand is derived from the paints and coatings industry. MEK can also be used in rubber-based industrial cements, low-temperature bonding agents and as an azeotropic separation solvent for printing inks. It is also a component of the solvent system used in producing magnetic tape. MEK is also a solvent required for the polymerisation processing of polystyrene (PS), acrylonitrile butadiene styrene (ABS) and styrene butadiene rubber (SBR).

SUPPLY/DEMAND

2017 found Asian suppliers banking on the open arbitrage window to Europe when Shell's refinery and petrochemical site in Pernis, the Netherlands, declared a string of force majeures across its production lines, including MEK, after suffering a fire and power outage on 29 July 2017.

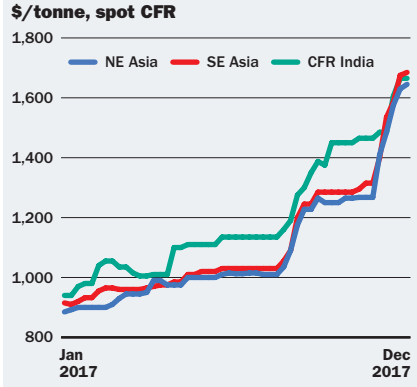
The arbitrage window to the US opened after Hurricane Harvey swept in late August. As no North American plant produces MEK, consumers depend completely on imported material. With the ongoing situation in Europe, MEK went on allocation, even after the force majeures were lifted.

These factors have led to a tightening in the Asian MEK market, as Asian suppliers diverted their cargoes to Europe and the US, seeking lucrative margins.

The market became even tighter after several small domestic Chinese plants were forced to shut when authorities cracked down on them amid stricter environmental regulations. Other major Chinese MEK plants, which mainly focus on exports, were also heard to be running on reduced capacities due to ongoing environmental inspections or logistical issues which prevented them from exporting.

In the tight market, Japanese suppliers were only concentrating on fulfilling contractual obligations and catering to their domestic market. There was little to no spot cargoes available. Traders for Japanese MEK manufacturers had only limited lots to sell every few months. At the end of 2017, only one supplier was heard to be offering any spot cargoes in the Asian market.

ASIA MEK



PRICES

Asian MEK spot prices trended up in August 2017 on tight supply after Asian suppliers sold the majority of cargoes to Europe and the US.

Spot prices spiked from November, with no signs of slowing down with demand outstripping supply. Towards the end of 2017, northeast Asian buyers were heard to be securing material at least two months in advance. A deal for a February cargo was heard at $1,690/tonne CFR (cost and freight) NE (northeast) Asia. Offers for February cargoes to the same region were heard around the range.

Between June and December, prices rose by about 60% on an ever-tightening supply. Buyers may be forced to accept higher offers if this market condition persists.

TECHNOLOGY

The main commercial route is the dehydrogenation of secondary butanol. The alcohol vapour is fed into a multi-tubular reactor containing zinc or copper oxides as catalysts. The reaction occurs at 400-500°C (752-932°F) and pressures of less than 4 bar. A newer technology involves the direct oxidation of n-butene in solution using palladium and cupric chlorides as catalysts. MEK can also be made as a by-product in butane-based acetic acid manufacture.

OUTLOOK

Asia spot availability is expected to be tight in the near term with ongoing environmental inspections in China, which have forced closures of several smaller domestic plants, and reduced operating rates in larger plants.

Japanese plants will also be undergoing biennial scheduled turnarounds, with very limited spot cargoes to offer the wider market.

With the majority of suppliers giving priority to their domestic customers and fulfilling their contractual obligations in 2018, the tight market situation is not likely to ease anytime soon. As a result, sources agree that prices are not likely to see a downturn at least in the near term, on the back of stable-to-strong demand.

Some sources said that end-users are feeling the heat and have turned to other solvents like ethyl acetate (EA) to replace part of MEK without impacting the quality of the end-products. The end-users will have to look for other alternatives to replace MEK if tight supply and high prices continue.

Southeast Asia and South Korea are entirely dependent on northeast Asia supply. Any disruption in the regular flow of supply will hit them hard, which the latter part of 2017 had shown. ■

ASIA MEK CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Maruzen	Ichihara, Japan	170
Tasco Chemical	Lin Yuan, Taiwan	120
Zibo Qixiang	Zibo and Shandong, China	100
JXTG	Kawasaki, Japan	90
Tonen	Kawasaki, Japan	90
CNPC Lanzhou Chemical	Lanzhou, China	60
Fushun Petrochemical	Fushun, China	55
Hebei Zhongjie Petrochemical	Cangzhou and Daqing, China	42
Isu Chem Shandong Dongming	Shangdong, China	40
Xinjiang Dushanzi Tianli	Dushanzi, China	40
Ningbo Haiyue	Zhejiang, China	40
Idemitsu Kosan	Tokuyama, Japan	40

NOTE: Top 12 plants listed by capacity

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

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MELISSA BARTLETT LONDON

Fatty acids

USES

Fatty acids and their chemical derivatives are largely used in cosmetics and toiletries such as shampoos, liquid detergents, fabric softeners and body lotions.

They are also used as lubricants and plasticizers in rubber and polymer processing because they improve the performance of paints, plastics, lubricants, textiles and rubber products.

Additionally, fatty acids add qualities to foods – and other materials.

FEEDSTOCKS

Fatty acids are derived primarily from vegetable oils such as palm and coconut oil. Palm oil and palm kernel oil are the raw material used for fatty acid production in Malaysia and Indonesia, while coconut oil is used in the Philippines.

Fatty acid production in Asia, particularly in southeast Asia, accounts for around 80% of global fatty acids production.

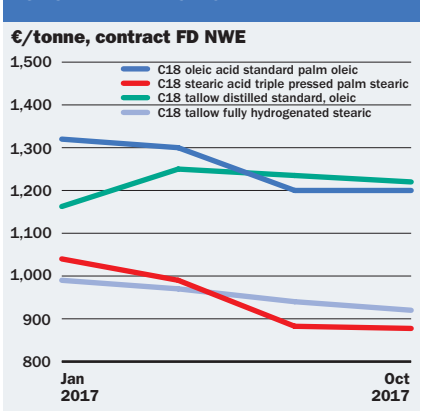
From 2010-2015, global fatty acids capacity more than doubled, and it nearly tripled in southeast Asia, with Indonesia seeing fivefold growth.

With capacity growth outpacing demand, the global market is expected to remain oversupplied for some time.

In Europe, fatty acids are also produced from tallow fats. The basic acids from this production are the C18 stearic and oleic acids.

Glycerine is a co-product of fatty acid production.

EUROPE FATTY ACIDS



SUPPLY/DEMAND

The global oleochemicals industry is facing 10 years of overcapacity and supply at about 2m tonnes of excess capacity while fatty alcohols supply is at about 1m tonnes of overcapacity. In recent years, global fatty acids demand has increased as a result of end-use consumption growth, as well as strong growth of oleochemicals supply (fatty acids, fatty alcohols, glycerine).

In the European market, supply and demand remained fairly well balanced and stable through much of 2017, after starting the year with somewhat tighter conditions on the back of limited feedstock availability and high prices.

There remains some differences between different acids. In particular availability of oleic acid in Europe was consistently described as tighter than other fatty acids in Europe.

Typical season trends continued to be observed through the year with the market seen as relatively quiet amid the traditional summer slowdown, particularly in the south of Europe.

PRICES

Prices in Europe ended 2016 under considerable upward pressure, amid tight conditions. In the first quarter of 2017, contract prices increased without exception, due to a feedstock supply shortage in Europe, albeit amid minimal purchases as buyers wait for softer prices.

Feedstock tallow prices were on the rise because of competitive demand from the energy sector, supply issues from inefficient production and on the back of a spike in alternative feedstock, vegetable oils.

Palm prices were also on an upward trajectory, driven by market shortage. Heat from El Nino in 2016 had adversely affected palm production and yields in Indonesia and Malaysia.

There was stiff competition between tallow and palm fatty acids, with some customers choosing to buy the cheaper tallow-based products. This, in some instances, offset some of the upward pressure on palm-based product, especially on palm oleic acid.

By the second-quarter, contract prices were stable to soft compared with the previous quarter, primarily on the back of significant price drops in feedstock crude palm oil (CPO) and palm kernel oil (PKO) in the first quarter.

Tallow oleic Q2 fatty acid contract prices were the only exception as these increased because of tighter availability, driven by a shortage in feedstock tallow or animal fat, due to continuing heavy use in the biodiesel industry, and the subsequent reduction in the supply pool available for the oleochemical sector.

In the third quarter, prices in Europe were assessed down again for both tallow and palm-based material. Trends in upstream and global pricing influenced price discussions in the quarter, with market participants adding that they had noted greater decreases in palm-based product while tallow-based acids gained some premium over vegetable-based material although still registered some softer sentiment.

In the fourth quarter, prices were again stable to slightly soft amid largely steady fundamentals.

OUTLOOK

An uncertain raw material price outlook will continue to affect both buying and selling sentiment globally in 2018.

With palm oil prices remaining volatile throughout 2017 and at times, moving against seasonal patterns and market expectations, buyers in Asia have been particularly cautious with restocking activities and operated mostly hand-to-mouth.

After palm oil production was severely affected by the El Nino in 2016, many had expected 2017 to be a year of recovery, but data showed that while production volume in 2017 was better than 2016, it still fell short of 2015 levels.

In terms of global supply, the issue of chronic overcapacity persists and most producers have been countering it by reducing their output to protect their margins.

Looking to the European market, several players have said they expect limited change in the market in the first quarter of 2018.

Contracts settled for Q1 2018 ahead of the end of 2017 were broadly stable. Domestic demand fundamentals are also expected to remain largely steady through the start of the year, and as yet, players are not anticipating any similar issues with supply as those seen in late 2016 and early 2017. ■

Additional reporting by Leela Landress, Jackie Wong and Cuckoo James.

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ZACHARY MOORE HOUSTON

LLDPE

USES

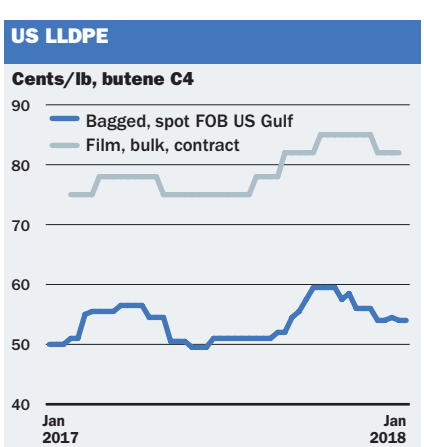
Linear low density polyethylene (LLDPE) is a thermoplastic polymer used mainly in the film sector. More than 80% of global LLDPE is used as film for food and non-food packaging. Stretch film is used for industrial packaging and LLDPE can be used for a wide range of other applications.

LLDPE is manufactured by adding alpha-olefin co-monomers (butene, hexene or octene) during ethylene polymerisation to produce a number of different products with a range of densities depending upon the amount of co-monomer added. This results in a very wide range of final products with improved performance compared to traditional low density polyethylene (LDPE) as a result of the more linear structure.

SUPPLY/DEMAND

The US added a large volume of LLDPE capacity in 2017 and additional capacity additions are anticipated for 2018. In 2017, ExxonMobil started up a 1.3m tonne/year LLDPE facility in Mont Belvieu, Texas while Chevron Phillips Chemical (CP Chem) started up a 500,000 tonne/year LLDPE plant in Old Ocean, Texas. In 2018, Sasol is expected to start up a 470,000 tonne/year LLDPE plant in Lake Charles, Louisiana.

While supply is increasing in the US, domestic demand for LLDPE is considered mature is not expected to expand beyond GDP growth. As such, the large majority of material from new LLDPE plants will need to be exported. US exporters have been building up sales and marketing networks overseas, especially in Asia, where sellers are likely to try to place most of their new volumes. US sellers have traditionally directed most of their exports to Latin America and are likely to try to expand their market share in the region, although demand from Latin America is not expected to grow fast enough to absorb all the additional capacities coming from the US.



PRICES

US LLDPE prices moved higher during the second half of 2017, pushed up by supply constraints and logistical disruptions stemming from the impact of Hurricane Harvey on the US Gulf Coast. Between August and October, domestic contract prices for LLDPE rose by a cumulative 10 cents/lb ($220/tonne).

However, prices started to moderate in November as Harvey's effects dissipated, while additional capacities contributed to a lengthening of supply. Prices began to come down in December and buyers are hoping to reclaim the full 10 cents/lb post-Harvey hike seen in domestic contract prices.

Export LLDPE prices also moved higher following Hurricane Harvey's landfall, rising 8.5 cents/lb from mid-August to late September, when export prices reached their 2017 peak. Export prices began to decline from mid-October through the end of the year as supply concerns eased.

In January, several polyethylene (PE) producers separately announced initiatives calling for price hikes of 4 cents/lb, effective 1 February or as contracts allow. Sellers commented that supply has tightened and demand has increased, as buyers are starting to come back to the market to secure material.

Buyers, on the other hand, are still carrying some of the price increases accumulated in the aftermath of Hurricane Harvey. In addition, some buyers commented that price increases cannot be justified, given the significant volumes of additional capacities brought on line late in 2017, along with the fact that US PE prices remain higher than prices seen in other major global regions. Buyers also pointed to higher inventory levels for both high density polyethylene (HDPE) and LLDPE.

ICIS assessed December contracts for LLDPE butene (C4) film at 81-83 cents/lb.

TECHNOLOGY

Solution, slurry or gas-phase processes are used to produce LLDPE and many processes can produce products with densities lower than LDPE and into the HDPE range. Usually, production plants tend to be focused on either LLDPE or HDPE but retain this inherent flexibility and often produce campaigns of either product.

The introduction of metallocene catalysts has enabled the production of resins with narrow molecular weight distribution resulting in improved product quality (performance) sometimes at the expense of the easy processability of traditional LDPE.

US LLDPE CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
ExxonMobil	Mont Belvieu, Texas	2,400
DowDuPont	Freeport, Texas	800
DowDuPont	Taft, Louisiana	760
ExxonMobil	Beaumont, Texas	727
DowDupont	Plaquemine, Louisiana	666
Chevron Phillips	Cedar Bayou, Texas	520
Chevron Phillips	Sweeny, Texas	500
DowDuPont	Seadrift, Texas	450
Formosa Plastics USA	Point Comfort, Texas	365
LyondellBasell	Morris, Illinois	320

NOTE: Top 10 plants

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

OUTLOOK

The US LLDPE market is expected to see some decreases in both domestic and export prices during the first quarter of 2018 on lengthening supply. Domestic demand for LLDPE is not expected to grow quickly enough to absorb all the new capacity additions coming online, ensuring that sellers will be looking to expand their presence in external markets.

This may also put some downward pressure on prices in the coming year as new plants may need to maintain an aggressive pricing policy in order to win market share from existing suppliers. ■

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AMY TAN SINGAPORE

Epichlorohydrin

USES

The primary market for epichlorohydrin (ECH) is epoxy resins. About 90% of ECH output goes into the manufacture of epoxy resins for surface coatings, castings, laminates and adhesives, as well as specialty resins for water treatment, paper treatment and ion exchange, to purify air and water.

ECH is also used as a raw material in the manufacture of a multitude of glycerine derivatives used as plasticizers, stabilisers, solvents, dyestuff intermediates, surface active agents, pharmaceuticals and as intermediates for further synthesis.

SUPPLY/DEMAND

The implementation of stricter environmental regulations by the Chinese government has resulted in several ECH plant shutdowns in the past two years. The laws were introduced as part of China's effort to fight pollution. Existing plants are running at rates estimated to be at 50% or less.

At the same time, producer margins were being squeezed by firmer feedstock propylene costs. As a result, smaller producers, which are less cost-efficient, either shut down plants or ran them at lower rates.

Elsewhere, ECH producers that use alternate feedstock glycerine have been running their plants at full capacity. However, some end-users and buyers said that there has not been a constant supply of glycerine-based ECH in the key China market.

China produces nearly 60% of Asia's total ECH output, based on industry estimates. While the supply of ECH has shrunk in the past year, some buyers are hesitant to import cargoes. Amid the current tight supply, offers for Asian origin spot import cargoes have been increasing in tandem with domestic prices in China.

Key ECH producers in South Korea say they have no incentive to sell to China as they can achieve better netbacks by diverting cargoes to Europe. South Korean ECH has steadily made inroads into Europe because of a free trade agreement (FTA) between the two.

Demand from downstream epoxy resins in Asia was largely stable in the first half of 2017 but gained momentum in the second half. Like ECH, many epoxy resins plants in China were forced to shut due to the stricter environmental regulations.

Most epoxy resins plants in China have been running at full capacity since 2017. As demand outstripped supply, buyers and producers in China also sourced epoxy resins from the region to meet demand.

ASIA ECH

PRICES

A persistent buy-sell gap has impeded spot import demand in China for most of 2016 and 2017. From January to early September 2017, ECH prices hovered around $1,125-1,150/tonne CFR (cost & freight) CMP (China Main Ports).

As a result, northeast Asian producers and suppliers based outside China focused on selling cargoes in their respective domestic markets. Some of them also sold cargoes in the US, Europe and India. However, demand for spot cargoes in these markets was sporadic. Demand for spot import cargoes into China picked up around September, when domestic prices rose amid tight supply.

Around this time, Asian ECH producers increased their offers into China as they could easily divert their cargoes to the US and Europe where they could achieve better netbacks. Amid tight supply, ECH prices in the China domestic market and spot import market faced upward pressure.

TECHNOLOGY

ECH is essentially a derivative of propylene and chlorine that combines the reactivity of an epoxide group with the additional reactivity of a chloro-group on to a propylene backbone. There are currently three process routes used to produce ECH at an industrial commercial level – via allyl chloride, allyl alcohol and the newer glycerine route.

ASIA ECH CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Shandong Haili Chemical	Shandong, China	320
Shandong Haili Chemical	Jiangsu, China	130
Samsung Fine Chemical	Ulsan, South Korea	120
Advanced Bio-chemical Thailand (Solvay)	Rayong, Thailand	100
Formosa	Yunlin, Taiwan	100
Yihai Kerry (Wilmar)	Jiangsu, China	100
Chang Chun Chemical	Liaoning, China	96
Jiangsu Yangnong Chemical	Jiangsu, China	90
Triplex Chemical	Taoyuan, Taiwan	72
Tianjin Chemical Plant	Tianjin, China	60

NOTE: Top 10 plants

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

OUTLOOK

Supply of ECH is expected to remain tight in the near-term. There are no signs that the Chinese government will ease environmental regulations. At the same time, ECH producers based in South Korea and Japan are seeing strong domestic demand in their respective markets. In addition to contractual volumes, they have received more spot enquiries from their home markets.

One southeast Asian producer and one northeast Asian producer revealed that they do not have any spot availability for January and February amid contractual obligations.

An anticipated pick-up in re-stocking activity is expected in January ahead of the Lunar New Year in mid-February.Against this backdrop, domestic ECH prices and spot import offers into China continue to face upward pressure. ■

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BILL BOWEN HOUSTON

VCM

USES

Vinyl chloride monomer (VCM) is a colourless gas with a mildly sweet odour that is toxic and a human carcinogen. It is used almost exclusively (90% plus) in the manufacture of polyvinyl chloride (PVC), though some goes to produce polyvinylidene and several chlorinated solvents. The majority of PVC, a durable and widely adaptable plastic, goes to end-uses with demand connected to construction. VCM demand is directly related to PVC demand and construction activity.

SUPPLY/DEMAND

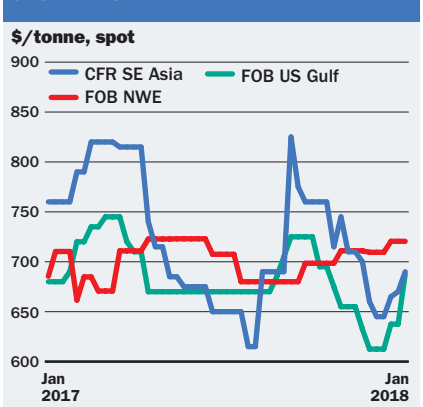
Global production capacity of VCM is about 55m tonnes/year with about half of global production and demand in Asia. Europe has production capacity of more than 10m tonnes/year, the Middle East about 2m tonnes/year and Latin America approximately 3m tonnes/year.

Additional capacity in the US is being added to the current 8.55m tonnes/year to capitalise on cheap shale gas feedstock from ethane. Demand growth has been pretty steady at about 3% as US and global construction activity continues to recover towards levels prior to the 2008-2009 real estate construction bubble.

Shintech expanded capacity by 300,000 tonnes/year at its 1.6m tonne/year VCM plant site in Plaquemine, Louisiana, in 2016. Efforts by Mexichem, in partnership with Mexican state oil company Pemex to boost VCM output at its plant in Veracruz, Mexico, ended with an explosion at the 330,000 tonne/year plant early in 2016.

Late in 2017, word came that the plant will not be repaired and returned to production. In early 2017, the Mexichem 50/50 joint venture with Occidental Chemical (OxyChem) launched production at their 544,000 tonne/year ethane cracker at Ingleside, Texas. It is operated by OxyChem to produce VCM for Mexichem's PVC plants in Mexico and Colombia through a contracted sales agreement. That has lifted US VCM exports with additional US shipments.

GLOBAL VCM



PRICES

US VCM prices pushed higher in early 2018, as they tend to follow the value of derivative PVC rather than raw materials costs for feedstock ethylene dichloride (EDC), as is the case with most chemical commodities. Most VCM is used internally by back-integrated producers of PVC with little spot sales activity.

VCM spot prices have fluctuated with crude oil, a key price driver for PVC in global markets because most PVC in Asia and Europe is made from feedstock naphtha, derived from crude. US VCM prices fell to the low $600s/tonne mid-year, and then rose to almost $690/tonne at the beginning of 2018. Rising PVC demand domestically is expected to help push prices up during 2018, as well.

In the US, ethylene feedstock is mainly derived from ethane from new and existing crackers. That gives US producers a global production cost advantage, along with producers in the Middle East.

TECHNOLOGY

Commercial production of VCM began in the 1920s based on the catalytic hydrochlorination of acetylene. That route suffered from high energy costs and is now obsolete everywhere but in China, where ample coal supplies have kept the cheap alternative going.

Nearly all production outside of China is based on ethylene. Ethylene is first reacted with chlorine to make EDC and then thermally cracked to make VCM.

Today there are two routes commonly used to make the necessary EDC – direct chlorination using pure chlorine and ethylene; and oxychlorination, in which the ethylene reacts with chlorine in hydrogen chloride. The EDC is then converted to VCM by thermal cracking, and the hydrogen chloride byproduct can be recycled to an oxychlorination plant to make more EDC.

US VCM CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Shintech	Plaquemine, Louisiana	1,900
Oxy Vinyls	La Porte, Texas	1,090
OxyMar	Ingleside, Texas	1,090
Westlake Chemical	Lake Charles, Louisiana	1,050
Westlake Chemical	Plaquemine, Louisiana	725
Oxy Vinyls	Deer Park, Texas	600
Formosa Plastics	Point Comfort, Texas	560
Westlake Chemical	Geismar, Louisiana	285
Westlake Chemical	Calvert City, Kentucky	590

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

INEOS Vinyls made a more recent breakthrough with its catalytic process for generating VCM directly from ethane, following tests at a pilot plant at Wilhelmshaven, Germany.

The company claims a 20-30% reduction in production costs across the PVC chain for the process, which decouples VCM/PVC production from the naphtha cracker.

OUTLOOK

The construction industry is a key consumer of VCM through its derivative product PVC, and it continues to recover globally, forecast to expand by 2.8-3.5% in 2018.

But revisions to that forecast have been more bullish after nearly flat GDP growth in several global regions and key high-growth countries, including Brazil, Russia and China.

The short-term outlook is that VCM demand will continue to grow at slightly better than macroeconomic growth, or about 3-3.5% annually. ■

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KATHERINE SALE LONDON

PMMA

USES

Polymethyl methacrylate (PMMA) is an acrylic polymer that has high ultraviolet (UV) resistance and is available as resin or sheet. About two-thirds of consumption is in sheets produced by extrusion or casting, while the remainder is moulded into various shapes.

PMMA's primary use is in car headlamps and tail lights. The second largest use is in construction (pool and sanitary ware, architectural fittings) and glazing/signage. Other uses are household appliances, optical media, electronics, mobile phone displays, cosmetics packaging, toys, pens and furniture.

SUPPLY/DEMAND

Demand for PMMA was healthy throughout 2017, with strong performances from the automotive and construction sectors.

Overall demand is expected to grow above GDP, but there will be some applications that are expected to significantly outperform this.

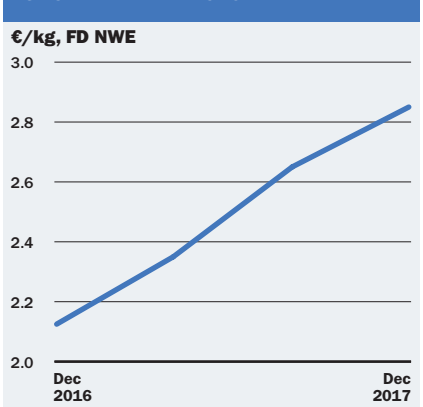
As the automotive sector continues a shift toward lightweight vehicles, then the demand for PMMA continues to grow, with a double-digit percentage increase expected in 2018.

Producers continue to develop methods to increase the impact-resistance for PMMA, which means it can be used in more parts of a vehicle, including bumpers.

There are also further opportunities in the construction sector.

The main concern, especially after a year of global shortage in 2017, is whether there will be the material to meet the growth in the industry.

EUROPE PMMA PRICES



Players are eagerly awaiting new capacity in the Middle East, with production now expected online in the first half of 2018.

An additional 40,000 tonnes/year additional PMMA capacity is expected to come online for Saudi Methacrylates, along with MMA. The 250,000 tonne/year MMA plant is a joint venture between Mitsubishi Chemical (MCC) and newcomer to the market SABIC.

There will also be an additional 50,000 tonne/year PMMA facility for Petro Rabigh, with the 90,000 tonne/year MMA plant expected on line in the first half of 2018, after a numbner of delays to the project. Petro Rabigh is the joint venture between Japan's Sumitomo Chemical and state-owned energy firm Saudi Aramco.

PRICES

European PMMA prices increased by 34% last year, with further triple-digit increases being discussed for first-quarter contracts for 2018.

The extreme MMA shortage has altered the makeup of the downstream market, with contract terms changing and some buyers leaving the market for supply security.

This is expected to continue into 2018, with both MMA and PMMA expected to remain unbalanced for at least the first half of the year.

The monthly European MMA contract rose 68% between January and December, significantly increasing costs for PMMA producers.

A number of quarterly contracts were changed to monthly, and even the large automotive players had to compromise to quarterly contracts from six-monthly.

Although the vast majority of business is still on a quarterly basis, shorter-term contracts will remain a factor in the market until supply rebalances.

With MMA prices at an historical high at the start of 2018, many PMMA players are questioning if 2018 will show an improvement, and how long can the shortage continue before it has long-term damage on the sector.

TECHNOLOGY

PMMA is produced from polymerizing MMA and several processes are in operation.

For glazing uses, some MMA can be pre-polymerized in a continuous stirred tank reactor and the resulting viscous liquid is fed into a series of flat glass plate-like moulds. This type of batch operation is very cumbersome, so continuous polymerization/cast technologies also operate. In belt polymerization processes, the MMA/PMMA syrup is injected between continuous highly polished metal belts. Continuous and batch solution processes also exist.

EUROPE PMMA CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Evonik	Worms, Germany	140
Polycasa	Mainz, Germany	40
Altuglas International	Rho, Italy	35
Lucite International	Rozenburg, Netherlands	23

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

OUTLOOK

There is a major stoppage approaching for Lucite International at its 200,000 tonne/year MMA facility in Cassel, UK. The overhaul will take place at the end of the first quarter, and is expected to take approximately two months.

There will also be a series of upstream MMA stoppages in Asia in 2018, which are likely to impact the flow of PMMA to Europe.

Imports were low level for the bulk of 2017, with buyers also unable to pay the higher prices for Asian product.

There are worries over margins for buyers, as many have been unable to pass on the sharp increases, with prices fixed on an annual basis.

Buyers in the extruded sheet sector in particular are citing poor and in some cases negative margins, with PMMA prices at their current level. In the long term, the current price level for MMA is not seen as sustainable, with prices at an all-time high.

However, prices are also not expected to fall to the lows of 2016, as it was the low margins of then that in part led to the series of production outages, with a lack of investment in facilities.

Although the second half of 2018 may bring relief to the market, turbulence is expected until then, as players battle with further outages and strong demand. ■

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VASILIKI PARAPOULI LONDON

Toluene

USES

The primary use of toluene, an aromatic, is as an octane booster in gasoline, but much of that portion remains in the refinery streams.

On the chemical side, toluene is used mainly for downstream toluene di-isocyanate (TDI) in polyurethane (PU) production. It is also sold as a solvent on the distribution market.

Toluene is used to produce other aromatics. Toluene hydrodealkylation (HDA) produces benzene, and toluene disproportionation (TDP) produces both paraxylene (PX) and benzene. These processes depend on the relative pricing of toluene to benzene and PX. Historically they have been the most significant driver of the spot toluene market.

SUPPLY/DEMAND

In the last quarter of 2017, the European toluene market saw a short period of healthy demand due to increased interest for mixed aromatics and blending components from China.

Players are confident that demand will be boosted in 2018 as soon as Germany's BASF ramps up production at its 300,000 tonnes toluene di-isocyanate (TDI) plant in Ludwigshafen.

Once this plant is fully operational, toluene prices might increase and could stop tracking Eurobob gasoline values exclusively.

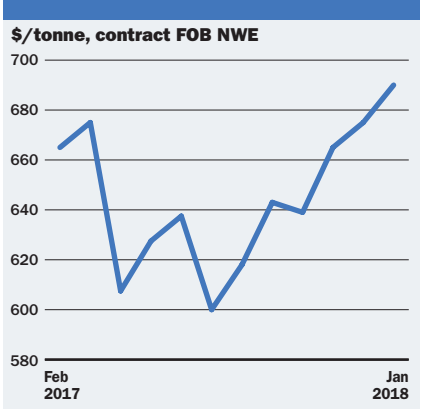
According to estimates, BASF's TDI plant should become fully operational sometime in the second quarter of 2018 but, according to some sources in the market, it could be earlier.

Distribution demand for the solvents market is relatively constant, but when compared to demand coming from the big markets, such as TDI or gasoline blending, the volumes moved should be considered relatively small.

On the supply side, the toluene market – which had been over-supplied – felt a bit more balanced from last September, after hurricane Harvey hit the US Gulf coast, an event that caused serious production problems in the region and prompted a surge in export activity from Europe.

Overall, toluene supply has been facing no real restrictions, while it frequently adjusts to meet demand, with refineries and crackers alike choosing not to extract toluene from reformate or pygas if the economics do not stack up.

EUROPE TOLUENE



PRICES

Toluene spot and contract prices have risen in recent months and continue to do so, in line with the strength seen in the global energy market, where crude oil values have been on an uptrend for six months now.

If it had not been for the firmness of the crude market, toluene prices might have seen a different start to the year since market fundamentals are slow with subdued demand and ample availability.

The European toluene contract price is settled between major producers and buyers for the TDI industry and tends to follow spot prices closely.

The spot price has been driven primarily by Eurobob gasoline valuations, but players are optimistic that if demand from the TDI side increases later in the year, toluene prices will increase and will stop tracking Eurobob values exclusively.

TECHNOLOGY

Toluene and other aromatics are largely a by-product of either the refining of crude oil or petrochemical steam cracking.

Within the refinery, a catalytic reformer transforms petroleum refinery naphtha into high octane reformates. In a steam cracker, aromatics rich pyroloysis gasoline (pygas) are a by-product of ethylene or propylene production.

Benzene is then extracted from the reformate, or pygas. Toluene can be left in combination with other aromatics such as xylenes in a toluene rich aromatic stream (TX), or purified via either distillation or solvent extraction.

EUROPE TOLUENE CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
ExxonMobil	Botlek, Netherlands	350
Dow	Bohlen, Germany	295
PKN Orlen	Plock, Poland	280
CEPSA	Algeciras, Spain	270
Slovnaft	Bratislava, Slovakia	195
BP	Gelsenkirchen, Germany	175
INEOS	Dormagen, Germany	170
Unipetrol	Litvinov, Czech Republic	165
CEPSA	Huelva, Spain	165
Galp	Porto, Portugal	150

*Note: Top 10 listed

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

OUTLOOK

European toluene players feel that the market will continue to be driven by price developments in the energy sector in the short-term, although they find it difficult to predict when the widely-discussed price correction in the crude oil market will be felt.

At the start of 2018, Brent crude, the global benchmark, surpassed $70/bbl, the highest level since December 2014, and some estimates expect it to remain robust throughout 2018.

The main drivers for oil prices have been better-than-expected demand, last autumn's major OPEC group of oil-producing nations, along with Russia's decision to extend production cuts, as well as geopolitical tensions around the globe.

An increase in US supply is probably the main reason that could drive crude oil values lower later in 2018, but this cannot be said with certainty given the persistent uptrend of the past six months.

Any possible growth in US production might well be counterbalanced by geopolitical tensions in Venezuela, the Middle East as well as Africa. ■

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JACKIE WONG SINGAPORE

Fatty acids

USES

Fatty acids are used in diverse consumer-related end applications such as soaps, detergents, personal care products, and the food, flavouring and fragrance sectors. It is also used in industrial applications for the pharmaceutical, lubricant, textile, plastic, paint and rubber sectors.

SUPPLY/DEMAND

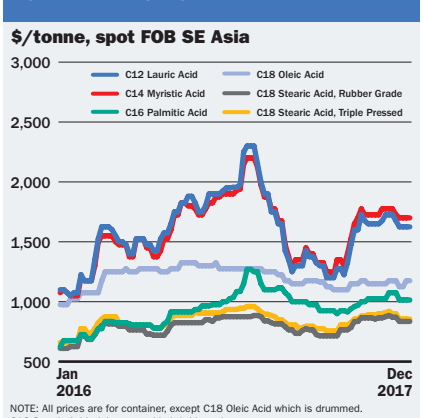
Production capacity in Asia has grown significantly over the last five years as a result of a series of aggressive expansion projects which were mostly completed by 2016, especially in southeast Asia which accounts for around 80% of global fatty acids production.

Since 2010, global fatty acids capacity grew by 140%. During that period, capacity in southeast Asia rose 195%, driven by 400% growth in Indonesia, while capacity in China and India grew by 120% and 150%, respectively. The growth in capacity has far outpaced demand growth. As a result, the market is facing chronic overcapacity, which is expected to persist for at least the next five to eight years.

In 2016, palm oil production was significantly affected by the El Nino weather phenomenon, resulting in the lowest yield in the last 10 years. This caused an upsurge in palm oil prices and squeezed the margins of fatty acids producers further.

Demand for fatty acids in Asia softened in 2014-2015 as a result of a slowdown in the global economy, but recovered somewhat in 2016-2017. However, demand growth in China, a key consumer market, has been slowing down. To limit risk, fatty acids producers have been controlling output, with some running based on orders, to protect against fluctuations in raw material prices and to safeguard their margins.

ASIA FATTY ACIDS



NOTE: All prices are for container, except C18 Oleic Acid which is drummed. C18 Stearic Acid triple pressed is hybrid spo/contract

PRICES

Price movements had been mimicking palm oil price trends closely in 2016 and 2017. Palm oil yields were significantly hit by the extreme dry and hot weather brought about by El Nino. Since October 2015, palm kernel oil (PKO) production in Malaysia has been on a steady decline.

Palm oil production recovered in 2017 and stock levels in Malaysia and Indonesia have been on the rise ever since.

In January 2018, Malaysia suspended its export tariff on crude palm oil (CPO) for three months or until the country's CPO stock drops to 1.6m tonnes.

With most fatty acids producers operating at lower rates, fatty acids prices received upward support in 2017 from tighter supply.

C14 myristic acids, whose premium over C12 lauric acids almost completely eroded in 2016, saw significant gain in value due to short supply. Prices of C14 myristic acids were around $50-100/tonne higher than C12 lauric acids for most of 2017, and the premium is expected to grow further in 2018.

C12 lauric acids and C14 myristic acids are co-products of PKO-based production lines. The output ratio of C12 lauric acids and C14 myristic acids is typically 3:1.

Since the start of 2017, supply of C10 capric acids and C8-10 caprylic-capric acids have been getting longer, which asserted downward price pressure. On the other hand, demand for C8 caprylic acids has been relatively stable.

FEEDSTOCKS

Malaysia and Indonesia are the major production hubs for global fatty acids because of raw material availability and government incentives for value-added palm industries. The major feedstock is palm oil, while coconut oil is sometimes used for certain fatty acids production.

The major products for Asia fatty acids are C12 and C14 fatty acids, and triple pressed stearic acids (TPSA). Outside Asia, C18 fatty acids are produced from animal fats or crude tall oil.

ASIA FATTY ACIDS CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
PT Musim Mas	Medan, Indonesia	800
KLK	Klang, Malaysia	450-550
Wilmar	Medan, Indonesia	450
Wilmar	Surabaya, Indonesia	450
IOI Group	Pasir Gudang, Malaysia	350
KLK	Rawang, Malaysia	300-400
IOI Group	Penang, Malaysia	330-350
Shuangma	Rugao, China	300
Dongma (Kwantas)	Guangzhou, China	200-210
Emery	Klang, Malaysia	200
Kerry/Wilmar	Shanghai, China	200

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

OUTLOOK

Fatty acids producers will continue to limit their production to protect margins.

Demand for C12 lauric acids is not expected to increase significantly in the near future, which means C14 myristic acid output will continued to be limited, allowing the premium that C14 myristic acids enjoy over C12 lauric acids to grow further.

Prices of C10 capric acids and C8-10 caprylic-capric acids will continue to face pressure from stock accumulation, although some producers have been reluctant to reduce their offers. The short chain fatty acids provide the highest margin among all fatty acid cuts.

Palm oil production is expected to continue to recover in 2018 and growing stock levels may result in the softening of palm oil prices, which would in turn put downward pressure on fatty acids prices. Fatty acids demand in Asia will grow further, with higher population and increasing disposable income from developing economies such as Indonesia, offsetting any slowdown in China. ■

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PETER GERRARD LONDON

VAM

USES

Vinyl acetate monomer (VAM) is used in water-based paints, adhesives, acrylic fibres, paper coatings and non-woven binder applications. Around half of VAM production volumes go into polyvinyl acetate (PVA), which is a primary molecule in paints, adhesives and other coatings. Approximately 30% of VAM output goes into polyvinyl alcohol (PVOH), which is used in packaging film and glass laminates.

SUPPLY/DEMAND

Hurricane Harvey, which hit the US Gulf region at the end of August, radically reduced VAM production, with continuing logistical difficulties exacerbating the shorter term problems that initially afflicted the plants in the petrochemical complexes in the region.

Supply to Europe was not immediately reduced because the continent had adequate stocks and some exports were already in transit. Towards the end of the year and in the opening weeks of 2018 the market was more balanced, partly because supply appeared to be more plentiful again and partly on account of a normal slowing in consumption during the low season in paintings and coatings.

PRICES

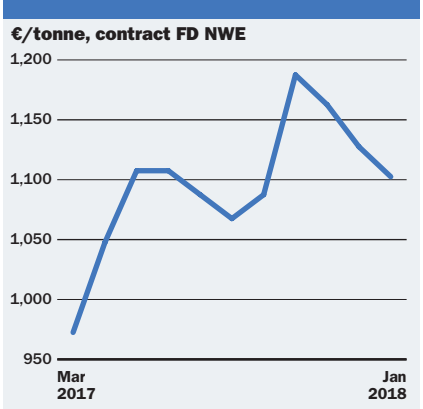
The European VAM market saw a steady rise in prices from the beginning of 2017 almost to the middle of the year.

Values by the end of 2016 had been at a relatively low point, not considered by producers to deliver realistic margins. They were able to raise contract prices in successive steps in the first half of 2017, generally anticipated by rising spot numbers, which increased more steeply. By the middle of the year, with supply again outstripping demand, spot prices dropped off more rapidly than contract prices, although both reached their lowest level in August.

The hurricane threw the gears into the opposite direction once more, with contract prices responding rather more sluggishly than spot to the implications of market tightness originating in the US Gulf region. The upturn in prices was quite sharp but proved to be relatively short-lived, with the Harvey-induced concerns about supply receding from November onwards.

Despite three months in which values slipped down by January they were still higher than they had been in the softer periods of the previous year, hovering around €1,000/tonne FD. The decline in January 2018 was smaller than would be reflected by a full pass-through of the duty suspension and suppliers were confident that prices would rise imminently. In February, prices rose modestly. At the time of writing it is not clear if that will prove to be a pivot point.

EUROPE VAM



TECHNOLOGY

Ethylene is the preferred feedstock, replacing the original acetylene route. VAM is usually produced by the catalysed vapour phase reaction of acetic acid with ethylene and oxygen in a fixed-bed tubular reactor, using a supported noble metal catalyst.

INEOS developed a fluidised bed technology, LEAP, where the catalyst is continuously removed and replenished, giving much longer run times. Celanese developed its Vantage process that it claims adds capacity equivalent to a world-scale plant at 10-15% of the cost of a grassroots facility.

US-based Praxair has patented the use of 99.95% oxygen to lower the amount of inerts in the reactor, reducing catalyst losses and boosting yields by up to 5%. US producer Eastman Chemical has developed a three-step liquid-phase process based solely on acetic acid that can give yields as high as 95%.

OUTLOOK

The European VAM market will continue to be predominantly dependent on imported material. The plant capacities listed above cannot describe the total volumes available for consumption; evidently, much of what is produced in other regions will be used locally and the proportion sold elsewhere, or specifically exported to Europe, will vary according to several factors, some of which will be completely independent of European requirements.

That said, what is known is that the import duty into the EU was suspended once again on 1 January 2018. It will be the same quota as for 2017, i.e. 350,000 tonnes.

As seen in 2017, the quota was not expected to have a significant impact on the market in the month of introduction. Since the quota is expected to last until summer, a rush of imports was unlikely in the first weeks.

One potential development that could have substantial implications for the whole European market, would be the awaited announcement by INEOS of the intended location of its new VAM plant because, if the company's plans go ahead, the new facility would bring an additional 300,000 tonnes of annual production capacity into being within Europe.

There could be upward momentum from the planned turnaround of one producer in the spring and from higher upstream raw material costs. The tighter environmental regulations in China may continue to lead to lower utilisation rates and less product availability for exports from Asia to Europe. ■

EUROPE VAM CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Celanese Chemicals Europe	Frankfurt, Germany	305
Wacker-Chemie	Burghausen, Germany	200
Stavrolen	Budyonnovsk, Russia	60
Azot Severodonetsk*	Severodonetsk, Ukraine	35

*Not operational

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AMY TAN SINGAPORE

Phthalic anhydride

USES

Phthalic anhydride (PA) is produced in two grades – flake (white solid) or molten (clear liquid). Its characteristics include: irritating odour, lightly soluble in hot water, hydrolysing to phthalic acid, soluble in alcohol and carbon disulphide. It reacts with strong oxidants and reacts violently when heated with copper oxide or sodium nitrate, posing an explosion hazard.

The major outlet for PA is the manufacture of phthalate plasticisers. This accounts for more than half of production. The main plasticiser in which it is used is dioctyl phthalate (DOP), which goes into polyvinyl chloride (PVC). The second largest outlet is unsaturated polyester resins (UPR), which are usually blended with glass fibres to produce fibreglass reinforced plastics. The third largest outlet is PA-based alkyd resins, which are used in solvent-based coatings.

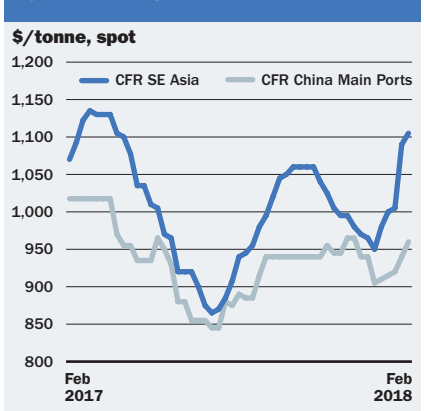
Principal end-markets for PA are the construction, marine and transportation industries, and architectural, machinery, furniture and fixture applications. Small volume uses for PA include dyes, pigments, detergents, herbicides, insecticides, fire retardants and saccharin.

SUPPLY/DEMAND

Supply from South Korea, Japan and Taiwan has been tight in recent months and this is anticipated to persist in the near term. In South Korea, supply is short as most February-loading cargoes have already been sold out. A major producer said its cargoes for March-loading are almost sold out. Other producers said they will only offer March allocations after the Lunar New Year holiday. In Japan, major producers are focusing on domestic demand and have not been active in the CFR southeast Asia market. In Taiwan, major producers have sold out February-loading cargoes and are running low on March-loading cargoes.

Demand is largely driven by India as key domestic producers have limited inventories and are only catering to contractual customers. While demand in southeast Asia is also robust, some PA producers are diverting their cargoes into India amid better netback. On the other hand, demand in the key China market has been subdued as domestic cargoes are cheaper than spot import cargoes. As such, PA suppliers note that buyers in China have to increase their bids in order to procure spot volumes.

ASIA PHTHALIC ANHYDRIDE



PRICES

Spot prices for PA in the key China market has been stable-to-soft in recent weeks amid a persistent buy-sell gap. In southeast Asia, spot prices face upward pressure amid strong demand from India. PA suppliers have limited inventories and prefer to focus on the Indian market amid better netback. As such, buyers in southeast Asia find themselves increasing their bids to acquire cargoes.

Feedstock orthoxylene (OX) prices are almost on par with PA prices. This unusual phenomenon of OX being higher than PA occurred due to upstream producers producing more paraxylene (PX) as compared with co-product OX. Most PA producers have their OX requirements fulfilled through contracts. Spot availability is limited and PA producers source spot quantities on a need-to basis.

TECHNOLOGY

PA was first made through the oxidation of naphthalene in concentrated sulphuric acid and in the presence of mercury sulphate. A catalytic vapour-phase oxidation of naphthalene later replaced this route. The latter process is done in air and in the presence of a vanadium oxide catalyst.

The process technology has changed little, although catalysts have a longer life of three years and yields have improved. One developmental improvement was the lowering of the air-to-OX weight ratio to 9.5:1, allowing energy savings and reduced capital costs.

ASIA PA CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Nan Ya Plastics	Mailiao, Taiwan	280
Aekyung Petrochemical	Ulsan, South Korea	210
Shandong Hongxin Chemical	Zibo, China	180
Anhui Tongling Chemical	Tongling, China	120
IG Petrochemicals	Taloja, India	120
Zhenjiang Union Chemical	Zhenjiang, China	120
Taizhou Union Chemical	Taizhou, China	115
Thirumalai Chemicals	Ranipet, India	115
Changzhou Yabang Chemical	Changzhou, China	100
Jiangsu Sanmu Group	Yixing, China	100
Shanghai Coking & Chemical	Shanghai, China	100
Zhuhai Union Chemical Industry	Zhuhai, China	100

NOTE: Top 12 listed by capacity

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

Today, most PA producers use OX, which has superseded naphthalene as the feedstock.

The proportion of naphthalene to OX-based Chinese producers in terms of nameplate capacity in 2013 is 20/80. Naphthalene prices have climbed by 20% in recent months so it is beginning to lose its competitiveness.

South Korea's OCI is running only its naphthalene-based line.

OUTLOOK

Most players anticipate PA prices to continue on an uptrend amid tight supply in Japan, South Korea and Taiwan. Three PA producers have also announced turnaround schedules for April. Meanwhile, demand in India is expected to remain strong in the near-term as some downstream buyers are ramping up production ahead of India's close of financial year in March.

In southeast Asia, demand is projected to remain stable, supported by downstream DOP. ■

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JOHN DIETRICH HOUSTON

SBR

USES

Styrene butadiene rubber (SBR), the largest volume synthetic rubber, is predominantly consumed in the manufacture of tyres and tyre products. Other non-tyre uses including applications in conveyor belts, gaskets, hoses, floor tiles, footwear and adhesives.

SUPPLY/DEMAND

US supply has been balanced to long, even with the shutdown of East West Copolymer's Baton Rouge plant in Louisiana in March 2017.

Supply of imported material from Asia has covered the gap, especially as a large crop of competing natural rubber (NR) in Asia has pushed SBR producers to increase overseas sales volumes.

SBR demand remains steady to slightly higher, driven by the US tyre and automotive sector. While automotive driving activity has increased on lower gasoline prices, tyre sales have been down slightly.

Non-automotive uses for SBR have experienced strong demand, owing to a healthy US construction sector.

PRICES

US January contract prices for 1502 non-oil grade SBR were in the high-60s cents/lb to high-70s cents/lb, while 1712 oil-extended contract prices were in the low-70s cents/lb to high-70s cents/lb.

February contracts are expected to increase 3.25-3.50 cents/lb ($72-77/tonne), tracking upstream butadiene (BD) levels. SBR contract prices are formula-based and tied to same-month BD movements, with some allowance for styrene movements as necessary.

Prices rebounded to start 2018 on upstream tightness and rebounding demand, but could reverse course because of ample NR supply in Asia. Long supply in the region in the fourth quarter of 2017 pushed SBR contract prices down 9 cents/lb in November and December.

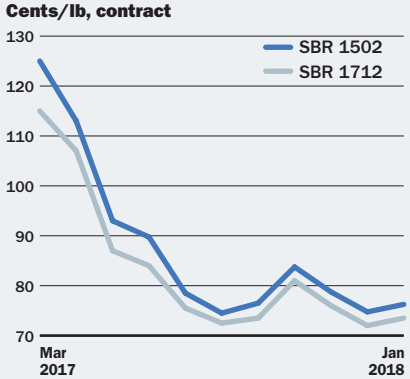
Spot SBR prices have moved to a slight premium to contract volumes because of the rising Asian market, but long supply could also reverse that situation.

SBR prices in China may face downward pressure after the Lunar New Year holiday if the NR price remains weak. Spot prices of non-oil grade 1502 SBR were assessed stable at $1,650-1,700/tonne CIF (cost, freight and insurance) China on 14 February, ICIS data showed. NR inventories remain abundant in warehouses in Qingdao, China, traders said. Tyre makers in Asia have more flexibility in feedstock substitution in their product formulations.

In Europe, SBR contracts for February were agreed at varying double-digit increases, due to the rise in feedstock prices. February contracts for dry (1500) grade material increased by €50/tonne at the low end of the range and rose by €65/tonne at the high end, bringing prices to €1,460-1,555/tonne FD (free delivered) NWE (northwest Europe).

Oil extended 1723 and 1783 grade contract prices for February increased by €40/tonne at the low end and by €55/tonne at the high end, bringing prices to €1,300-1,485/tonne FD NWE.

US SBR



TECHNOLOGY

SBR is produced by the copolymerisation of BD with styrene in the approximate proportion of 3:1 by weight.

The emulsion process, which produces general-purpose grades, uses feedstocks suspended in a large proportion of water in the presence of an initiator, or a catalyst, and a stabiliser. This employs continuous process production.

In the solution process, the copolymerisation proceeds in a hydrocarbon solution in the presence of an organometallic complex. This can be either a continuous or batch process. Some manufacturing facilities have swing capacity with polybutadiene rubber (PBR).

US SBR CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Goodyear Tire and Rubber	Houston, Texas, US	250
Grupo Dynasol	Altamira, Mexico, US	220
Lion Copolymer	Port Neches, Texas, US	180
Bridgestone Firestone	Lake Charles, Louisiana, US	134
Goodyear Tire and Rubber	Beaumont, Texas, US	125
TSRC	Plaquemine, Louisiana, US	62
Bridgestone Firestone	Orange, Texas, US	25

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

Process modifications can produce higher performance polymers. Companies like Asahi Chemical of Japan are pursuing the development of premium products by such means.

OUTLOOK

Global and US SBR supply is expected to trend toward a long position, given ample capacity in Asia and the potential for long supply of competing NR.

Demand growth remains somewhat limited by the automotive industry, which has experienced stagnant growth levels for the past several years. While new auto sales have experienced growth, the replacement tyre market continues to lag behind.

However, tyre production in the US is growing, which could boost the need for domestic production or, more likely, imported rubber.

Trade actions to add tariffs and duties to imported SBR have been discussed and could lead to increased imports from non-affected countries, especially Canada.

Non-automotive uses for SBR will likely remain a small portion of overall sales, although growth levels in these sectors is likely to be higher than that of tyre production. ■

Additional information from Helen Yan and Melissa Hurley

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CHRIS BARKER LONDON

VCM

USES

More than 98% of vinyl chloride monomer (VCM) in Europe is used to produce polyvinyl chloride (PVC). The rest is consumed in polyvinylidene chloride and chlorinated solvents. There is only a small spot market for VCM in Europe, except in the event of planned or unplanned maintenance shutdowns.

SUPPLY/DEMAND

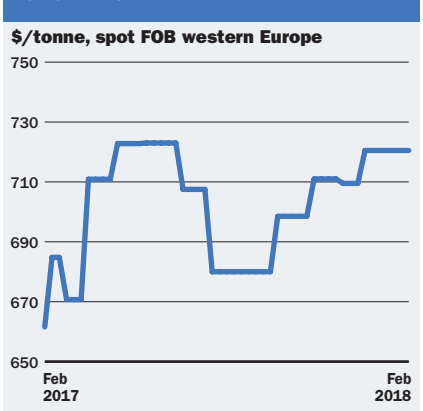
European producers closed a considerable amount of upstream chlorine capacity in the second half of 2017 due to the phasing out of mercury cell production in December.

However, this is not likely to affect the production of VCM in Europe for the short term, because producers have switched to importing intermediate ethylene dichloride (EDC) on a contractual basis to continue producing PVC. As a result, potential VCM capacity has so far remained constant in 2018.

Inclement weather in the first quarter of 2018 has negatively impacted VCM availability for producers and introduced logistical complications. Two of KEM ONE's PVC plants in France had production limitations due to high water levels making feedstock transport difficult.

Downstream PVC demand is expected to be healthy in 2018, on the back of the healthier growth forecast for the European economy, with GDP growth predicted to be close to 2% by the European Commission. PVC demand is driven by construction and technical applications and is therefore strongly connected to overall GDP growth.

EUROPE VCM



PRICES

European VCM prices are driven primarily by upstream ethylene and downstream PVC trends. There was very little spot business in Europe in 2017 and early 2018, although buying interest did increase in the first quarter of 2018 as a result of the upcoming shutdown season for chlor-alkali and vinyls producers.

Estimated achievable VCM prices trended upwards in the first half of 2017, in line with upstream and downstream trends, before reaching a low point in the middle of the third quarter, due to the global decrease in PVC and feedstock prices. However, spot prices recovered later in the fourth quarter and in early Q1 2018 as global PVC prices rebounded and feedstock prices also trended upwards.

TECHNOLOGY

Most commercial production in Europe is based on ethylene, which is reacted with chlorine to make EDC. This is converted into VCM using thermal cracking. Hydrogen chloride byproduct can be recycled to an oxychlorination plant to make more EDC.

The acetylene route dominates in China because of the abundance and cheap cost of coal feedstock. Several attempts have been made to develop ethane-based processes, but without commercial success.

OUTLOOK

VCM prices and demand are expected to track the trends in downstream PVC and upstream ethylene from 2018 onwards due to the lack of any significant spot market for the product and the heavily integrated European market. Feedstock prices are expected to be slightly firm compared to 2017 because of an upward trend in crude oil prices.

Europe will change from a net exporter of EDC to a net importer from 2018 onwards; however, any volumes lost for PVC production have been structurally replaced by contracted imports from European and non-European sources. Dow's EDC/VCM plant at Schkopau, Germany lacks an accompanying PVC plant, which leaves some spare capacity available in Europe.

As a result, VCM availability is not expected to shrink significantly in 2018. There have been new membrane-based chlorine plants announced by several producers, which might ultimately return the European market to a more balanced situation regarding EDC. European producer INOVYN also announced a VCM capacity expansion of 70,000 tonnes/year at Rafnes, Norway for 2019, supported by new membrane-based chlorine capacity.

The forecast for PVC is for a balanced market in the first half of the year and steady growth on the back of the forecast for the European economy to return to GDP growth of close to 2% per year. The current high price of chlorine co-product caustic soda is likely to incentivise the production of chlorine in Europe for at least the first quarter of 2018, which could lengthen the market for derivatives such as EDC and VCM, at least in local areas of high caustic soda demand such as the Mediterranean.

Overseas VCM markets such as the US are becoming more integrated, with limited spot business expected in 2018. The US market is balanced for domestic production, with very little spot export business taking place. Shipments from the US to Australia are no longer a factor due to production in the latter closing in late 2015. Global PVC demand, which consumes the vast majority of VCM production, is expected to continue to grow healthily on the back of the expanding market in India, as well as the relatively strong outlook for construction and manufacturing in Europe. ■

EUROPE VCM CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
VYNOVA	Tessenderlo, Belgium	740
Shinetsu	Botlek, the Netherlands	620
INOVYN	Bamble, Norway	530
KEM ONE	Lavera, France	450
Vestolit	Marl, Germany	400
VYNOVA	Wilhelmshaven, Germany	400
KEM ONE	Fos, France	375
Vinnolit	Knapsack, Germany	370
Anwil	Wloclawek, Poland	340
Dow	Schkopau, Germany	330

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

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DAVID LOVE HOUSTON

Styrene

USES

Styrene's main outlet is in polystyrene (PS) and expandable polystyrene (EPS), which together account for about two-thirds of global consumption. Other major uses are in styrene butadiene rubber (SBR), acrylonitrile butadiene styrene (ABS) and styrene acrylonitrile (SAN) resins, with smaller uses in unsaturated polyester resins (UPR), styrene butadiene (SB) latex and styrenated polyesters.

Pure styrene is a colourless to yellow, oily liquid that evaporates easily and has a sweet smell. Styrene is highly flammable, forms explosive mixtures in air and is dangerous when exposed to flame, heat or oxidants. On decomposition, styrene emits acrid fumes.

SUPPLY/DEMAND

Supply in the US styrene market is tight amid two plant outages – one planned and the other unplanned. SABIC notified customers in mid-February that it could be mid-April before full production has been restored at the 1.18m tonne/year CosMar styrene plant in Carville, Louisiana. The new timeline is two months later than originally expected. SABIC and Total jointly own styrene operations at the CosMar complex.

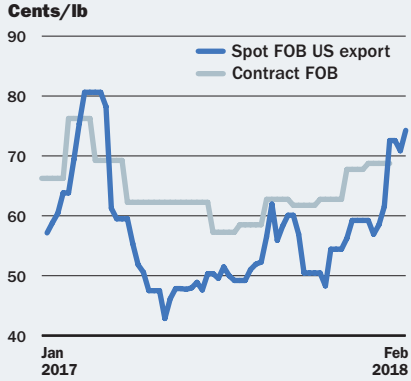
In late January, SABIC notified customers that an equipment failure caused by unusually cold temperatures led to polymerisation plugging in the purification units, which severely impacted styrene production.

INEOS Styrolution began a planned turnaround in early January at its 770,000 tonne/year Bayport styrene plant in Baytown, Texas. The plant is expected to be down until the first half of March.

The US is a net styrene exporter, with Mexico, China and South Korea being the largest destinations for shipments. Exports in 2017 fell by 11% due to constrained domestic supply as a result of heavy turnarounds during the first two quarters of the year.

The US imports about one-fourth of the volume that it exports. Canada is typically the only source of styrene imports due to the close proximity of two styrene plants to the US. However, last year South Korea, Spain, the Netherlands and France exported styrene to the US when prices hit historic highs in February.

US STYRENE



PRICES

The US styrene market has two primary feedstocks – benzene and ethylene – but styrene typically takes its pricing cues from benzene.

Prices in the US styrene market are poised to peak in Q1 amid peak turnaround season. Spot prices have jumped from 56.92 cents/lb in early January to 74.27 cents/lb in mid-February because of tight supply.

Prices in 2017 peaked from mid-February through early March to the highest levels since prior to 2000 as simultaneous turnarounds were being conducted at three US Gulf styrene plants. Two of the turnarounds had to be extended.

January US integrated spot styrene margins based on ethane rose by 27% month on month while naphtha-based margins rose by almost 46%. Integrated contract margins based on ethane rose by 3.1%, while those based on naphtha rose by 9.6%.

TECHNOLOGY

The conventional method of producing styrene involves the alkylation of benzene with ethylene to produce ethylbenzene, followed by dehydrogenation of ethylbenzene to styrene. Styrene undergoes polymerisation by all the common methods used in plastics technology to produce a wide variety of polymers and copolymers. Commercially, styrene is also co-produced with propylene oxide (PO) within POSM (PO/styrene monomer) units. Although POSM units are widely used in Europe, LyondellBasell is the only producer in the US that utilises POSM units.

US STYRENE CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
LyondellBasell	Channelview, Texas	1,250
CosMar	Carville, Louisiana	1,100
Americas Styrenics	St James, Louisiana	950
INEOS Styrolution	Bayport, Texas	770
INEOS Styrolution	Texas City, Texas	450
Westlake Chemical	Lake Charles, Louisiana	259

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

OUTLOOK

Seasonal demand for US styrene typically picks up in the spring, ahead of the summer packaging season, and again in the autumn, ahead of the winter holiday shopping season.

After peaking in Q1, US styrene prices should weaken from May through August before hitting a second, smaller peak at the end of Q3. The second peak will largely be the result of a busy turnaround schedule in Asia.

China has imposed antidumping duties (ADD) on styrene of US, South Korean and Taiwan origin starting 13 February, in a preliminary decision.

The global styrene market was being impacted by China's antidumping investigations long before an initial decision was rendered in February. US styrene sellers in Q4 largely began to avoid selling spot material to China because of the investigation, and the uncertainty of what the outcome would be.

Styrene from the Middle East, which typically moved to Europe, began moving instead to China. As a result, the US began to ship more material to Belgium, France and Turkey, which found themselves short of supply.

Styrene exports from the US to China last year fell by 29% year on year, which amounted to a drop of 111,249 tonnes. ■

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		Asia	Europe	US	Global
Price forecast reports currently available	Polypropylene	✓	✓	✓	
	Polyethylene	✓	✓	✓	
	Benzene				✓
	Styrene/Polystyrene		✓		
	Methanol				✓
Available as price forecast windows only	Ethylene	✓	✓	✓	
	Propylene	✓	✓	✓	
	Styrene	✓		✓	

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JESSIE WALDHEIM HOUSTON

Propylene

USES

Propylene is mainly used to make polypropylene (PP), which accounts for about half of propylene consumption in the US. Other outlets for propylene include acrylonitrile (ACN), propylene oxide (PO), a number of alcohols, cumene and acrylic acid.

SUPPLY/DEMAND

US propylene supplies had been tight in early 2018 amid production issues and low inventory levels. Inventory levels had been low since late 2017, following the impact of Hurricane Harvey on production in the US Gulf coast. Multiple production units, both including crackers and refineries, were taken off line during the late-August hurricane. Supplies were not immediately tightened as the hurricane also affected downstream plants.

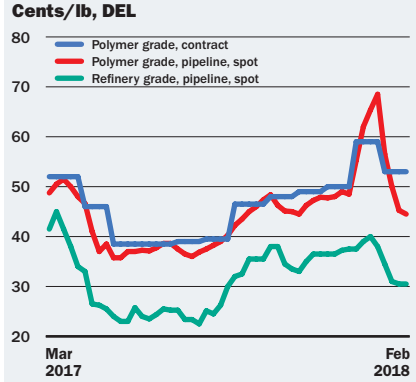
Many outages were resolved by late September. However some cracker outages continued into the fourth quarter and refinery operating rates remained below pre-Harvey levels into late November. As consumption levels had normalised by the fourth quarter, propylene supply was snug and inventory levels remained low.

Meanwhile, the propylene market continued to await the start-up of a new propane dehydrogenation (PDH) unit, which had faced several delays. A production outage for another PDH unit in late December, followed by a days-long outage for a third PDH unit in mid-January, further tightened supplies and caused propylene prices to spike.

Those high propylene prices caused downstream derivative prices to rise as well, which caused domestic derivatives to be less competitive against imported derivatives. Operating rates for downstream polypropylene (PP) fell as imports rose.

The lower propylene consumption allowed supply levels to recover and inventory levels began ticking higher in mid-January and continued to recover through much of February.

US PROPYLENE



PRICES

Propylene spot and contract prices rose sharply at the start of 2018, and in January reached their highest points since December 2014. The high prices were due largely to tight supplies following production issues. Spot prices for polymer-grade propylene (PGP) had diverged from refinery-grade propylene (RGP), as the production issues had centred around propane dehydrogenation (PDH) units, which produce PGP. RGP is rarely used for chemical derivatives, but is commonly used to produce PGP.

Historically, spot PGP has been valued about 10 cents/lb above spot RGP. However, amid a tight market for PGP and relatively balanced market for RGP, the spread widened to 30.5 cents/lb in late January. As the high-cost propylene affected downstream demand, consumption rates fell and propylene prices began to moderate. Propylene contract prices in February fell by 6 cents/lb, while spot PGP prices dropped by about 20 cents/lb in the three weeks following the late-January high point.

TECHNOLOGY

Propylene comes in three grades: polymer grade (99.5% minimum purity), chemical grade (93-94% minimum purity) and refinery grade (60-70% purity).

There are several routes to produce propylene, most commonly as a by-product of gasoline production in fluid catalytic cracking (FCC) units in refineries. Propylene also is a by-product steam cracking of liquid feedstocks such as ethane and naphtha. More than half the propylene produced in the US comes from refineries, while about a third comes from steam cracking.

On-purpose routes for propylene include metathesis, which converts ethylene into propylene, and PDH, which converts propane into propylene. While on-purpose systems have been a small part of domestic propylene production, it has been growing. Two 750,000 tonne/year PDH units were recently built in the US Gulf, one which started up in December 2015 and the other which was ramping up to full production as of late February.

US PROPYLENE CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
LyondellBasell	Channelview, Texas	1,905
ExxonMobil Chemical	Baytown, Texas	1,700
DowDuPont	Freeport, Texas	1,430
ExxonMobil Chemical	Baton Rouge, Louisiana	1,275
Shell Chemicals	Norco, Louisiana	1,065
Flint Hills Resources	Houston, Texas	790
Enterprise Products	Mont Belvieu, Texas	750
BASF Total	Port Arthur, Texas	635
Formosa Plastics USA	Point Comfort, Texas	575
Chevron Phillips Chemical	Sweeny, Texas	545

Note: Top 10 sites

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

OUTLOOK

The US propylene market is expected to lengthen as several production projects are scheduled to be complete by the end of 2018, while no consumption projects are expected over the same timeline. This is a shift from recent years as propylene supply has been tight due to a move in the US towards lighter cracker feedstocks like ethane. Despite light feedstocks continuing to be favoured, several new cracker projects are expected to expand the volume of propylene produced.

In addition, a new 750,000 tonne/year PDH unit in the US Gulf is expected to be operating at full capacity. Another new 750,000 tonne/year PDH unit had started up in December 2015.

Meanwhile, strong demand for US gasoline exports is continuing to encourage strong operating rates for US refineries, which is resulting in good propylene production from refineries. ■

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MELISSA HURLEY LONDON

SBR

USES

The largest use for styrene butadiene rubber (SBR) is in the manufacture of tyre products. The replacement tyre market drives the majority of SBR demand, along with the original equipment manufacturer (OEM) market.

The two main types of SBR include solution SBR (S-SBR) and emulsion SBR (E-SBR). S-SBR demand for higher performance tyres in Europe has increased in recent years.

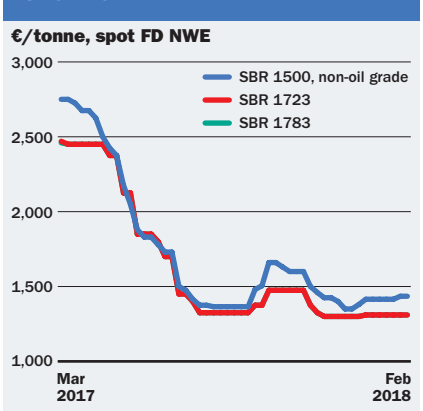
SUPPLY/DEMAND

The SBR market witnessed price swings in either direction and volatility was a key focus in 2017. There were periods of sustained tightness in the spot market, as suppliers focused on sending non-contractual European volumes to Asia, due to the widening arbitrage between the two regions. This year started in a more balanced supply situation compared to last year.

First quarter E-SBR imports in 2017 dipped year on year because EU suppliers focused on sending more export material to Asia to maximise the open arbitrage between Europe and Asia. The increased pull for export material into Asia at the start of 2017 resulted in tightening spot supply in Europe, sending prices soaring.

In 2017, there was a drop in S-SBR imports into the EU of around 14%. This could be because of increased European investment in S-SBR production in order to meet certain tyre industry requirements. S-SBR improves grip on wet roads, reduces rolling resistance in cars. In 2016, imports rose due to better demand for high performance tyres.

EUROPE SBR



Trinseo recently increased its S-SBR capacity by 50,000 tonnes/year in Schkopau, Germany, bringing S-SBR capacity to 200,000 tonnes/year. The additional supply was expected to reach the market in 2018. Trinseo also opened a new S-SBR pilot plant at the same location in Germany for developing new performance tyre innovations. Through a joint venture with JSR Corporation (JSR), MOL Group planned to construct a new 60,000 tonnes/year S-SBR plant in Tiszaujvaros, Hungary. Hungary's MOL is on schedule to announce a 2018 launch date for its planned S-SBR plant, the company said in February.

PRICES

2017 was a year of monumental peaks and troughs with contract prices exposed to the rising and falling movements in the upstream butadiene market. The largest month-on-month increase since contracts moved from a quarterly to a monthly basis happened in February 2017.

At the beginning of 2018, contract price rises were more moderate compared to the start of 2017. Spot prices have remained fairly stable on rather uninspiring demand, compared to last year. The styrene contract price also plays a role in SBR contract discussions and the February styrene contract price emerged at a notable three-digit hike compared to the month before.

In February, some SBR contracts were agreed before the sizable styrene increase emerged, so margin recovery is a focus for some sellers for March after the upstream monthly butadiene (BD) contract price settled at a double-digit increase.

TECHNOLOGY

SBR is produced by the copolymerisation of butadiene and styrene in the approximate proportion of 3:1 by weight in a continuous process. In the emulsion process, producing general-purpose grades, the feedstocks are suspended in a large proportion of water in the presence of an initiator or a catalyst and a stabiliser.

In the solution process, the copolymerisation proceeds in a hydrocarbon solution in the presence of an organometallic complex. This can either be a continuous or batch process. Some manufacturing facilities have swing capacity with polybutadiene rubber.

In terms of S-SBR, producers are looking at developing technology used to manufacture top performance tyres, including "green tyre" technology and bio-based chemistry.

Previously, US renewable technology firm Genomatica and Italy-based Versalis developed an end-to-end process for bio-butadiene production for E-SBR. As of 2018, the production process is still under development.

EUROPE SBR CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Trinseo	Schkopau, Germany	330
Synthos Dwory	Oswiecim, Poland	270
Michelin	Bassens, France	130
Grupo Dynasol	Santander, Spain	120
Versalis	Ravenna, Italy	120
Voronez Rubber (Sibur)	Voronezh, Russia	120
Synthos Kralupy	Kralupy, Czech Republic	105
Voronez Rubber (Sibur)	Togliatti, Russia	60
Versalis	Grangemouth, UK	60
Hip Petrohemija	Zrenjanin, Serbia	40
Arlanxeo	Port Jerome, France	40

Note: Top 11 plants listed

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

OUTLOOK

There is some expectation that European SBR demand could rise at the end of the first quarter. This is due to an increase in enquiry levels seen for March volumes from Europe to Asia compared to earlier in the year.

After last year's antidumping rules and investigations, European players have been contemplating if imports from countries not involved in the rulings will increase into the US, Mexico and India.

European SBR market players are expecting single-digit growth of varying degrees in 2018. On average, canvassed market players are expecting 1-3% growth in the EU market.

The tax incentives in China drove high levels of growth in 2016 and spurred on demand in the region ahead of the expiration of the tax incentives in 2017. ■

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VASILIKI PARAPOULI LONDON

Styrene

USES

Styrene's main outlets are polystyrene (PS) and expandable polystyrene (EPS), which together account for about two-thirds of global consumption. Other major uses are in styrene-butadiene rubber (SBR), acrylonitrile-butadiene-styrene (ABS) and styrene-acrylonitrile (SAN) resins, with smaller uses in unsaturated polyester resins (UPR), styrene butadiene (SB) latex and styrenated polyesters.

SUPPLY/DEMAND

Following the closure of INEOS Styrenics' 350,000 tonne/year styrene unit in Marl, Germany in late 2012, the European market has been more finely balanced.

The European styrene market was poised for a rather challenging supply situation at the start of 2018, given the heavy schedule of planned maintenance turnarounds in the region, but also in the US and the Middle East, which was expected to take out significant capacity during most of the first quarter.

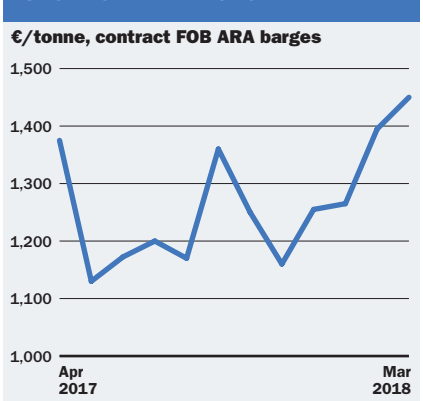
Several shutdowns are underway globally, some also unplanned, and even if European prices nearly reached $1,600/tonne in the course of February, supply does not seem to be a problem for the market.

Players are cautious about availability and probably pay a higher price when in-need of material, but it seems that most of them have been rather well prepared.

On the demand side, the European expandable polystyrene (EPS) market experienced good order entry in January, but volumes were under pressure in February following the significant monthly feedstock barge contract increase. EPS demand was also weak in March after styrene recorded another-higher than expected-increase

Polystyrene (PS) volumes were impacted more evidently by styrene's increased volatility, while some players have already decided to switch to other, more competitive, materials like polypropylene (PP) by the end of the year.

EUROPE STYRENE MONOMER



PRICES

To the surprise of most market players, January started with a smaller than anticipated increase for the styrene contract price, while February ended up in a bigger one than what was initially expected.

Unplanned production disruptions in the US was the main reason that took the European spot market in the high $1,500s/tonne, although the supply status of the domestic market could not justify such a high level.

European players are convinced the market will soon correct itself more manifestly, probably from April, once the planned turnaround season is close to the end and all restarts will have gone according to schedule. The volatility of the spot market, which was rather similar to the same period in 2017, had been more difficult for some of the downstream styrenics markets to manage, as it impacted their demand.

The EPS market was not so much affected, although volumes were pushed lower by the high price in February, while the impact was more evident in the PS market that was expecting March demand to be 10-15% lower than an already weak February.

TECHNOLOGY

The dominant route uses ethylbenzene (EB), which is dehydrogenated to styrene in the presence of steam.

Styrene is also co-produced with propylene oxide (PO). Following the closure of the Marl plant in Germany in late 2012, European styrene volume has been increasingly supplied by propylene oxide /SM (styrene monomer) units, with approximately 40-45% of regional capacity now produced through this route.

There is a renewed focus among styrene players to understand and anticipate the dynamics of the propylene oxide market.

EUROPE STYRENE CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
LyondellBasell/ Covestro	Maasvlakte, Netherlands	680
Total	Gonfreville, France	600
Versalis	Mantova, Italy	595
BASF	Ludwigshafen, Germany	550
ELLBA	Moerdijk, Netherlands	550
Trinseo	Terneuzen, Netherlands	500
Styrolution	Antwerp, Belgium	500
Repsol	Tarragona, Spain	450
Shell	Moerdijk, Netherlands	440
Trinseo	Boehlen, Germany	300

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

OUTLOOK

As activity in the Asian market resumes after the Chinese Lunar Year, global styrene players await to see what the impact of the recently announced preliminary antidumping duties (ADD) from China on cargoes of South Korean origin, as well the US and Taiwan, will be.

The levy to be imposed on imports from South Korea ranges from 7.8% to 8.4%, US faces 9.2-10.7% and Taiwan 5%.

Based on initial estimates, the ADD will most likely change trade flows between the regions and countries involved, with, while even ahead of the ADD announcement, trade flows had begun to shift. It is likely that more US material will be arriving into Europe, while some traders are even looking at taking more cargoes from Europe into China.

The ADD announcement is a part of China's target for self-sufficiency by 2020 as a slew of plant expansions and new builds is expected to almost double current plant capacity. New capacity builds in China could reach up to 5m tonnes/year in two years time2020, bringing total nameplate capacity to 13.5m tonnes/year. ■

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RON COIFMAN HOUSTON

PVC

USES

Polyvinyl chloride (PVC) is a widely used plastic as either rigid or flexible resin. Rigid PVC can be used in pipes and accessories for construction and agriculture, window and door profiles, conduits and automotive parts. Flexible PVC contains plasticizers and is used in calendering applications, vinyl floor covering, upholstery, electrical cable insulation, inflatable products, containers for intravenous solutions and packaging and bottles.

SUPPLY/DEMAND

Argentina, Brazil, Colombia and Mexico produce PVC for domestic consumption and for export. Colombia and Mexico will first service the domestic market, but usually have sufficient supply for exports to South America, Europe, Turkey or India. Argentina may offer moderate PVC volumes to neighbouring countries. Brazil is a net importer of PVC, but has occasionally had some availability for export because of weak domestic demand. Non-producing countries along the Pacific coast of South America will import from the US, Colombia and Mexico.

PVC demand in Argentina and Brazil remained weaker than expected in 2017, as the construction sectors gradually recovered from the recessions of 2016 in the two countries. While greater optimism was noted in Argentina as the economy recovers from the country's recession of 2016, projections in Brazil were more cautious in the aftermath of the Lava Jato corruption scandal. Also, Brazil's PVC demand could remain slow until a significant construction inventory overhang is reduced.

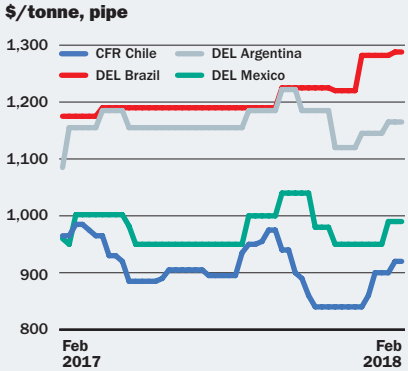
In Mexico, PVC demand in 2017 was steady, though not considered stellar.

PVC demand is generally expected to improve in 2018 on positive GDP growth projected for the major economies in Latin America, with the exception of Venezuela because of the country's continuing recession amid political uncertainty.

Seasonality also tends to drive PVC demand throughout Latin America. PVC business generally weakens as construction activity slows with cold weather. On the other hand, building, along with PVC activity, picks up with rising temperatures.

LATIN AMERICA PVC

$/tonne, pipe



PRICES

PVC prices in Latin America are generally driven by developments in other regions – for example, by Asia with Taiwan's Formosa Plastics Corp (FPC) benchmark price announcements every month and by US pricing. PVC prices in Latin America rose in early 2018 in line with increasing prices in Asia.

However, the magnitude of the price change in Latin America may not be an exact reflection of the change in other regions, and implementation would likely be at a lag of one or two months. Additionally, PVC domestic prices in Brazil are generally high compared with other regions, because of significant import duties and other barriers to lower-priced imports that protect domestic resin production.

Price changes in Mexico generally track price fluctuations in the US. Prices in non-producing countries along the Pacific coast of South America that depend on imports are the quickest to react to changes in other regions.

TECHNOLOGY

Most PVC is produced through the polymerisation of vinyl chloride monomer (VCM) feedstock in a liquid state. The majority of PVC in China is carbide- or acetylene-based using feedstock calcium carbide, while other countries use upstream ethylene to produce PVC.

PVC can be produced by suspension polymerisation (the most common), emulsion polymerisation and bulk polymerisation.

In the US, most ethylene is obtained from ethane, and is cheaper than ethylene derived from naphtha in other regions, giving US producers a significant cost advantage.

LATIN AMERICA PVC '000 TONNES/YEAR

Company	Location	Capacity
Mexichem	Altamira, Mexico	690
Braskem	Maceio, Brazil	460
Mexichem	Mamonal, Colombia	400
Unipar Indupa	Santo Andre, Brazil	300
Braskem	Camacari, Brazil	250
Unipar Indupa	Bahia Blanca, Argentina	222
Cloro Vinilos Del Zulia	El Tablazo, Venezuela	155

NOTE: Top 7 sites

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

OUTLOOK

PVC demand in Latin America is expected to increase in 2018 in line with rising GDP projections and with demographics, as the region is considered a developing market in comparison with a more mature US market.

More stable politics in 2018 in most countries in the region should contribute to improving economies and to general demand, following earlier disruptions from charges of corruption. However, continuing political and social discontent in Venezuela should limit the country's growth. Also, recent opposition to President Pedro Pablo Kuczynski could dampen the outlook in Peru.

As Argentina and Brazil place greater distance from the recessions of 2016, the recovering economies in the two countries will lend support to rising demand. The outlook in Brazil and Mexico will also depend on the results of elections to be held in the two countries in 2018.

The next President in Mexico to be determined in the July election will unlikely overturn Mexico's recent energy reforms, which opened up the country to outside investment. Before, only state company Pemex was allowed to produce oil, fuels and natural gas. ■

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IZHAM AHMAD SINGAPORE

Polyols

USES

The major use of polyols is in polyurethane (PU) foams, flexible or rigid, which are produced by the reaction of a polyol with an isocyanate, usually toluene di-isocyanate (TDI) or methyl di-p-phenylene isocyanate (MDI).

Polyether polyols are more widely used, with the main applications being rigid and flexible polyurethane foams. Rigid foams are mainly used in insulation, refrigeration, packaging and construction, while flexible foams have applications in upholstery, mattresses and seats. Polyols can also be used in elastomers, adhesives, coatings and fibres.

SUPPLY/DEMAND

The oversupply of polyols in Asia, especially in China, has resulted in the consolidation of the PU industry, while the price and availability of feedstock propylene oxide (PO) has been a key driver behind the recent rise in polyols prices in the Middle East. In the past few years, there has also been a shift away from base flexible polyols production to other specialty polyols grades.

In terms of start-ups, Sadara's 400,000 tonne/year polyether polyols unit in Saudi Arabia, came on stream in mid-July 2017 and its first batch of flexible polyols cargoes arrived in China in late October. However, supply to the Middle East has been limited, in part because Sadara is believed to be only offering conventional grade polyols at the moment.

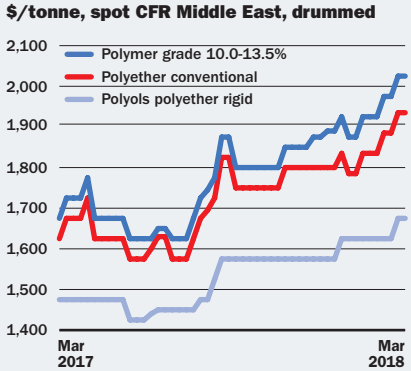
Meanwhile, the three main South Korean polyols producers, namely KPX, Kumho Petrochemical and Mitsui Chemicals & SKC Polyurethanes (MCNS), have at times run into difficulties securing sufficient PO to run their plants at full capacity.

Chinese producers have also been affected by PO prices and few have been able to offer polyols to Middle East buyers due to high production costs and eroding profit margins.

On the demand side, downstream foam makers have also been under pressure due to dwindling inventories, but have shown a muted response to the higher prices because of the higher TDI and MDI prices.

MIDDLE EAST POLYOLS

$/tonne, spot CFR Middle East, drummed



PRICES

Polyols prices have been tracking feedstock PO prices closely, with polyols producer margins tightly squeezed.

Prices of 10-13.5% polymer polyols (POP) in the Middle East have mostly been firmer over the last few months as sellers tried to push the higher production costs on to their customers, but with limited success.

In the week ended 1 March, POP prices hit their highest level since ICIS began tracking the data in August 2015, while prices of conventional polyols have largely tracked the move in POP prices.

Buyers have been apprehensive about the price gains. Many were believed to be buying on a need-to basis and few were willing to stock up on inventories due to the high prices.

Prices of rigid grade polyols have been largely steady over the last few months mainly due to limited buying interest and a lack of firm deals for this particular grade. Rigid polyols prices have, however, also seen sporadic price increases in line with the increase in POP and conventional polyols as well as tracking Asian prices.

In related Asian markets, prices of US dollar denominated flexible slabstock grade of polyols in China hit a 10-month high in the second half of August 2017, along with a spike in China PO prices. They jumped again in early 2018 before retreating again.

Polyols spot import prices in southeast Asia and India were much less volatile and generally range-bound during the year, with prices inching up in August and September on supplier price hikes amid the rise in feedstock costs and tighter regional supply.

TECHNOLOGY

Polyether polyols are produced by the catalysed addition of epoxides, mainly PO or ethylene oxide (EO), to an initiator having active hydrogens. The most common catalyst is potassium hydroxide.

The reaction is carried out by a discontinuous batch process in an inert atmosphere. After polymerisation, the catalyst is removed. The polyol is then purified.

ASIA AND MIDDLE EAST POLYOLS CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Jurong Ningwu New Material Development	Jurong, China	400
Sadara	Al Jubail, Saudi Arabia	400
Shell Eastern Petrochem	Pulau Seraya, Singapore	360
Zibo Dexin Lianbang	Zibo, China	350
Shandong Dongda	Zibo, China	300
Wudi Dexin Chemical	Wudi, China	300
CNOOC and Shell Petrochemicals Co (CSPC)	Huizhou, China	280
Wanhua Chemical	Yantai, China	270
Shandong Longhua	Zibo, China	260
KPX	Ulsan, South Korea	230

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

OUTLOOK

The expected influx of Sadara's polyols into Asia and the Middle East in 2018 will likely weigh on polyols prices, although the price movement of feedstock PO will remain a key factor in determining direction.

The PU industry looks set to continue on its path of consolidation, with producers operating integrated facilities that produce upstream propylene and downstream polyols.

Polyols consumption in the Middle East is projected to be relatively healthy as the Sadara start-up is likely to boost to the development of the PU value chain, according to the ICIS Supply and Demand Database. But many are also concerned about a recent gain in the price of isocyanates, which has dampened demand for polyols in the Middle East. ■

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BILL BOWEN HOUSTON

PVC

USES

Polyvinyl chloride (PVC) is a rigid and durable thermoplastic with a broad variety of applications, especially in the construction industry, which consumes about 70% of US PVC production. With the addition of plasticizers and other additives, PVC can be made clear and flexible enough to make clear film to package food or for medical uses, such as blood bags. It is also made into fibres used in clothing, upholstery, or vinyl floor covering and electrical wire insulation. It is the third largest plastic produced in the US by volume after polyethylene (PE) and polypropylene (PP).

SUPPLY/DEMAND

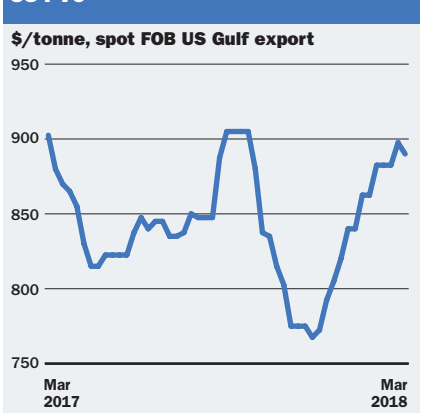
US PVC domestic demand grew by 4.6% during 2017 as US construction activity gained momentum. US production was up more than 2.7% and sales rose 4.6%. Exports, though, grew by only 0.1% because of the greater domestic demand. Stable and growing ethylene feedstock supplies have allowed US producers to increase margins on the lower prices for raw material.

Ethylene feedstock supply should be more stable in 2018, with a number of ethane crackers having launched production after output constraints in 2017.

Healthy US economic growth is expected to continue in 2018 after GDP rising to 2.3% in 2017, according to preliminary data. That is up from 1.6% GDP growth in 2016. That helped US construction spending to grow at a rate of 3.8% – a healthy rate, but slightly slower than in 2016.

US housing starts have risen steadily in recent years, from 1.06m units in 2014, to 1.11m in 2015, 1.21m in 2016 and 1.26m in 2017, according to US government figures. February 2018 US housing starts came in at a seasonally adjusted annual rate of 1.24m units, down from 1.33m in January 2018.

US PVC



PRICES

US domestic prices rose by a net 2 cents/lb in 2017 and have started 2018 with a 3 cents/lb increase, with more on the table for the first quarter.

Spot export prices rose steadily through December 2017 and the first two months of 2018 before levelling off in March.

Domestic ethylene prices are expected to soften in the second quarter as greater production capacity enters the market in the Texas Gulf Coast region. Cheaper ethylene prices through most of 2017 were made volatile by Hurricane Harvey's arrival in late August.

TECHNOLOGY

Most PVC is produced through the polymerisation of vinyl chloride monomer (VCM) feedstock in a liquid state.

The so-called process of suspension polymerisation accounts for almost 90% of PVC manufacture. Other processes include emulsion polymerisation and mass polymerisation.

Most global PVC producers produce or buy ethylene derived from naphtha, which is in turn derived from oil refining.

But in the US, most ethylene comes from ethane, a natural gas liquid and a cheaper alternative that gives US producers a significant production cost advantage, helping maintain an open arbitrage to global markets.

OUTLOOK

Most market participants anticipate a year of growing demand amid a strengthening construction sector in the US. Estimates hold that PVC demand will growth by an average 3.8%/year through 2020.

US residential construction rose through 2017 and is expected to continue to build during 2018 on efforts to repair damage from three major hurricanes during 2017 and extensive damage from wildfires in the western US that have destroyed more than 10,000 structures.

Single-family residential construction is expected to grow after a couple of years of strong apartment growth. Multi-family structures have less wiring, fewer exterior walls and exterior features than single-family residences and use less PVC for pipes, doors and window profiles, fixtures and architectural features.

US President Donald Trump's planned infrastructure programme, while appearing far from being agreed upon by Congress, would boost construction activity further if implemented. Although this would not be housing related, PVC pipes could come in for greater use in electrical and water infrastructure.

Rising home values in the US are also expected to increase equity lending and remodelling activity.

With lower feedstock costs, PVC prices are expected to continue to fall in the first quarter of 2018, but then level off through the rest of the year. ■

US PVC CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Shintech	Freeport, Texas	1,450
Shintech	Addis, Louisiana	960
OxyVinyls	Pasadena, Texas	950
Westlake	Plaquemine, Louisiana	750
Formosa Plastics	Point Comfort, Texas	690
Westlake	Calvert City, Kentucky	592
Shintech	Plaquemine, Louisiana	590
Formosa Plastics	Baton Rouge, Louisiana	470
Westlake	Aberdeen, Mississippi	454
OxyVinyls	Deer Park, Texas	307

A full list of plants and projects capacities, forecasts, production volumes and operating rates is available on the **ICIS Supply and Demand database**

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AMANDA HAY HOUSTON

PTA

USES

Nearly all of the output of purified terephthalic acid (PTA) is consumed in the production of polyester, including polyester fibre, polyethylene terephthalate (PET) bottle resin and polyester film. Other, smaller outlets for PTA are cyclohexanedimethanol, terephthaloyl chloride, copolyester-ether elastomers, plasticizers and liquid crystal polymers. In the US, demand primarily comes from the production of PET bottle resin.

SUPPLY/DEMAND

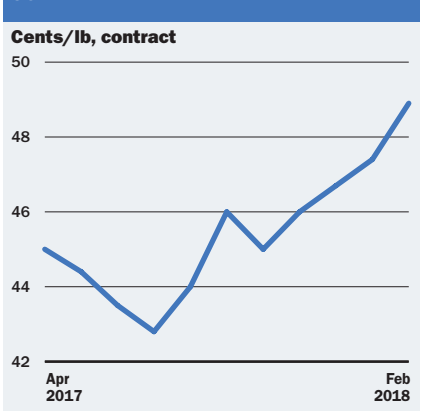
US PTA plants are in North and South Carolina, Alabama, Mississippi and Tennessee, so production was not disrupted in August 2017 by Hurricane Harvey. No interruptions to production were known despite the storm's impact on production of feedstock paraxylene (PX).

Demand for PTA in the US was muted in the second half of 2017 along with feedstock PX. Lower demand was attributed to reduced PET production capacity throughout the Americas, which carried into 2018.

Italy-based PET producer Mossi & Ghisolfi (M&G) was forced to shutter its PET resin plant in West Virginia and to temporarily stop PET resin production in Altamira, Mexico, in autumn 2017 amid financial difficulties.

The company became saddled with $1.7bn of debt because of the construction of its giant PET/PTA complex in Corpus Christi, Texas. M&G subsequently filed for bankruptcy protection in October 2017 and started a sales process for its US plants.

US PTA



US PET capacity remains restricted as the West Virginia plant is still idled and the Corpus Christi plant is unfinished. Taiwanese PET producer Far Eastern New Century purchased the West Virginia plant, but plans for a restart are not yet known.

In March, a consortium led by Mexico's Alpek and Thailand's Indorama Ventures agreed to buy M&G USA Corp's PTA and PET plant in Corpus Christi for $1.125bn through a joint venture, CC Polymers. Another partner in the venture is Far Eastern Investment, a subsidiary of Far Eastern New Century Corporation.

Each stakeholder will have the right to receive a third of the PET and PTA produced at the site, with capacity estimated at 1.1m tonnes/year and 1.3m tonnes/year, respectively, making it the largest facility of its kind in the world. A timeline for the completion of the plant will be communicated at a later date, the companies said. Before the announcement, market sources had anticipated the plant to operate by late 2019 at the earliest. This will greatly impact future PTA consumption in the US.

M&G's Mexico plant has restarted its operations, although it is running at reduced rates.

The US PET market is approaching the summer peak consumption season, which could increase demand for PTA.

In Asia, the market outlook also became uncertain, with a change in sentiment from bullish to bearish in March. The fluctuations in upstream crude and the possibility of implications for petrochemical trades stemming from the US plan to impose tariffs on steel and aluminium imports added uncertainty to the PTA market.

PRICES

PTA contract prices have been on an uptrend since August 2017, tracking rising prices for PX.

Initially, prices spiked in response to Harvey's direct hit on the Texas Gulf Coast. The storm knocked more than 40% of US PX production off line and impeded logistics, delaying shipments to PTA producers. Production of PX began to normalise in November.

PTA prices settled downward somewhat in October, but then began climbing with crude prices. PX and PTA prices remain at their highest levels since August 2015.

For US February contracts, ICIS assessed PTA prices at 48.87 cents/lb ($1,077/tonne), tracking rising prices in February for PX.

US PTA CAPACITIES '000 TONNES/YEAR

Company	Site	Capacity
BP Chemicals	Cooper River, South Carolina	1,350
Indorama Ventures	Decatur, Alabama	1,115
DAK Americas	Cape Fear, North Carolina	550
DAK Americas	Columbia, South Carolina	425
DAK Americas	Port Bienville, Mississippi	275
Eastman Chemical	Kingsport, Tennessee	225
Invista	Wilmington, North Carolina	180

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

The US PTA price is not freely negotiated and, for the purpose of the ICIS assessment, its movement is equivalent to 67% of the US PX price delta for the month in which it was settled.

TECHNOLOGY

Initially, PTA was produced by the oxidation of PX using dilute nitric acid and, later, air. It was the first product to be made commercially this process.

Modern technologies produce PTA by the catalytic liquid-phase oxidation of PX in acetic acid, which is done in the presence of air and uses manganese or cobalt acetate as a catalyst. PTA is purified in a crystalliser, where unreacted xylene and water are flashed off.

PTA technology has been led by BP and fibres producer Advansa. BP claims to have simplified the process, offering savings in capital and operating costs with the optimal plant size at 700,000 tonnes/year.

Processes have also been developed by US-based Dow and Eastman, as well as Japan's Mitsubishi Chemical and Mitsui Chemicals.

OUTLOOK

There is some uncertainty for the US PTA market. Much will hinge on when reduced US capacity will return after the M&G asset sales. ■

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JANE MASSINGHAM LONDON

Plasticizers

USES

Plasticizers are added to polyvinyl chloride (PVC) and other materials to give them more flexibility and durability. DOP is used in tubing and hoses, flooring, construction materials, electrical cables and wiring and moulded plastic products. It can also be used as a hydraulic fluid, a dielectric fluid and a solvent. DINP is used in vinyl products for housing and construction material, flexible PVC products, coatings and durable goods made from moulded plastics.

DOTP is a non-phthalate plasticizer used in an array of products including plastic films, home flooring and wall coverings, wires and cables, automotive parts, and some adhesives, coatings and sealants. Dipropyl heptyl phthalate (DPHP) is used to enhance the durability of PVC applications such as cables, wires and roofing membranes.

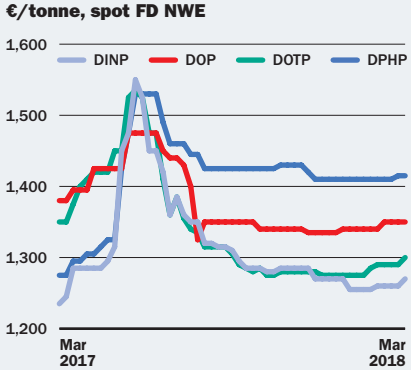
SUPPLY/DEMAND

Availability of European plasticizers varies depending on grade. The market experienced a number of production issues in 2017, both planned and unplanned and prices soared during the traditional peak demand period of Q2 with supply tight.

Although improved supplies were seen mid-year, the market is quite precariously balanced and any small unexpected hiccups in production tend to be felt quite quickly. DOTP in particular is reliant upon imports to satisfy European demand and with some reduction of volumes early 2018, there are pockets of snug supply still in evidence. The focus on non-phthalate plasticizers due to legislation and particular growth in DOTP, has resulted in a number of announcements regarding new/increased DOTP capacity later in 2018 and in 2019.

EUROPE PLASTICIZERS

€/tonne, spot FD NWE



PRICES

There were big jumps in pricing in the first half of 2017. DOTP saw triple digit rises at the end of Q1 on the back of force majeure declarations resulting in tight supply pressure noted from healthy demand and upstream cost pressure.

For May, it was DINP in particular that struggled with supplies and saw the biggest hikes and this was largely due to another force majeure declaration. By mid-June, many buyers on the spot market had absorbed close to triple digit rises for all grades. The markets softened into July on the back of improved availability and downward pressure from feedstocks. The only production issue was the ongoing reduced output at BASF, which had been the case since the explosion at the Ludwigshafen, Germany, site in October 2016, but this too returned to normal production at the start of Q4.

Overall in Q4, planned and unplanned supply restrictions, although not as severe as earlier in the year, kept the market well supported and prices steady. Good demand later in January and into February combined with some reduced imports of DOTP and upstream cost pressure from stronger than expected propylene have kept prices steady to firm.

TECHNOLOGY

DOP and DINP are produced by the esterification reaction of an alcohol with phthalic anhydride (PA), using a catalyst. For DOP, 2-ethylhexanol (2-EH) is used, while isononyl alcohol is used for DINP. After esterification, excess alcohol is removed and the plasticizer is filtered.

DOTP is produced by reacting 2-EH with either dimethyl terephthalate (DMT) or terephthalic acid (PTA) at elevated temperatures and pressures, with the reaction time twice as long as DINP or DOTP. Feedstocks for DPHP include phthalic anhydride (PA) and 2-propyl heptanol (2-PH).

OUTLOOK

European plasticizer markets are largely expected to have a positive 2018, with growth rates around 3-5%. Economies and demand are due to remain fairly strong and buyers expect it will be a smoother ride in terms of supply compared to that experienced in 2017.

Looking ahead, there is new capacity of DOTP due on stream from Grupa Azoty Zak, Plastifay, Oxea and Sibur.

Certain sources said there will be the inevitable conversion to phthalate-free plasticizers in the years ahead and most feel that by 2020 there will be far fewer applications using DINP and a natural switch to DOTP is the most likely trend. However, in March 2018, it was revealed that DINP does not require classification for reprotoxic effects, the European Chemicals Agency (ECHA) said. In February 2015, Denmark had submitted the proposal for the classification of DINP to ECHA.

There is little price advantage of using DINP at the time of publication and with a more diverse number of DOTP suppliers, some said the consumer pull towards DOTP was already being seen at some accounts. The market is expected to remain balanced to tight until the new planned capacity comes online. ■

EUROPE PLASTICIZERS CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
BASF	Ludwigshafen, Germany	300
Evonik	Marl, Germany	220
Polynt	San Giovanni, Italy	110
Exxon	Botlek, Netherlands	90
Perstorp	Stenungsund, Sweden	70
Ela Kimya	Tuzla, Turkey	60
Deza	Valasske Mezirici, Czech Republic	50
Grupa Azoty ZAK	Kedzierzyn-Kozle, Poland	50*
INEOS	Verdun, france	50
Plastifay	Istanbul, Turkey	40**

*Grupa Azoty Zak to increase nameplate capacity to 65,000 tonnes/year in Q3 2018

**Plastifay to increase nameplate capacity to 46,000 tonnes/year mid 2018

NOTE: Oxea to start production of 65,000 tonnes/year in 2H 2019 in Germany

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

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HAZEL GOH SINGAPORE

PTA

USES

Purified terephthalic acid (PTA) occurs as a white, crystalline powder with a slightly acidic odour. Nearly all PTA is consumed in polyester production including polyester fibre, polyethylene terephthalate (PET) bottle resin and polyester film.

PTA and monoethylene glycol (MEG) are reacted to make a basic ester which is polymerised in a melt phase, polycondensation finishing reactor to make polyester.

PTA is also the feedstock for dioctyl terephthalate (DOPT) and polybutylene terephthalate (PBT) production.

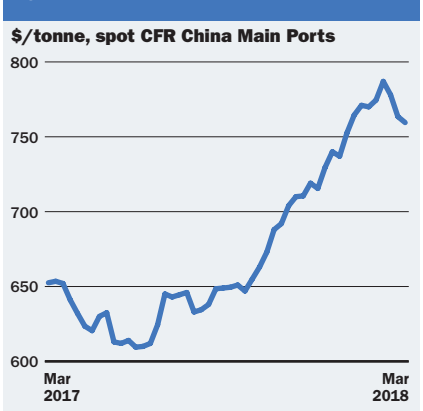
SUPPLY/DEMAND

Generally solid performance in the downstream polyester industry since 2017 contributed to positive sentiment and kept PTA supply/demand fundamentals on the tight side for most of the first quarter of 2018. With the supportive downstream market situation, several idled PTA plants restarted. Plus, new PTA plants started up in the fourth quarter of 2017.

Hanbang Petrochemical's No 1 PTA unit of 600,000 tonnes/year and part of Fuhua Gulei Petrochemical's No 2 unit of 1.5m tonnes/year – both in China – restarted in the fourth quarter of 2017.

Jiaxing Petrochemical's No 2 unit with 2.2m tonnes/year capacity in China, and Oriental Petrochemical Taiwan Co's (OPTC) Line 3 with 1.5m tonnes/year capacity in Taiwan were the new plants that started up in the fourth quarter of 2017.

ASIA PTA



There were expectations for some of the idled PTA plants to restart in mid-2017, but that did not happen until Q4 2017. Hence, PTA supply tightness continued even when there was a slight slowdown in the polyester sector before and after the Lunar New Year in February 2018 when polyester operating rates slowed for about a month. PTA inventories remained generally low.

PX-PTA spreads widened amid the supply/demand tightness and there was improved margins for PTA producers. The favourable conditions allowed PTA producers to run their plants at high operating rates. South Korea, Thailand, Taiwan and China have spot export volumes.

PRICES

Both PTA and feedstock paraxylene (PX) prices have been on the uptrend since the second half of 2017.

The generally tight PTA supply/demand fundamentals during this period drove PTA prices to increase faster than PX prices.

The PX-PTA spreads widened and margins improved for PTA producers, encouraging PTA producers to run their plants at high operating rates. PX-PTA spreads increased from around the $80s/tonne range for most of 2017, to around the $90-100s/tonne range in Q4 2017, and are now around the $120s/tonne level.

TECHNOLOGY

Modern technologies produce purified terephthalic acid by the catalytic liquid phase oxidation of PX in acetic acid, in the presence of air. The process uses manganese or cobalt acetate as a catalyst.

PTA is a low-risk hazard to health but prolonged exposure should be avoided. In addition, PTA dust can be explosive, and it reacts strongly with oxidants. The substance can irritate the eyes and skin.

OUTLOOK

The balancing of run rates against margins will likely be a key point for Asia PTA producers. With a wide PX-PTA spread, PTA producers will target high operating rates. However, operating rates need to be controlled to avoid a supply overhang which would jeopardise margins.

ASIA PTA CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Hengli Petrochemical	Changxing Island, China	6,600
Yisheng Dahua Petrochemical	Dalian, China	5,950
Yisheng Petrochemical	Ningbo, China	5,100
Jiaxing Petrochemical	Jiaxing, China	3,700
Xiang Lu Petrochemical	Zhangzhou, China	3,000
Hanbang Jiangyin Petrochemical	Jiangyin, China	2,800
Jiangsu Hailun Chemical	Jiangyin, China	2,400
BP Zhuhai Chemical	Zhuhai, China	2,350
Reliance Industries	Dahej, India	2,300
Yisheng Petrochemical	Yangpu, China	2,000
Oriental Petrochemical (Taiwan) Co	Kwan Yin, Taiwan	2,000

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

PTA producers should be able to achieve solid margins and high operating rates as there were more than 1m tonnes/year of new downstream polyester capacity in China in the first quarter of 2018, and more than 4m tonnes/year of upcoming new downstream polyester capacity expected in China for the rest of 2018.

Meanwhile, there are no firm plans for new PTA plants this year.

On a global basis, upcoming PTA projects are the JBF Industries 1.25m tonne/year plant in India, Oman International Petrochemical Industries Company's (OMPET) 1.1m tonne/year unit in Oman and Corpus Christi Polymer's (in progress of acquiring the under-construction plant from Mossi & Ghisolfi) of 1.3m tonne/year plant in Texas, US.

A couple of existing Chinese producers, Hengli Petrochemical and Yisheng Petrochemical, were heard to have plans to expand capacity, but more details have not been revealed. ■

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CIARAN TYLER LONDON

Nylon

USES

The two major forms of nylon (polyamide/PA) virgin polymer are nylon 6, based on caprolactam (capro) and nylon 6,6, based on adiponitrile (ADN), adipic acid and hexamethylene diamine (HMDA). Most nylon 6 production is used for clothing, carpets and engineering plastics for automotive, electrics and electronics. Nylon 6,6 is used predominantly for engineering plastics.

SUPPLY/DEMAND

The nylon 6 market in Europe is structurally oversupplied by hundreds of thousands of tonnes. New nylon capacity has continued to come onstream in part to alleviate structural oversupply of capro in Europe, which is more acute as fewer volumes are exported into Asia, partly due to China's substantial capro capacity construction over the last decade.

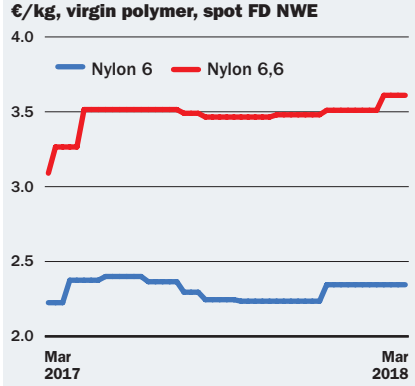
The most recent nylon 6 expansions in Europe were carried out by Grupa Azoty in Poland and UBE in Spain. Both units came online in late-2017. Combined, the expansions add 120,000 tonnes/year to Europe.

The nylon 6 market in Q1 2018 has witnessed mostly healthy demand, especially in the engineering plastics and compounding sectors. The exception is nylon-made bulk continuous filament (BCF) carpets thanks to changing fashions and alterative BCF polymers such as polyester.

High quality nylon textiles for fashion and sportswear in Europe, however, has continued to grow. Nylon 6,6 capacity has remained broadly unchanged although a plethora of production issues in the upstream ADN and HMDA markets have meant that nylon 6,6 availability remains extremely tight.

EUROPE NYLON

€/kg, virgin polymer, spot FD NWE



PRICES

Nylon prices have fluctuated quite significantly over the last year with volatility in upstream benzene remaining a significant cause. The macroeconomic situation in Europe has been broadly healthy, and demand in most sectors and grades has remained buoyant, helping to keep prices and margins mostly positive.

Some nylon producers have bemoaned the spread between capro and nylon as too large and described the margins for nylon producers as relatively low. This has become less of an issue for some with more players now integrated capro producers.

Nylon 6 prices in Q1 2018 have remained steady with fundamentals balanced and upstream costs less volatile than expected.

Nylon 6,6, however, has seen further sizeable increases throughout Q1 2018, following multiple issues in the upstream markets which led to a number of players in Europe and around the world declaring force majeure on 6,6 production and ever-tightening market conditions.

With nylon 6,6 prices continuing to rise, some players have questioned how sustainable the spread between the two nylons is, standing at over €1.00/kg (€1000/tonne) currently.

TECHNOLOGY

Nylon 6 is made from reacting capro with water and a molecular mass regulator, such as ethanoic acid. These elements are poured into a reaction vessel and heated under nitrogen at 227°C. An intermediate, aminocaproic acid, is produced. The process then undergoes condensation to polymerise the molecules.

For nylon 6,6 production, ADN is made from butadiene or acrylonitrile and then converted to HMDA. Then, HMDA is mixed with adipic acid to form a salt. Ethanoic acid is mixed into a solution with the salt and the mixture is heated and the steam bled off. The pressure is reduced, and the polymer is extruded under nitrogen to yield a lace, which is then granulated.

OUTLOOK

Q1 2018 has seen supply remain balanced amid healthy demand and some buyers reporting that additional volumes from the new capacity are yet to be on offer in sizeable amounts. With demand remaining robust in most sectors and availability not lengthening as quickly as some have anticipated, nylon fundamentals are expected to continue to be mostly balanced in the shorter-term with potential lengthening in the long-term.

Overall growth in Europe for 2017 stood above inflation at around 3%. On a global scale, nylon demand grew by an estimated 6% in 2017, with much of that coming from buying appetite in China.

These growth trends are expected to continue for 2018, with the engineering plastics and compounding sectors anticipated to drive much of the growth market in Europe for the year. Meanwhile, nylon 6,6 demand is also expected to grow at a similar level with some small expansions expected in the US to help meet this growth.

Furthermore, BASF's purchase of Solvay's global polyamide business in H2 2017 is expected to conclude by the summer of 2018. If the deal is concluded as planned, players expect BASF to potentially reorganise its upstream facilities to better ensure a stable, more efficient supply of nylon 6,6 in Europe. ■

EUROPE NYLON 6 CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
BASF	Germany, Ludwigshafen	241
Dow Chemical	Germany, Uentrop	145
LANXESS	Germany, Krefeld	140
Grupa Azoty	Poland, Tarnow	125
DSM	The Netherlands, Emmen	125
Solvay	France, St.Fons	98*
Radici Group	Italy, Novara	90*
LANXESS	Belgium, Antwerp	90
Ube Industries	Spain, Castellon	70

*Nylon 6,6

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

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TARUN RAIZADA HOUSTON

Ethylene oxide

USES

Ethylene oxide (EO) is mainly used to make ethylene glycol (EG), which accounts for three-quarters of global EO consumption. The second largest outlet is in surface active agents, including non-ionic alkylphenol ethoxylates and detergent alcohol ethoxylates.

Monoethylene glycol (MEG) is used in polyester fibres, resins and antifreeze formulations, and polyethylene terephthalate (PET) film for packaging. Diethylene glycol (DEG) is used in polyols, unsaturated polyester resins and plasticizers. Triethylene glycol (TEG) is used in natural gas dehydration and as a dehumidifier.

Other EO derivatives include glycol ethers (used in solvents and fuels), ethanolamines (used in surfactants and personal care products), polyols for polyurethane (PU) systems, polyethylene glycols (used in toothpaste and medicines) and polyalkylene glycols (used in antifoam agents and hydraulic lubricants).

EO is very explosive and difficult to transport over long distances.

SUPPLY/DEMAND

US EO supply is somewhat tight due to recent production issues in the first quarter and the impending start of the peak season in the downstream surfactants and PET sectors. The anticipated pick-up in demand from the downstream sectors will run from April to August.

Demand was also at a healthy level during the winter season as the downstream EG market was boosted by winter weather, which drove antifreeze sales.

Sasol's $11bn Lake Charles Chemicals Project (LCCP) in the US is 81% complete, and the company is scheduled to start up its first units at the site in the second half of 2018. LCCP consists of a 1.5m tonne/year ethane cracker, as well as six downstream facilities. The EO/EG unit will have a capacity of 300,000 tonnes/year of crude EO and 250,000 tonnes/year of MEG and associated higher glycols. US cracker capacity is expected to increase by 35% by 2019, taking into account new cracker projects and expansions of existing crackers.

In Mexico, Pemex's output of EO reached 218,000 tonnes in 2017, down from 294,000 tonnes in 2016. The state giant is struggling to supply feedstock ethylene to its downstream units following its contractual pledge to deliver ethane to Ethylene XXI, a $5.2bn JV between Brazil's Braskem and Mexico's Grupo Idesa.

Surfactants producers in Asia and elsewhere in the world may be in for a tough time on account of lacklustre demand growth, global overcapacity and an increasingly stringent regulatory environment, especially in China.

PRICES

EO contract prices for March fell from February following a decline in the feedstock ethylene contract for March. The ethylene contract typically settles at the beginning of the month for the previous month, and the EO contract price moves in tandem with ethylene. The majority of EO contracts are formula-based, and price movement comprises 80% of the change in the ethylene price and an additional conversion fee, or adder.

The March EO contract settled at 51.60-61.10 cents/lb free on board (FOB), a decrease of 1.40 cents/lb from February.

US spot feedstock ethylene prices have fallen to their lowest point in nine years as production continues to be bolstered by new crackers and demand is hampered by downstream outages.

TECHNOLOGY

EO was first manufactured using ethylene chlorohydrin as an intermediate, but this route has been superseded by the direct oxidation of ethylene with air or oxygen. Ethylene, compressed oxygen and recycled gas are mixed and fed to a multitubular catalytic reactor. The mixture is passed over a silver oxide catalyst at 200-300°C and 10-30 bar. The resulting gases from the reactor are cooled and then passed through a scrubber where the EO is absorbed, and can go straight to glycol production or be purified to produce other EO derivatives.

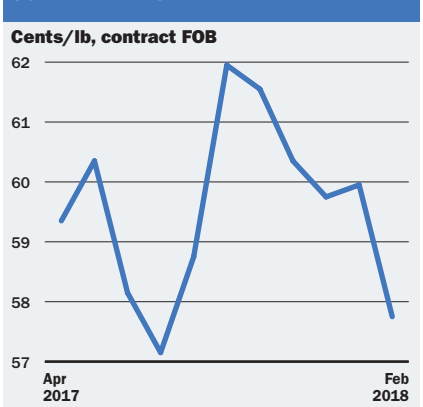
A crude EG mixture is produced by the hydrolysis of EO with water under pressure. Fractional distillation under vacuum separates the MEG from DEG and TEG.

OUTLOOK

EO supply is expected to be tighter by the start of summer, driven by several EO/EG turnarounds and higher demand from the onset of the peak downstream surfactants season. Turnarounds are generally scheduled after the peak antifreeze season since demand tends to be slower. In addition, demand from downstream EG is also expected to see a pick-up from the PET market, which has its peak season from April to August. PET is a major outlet for EG.

Feedstock ethylene supply may become more snug as downstream polyethylene (PE) outages wrap up and as new PE plants increase production. ■

US ETHYLENE OXIDE



US ETHYLENE OXIDE CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Shell Chemicals	Geismar, Louisiana	715
Dow Chemical	Taft, Louisiana	700
Huntsman	Port Neches, Texas	580
Indorama Ventures	Clear Lake, Texas	435
Dow Chemical	Seadrift, Texas	420
Equistar Chemicals	Bayport, Texas	380
Dow Chemical	Plaquemine, Louisiana	270

NOTE: Top seven listed

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JOSON NG SINGAPORE

Propylene

USES

Propylene is mainly used to make polypropylene (PP), which accounts for nearly two-thirds of global propylene consumption. Other outlets include acrylonitrile (ACN), propylene oxide (PO), cumene, acrylic acid (AA) and a number of alcohols such as 2-ethylhexanol (2-EH), n-butanol (NBA) and isopropanol (IPA).

SUPPLY/DEMAND

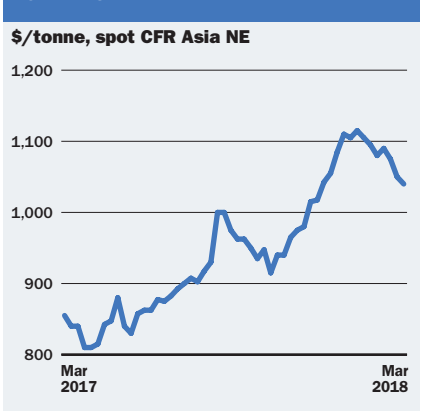
Chinese demand for import cargoes is not expected to change drastically in 2018. Import volumes have been hovering between the mid to high-2,000,000s tonnes/year to the low-3,000,000s tonnes/year level since 2013.

In South Korea, KPIC expanded its cracker in mid-2017 and increased propylene production from around 350,000 tonnes/year to approximately 510,000-520,000 tonnes/year.

There is potential for more spot cargoes available in the second half of 2018 as S-Oil will expand propylene capacity by adding a new fluid catalytic cracking (FCC) unit. On paper, some 100,000 additional tonnes of propylene may be available to the merchant market.

In southeast Asia, Lotte Chemical Titan is expected to be in a long position in the second half of 2018 after starting up a catalytic olefin cracking unit in late 2017. The company may return to a buy position after its new PP plant starts up in H2 2018.

ASIA PROPYLENE



PRICES

Spot propylene prices rose some 8.6% from December 2017 to an average of $1,105/tonne CFR (cost & freight) NE (northeast) Asia by mid-February. If that is an indication of things to come – bearing in mind most production losses are expected in the summer months – spot prices may continue to enjoy further support. That said, spot prices in the region have been bearish after the Lunar New Year due to the weak performing Chinese domestic markets.

For the week ending 6 April, spot propylene prices in the northeast Asian import markets were assessed firmer on improved sentiment in the Chinese domestic market. The Chinese domestic market saw higher prices as downstream buyers returned to the spot market while propylene inventories were heard to be lower with planned maintenance work taking place in the Shandong region.

The import market experienced improved sentiment in the week, buoyed by rebounding domestic market prices. Concrete discussions were, however, fewer week on week as the assessment week was cut short in China and the region of Taiwan due to the holidays. Certain buyers were still in a wait and see mode in the holiday shortened week. Sellers, on the other hand, were keen to increase their offer prices.

While the uptick in prices gave some producers in the region reasons to smile, Chinese buyers cautioned that the buying activity in the week was purely on a need-to basis as buyers have been out of the market in the last few weeks.

As such, there might not be too much support in the coming week. Spot negotiations are expected to move onto May arrivals in the week after that, and it is not likely sellers will be under any pressure. As a result, the potential for a downtrend could be limited barring a significant drop in domestic China prices.

TECHNOLOGY

Propylene comes in three grades: polymer grade (99.5% minimum purity), chemical grade (93-94% minimum purity), and refinery grade (60-70% purity).

Propylene is produced as a by-product of steam cracking of liquid feedstocks such as naphtha and liquefied petroleum gas (LPG), as well as off-gases produced in fluid catalytic cracking (FCC) units in refineries.

It is also made via on-purpose technologies such as metathesis and propane dehydrogenation (PDH), which is becoming the preferred production route in China.

NORTHEAST ASIA PROPYLENE CAPACITY* '000 TONNES/YEAR

Company	Location	Capacity
Formosa	Mailiao, Taiwan	2,400
SKGC	Ulsan, S. Korea	1,000
YNCC	Yeosu, S. Korea	950
Hanwha Total	Daesan, S. Korea	860
LG Chem	Yeosu, S. Korea	760
LG Chem	Daesan, S. Korea	600
SK Advanced	Ulsan, S. Korea	600
CPC	Linyuan, Taiwan	560

*Top eight listed (excludes mainland China)

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

OUTLOOK

Chinese demand for propylene import cargoes is expected to see limited changes from 2017. For PP, the outlook in Asia is expected to be strong on tight deep-sea supply into the Chinese import market.

For propylene oxide (PO), the first half of 2018 could see Hong Bao Li start up its new 120,000 tonne/year PO plant in Nanjing. As it is not expected to make an immediate impact on the market, PO margins are therefore expected to be healthy.

Acrylonitrile (ACN) reached a 3-year high in the CFR NE Asia spot market in 2017 due to tight US supply. In 2018, the market is still expected to perform strongly especially during the turnaround season in the first half of the year. Oxo-alcohols production in China is estimated to be 3.9m tonnes in 2018 and demand for propylene is estimated to be 2.5m tonnes, compared to 2.4 m tonnes in 2017. ■

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ZACHARY MOORE HOUSTON

Polypropylene

USES

Polypropylene (PP) is used in a wide range of consumer and industrial products. Three forms of PP can be produced – isotactic, syndiotactic and atactic. Isotatic PP is the main form manufactured. The largest outlet is injection moulding applications, which include packaging, parts for electronic and electrical appliances, caps and closures, toys, luggage and a variety of household goods. The second largest outlet is in fibres, where carpet face yarn has been a growth market for PP.

SUPPLY/DEMAND

US PP supply has been improving in recent months following a period of reduced operating rates during the first months of the year. Severe winter weather along the US Gulf along with a sharp spike in propylene had pushed operating rates lower during January and February, with one major US producer declaring force majeure due to production issues caused by winter weather.

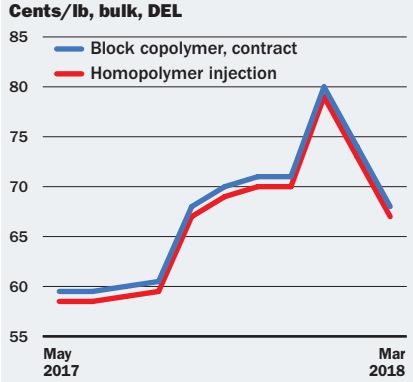
Operating rates have been picking up in March and April as propylene costs have come down and US Gulf Coast plants resumed operations following disruptions in January and February. Operating rates are expected to remain healthy during the coming months assuming new propane dehydrogenation (PDH) units manage to stabilise their operations.

PDH units, which produce feedstock propylene on-purpose, have exhibited a tendency towards uneven operations over the past few years, although the market is hopeful that PDH plants will stabilise and that this will help keep supply and demand dynamics for both feedstock propylene and PP more balanced following significant ups and downs during the first quarter.

A larger volume of import material had been ordered for January and February but imports started to come back down in March and April as domestic material grew more competitive relative to imported material.

The arbitrage window between Asia and the US has been open on paper for the better part of the past year, but US buyers are generally reluctant to purchase large volumes of imports given the long transit time between Asia and the US. Cargoes shipped from Asia generally require six to eight weeks to be delivered into the US.

US POLYPROPYLENE



PRICES

US PP prices have come down over the past two months after hitting a 26-month high in January. The jump in January contract prices was spurred by a significant rise in feedstock propylene costs stemming from tighter propylene supply.

US PP contracts are generally formula-based and are set at polymer grade propylene (PGP) prices plus an adder.

Domestic contract prices for February and March moved lower, tracking reductions in propylene feedstock costs. Producers have separately announced price increases of 3-5 cents/lb ($66-110/tonne) on top of any changes in PGP contracts prices for April.

Sentiment is divided as to whether or not sellers will be able to achieve any margin expansion in the coming months, with participants anticipating April contracts either to move with the change in PGP contract prices or see an additional 1-2 cents/lb margin expansion.

Sellers had previously attempted margin expansions in the second half of 2017. These margin expansions met with some initial success, but were ultimately rescinded as a sharp rise in feedstock propylene costs which prompted mounting resistance from buyers towards paying any additional margins.

Export prices have remained at elevated levels throughout the first quarter but overseas buyers have shown little interest as US material has been relatively uncompetitive compared to other exporting regions.

US PP CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Total Petrochemicals	La Porte, Texas	1,200
Formosa Plastics USA	Point Comfort, Texas	740
Braskem	Marcus Hook, Pennsylvania	414
Pinnacle Polymers	Garyville, Louisiana	410
INEOS	Chocolate Bayou, Texas	400
ExxonMobil Chemical	Baytown, Texas	396
Phillips 66	Linden, New Jersey	352
ExxonMobil Chemical	Baton Rouge, Louisiana	335
Flint Hills Resources	Longview, Texas	330
Braskem	Seadrift, Texas	225

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TECHNOLOGY

Current bulk technologies such as the Spheripol process developed in 1982 by Himont, replaced the solvent in an older process with liquid propylene. Catalyst activity from the older process was also improved, allowing for the introduction of gas phase technology.

Work is underway to develop the use of metallocene catalysts in PP production to improve resin properties. Borealis' Borstar bimodal polyethylene (PE) process developed in the mid-1990s has also been adopted for the production of PP.

OUTLOOK

US PP demand is expected to gradually gain ground later in 2018 following a period of sluggish buying activity during the first quarter.

Greater import volumes may be needed over the short term until new US PP capacity begins to come online. Braskem is building a 450,000 tonne/year PP project in La Porte, Texas, scheduled for completion in the first quarter of 2020. Inter Pipeline and Formosa are both moving ahead with new PDH and downstream PP units in Canada and the US, respectively. ■

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PAVLE POPOVIC LONDON

Phenol

USES

Phenol's main downstream use is in bisphenol A (BPA). Other primary uses for phenol include use in phenolic resins and caprolactam (capro), as well as alkylphenols, aniline and adipic acid. BPA is used to produce polycarbonates (PC) and epoxy resins.

Phenolic resins have a range of applications including moulding applications, laminates, coatings and adhesives.

Capro is used to produce nylon 6, which is itself used to create nylon fibres and engineering resins.

SUPPLY/DEMAND

There was tightness in quarter four of 2017 for the European phenol market due to production issues at Spanish producer CEPSA and Italian seller Versalis.

CEPSA declared a force majeure on acetone and phenol in September after a technical problem at its Huelva site. The force majeure was lifted in October.

However, in October, Versalis also announced a force majeure on phenol at its 300,000 tonne/year Mantova, Italy unit, which ended in November.

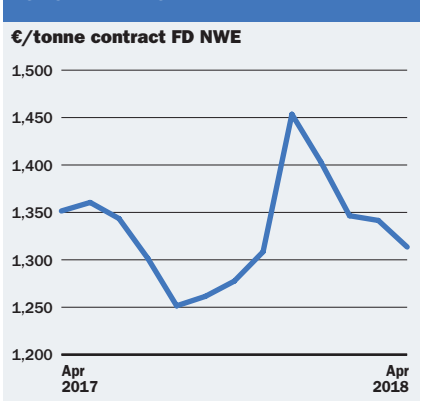
Lack of product consequently persisted into December and then balanced due to seasonally low demand at year end.

At the start of 2018 high consumption levels diminished availability, with sellers struggling to offer any extra material to the market.

There was a downward trend for co-product acetone at the time as a result of lengthy conditions, which led to market talk of a potential cut in operating rates.

Strong phenol demand was mostly seen in contractual business. Although, there was an atypical jump in order book volumes for spot business as well.

EUROPE PHENOL



PRICES

The phenol contract price follows the movement of upstream benzene with an adder or fee on top. In 2017 the contract price midpoint hit a peak for the year in February when the benzene settlement had a triple-digit jump. In August it slumped to a low for the year after a €50/tonne benzene decrease.

2017 annual adder levels were reflected in the January contract with fees rolling over on the low end of the range and reducing by €5/tonne on the high.

In 2018, annual adders were negotiated largely with rollovers and slight increases of up to €10/tonne, which was also reflected in the January contract price.

Otherwise, strong demand for contractual volumes in 2018 and a weak acetone trend put upward pressure on spot phenol pricing at the start of the year.

As the first quarter continued, suppliers said they had no material to offer and were only looking to sell product at a premium.

TECHNOLOGY

The primary synthetic route is a cumene-based technology in which benzene and propylene are reacted to form cumene, which is then oxidised to hydrogen peroxide, followed by acid-catalysed cleavage.

The resulting products are phenol and acetone. Over the years, there have been refinements to cleavage, distillation and purification, but the basic technology is little changed.

Other technologies include the oxidation of toluene and hydrolysis of chlorobenzene.

OUTLOOK

In terms of planned outages, Borealis scheduled maintenance at is 195,000 tonne/year Porvoo, Finland site in April with a finish date at the start of May. This turnaround was expected to tighten the market in a period of low availability due to strong contractual demand.

There is also a scheduled shutdown at downstream capro producer Fibrant in Geleen, the Netherlands. Planned maintenance at the 270,000 tonne/year plant is set to begin in May and finish in June, which will have an effect on consumption.

Regarding long-term changes, the Chinese Ministry of Commerce announced in late March that it had begun investigations for antidumping duties (ADDs) on phenol imports from the US, the EU, South Korea, Japan and Thailand.

The probe is expected to finish by March 2019 and sources were initially unsure about the potential impact of the investigation.

Market participants did say that if duties were imposed, trade flows could change as suppliers look to redirect their material from China.

Exports from the US would specifically also be affected by the idling of Shell's Phenol 3 unit at its Deer Park, Texas plant. The process began and was completed in late February.

Italian seller Versalis announced at the ICIS World Olefins conference in March that it was looking into a feasibility study for a feedstock cumene plant in Mantua, Italy. The 400,000 tonne/year facility would be for integrated phenol and acetone production. ■

EUROPE PHENOL CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
INEOS Phenol	Antwerp, Belgium	680
INEOS Phenol	Gladbeck, Germany	650
Cepsa Quimica	Huelva, Spain	450
Versalis	Mantova, Italy	300
Borealis	Porvoo, Finland	195
Novapex	Peage, France	175
Domo Caproleuna	Leuna, Germany	150
PKN Orlen	Plock, Poland	55
Deza	Valasske Mezirici, Czech Republic	30
Total Petrochemicals	Marienau, France	5

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CAROLINE MURRAY LONDON

PET

USES

Polyethylene terephthalate (PET) has a crystalline structure and good chemical resistance to mineral oils, acids and solvents but not to bases. It has good electrical resistance and low moisture absorption. It resists combustion and is self-extinguishing.

PET exists both as an amorphous (transparent) and a semi-crystalline (opaque and white) thermoplastic, and can be made into either a resin or a film. The semi-crystalline PET has good strength, stiffness and hardness while the amorphous PET has better ductility. PET can be made into a resin, fibre or film and has good processability that allows it to be recycled for other applications or returned to its constituent monomers.

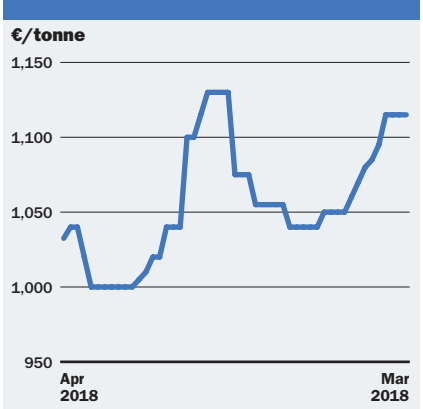
The largest outlet is synthetic fibres, followed by bottle resin, which dominates the European market. PET film is used in electrical applications and packaging.

SUPPLY/DEMAND

2017 was a year of unpredictability, as unexpected plant shutdowns and subsequent variation on traditional, global trade flows played havoc on supply. August was extremely tight in Europe. Lotte Chemical UK declared force majeure and financial difficulties were revealed at JBF RAK, which resulted in it taking the Geel plant in Belgium plant off line.

Japan imposed preliminary antidumping duties on Chinese material from September 2017. At this point M&G disclosed it too, was in financial distress.

EUROPE PET



By October's low season, consumption has dropped. M&G declared chapter 11 bankruptcy in the US and *Concordato preventivo* in Italy, and the US began antidumping investigations on five countries. Chinese material flowed into Europe, and JBF restarted one of its lines at Geel with the financial support of MB Barter.

November saw Poland's PKN Orlen declaring two force majeures, and the US antidumping investigation finds PET imports harm the market.

The year ends with JBF restarting its second line at Geel.

The first quarter of 2018 was still fraught with tension, as buyers scrambled to find additional volumes for the upcoming peak season. Three planned, domestic shutdowns in March helped to maintain a precarious demand/supply balance.

The PET market is tight and there are ongoing problems at BP's upstream purified terephthalic acid (PTA) plant in Belgium. This has led to nervousness on both sides of the PET market, and there was talk of some PET customers receiving less material than expected. Producers' margins looked set to increase again in April, following the decrease of the monoethylene glycol (MEG) contract price.

PRICES

The turmoil of a market defined by the unreliability of supply resulted in a fresh approach to pricing in 2018. Accounts are now mostly supplied under contract, as opposed to most deals being concluded on a spot or domestic basis.

Contract prices are calculated using raw material movements and/or index benchmarks.

As supply or rather the lack of it, has been key, the value of spot PET has often far surpassed contract prices, resulting in improved margins for producers.

Customers usually have plenty of chances to buy imports, but exchange rate volatility and the change in import flows, means there are fewer opportunities to grab a bargain.

TECHNOLOGY

In the manufacture of PET resins, purified terephthalic acid (PTA) and monoethylene glycol (MEG) are reacted to make a basic ester which is polymerised in a melt phase, polycondensation finishing reactor.

Dimethyl terephthalate (DMT) is an alternative feedstock to PTA but the PTA route is preferred. The molten polymer is extruded, cut into chips and cooled. The chips pass to a solid state polycondensation unit to form the PET resin.

EUROPE, RUSSIA PET CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
JBF-RAK	Geel, Belgium	432
Indorama Ventures	Rotterdam, The Netherlands	410
Lotte Chemical	Wilton, UK	381
Equipolymers	Schkopau, Germany	335
Neo Group	Klaipeda, Lithuania	320
UAB Orion Global PET*	Klaipeda, Lithuania	274
Novapet	Barbastro, Spain	260
Indorama Ventures	Corlu, Turkey	252
Alco-Naphta	Kaliningrad, Russia	220
Koksan	Gaziantep, Turkey	216

*Owned by Indorama Ventures

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

OUTLOOK

The challenge for customers is to know when to buy and where from. Imports form a significant part of the European PET psyche, but they have been scarce. Those who are now in need of material have little choice but to opt for European product, most of which is contracted out and therefore producers are selling out fast.

Much will depend on how much import was bought through the first quarter, when imports appeared to be uncompetitive, but customers were keen to secure PET for the high season.

By April, the delivery lead time was dragging into May and even June. The height of the summer is normally when prices start to flag, although 2017 was an exception.

The EU has a history of multiple, active antidumping and anti-subsidy duties, but with the expiry of anti-subsidy measures on PET from India in May, Europe will continue to be the most open market in the world. ■

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HO ZHI XUAN SINGAPORE

Caprolactam

USES

Caprolactam (capro) is mainly used to make nylon 6 (or polyamide 6) fibres and engineering plastics. Nylon 6 fibres are used extensively in textiles, carpets, and industrial yarns. Nylon resins are the basis of engineering plastics, used in electronic and electrical components, automobiles and oriented nylon films, which are used widely in food packaging.

SUPPLY/DEMAND

Supply of caprolactam in Taiwan and China is limited amid upcoming and ongoing turnarounds. Many major producers are sold out of stock through contracts and have little to no cargo to offer for spot trade.

Increases in benzene prices led producers to hike capro offers. The rising prices dampened demand for spot cargo, with buyers increasingly buying cargo only to meet immediate needs.

Demand for downstream nylon 6 has not been high. Producers have been trying to increase operating rates at nylon polymerisation plants in anticipation of a traditional demand season, but producers have been unable to pass on the higher costs of capro to their buyers.

Trade momentum for capro has been sluggish, with sustained tight supply in the northeast Asia region lending support to higher prices. However, with turnarounds coming up in Taiwan and China, demand is expected to make a rebound amid constrained supply of the material. Projected capro expansions will add 400,000-600,000 tonnes/year capacity in China by 2020 if plans proceed smoothly. This will increase supply of capro regionally and alleviate the tight supply situation.

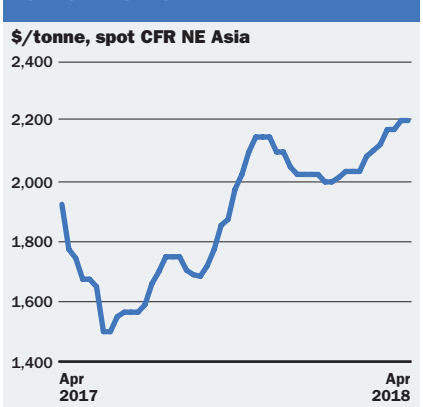
European and US export volumes to northeast Asia have also been reduced, further supporting the supply crunch.

In Europe last year, capro suppliers started exporting volumes to China, Taiwan and Japan, which appeared to be either short or tight of material from January onwards. That limited European availability while increasing supply in northeast Asia.

The downstream nylon 6 market in Europe is structurally oversupplied by hundreds of thousands of tonnes. New nylon capacity has continued to come onstream in part to alleviate structural oversupply of capro in Europe, which is more acute as fewer volumes are exported into Asia, partly due to China's substantial capro capacity construction over the last decade.

The European nylon 6 market in Q1 2018 has witnessed mostly healthy demand, especially in the engineering plastics and compounding sectors. The exception is in nylon-made bulk continuous filament (BCF) carpets thanks to changing fashions and alterative BCF polymers such as polyester.

ASIA CAPROLACTAM



PRICES

In the second quarter of 2017, the large gap in buy-sell ideas hampered discussions and trade for spot caprolactam cargoes. This led to a downtrend in prices, and prices hit an all-time low in mid-May.

Since then, however, prices have been on a steady uptrend, with trade activity in late January to early March limited due to the Lunar New Year holidays in much of Asia.

In Europe, nylon 6 prices in the first quarter of 2018 have remained steady with fundamentals balanced and upstream costs less volatile than expected, despite fluctuations over the last year due to the volatility of upstream benzene prices. This expected to support capro prices and help keep margins healthy.

TECHNOLOGY

Most capro is produced from cyclohexane (CX), but can also be made from phenol or toluene. CX is oxidized to cyclohexanone, then reacted with hydroxylamine sulphate to cyclohexanone oxime, followed by a Beckman rearrangement to yield capro. However, this route also produces large volumes of ammonium sulphate and work is ongoing to reduce or eliminating the co-product.

ASIA CAPROLACTAM CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Hengshen Technology	Lianjiang, China	400
Fujian Shenyuan New Materials	Lianjiang, China	400
Fibrant	Nanjing, China	400
Jiangsu Haili Chemical	Yancheng, China	400
Zhejiang Baling Hengyi	Hangzhou, China	300
Luxi Chemical Group	Liaocheng, China	300
Sinopec Baling Petrochemical	Yueyang, China	300
Sinopec Shijiazhuang Refining & Chemical	Shijiazhuang, China	265

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

OUTLOOK

The growth of capro capacity in northeast Asia is expected to slow, with only a few major producers in the region of China evaluating expansion plans. There is a projected increase of at least 600,000 tonnes/year across various plants, including Shanxi Jintaoyuan and Hengshen Technology.

Luxi Chemical started its new 100,000 tonne/year capro line at Liaocheng in Shandong province in February 2018. The new line is the second phase of the company's 200,000 tonne/year capro project at the site.

Some market players are sceptical on demand from the yarn and textile sectors. With buyers reducing quantities, producers are pressured to increase prices in order to cover margins. Many nylon polymerisation plants are not operating at maximum operating rates, with the lowest at 65%. Seasonal demand is expected to boost the market, although trade volumes are not expected to increase much due to tightening supply in northeast Asia. ■

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ADAM YANELLI HOUSTON

MPG

USES

Monopropylene glycol (MPG), also referred to as propylene glycol (PG), is a clear, colourless, odourless, hygroscopic, viscous liquid. It is relatively non-toxic, but is a mild irritant and defatting agent. MPG is combustible, but not flammable at room temperature.

MPG is used in the manufacture of high performance unsaturated polyester resins (UPR), as well as engine coolants; antifreeze applications; aircraft wing and runway de-icers; food, pharmaceuticals and personal care products; and paints and coatings.

The manufacture of plasticizers and hydraulic brake fluids consumes considerable quantities. It is also used in the petroleum, sugar refining and paper making industries, and in the preparation of toiletries, non-ionic detergents, antibiotics and liquid washing formulations.

SUPPLY/DEMAND

US exports in January through February 2018 totalled 15,319 tonnes, 18% lower than the 18,721 tonnes in the year-ago period, according to trade data from the US International Trade Commission (ITC).

Mexico has been the top destination for US exports, taking over 26% of all exported material, followed by Canada (17.6%), Singapore (17.5%), Taiwan (15%) and Colombia (8.9%).

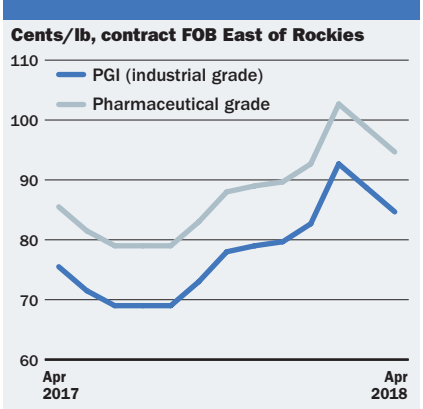
US imports through February totalled 3,798 tonnes, almost three times higher than the same period in 2017, according to the ITC data.

Brazil and South Korea are the top two sources for imports this year, accounting for 92% of all material shipped to the US. A record breaking cold winter led to strong demand from the antifreeze and deicing sectors. There was additional demand in the Houston area of Texas, as many plants used de-icing fluids to cope with the cold weather.

Demand was steady through the end of the quarter, and a buyer said its March business has been higher than March 2017.

Availability was generally good throughout 2017. However, supply tightened in September and October, due to Hurricane Harvey severely impacting production along the US Gulf Coast. There were some regional supply constraints in certain areas, but generally there is a lot of overall capacity.

US MONOPROPYLENE GLYCOL



PRICES

MPG prices stayed firm relative to propylene pricing, and have risen steadily since September 2017. Monthly contracts are typically influenced by the delta of the previous month's propylene contract price and generally follow formula-based pricing. Monthly MPG trends also take into account pricing based on negotiations between buyers and sellers that are not dependent on the formula pricing.

March contracts were assessed at a decrease of 4 cents/lb ($88/tonne), following the decrease in February propylene contracts.

US April MPG contracts settled lower, following feedstock propylene, as upstream prices have softened on improved supply. MPG was assessed down by 4 cents/lb. April MPG contracts as assessed by ICIS are at 82.67-86.67 cents/lb FOB east of the Rockies for industrial grade and at 91.67-97.67 cents/lb for pharmaceutical grade.

US March propylene contracts settled at a decrease of 6 cents/lb. Upstream propylene, and, in addition, crude oil price trends, will ultimately influence price direction of MPG contracts. To that extent, US propylene April contract negotiations are ongoing, and discussions are ranging from a rollover to a 1 cent/lb decline. This would indicate that May MPG contracts could stay flat to April.

TECHNOLOGY

MPG is produced by the hydration of propylene oxide (PO). The reaction also produces dipropylene glycol, tripropylene glycols and small quantities of higher glycols.

MPG production is driven by PO availability and extra MPG can be produced to balance PO. There has been a lot of interest in producing MPG from renewable resources such as glycerine, a by-product in biodiesel manufacture. Hong Kong-based Global BioChem Technology Group and US-based Archer Daniels Midland (ADM) are the two companies that produce MPG from renewable resources. Global BioChem started bio-based MPG production in 2008 and ADM began production in March 2011.

NORTH AMERICA MPG CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
LyondellBasell	Bayport, Texas, US	280
Dow Chemical	Plaquemine, Louisiana, US	190
Dow Chemical	Freeport, Texas, US	180
ADM	Decatur, Illinois, US	100
Dow Chemical	Candeias, Brazil	95
Huntsman	Port Neches, Texas, US	66
Monument Chemical	Brandenburg, Kentucky, US	35

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

OUTLOOK

Demand for MPG is likely to increase in the second quarter of 2018 as production of UPR ramps up.

One producer said it expects UPR demand to be fairly typical as compared to previous years. However, another producer said UPR producers at a recent industry event were optimistic about demand for the coming season.

A market source said there could be slightly less demand from distribution channels.

Supply is expected to be good into the second quarter of 2018 as it comes out of the high demand de-icing season and is yet to enter the spring UPR season. A producer said there is ample supply of feedstock PO, which should contribute to MPG supply availability. ■

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DEBORAH LEE SINGAPORE

Styrene

USES

Pure styrene (SM) is a colourless to yellow, oily liquid that evaporates easily and has a sweet smell. Styrene is mainly used in the manufacture of homopolymers and copolymers.

These include polystyrene (PS), expandable polystyrene (EPS), styrene copolymers (such as acrylonitrile-butadiene-styrene (ABS) resins, styrene-acrylonitrile (SAN) and styrene-butadiene latexes), styrene-butadiene rubber (SBR) and unsaturated polyester resins.

SUPPLY/DEMAND

Demand in the second quarter of the year is expected to pick up due to the seasonal uptick in manufacturing activity. Downstream margins have been lackluster the first quarter of the year on growing feedstock costs, but that is likely to improve amid growing buying interest in styrenic resins.

On the supply front, cargo availability has been limited in H1 2018 due to the introduction of antidumping duties (ADD) on cargoes imported from South Korea, Taiwan and the US into China in February. This, compounded with a slew of production issues in US and Europe, has deterred many traders from bringing SM cargoes from these regions into Asia. Meanwhile, SM production in Asia is expected to remain limited in the near term on the back a heavy maintenance schedule over the period. Import demand in China is likely to increase with the bulk of the turnarounds taking place in the country.

In the longer term, a slew of new production capacities is planned to start up over the next couple of years, which will greatly reduce the import demand from the region's largest buyer of SM. A number of new plants have already started up since 2017, with the most recent being Qingdao Soda Ash's 500,000 tonne/year plant in China started up in January 2018.

ASIA STYRENE

PRICES

The CFR China benchmark largely trended higher after bottoming out in May 2017. Later in the year, prices peaked in September amid concerns that short term supply would be cut off due to vessel restrictions in China.

Prices rose in February 2018, urged along by an ongoing ADD probe in China, as well as an overall stronger petrochemical complex amid firming crude prices. But talk of a potential trade war with the US, compounded with a credit crunch in China, added downward pressure to the market. Sentiment, however, remains on the bullish side as fundamentals were supportive with expectations of tight supply and stronger demand over the second quarter.

For the week ending 27 April, the Asian SM market was overall softer week on week, but sentiment remained bullish on firm supply and demand fundamentals. Tight supply concerns further exacerbated by an issue at Abel's plant in Jiangsu, China. Demand, on the other hand, was still steady, with expectations that end-user demand will improve further in May and June.

TECHNOLOGY

Styrene is produced predominately by ethylbenzene (EB)-based technology. EB is first made by the catalytic alkylation of benzene with ethylene and then dehydrogenated to styrene. Another method becoming increasingly popular is the co-production of styrene with propylene oxide (PO) by the PO/SM process.

OUTLOOK

In the near term, the market will be waiting on China's final decision on the ADD in June, after the preliminary results were released in February. Most market participants are expecting the ADD decision to remain unchanged, but some were concerned that the quantum imposed could be adjusted.

Further out, a slew of new SM projects in China scheduled to come online over the next couple of years has producers and traders worried about the country's increasing self-sufficiency and oversupply in the global market. Almost 5m tonnes/year of additional capacity is expected to be added by the end of 2020, with the bulk of that to be within China itself. With China by far the biggest importer of SM in Asia, with over 3m tonnes/year of its domestic requirements met by SM from other countries, market participants pointed to increasing length in the region.

Meanwhile, downstream plant capacity is not projected to grow as quickly as SM. Margins for key styrenic resins PS and EPS have been lackluster in recent years, limiting interest in additional investments in production. ABS has drawn more attention with margins outperforming the other downstream materials over the past year. But with a number of plant expansions within Asia already laid out, industry sources saw limited opportunities in further investments in similar plants, with concerns that end-user demand would be unable to keep pace with the additional output. ■

ASIA STRYENE CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Formosa Chemicals and Fibre	Mai Liao, Taiwan	1,320
Hanwha-Total	Daesan, South Korea	1,050
Changzhou New Solar Chem	Changzhou, China	850
CNOOC And Shell	Huizhou, China	700
Shanghai SECCO	Caojing, China	670
ZRCC Lyondell Chemical	Zhenhai, China	620
Lotte Chemical	Daesan, South Korea	580
Ellba Eastern	Pulau Seraya, Singapore	550
LG Chemical	Yeosu, South Korea	525
Qingdao Haiwan Group	Qingdao, China	500
Dagu Chemical	Tianjin, China	500

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HELENA STRATHEARN LONDON

Orthoxylene

USES

Orthoxylene (OX) is the second largest of the three commercial isomers of xylene. The majority is used to make phthalic anhydride (PA), which is used in phthalate plasticizers.

Minor uses include solvents, soya bean herbicides, bactericide, lubricant additives and polyethylene naphthalate.

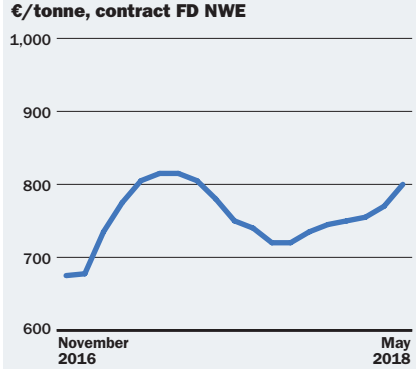
SUPPLY/DEMAND

Supply for OX continues to be predominantly driven by production of primary co-product PX. PX demand has been weak in Europe due to poor polyester volumes. There has been no fresh OX capacity in Europe for several years and utilisation rates in 2018 were assessed at around 80%.

Almost all OX output is consumed in the manufacture of PA. PX is the largest commercial volume isomer of the mixed xylenes. Around 98% of PX demand comes from the polyester chain via one of its intermediates, purified terephthalic acid (PTA) or dimethyl terephthalate (DMT).

Indorama Ventures Portugal is no longer idled, and has been undergoing maintenance. A restart date has not been verified, although producing in time to negotiate for 2019 deliveries would make sense. The plant formerly known as Artlant PTA came up originally in 2012 but closed in 2014 for financial reasons, and bar a brief period in operation, was subsequently idled. Thailand-based Indorama acquired the company in Q4 2017. It remains to be seen how overall OX supply might be affected on the back of the potential supply disruption in Europe. BP has declared force majeure on production of OX at its Gelsenkirchen facility in Germany. Two planned maintenances in April have had no impact on availability. Demand is expected to pick up slightly through the second quarter. Supply and demand at present are balanced to long.

EUROPE OX



PRICES

OX contract prices are traditionally agreed in the first week of the month between key buyers and sellers. This is usually more timely than the PX talks which are often protracted, but OX contracts are also occasionally agreed later in the month. Talks are influenced by supply, demand, global prices, upstream price movements and exchange rates.

Some attribution of the difficult talks is placed on the disappearance of some players from the market because of consolidation of the downstream industry. The European April OX contract price settled at an increase over March. Prices have been steadily rising in 2018, after declining for H2 2017.

The Europe May OX contract price has been fully confirmed at a €30/tonne increase, three buyers and two sellers said. An increase had been widely expected given the higher energy costs in recent weeks and on slightly firmer supply and demand fundamentals, with offtake traditionally picking up in the spring months. Prices have been on an uptrend since December. Spot volumes are thin as producers choose to blend xylenes into gasoline and adjust the rates at plants to cover contractual demand. This leaves limited volumes for spot business.

In the absence of fresh spot price assessments, spot is considered to be at a discount of a few percent to contract or a netback price from Asian numbers minus freight.

TECHNOLOGY

OX is produced by high-severity catalytic reforming of naphtha from which the C8 stream contains mixed xylenes (MX) and ethylbenzene (EB). OX is usually separated from primary product PX using distillation of the MX stream.

Xylenes are also obtained from the pyrolysis gas (pygas) stream in a naphtha steam cracker and by toluene disproportionation (TDP).

OUTLOOK

Players are hoping that the market will see the return of more prompt and definitive contract settlements. OX spot is likely to carry on generally following the trend of the more active Asian markets, upstream crude oil movements, and reacting to USD/EUR exchange rate fluctuations.

Some players across the supply chain are facing higher freight rates due to the structural shortage of truck drivers that had caused significant transport disruption in 2017.

The PA market anticipates good growth and demand in 2018, with demand into the polyester polyol market estimated by some to grow by around 10%. Plasticizers is expected to have low single-digit growth.

In the years ahead, PA is facing substitution with more environmentally friendly chemicals due to a desire to move away from phthalates in consumer products.

Non-phthalate plasticizers have been developed by Eastman Chemical and BASF. The substitution of what used to be the main phthalate plasticizer, dioctyl phthalate (DOP), by alternative phthalates and other plasticizer types is virtually complete in Europe. ■

EUROPE/RUSSIA/MIDDLE EAST OX CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Gazpromneft-Omsk	Omsk, Russian Federation	165
Exxonmobil Chemical	Botlek, Netherlands	135
Total Petrochemicals	Gonfreville, France	115
BP Refining and Petrochem	Gelsen. Buer, Germany	70
Gadiv Pc	Haifa, Israel	60
Kinef	Kirishi, Russian Federation	60
Shell Deutschl. Oil	Wesseling, Germany	60
Mol Hungarian Oil and Gas	Szazhalombatta, Hungary	45
Cepsa	Algeciras, Spain	40
Petkim Petrokimya	Aliaga, Turkey	40

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JOHN DIETRICH HOUSTON

Polycarbonate

USES

Polycarbonate (PC) is an engineered plastic produced from bisphenol A (BPA) through building blocks benzene and propylene that offers clarity and high-impact resistance.

Aside from the automotive segment, market strength has come from two other major market areas – the electrical/electronic, and glazing and sheet segments.

Polycarbonate weighs much less than glass and can be injected or moulded to produce various shapes for an assortment of purposes. It is used in optical media such as CDs and DVDs, housing components, aircraft and missile components, water cooler bottles, safety helmets, medical equipment and eyeglasses.

ICIS monitors the general purpose (GP) moulding and GP extrusion grades in the US, Europe and Asia-Pacific, and tracks prices for optical grade PC in the Asia-Pacific report.

SUPPLY/DEMAND

The US polycarbonate market has been in a position of tight supply and growing demand since the fourth quarter of 2016.

Unplanned logistics issues at one major US producer started in the fourth quarter of 2016 and persisted through the majority of 2017. The lost production created strong levels of pent-up demand that have remained into the first half of 2018.

Further, production was lost at the same producer in the first half of 2017 at one of its two plants because of a production issue.

A second producer experienced shutdowns in the third quarter of 2017 as a result of the fallout of Hurricane Harvey on the US Gulf.

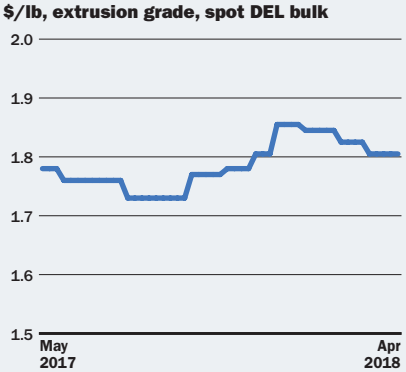
There has been little to no loosening of supply from imported product, as volumes from Asia have been limited, on tight supply in the region.

Additionally, prices in Asia have surged in 2018, allowing exporters to raise prices on US buyers while not losing overall volumes. This has curbed imports into the US.

Demand growth has been steady at slightly above GDP levels in the US, driven mostly by consumer electronics and construction. Automotive demand has also been strong, as more and more polycarbonate is being used, although auto sales have been slightly sluggish.

US POLYCARBONATE

$/lb, extrusion grade, spot DEL bulk



PRICES

ICIS polycarbonate prices are strictly formula-based and tied to same-month feedstock costs for phenol and acetone. These prices are $1.60-2.00/lb on a DEL (delivered) basis.

April prices rolled over, and May prices are expected to fall slightly on weaker phenol. However, acetone prices could increase enough to balance the weaker phenol, leading to another rollover.

In the freely negotiated sector, polycarbonate prices have been climbing since the start of the fourth quarter of 2017.

This has been largely driven by less competition from Asian imports, as well as tight domestic supply and persistent pent-up demand.

In March, one producer nominated an increase of 7 cents/lb, and sources said about 4-5 cents/lb of the nomination found traction.

Currently, US domestic freely negotiated prices are about 25 cents/lb below import pricing levels, which could lead to increase nominations for June/July, sources said.

In Europe, prices further increased in April by €0.10/kg on either end of the range, in line with moulding-grade PC quarterly settlements. Strong demand in China continues to draw material from other regions.

TECHNOLOGY

The engineered plastic has been in use since the 1950s, when Bayer and GE started production processes to make polycarbonate from BPA. Changes were made to the process to respond to environmental restrictions on phosgene, which was initially used in the process. US producers include Covestro and SABIC. A former US producer was Styron. Other global producers include Asahi, LG Chemical and Mitsubishi.

Polycarbonate can also be blended, or compounded, with other materials such as acrylonitrile butadiene styrene (ABS) to form alloys that meet specific downstream needs.

US POLYCARBONATE CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
SABIC	Burkville, Alabama	270
Covestro	Baytown, Texas	260
SABIC	Mount Vernon, Indiana	245

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

OUTLOOK

Sources expect US supply to remain constrained throughout 2018 and into 2019, especially as consumption ramps up in the second and third quarters on seasonal factors.

Asia supply of imports is also expected to remain tight, as the region itself is tight and high prices are making it more attractive to sell domestically than to export to the US.

Formula-based polycarbonate prices are likely to come down in the second and third quarters on weaker feedstock costs, but could also stay largely steady.

Sources said that as long as a wide spread continues between imported and domestic PC, domestic sellers are likely to seek higher prices to capitalise and boost margins.

Demand-wise, the automotive sector remains the largest growth opportunity for US polycarbonate, as the product works to replace glass in rear and side windows and possibly the front windshield. In the short term, however, most demand growth is coming from the construction and consumer electronic sectors. ■

Additional reporting by Morgan Condon in London

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JANE MASSINGHAM LONDON

Oxo-alcohols

USES

The oxo-alcohols chain consists of n-butanol (NBA), isobutanol (IBA), and 2-ethylhexanol (2-EH). Around 50% of 2-EH is used to make plasticizers, mainly dioctyl phthalate (DOP) and dioctyl terephthalate (DOTP).

NBA, IBA and 2-EH have uses as solvents but are primarily used as feedstock for other products. NBA is a solvent with a variety of chemical, industrial and retail end-uses. More than half of the production is used as an intermediate chemical in the production of butyl acrylates for paints, coatings and adhesives or to formulate acetates and glycol ethers, as well as being used directly as an industrial solvent.

Key drivers for oxo-alcohols are construction (home and commercial), appliances, automotive and industries that need imperial coating material.

SUPPLY/DEMAND

Oxo-alcohols traditionally hit peak consumption during Q2, and 2018 has a heavy shutdown schedule, with at least two of the five producers in Europe undergoing their five-yearly outage programmes.

This maintenance takes six weeks and the producers have been or will be preparing stocks accordingly to cover contractual commitments.

The initial order books are not as strong as expected for the start of Q2 for NBA and IBA, with a stronger picture seen on 2-EH. This is mostly attributed to the timing of public holidays and the extended cold snap seen in much of Europe this year.

Demand is good, but not as robust as some predicted. There is still confidence that consumption will strengthen later in Q2. There could be less spot volume as outages take place for Oxea later in Q2 and then Zak in July, BASF from mid-August and Perstorp in September. INEOS already completed its six-week maintenance in Q1.

PRICES

The majority of oxo-alcohol business is agreed on a formula-related basis which follows the cost of feedstock propylene. Freely negotiated business peaked in Q2 2017 when the market was tight amid a long-term force majeure declaration from BASF due to its fire in Ludwigshafen, Germany, in October 2016.

Prices adjusted back to what was considered a more normal level during H2 2017, and 2-EH reverted back to its usual premium over NBA once supplies of NBA became balanced again in the latter months of 2017.

Prices in 2018 have firmed for 2-EH against snug supplies and good demand both domestically and for export. A largely balanced NBA market has held steady while the smaller bi-product IBA has seen some softening.

With higher propylene prices, suppliers intend to recover some costs through the balance of Q2 for freely negotiated business.

TECHNOLOGY

The main commercial route is the oxo process, comprising the catalytic hydroformylation of propylene with carbon monoxide and syngas, followed by the hydrogenation of the aldehydes formed to give a mixture of NBA and IBA. Most global production is based on the low-pressure process developed by the UK's Davy Process Technology. LP Oxo Technology has been developed and marketed in cooperation by US-based Dow and Davy for more than 40 years. More than 70% of all global propylene-based oxo capacity and 90% of all licensed propylene-based oxo capacity utilises LP Oxo Technology.

OUTLOOK

Provided plants restart as planned, the market should remain well supported moving forward through Q2 and Q3. If one of the maintenance programmes extends past the forecasted timeframes, then there could be consequences of a tighter market and therefore firming prices. Propylene supply should improve in Q2 as turnarounds come to an end.

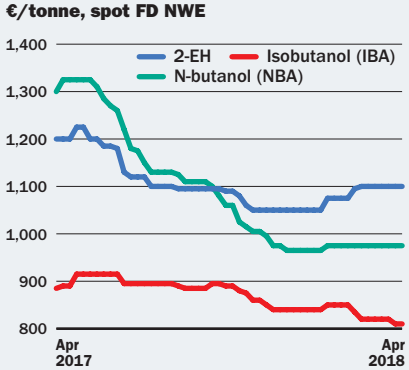
The summer lull may not be felt as much this year, with Grupa Azoty Zak going into its planned shutdown in July and increased downstream capacity taking a little more 2-EH out of the market. The increased capacity downstream will be for DOTP.

BASF also has maintenance from mid-August to early October, and Perstorp has a planned outage in September.

While suppliers have been preparing for these and say contractual commitments should be covered, it is likely to impact the amount of spot volume available. ■

EUROPE OXO-ALCOHOLS

€/tonne, spot FD NWE



EUROPE OXO-ALCOHOLS CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
2-EH		
Oxea	Oberhausen, Germany	300
Grupa Azoty	Kedzierzyn, Poland	170
INEOS/ Oxochemie	Lavera, France	125
Perstorp	Stenungsund, Sweden	120
NBA		
BASF	Ludwigshafen, Germany	450
INEOS/ Oxochemie	Lavera, France	160
Oxea	Oberhausen, Germany	130
IBA		
BASF	Ludwigshafen, Germany	50
INEOS/ Oxochimie	Lavera, France	30
Grupa Azoty	Kedzierzyn, Poland	20
Oxea	Oberhausen, Germany	10

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

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HELEN YAN SINGAPORE

SBR

USES

Styrene butadiene rubber (SBR) is the most widely used synthetic rubber. Emulsion SBR (E-SBR) contains 23.5% styrene (SM) and 76.5% butadiene (BD).

E-SBR is predominantly used for the production of car and light truck tyres and truck tyre retread compounds, which accounts for more than 75% of global consumption.

Mechanical goods account for 15%, automotive goods 5% and others such as adhesives, floor tiles and shoe soles, account for about 4%. Adhesives and chewing gum have been identified as two growing markets for SBR applications.

SUPPLY/DEMAND

Asia SBR demand is likely to pick up in May in China as tyre factories ramp up operating rates to build inventories ahead of a conference in June in Qingdao. Logistical issues such as road blocks or factory closures are not unusual during major international conferences in China.

Chinese president Xi Jinping will host the Shanghai Co-operation Organisation (SCO) summit in Qingdao in June. Qingdao is a port in the Shandong province where many tyre factories are sited. The summit has China, Russia, Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan, India and Pakistan as full members.

In southeast Asia, tyre factories are also expected to build inventories in May ahead of the Muslim Eid festival.

Malaysia and Indonesia are majority Muslim countries, with Indonesia having the world's largest Muslim population. Market activities in these countries are expected to wind down for the mid-June festive holiday.

Demand had been lacklustre in Asia in March and April due to the much cheaper natural rubber (NR) price. Tyre makers in Asia had switched to using more NR in formulations, thus capping demand for SBR.

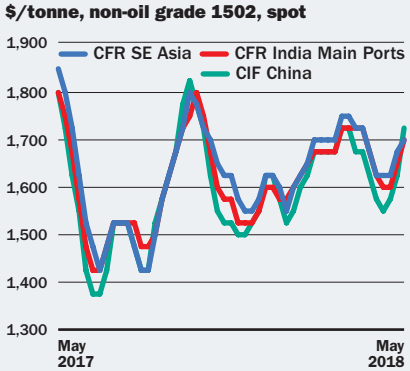
NR and SBR are competing feedstocks in the production of tyres for the automotive industry. Tyre makers in Asia have more flexibility in feedstock substitution in their product formulations.

In India, demand for SBR had also dwindled in March and April due to the closure of the fiscal year in end March. India also imported more SBR in February to cover its requirements for March and April.

India's SBR imports in February increased by 42% month on month to 9,014 tonnes, according to India Customs. On a year-on-year basis, the country's imports of SBR increased by 34% in February.

ASIA SBR

$/tonne, non-oil grade 1502, spot



PRICES

SBR non-oil grade 1502 prices have seen upward pressure since mid-April due to soaring feedstock butadiene (BD) costs.

BD prices surged by 15% within a month since early April, prompting Asian SBR makers to hike their offers, given the continued erosion in margins.

Spot offers for fresh May shipments of non-oil grade 1502 were hiked by about $100/tonne to $1,800/tonne CFR SE Asia, in line with the upswing in BD.

However, cheaper NR, at about $300-400/tonne less than SBR, weighed on demand.

Uncertainty over the sustainability of the feedstock BD price upsurge also curbed spot interest in SBR.

TECHNOLOGY

SBR is one of the most versatile copolymer rubber compounds. It consists of the organic compound styrene and BD, with the amount of BD usually about three times more than the amount of styrene.

This compound is produced either through ionic polymerisation of a solution or as an emulsion through free radical polymerisation.

Also known as E-SBR, this product was first developed in the 1930s by I.G. Farbenindustrie in Germany. It was created through an emulsion procedure that used polymerisation to produce a material with a low reaction viscosity but had all the attributes of natural rubber.

ASIA SBR CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Korea Kumho Petrochemical	Ulsan, South Korea	387
Sinopec Qilu Petrochemical	Zibo, China	250
JSR	Yokkaichi, Japan	210
PetroChina Fushun Petrochemical	Fushun, China	200
Shen Hua Chemical Industrial	Nantong, China	180
LG Chem	Daesan, South Korea	160
PetroChina Jilin Petrochemical	Jilin, China	150
PetroChina Lanzhou Petrochemical	Lanzhou, China	150
Reliance Industries Limited	Hazira, India	150
Indian Synthetic Rubber Ltd	Panipat, India	120
Zeon	Tokuyama, Japan	110
TSRC	Ta-Sheh, Taiwan	100

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

OUTLOOK

SBR non-oil grade 1502 prices will likely see upward pressure in the third quarter from improved demand on restocking activities. Tyre makers usually ramp up their operating rates in the third quarter to build up inventories ahead of the seasonally robust demand season towards the end of the year.

The natural rubber price may also see further upward pressure from May onwards on tight supply amid the winter season in southeast Asia. This will help to bolster SBR, as its price tends to move in tandem with that of natural rubber. ■

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STEVEN MCGINN HOUSTON

MTBE

USES

Methyl tertiary butyl ether (MTBE) is a fuel additive used to boost the octane value in gasoline, helping it burn more completely and reducing particle emissions from tailpipes.

MTBE can also be used to make high-purity isobutylene, which can be further processed to make butyl rubber, highly reactive polyisobutylene, methyl methacrylate (MMA) and other smaller derivatives. MTBE is also used as a solvent and extractant.

SUPPLY/DEMAND

US production of MTBE sank to around 17m bbl in 2017 from over 45m bbl in 2005 due to its phase-out in the US domestic gasoline pool in favour of corn-based ethanol. US-produced material is primarily exported to international gasoline markets, with chief destinations being Mexico, Chile and Venezuela.

In March, the US exported 120,860 tonnes of MTBE, with Mexico accounting for around 96,000 tonnes and Chile taking in 24,845 tonnes. Through the first quarter of 2018, the US exported 392,145 tonnes, down by 9% from last year due to a turnaround at LyondellBasell.

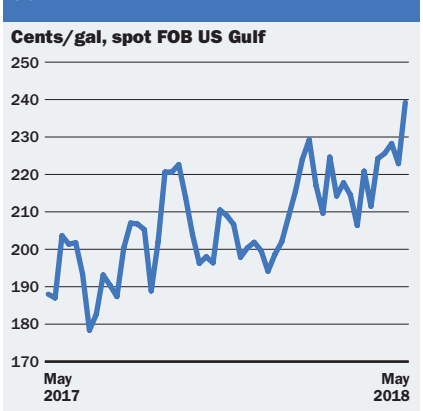
Supply in the US has steadily increased since 2010, as production margins remained favourable due to exports from the remaining producers.

With virtually zero demand in the US – save for specialty fuels – demand has increased in Asia and Mexico due to population growth. Refinery outages and problems at production sites in Venezuela and Mexico have also added to demand growth in those countries.

Market sources said suppliers are bringing product from Europe and blending with gasoline in the US Gulf Coast for distribution to Mexico and Latin America. Middle East-produced material is also heard to be making its way to the Americas region.

US producers tend to maximise MTBE production capacity due to favourable margins.

US MTBE



PRICES

US MTBE prices track movement in the Amsterdam/Rotterdam/Antwerp market, with US pricing at around a 10-15 cents/gal premium to the ARA market. ICIS assessed MTBE at 239.25 cents/gal on 11 May, closing at a three-year high on multi-year highs in the upstream crude oil and gasoline futures complex.

The European market is the key driver of prices in the US Gulf production region since US market demand for MTBE is virtually non-existent. Asia MTBE prices rose to above $860/tonne FOB (free on board) Singapore in mid-May, a level unseen in the past three years, on firmer gasoline prices and higher bids in the open trading market.

TECHNOLOGY

MTBE is manufactured by the chemical reaction of methanol and isobutylene. The reaction can take place in either a liquid phase or mixed gas-liquid-phase reactor that contains an acidic ion exchange resin. Alternatively, sulphuric acid can be used as a catalyst.

The reaction takes place at a temperature range of 50-90°C (122-194°F) and a pressure of 20 bar. The resulting product mixture is then distilled to get high-purity MTBE.

OUTLOOK

US MTBE spot prices are expected to remain firm heading into the summer driving season, as the gasoline and crude oil futures complex continues to lead the oxygenate market upwards. Octane supply remains tight, adding further upward pressure.

MTBE's phase-out in the US led to producers finding new global markets for material. The US local ban shortened supply but has led to favourable margins.

US producers include: Huntsman (Port Neches, Texas), TPC Group (Houston, Texas), Enterprise Products (Mont Belvieu, Texas), and LyondellBasell (Channelview, Texas).

Producers are looking to capitalise on the long-term needs of the global market, setting up export growth expansion. LyondellBasell announced plans to double its butyl ether production at its Channelview site. The company is building a $2.4bn propylene oxide/tertiary butyl alcohol (PO/TBA) project in Channelview for completion in 2021.

It will have capacities of 470,000 tonnes/year of PO and 1m tonnes/year of TBA. The TBA will be converted to MTBE and ethyl tertiary butyl ether (ETBE) at its Bayport Complex near Pasadena, Texas.

Enterprise Products is building up its high-purity isobutylene production at its Mont Belvieu site by installing a new 425,000 tonne/year isobutene dehydrogenation (iBDH) unit.

The iBDH plant is expected to be completed by the end of 2019. Company officials in 2017 said the iBDH facility is designed to increase production of isobutylene for the production of lubricants, rubber products and alkylate for gasoline blendstock, as well as MTBE for export. ■

Additional reporting by Trixie Yap in Singapore and Joseph Chang in New York

US MTBE CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Huntsman	Port Neches, Texas	650
Enterprise Products	Mont Belvieu, Texas	640
LyondellBasell Industries	Bayport, Texas	550
TPC Group	Port Neches, Texas	400
TPC Group	Houston, Texas	280
LyondellBasell Industries*	Channelview, Texas	200

*Reflects total oxygenate production

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MATTHEW CHONG SINGAPORE

TDI

USES

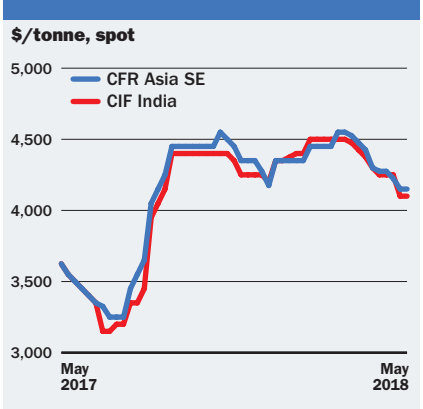
Toluene di-isocyanate (TDI) is used in flexible polyurethane (PU) foam, which has outlets in upholstery, mattresses and automotive seats. Other uses include rigid foams and adhesives, paints, concrete sealers and as a crosslinking agent for nylon 6 and intermediates in PU coatings and elastomers.

SUPPLY/DEMAND

Supply was overall stable in the first quarter, with shorter supply from January to around mid-February having turned longish by the end of March in the domestic China market. A couple of major eastern China-based producers' plants recovered normal production by the end of February after running at reduced rates. Small volumes of TDI from Sadara were heard being exported to northeast Asia and southeast Asia since early this year, but the entry of Sadara to the region did not dampen generally steady TDI prices in the first quarter. Export availability from Japan and South Korea has declined in the second quarter due to turnarounds in these two countries, including Mitsui Chemicals & SKC Polyurethanes Inc's (MCNS) Omuta unit from May to June and Hanwha Chemical's Yeosu units in April.

In May, there were supply concerns following a fatal blast at Shanghai SECCO's facilities on 12 May. Chlorine raw material suppliers of some eastern China-based methyl di-p-phenylene isocyanate (MDI) and TDI plants source their feedstock from SECCO, market sources said.

ASIA TDI



Demand has been subdued in recent months as buyers were lukewarm to the excessive prices that were hovering near their peaks in January. Downstream foam makers were buying on a need-to basis and some had resorted to cutting their plant production as they were not able to pass on cost increases to their customers. This is despite April to May being the traditional peak demand season for TDI.

PRICES

Average domestic prices in China held up at Chinese yuan (CNY) 38,500/tonne DEL (delivered) east China and above in January and February, according to ICIS data. Prices were subsequently on a steady downtrend from early March to the end of April to hit a 10-month low of CNY26,300/tonne DEL east China, ICIS data showed, losing one third of their value in the process. The downtrend was halted, at least momentarily, in early May as prices rebounded slightly on news that a major eastern China-based plant will be shut in H2 May for a turnaround for two weeks, market sources said. In the Asia spot import market, prices largely tracked China domestic prices and have stayed above $4,000/tonne CFR (cost & freight) China/Hong Kong/southeast Asia and CIF (cost, insurance & freight) India since H2 August 2017. Buyers were lukewarm in their restocking activities as sellers had been staunch on their offers.

In China, domestic prices of drummed TDI rose sharply in mid-May as producers raised their prices due to concerns over raw material supply disruption to eastern China-based plants following the blast at Shanghai Secco. Prices have since stabilised in the week following the incident as the eventual impact on TDI production seems to be limited.

TECHNOLOGY

The main route is the nitration of toluene to dinitrotoluene, followed by catalytic hydrogenation to toluene diamine (TDA), which is dissolved in an inert solvent and reacted with phosgene to produce a crude TDI solution. TDI can also be produced directly from dinitrotoluene by liquid phase carbonylation with o-dichlorobenzene. Germany's Covestro developed a route that carries out phosgenation in the gas rather than the liquid phase. The technology was already commercialised at its 250,000 tonne/year TDI plant in Shanghai, China.

ASIA TDI CAPACITY ('000 TONNES/YEAR)

Company	Location	Capacity
Covestro	Caojing, China	250
Shanghai BASF Polyurethane Co (SBPC)	Caojing, China	160
BASF	Yeosu, South Korea	160
Cangzhou Dahua	Cangzhou, China	150
Hanwha Chemical	Yeosu, South Korea	150
Mitsui Chemicals & SKC Polyurethanes Inc	Omuta, Japan	120
Fujian Southeast Electrochemical	Fuqing, China	100
Gansu Yinguang	Baiyin, China	100
Yantai Juli	Yantai, China	80
Beifang Jinhua	Huludao, China	50

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Covestro has also been running a 30,000 tonne/year pilot plant since 2004 and is thought to have used this technology in its new 300,000 tonne/year TDI plant in Dormagen, Germany, which came on stream in late 2014.

OUTLOOK

TDI prices are expected to come under pressure in H2 2018 following the completion of the turnaround season for northeast Asian plants in the second quarter. Price declines may accelerate in the second half of the year depending on when BASF is able to run its 300,000 tonne/year Ludwigshafen plant at full capacity. The unit has been running at reduced rates in the past couple of years due to technical issues and is not expected to resume full production until June, after a new reactor is installed.

Additional supply could also come from China, with Wanhua Chemical scheduled to start up a 300,000 tonne/year TDI plant in Yantai in September/October 2018. Players do not rule out a sharp drop in prices in the latter half of the year, but most are doubtful prices will re-visit the lows of early 2016, at least not until Wanhua's TDI plant comes on stream. ■

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AMANDA HAY HOUSTON

PA

USES

Phthalic anhydride (PA) occurs as white solid flake or clear molten liquid. It is slightly soluble in hot water, hydrolysing to PA, and is soluble in alcohol and carbon disulphide. It reacts with strong oxidants and violently on heating with copper oxide or sodium nitrite, causing an explosion hazard.

The largest downstream application of PA, accounting for just over half of production, is the manufacture of phthalate plasticizers, primarily dioctyl phthalate (DOP) which is used as a plasticizer in polyvinyl chloride (PVC), and di-isononyl phthalate (DINP).

The second largest outlet is in unsaturated polyester resins (UPR), which are blended with glass fibres to produce fibreglass reinforced plastics. Principal end markets are construction, marine and transportation.

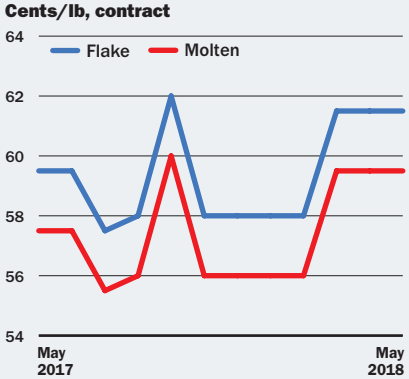
The third largest outlet is PA-based alkyd resins, which are used in solvent-based coatings for architectural, machinery, furniture and fixture applications.

Small volume uses for PA include the manufacture of dyes and pigments, detergents, herbicides and insecticides, fire retardants, saccharin and polyester resin cross-linking agents.

SUPPLY/DEMAND

Supply is balanced with demand in the US PA market. Two US producers, Stepan and Koppers, sell product to the market, while ExxonMobil produces PA for captive use in its production of DINP. Koppers is the only US producer that makes both flake and molten PA.

US PHTHALIC ANHYDRIDE



Altogether, the three companies account for about 326,000 tonnes/year of PA capacity.

The US PA market is mature and largely self-contained, with trade having little impact on the domestic market. The US exports very small amounts of PA, under 1,000 tonnes/month. Imports are a larger portion of the market, at about 2,000-3,000 tonnes/month.

Import volumes in the first half of 2018 have trended higher versus the same period in 2017. This is due to issues at overseas plants that have been resolved. The largest sources of product in 2018 have included South Korea, Italy, Israel and Mexico.

US supply is returning to normal levels after a spring plant outage. Koppers returned to production on schedule in early May after a six-week planned recatalysation of its plant. No supply disruption resulted from the outage.

Demand has generally been stable in the last year. Spring/summer and early autumn are generally stronger seasons in the downstream plasticizers market. Market participants have noted steady demand that follows typical seasonality with little change.

Rebuilding efforts across the US after fires in California and hurricanes in Texas and Florida in late 2017 have lingered into 2018. Additional demand in the plasticizers market has stemmed from this.

PRICES

PA prices have been relatively stable in the last three years. PA price movements track the movements of feedstock orthoxylene (OX). There have not been any initiatives to increase the conversion adder this year, and market participants do not expect any new efforts.

OX, which is made from mixed xylenes (MX), has not been pressured higher in the last three years by summer cost pushes in the MX market when demand is higher for MX in gasoline blending. Most chemical demand for MX comes from paraxylene (PX) rather than OX.

This year, however, OX and PA prices have trended higher amid tight supply and unseasonably high demand for MX in the gasoline blending pool and firming crude values. PA contract prices spiked in March and are likely to move higher again in June, tracking higher OX contract prices in May.

Crude prices, which have topped $70/bbl, have kept pressure on downstream products in early 2018. Pressure will likely continue if crude prices remain around $70/bbl.

PA prices experienced an unusual spike in October 2017 following Hurricane Harvey's blow to the Texas Gulf coast petrochemical sector. The storm disrupted production and logistics for a wide swath of refineries and chemical plants, affecting OX and ultimately PA prices.

US PHTHALIC ANHYDRIDE CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
ExxonMobil Chemical	Baton Rouge, Louisiana	136
Koppers	Stickney, Illinois	100
Stepan Chemical	Millsdale, Illinois	90

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

TECHNOLOGY

PA was first made through the oxidation of naphthalene in concentrated sulphuric acid and in the presence of mercury sulphate. A catalytic vapour-phase oxidation of naphthalene later replaced this route. The latter process is done in air and in the presence of a vanadium oxide catalyst. Today, naphthalene provides only about 16% of feedstock needs. In the US, Stepan produces all of its PA from OX feedstock. Koppers uses a mixed feed of OX and internally produced naphthalene.

The process technology has changed little, although catalysts have a longer life of three years and yields have improved. One developmental improvement was the lowering of the air-to-OX weight ratio to 9.5:1, allowing energy savings and reduced capital costs.

OUTLOOK

As the PA market is mature in the US, supply and demand should remain relatively stable in the near term. Looking ahead, demand may wane in the largest downstream outlet, phthalate plasticizers. That market is declining in the US amid growing concerns over the health risks of phthalates. ■

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SAMANTHA WRIGHT LONDON

MTBE

USES

Around 95% of methyl tertiary butyl ether (MTBE) produced is used as an octane booster and oxygenate in gasoline.

MTBE can also be used to make high-purity isobutylene, which can be further processed to make butyl rubber, highly reactive polyisobutylene, methyl methacrylate (MMA) and other smaller derivatives.

MTBE is also a solvent and extractant, as well as a pharmaceutical agent to dissolve gallstones.

SUPPLY/DEMAND

2017 demand levels, as is traditional, generally depended on seasonality. Buying interest sees a boost in the summer, with the driving season between June and August providing the biggest lift in demand.

Q2 of 2018 saw less demand than is typical heading towards summer, attributed mainly to healthy stocks having been built up in winter in preparation for the high demand season.

Increased offtake was noted from Mexico through most of 2017 and into 2018. Though a lot of Mexican demand is fulfilled by US producers, European players saw an uptick in material leaving the continent for South America.

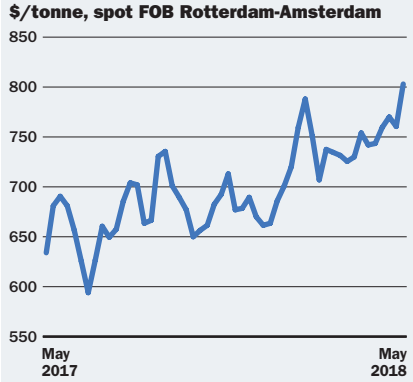
A spate of planned maintenances and unplanned production issues in the second and third quarters of 2017 meant MTBE supply was fairly tight for a large portion of the year, though healthy supply has so far been noted in 2018.

There was also a spike in European MTBE demand in September following Hurricane Harvey in the US, with many plants in force majeure in the country. As a result, imports to the EU slipped in October, with rising US prices making it a more attractive export destination.

Strong buying interest from the US continued into 2018 with several turnarounds noted in the nation, though this had mostly dried up by March. EU imports of MTBE were generally higher in 2017 than 2016, according to EU trade data, though there were significantly less imports in July, August and October than in 2016. In the first two months of 2018 there was a definite increase in imports of MTBE to the EU.

EUROPE MTBE

$/tonne, spot FOB Rotterdam-Amsterdam



PRICES

MTBE prices fluctuated in line with Eurobob gasoline in 2017 and into 2018, with gasoline in turn tracking crude oil prices. There was a typical lift in MTBE values in summer, particularly in July and into August, with a large uptick seen in September, during the aftermath of Hurricane Harvey and the resulting extra demand from the US. The factor against Eurobob gasoline stayed relatively strong for the majority of 2017, before tumbling down in October and November, amid a spike in crude and gasoline prices.

There was a lift in the factor again in March, amid robust trading activity, though this fell back down to generally low levels again after the switch to typically more expensive summer grade gasoline.

Outright prices spiked in early May following the announcement that the US plans to pull out of the joint Iran nuclear deal. This led to a spike in crude oil prices which in turn pushed up gasoline and MTBE values.

TECHNOLOGY

MTBE is produced when isobutene reacts with methanol over a catalyst bed. Either a liquid-phase reactor or a mixed gas-liquid-phase reactor containing an acidic ion exchange resin can be used for the process. Sulphuric acid can be also used as a catalyst.

The mixture obtained from the reaction is distilled to produce high-purity MTBE. MTBE can also be created as by-product from the propylene oxide (PO) process when tertiary butyl alcohol is dehydrated to isobutene.

OUTLOOK

Players are hoping for an uptick in demand in the summer months, with the current oversupply expected to be consumed by rising buying interest during the peak driving season.

Strong demand is anticipated to remain until the end of Q3, when demand typically begins to wane with the approaching switch to winter grade gasoline.

In the mid- to long term, European countries' shift away from diesel powered cars could have a positive effect on the MTBE industry, with gasoline powered cars anticipated to see more demand as a result.

In the long term, the increasing focus on electric vehicles (EVs) is calling into question the future of the gasoline market, particularly with bans on new petrol and diesel vehicles coming into force in countries including the UK and France from 2040, as well as plans for similar bans in other European countries.

MTBE demand is heavily dependent on the gasoline industry, with gasoline blending the most popular application for the octane booster in Europe. Any ban on gasoline powered vehicles would have a large impact on MTBE buying interest. ■

EUROPE MTBE CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
LyondellBasell	Botlek, Netherlands	590
Evonik	Marl, Germany	325
Evonik Oxeno Antwerpen	Antwerp, Belgium	315
Shell	Pernis, Netherlands	165
Esso Petroleum	Fawley, UK	125
Neste Oil	Porvoo, Finland	123
Total Lindsey Oil Refinery	Immingham, UK	100
BP Nerefco	Rotterdam, Netherlands	100
Unipetrol	Kralupy, Czech Republic	90
OMV	Schwechat, Austria	70

*Top 10 plants by capacity

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

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HEIDI FINCH LONDON

MPG

USES

Monopropylene glycol (MPG), also referred to as propylene glycol (PG), is a clear, colourless, odourless, hygroscopic, viscous liquid. It is relatively non-toxic, but is a mild irritant and defatting agent. MPG is combustible, but not flammable at room temperature.

MPG is used in the manufacture of high performance unsaturated polyester resins (UPR), as well as engine coolants; antifreeze applications; aircraft wing and runway de-icers; food, pharmaceuticals and personal care products; and paints and coatings.

The manufacture of plasticizers and hydraulic brake fluids consumes considerable quantities. It is also used in the petroleum, sugar refining and paper making industries, and in the preparation of toiletries, non-ionic detergents, antibiotics and liquid washing formulations.

SUPPLY/DEMAND

In July 2017, MPG industrial grade (MPGI) spot supply tightened because of an unplanned issue at the propylene oxide (PO)/styrene monomer (SM) Ellba facility in the Netherlands, which restricted upstream PO supply and led to stricter optimisation of PO into better performing derivatives. During the winter of 2017 and into early 2018, MPGI tightened significantly, because of surge in winter de-icer demand, resulting from cold snaps in Europe.

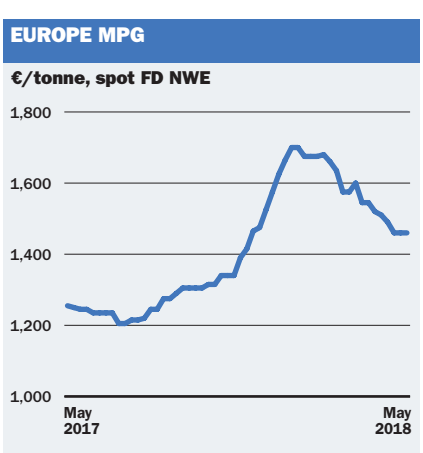
Upstream PO supply has also been tight for structural and demand related reasons and there was also a lengthy maintenance turnaround for Repsol during Q1 2018 at its PO and derivatives operations at Tarragona, which added to the MPGI spot supply constraints.

However, once the winter season drew to a close in April and Repsol's maintenance turnaround at Tarragona ended, the MPGI spot market has become more balanced to well-supplied. Demand from the downstream UPR sector was healthy into Q2, but was not sufficient to compensate for the end of the winter de-icer season. MPGI spot prices began to stabilise during May on the back of a better balanced market and healthy demand from other sectors outside the de-icer/antifreeze sectors.

MPG US pharmaceutical (MPG USP) spot availability was fairly balanced over the past year, although there were some periods of tighter spot supply when MPGI winter demand was particularly strong.

Dipropylene glycol (DPG) demand has outpaced DPG spot supply over the past year, which has led to prolonged tightness. Even during the high MPG run rates during the winter, there was little-to-no relief in DPG spot supply, because DPG demand remained strong. DPG is produced in a structurally lower yield to MPGI or MPG USP during the MPG production process.

EUROPE MPG



PRICES

Prices moved up by €360/tonne on average during November until the first half of January 2018, driven by strong winter de-icer demand. MPGI spot prices hit a high of €1,750/tonne on 12 January 2018. From the second half of January 2018 and into April, prices came off the highs as supply improved. Prices decreased by €180/tonne between the second half of January to mid-April, taking MPGI spot to €1,520/tonne. MPG US pharmaceutical spot prices followed a similar trend to MPGI over the past year, albeit to a lesser extent.

DPG spot prices have been trading at high levels over the past year, amid structural supply limitations and robust demand. Prices were quoted closely either side of €3,000/tonne FD, reaching a peak in the low €3,000s/tonne FD in late 2017 and into Q1 2018. DPG spot prices came off in early Q2 on slight easing in supply. Possible reasons for the slight improvement in DPG spot supply was believed to be due to imports or demand not being as strong as before.

EUROPE MPG CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Dow Chemical	Stade, Germany	290
INEOS	Dormagen, Germany	120
LyondellBasell	Botlek, Netherlands	95
LyondellBasell	Fos, France	85
BASF	Ludwigshafen, Germany	80
Sadara	Al Jubail, Saudi Arabia	70
Repsol	Tarragona, Spain	63
Oleon*	Ertvelde, Belgium	20
Oltchim	Rimnicu Vilcea, Romania	9
PCC Rokita	Brzeg Dolny, Poland	4

*Bio-based MPG

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

TECHNOLOGY

MPGI and MPG USP are produced by the hydration of PO. The reaction also produces DPG and tri-propylene glycol (TPG) and a small quantity of higher glycols.

OUTLOOK

MPGI demand growth particularly in sectors such as UPR/construction is likely to be close ly linked to GDP, although also affected by de-icer and antifreeze activity gaining momentum during the winter and UPR picking up during the spring/early summer. There is some talk that certain MPGI and DPG applications such as personal care products are likely to grow slightly above GDP over the coming years.

There is some expectation that DPG supply could remain tight structurally in the short to medium term, if there is no new MPG/DPG capacity and provided demand remains healthy. While the underlying growth potential is expected to be robust for DPG, the risk of demand being jeopardised by high price levels and players looking for substitutes remains a consideration.

However, there is some talk that it is not easy to find a substitute for DPG and for certain applications, substitution is not seen to be an option at all. ■

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TRIXIE YAP SINGAPORE

Toluene

USES

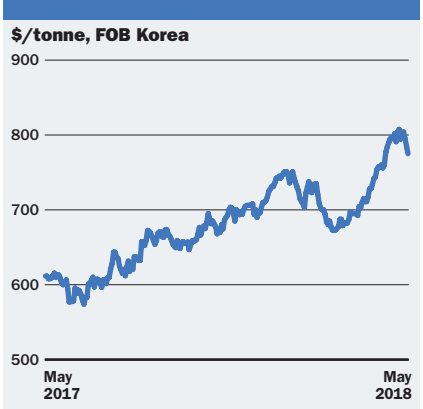
Toluene is used to produce synthetic drugs, pesticides, toluene di-isocyanate, benzene, both mixed and paraxylenes, benzyl chloride and benzoic acid. It can be used directly as a common solvent such as in paints, thinners, adhesives and disinfectants – mainly within southeast Asia. Toluene is used as an octane booster for higher-RON gasoline.

DEMAND/SUPPLY

At the start of 2018, demand was robust from Chinese and Indian importers because of stocking up before the Lunar New Year and replenishment amid positive distributor margins. Buyers took a break in H2 March and April to digest their cargoes at the public shoretanks in both regions. Demand regained momentum from May, in line with the crude uptrend, because of restocking after inventory levels hit lower-than-usual levels in both India and China.

Demand from the key downstream toluene disproportionation (TDP) units was strong through January and April because of positive spreads for benzene and xylenes production. The healthy margins for paraxylene products provided impetus for stocking up on toluene cargoes as well from the selective TDP units in South Korea and Thailand. However, a reversal in the demand trend emerged in May after benzene demand remained lacklustre and spreads were close to falling beyond the breakeven level.

ASIA TOLUENE



Supply has been generally long between January and end-April, owing to the stable operating plant rates and overall sufficient availability in southeast Asia which is a key net exporter within the region. Availability of northeast Asian cargoes was curtailed at times because of turnarounds.

However, southeast Asia-origin cargoes made up for the loss in production in the other side of the hemisphere. Spot exports from Malaysia have been particularly prevalent, a trend that emerged only in 2018, because of the debottlenecking at Lotte Chemical Titan's unit and lower domestic obligations.

PRICES

Prices have been volatile in all markets within Asia. The overarching price trend in the first three months was up. Subsequently, the market fell back down after all replenishing activities were completed, with FOB Korea prices falling to the lowest point at $673/tonne.

After hitting the lowest point for the first half of 2018, prices found support, with buyers starting to procure competitively priced cargoes since they believed the overall market was hitting a bottom. This was against a backdrop of a narrow toluene-naphtha spread – below $80/tonne.

TECHNOLOGY

In Asia, there are two key production methods for toluene. The first is extraction from pyrolysis gasoline (pygas), which is produced from steam cracking of light naphtha. The second is the extraction method from reformate, which is produced from a reformer via the cracking of heavy naphtha.

OUTLOOK

Chinese domestic demand-supply will be the key game changer going forward into 2019, as government taxation reforms in the gasoline market will likely result in changes with overall trader and end-user perceptions. The country implemented a new online tax (consumption and VAT) filing system for gasoline and this could effectively swing the market both ways. Domestic toluene supply could be limited from state-owned refineries if they need to increase gasoline production and cover their shortfall, since private blenders may become obsolete.

Downstream TDI demand-supply fundamentals may also result in potential market shifts as well. With new plants like Wan Hua Chemical and restarts such as BASF's Ludwigshafen expected by the third quarter of 2018, there is a possibility that demand in Asia could go either way. Demand may go up because of the need for these plants to run, but it will act as a double-edged sword since TDI supply will increase and it may result in an imbalance in this market.

Narrower or continuously narrow TDP spreads will be a third key determinant in demand-supply changes. Already, smaller-sized TDP plants have been shut or looking to cut rates since mid-May because of squeezed producer spreads and expectations that benzene demand-supply is unlikely to improve in the short run. ■

ASIA TOLUENE CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
SK Global Chemicals	Ulsan, South Korea	1,100
GS Caltex	Yeosu, South Korea	700
ExxonMobil Chemical	Singapore	690
Sinopec Yangzi Petrochemical	Jiangsu, China	580
Dalian Petrochemical	Liaoning, China	486
Shanghai Petrochemical	Shanghai, China	480
Guangxi Ruanzhou	Guangxi, China	480
Jilin Petrochemical	Jilin, China	470
Formosa Chemicals & Fibre Corp	Mailiao, Taiwan	470
Sinopec Zhenhai Refining & Chemical Company	Zhejiang, China	410

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

Click here to see an interactive map of Asia toluene turnarounds

IZHAM AHMAD SINGAPORE

MDI

USES

About 80% of the global consumption of methyl di-p-phenylene isocyanate (MDI) is used in polyurethane (PU) foams. The largest outlet is in rigid foams used in construction, refrigeration, packaging and insulation. MDI is also used to make binders, elastomers, adhesives, sealants, coatings and fibres. Other outlets include binders and microcellular products.

Polymeric MDI (PMDI), when combined with rigid polyols, is used in refrigerators, as well as insulation in the construction sector. Monomeric MDI (MMDI) or pure MDI, when combined with adipic acid, butanediol (BDO) and methyl ethyl ketone (MEK), is used as a pre-polymer for applications in shoe soles, adhesives, thermoplastic polyurethane (TPU) resins, spandex and synthetic leather.

SUPPLY/DEMAND

In the Middle East, demand is believed to be largely for PMDI, used mainly by the construction industry as insulation panels. Buyers are mainly system houses in the Middle East, some of whom bundle and sell the PMDI with polyols. The first half of the year is typically a slower period for PMDI demand in the Middle East but demand increases after the end of the Eid holidays, with the peak season usually seen during the third or fourth quarter.

However, buyers have been largely sanguine about purchasing large orders while prices are declining, as they eyed further price erosion.

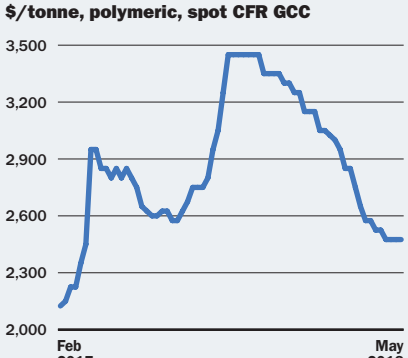
Currently over half of the world's PMDI is produced in northeast Asia and the world's major producer is currently China's Wanhua Chemical, which has a total production capacity of 1.8m tonnes/year from its three units. There were supply concerns following a fatal blast at Shanghai SECCO's facilities on 12 May. Chlorine raw material suppliers of some eastern China-based methyl di-p-phenylene isocyanate (MDI) and TDI plants source their feedstock from SECCO, market sources said.

In the Middle East, Sadara started PMDI production in June 2017 and the plant has the capacity to produce 400,000 tonnes/year of PMDI.

Iran's Karoon Petrochemical is the only other Middle Eastern PMDI producer although it mainly produces PMDI and MMDI for its domestic market from a 40,000 tonne/year installation.

MIDDLE EAST MDI

$/tonne, polymeric, spot CFR GCC



PRICES

In the Middle East, PMDI prices started 2018 on a downtrend, retreating from the record highs traded in November 2017. Supply increased after some plants resumed production following maintenance shutdowns. The downtrend continued through the first half of this year and in the week ended 10 May, PMDI prices sank to their lowest since March 2017.

The trend was mirrored to some extent by prices in China and southeast Asia.

Prices have been on a stable trend, as the Muslim fasting month of Ramadan started in mid-May. Trade activity is expected to be muted over the next few weeks and beyond.

TECHNOLOGY

MDI is made primarily from nitrobenzene, which is produced by the nitration of benzene in a continuous or batch process. Nitrobenzene is then hydrogenated to aniline, which is condensed with formaldehyde to form diphenylmethane diamine. This is reacted with phosgene in solvent to yield an isocyanate mixture, and then MMDI is distilled under reduced pressure.

An MDI plant's output is 70-80% PMDI and 20-30% MMDI. This ratio moves within a narrow range and is not easily adjustable, according to industry sources. Sadara's Jubail plant however is believed to be producing only PMDI, industry sources have said.

OUTLOOK

Supply to the Middle East is expected to be sufficient over the next few months. Demand is widely expected to be in a typically slow season due to Ramadan and the Eid holidays following that, so prices are expected to remain under downward pressure.

Sadara is believed to be largely focused on Asian markets for its isocyanates, and as such actual volumes available to Middle East buyers are unclear.

Karoon is largely driven by the domestic market in Iran, although it also hopes to be able to export material in future. Iran, however, is expected to struggle to cope with the threat of renewed sanctions after the US withdrew from the nuclear deal in May.

Elsewhere, PMDI capacity expansions for 2018 are limited, with no known plans in the Middle East and only one expected in China this year.

Longer term, however, PMDI production is still expected to outpace consumption globally and the Middle East will be no exception. ■

MIDDLE EAST AND ASIA MDI CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Wanhua Chemical	Ningbo, China	1,200
Wanhua Chemical	Yantai, China	600
Covestro	Caojing, China	500
BASF/Chongqing Chemical and Pharmaceutical Holding	Chongqing, China	400
Sadara Chemical	Jubail, Saudi Arabia	400
Tosoh	Nanyo, Japan	400
BASF	Yeosu, South Korea	250
Huntsman Polyurethanes Shanghai / BASF JV	Caojing, China	240
Kumho Mitsui Chemicals	Yeosu, South Korea	200
Shanghai BASF Polyurethane	Caojing, China	160

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ADAM YANELLI HOUSTON

MMA

USES

Methyl methacrylate (MMA) is a liquid monomer used primarily to produce resins and acrylic polymers. It brings durability, stability and UV resistance to products such as point-of-sale displays for cosmetics and other products; baths and spas; dental prosthetics; automotive and other lighting fixtures; and flat-screen monitors as well as industrial coatings on roads and heavy equipment, and acrylic architectural paints and adhesives.

A large percentage of MMA goes into polymethyl methacrylate (PMMA), which can be cast or extruded. PMMA is a transparent thermoplastic, often used as a lighter, shatter-resistant alternative to glass.

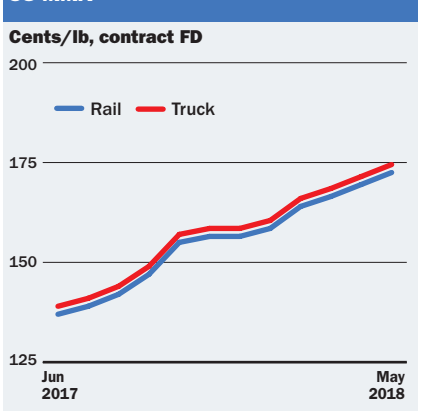
Most PMMA demand emanates from Asia, due to TV manufacturing there and the use of PMMA in flat-panel TV screens.

SUPPLY/DEMAND

Supply of MMA has been tight regionally and globally throughout most of 2017 and into 2018. Part of the supply crunch was attributed to an almost year-long force majeure by Lucite International. Lucite's two plants account for 33% of US MMA capacity.

Tightness is likely to persist, as two US MMA producers separately put customers on sales control recently. Evonik is implementing sales control immediately due to raw material supply and lead times will be increased to three weeks plus transit time. It is unclear which raw materials were causing the problem, but the company said it is working to address the issues.

US MMA



Lucite implemented sales control, effective immediately. It said both its US plants are operational and running to plan, but the move was made "to protect Lucite's contract customers and shield limited inventory from incremental order requests beyond forecasts provided by contract customers".

US MMA demand has seen increased consumption in the plastics sector, and primarily the coatings sector, as many paint companies are using more acrylic formulations. There has also been increased demand from construction activity related to disaster recovery from hurricanes, wildfires and landslides in Texas, Florida and California.

US exports of MMA are up by 25% year on year through Q1 2018, with almost a third of all exports going to Belgium.

PRICES

May contracts for US MMA settled at a new all-time high on 30 May. Formula buyers also saw an increase, owing to higher costs for raw materials, specifically acetone. Prices have soared to their current levels after jumping by around 70% in 2017. Contract prices have risen in 10 of the last 11 months.

Some market sources think MMA prices are likely to continue rising, as demand is not expected to diminish. Two producers have separately announced increases for June.

There is support for the June increases – in addition to the existing supply/demand situation – from upstream raw material costs.

US May barge acetone contracts fully settled up by 10%. Demand was described as slowing in May, owing to downstream production issues. Supply is expected to tighten by July/August, and is long now because of high inventory levels, rather than production outpacing consumption.

Discussions for June barge contracts have gone back and forth from a rollover to a possible reduction, although one player sees a rollover or a slight increase.

TECHNOLOGY

MMA was first produced in the mid-1930s by an acetone cyanohydrin (ACH) route still used in many plants today, primarily in North America and Europe, and in about 40% of the plants in Asia. It is dependent upon sulphuric acid and acetone, the latter of which has become less available with the reduction in co-product phenol demand and production over the past two years. An alternative method pioneered by Lucite – its Alpha process – uses ethylene rather than acetone, thus lowering variable and capital costs and eliminating the need for a spent acid recovery system because there is no use of sulphuric acid.

Another method of MMA production is the I-C-4 process used in most of Asia and Europe, which involves the direct oxidation of isobutylene. Lastly, Evonik's Aveneer process is an ACH route that also avoids the use of feedstock sulphuric acid.

US MMA CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Dow Chemical	Deer Park, Texas	475
Evonik Industries	Fortier, Louisiana	160
Lucite International	Beaumont, Texas	155
Lucite International	Memphis, Tennessee	155
Altuglas International	Clear Lake, Texas	45

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OUTLOOK

In the near term, supply could ease a bit in mid-2018 once the majority of global turnarounds are complete. Longer term, a producer said it anticipates global tightness to extend at least into mid-2019.

New supply from Saudi Methacrylates (SAMAC), a joint venture between Mitsubishi Chemical Corporation (MCC) and SABIC, could help ease the tight market. There has been little impact so far from the 250,000 tonne/year plant. The plant went off line in May amid a production hiccup, after starting commercial operations at the beginning of April, then restarted after a few days.

One producer anticipates MMA demand growth of about 5% annually over the next couple of years. ■

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VEENA PATHARE SINGAPORE

Polyethylene

USES

Low density polyethylene (LDPE) is used as a packaging film, either on its own or blended with linear low density PE (LLDPE) to make bags, bottles, tubing and moulded laboratory equipment. LLDPE is used as film for food and non-food packaging, shrink and stretch film, injection moulding products, wire and cable, and rotomoulding applications.

High density PE (HDPE) is used in blow-moulded products such as milk bottles, packaging containers, drums, car fuel tanks, toys and household goods. Film and sheet are used in wrapping, refuse sacks, carrier bags and industrial liners. Injection moulded products include crates, pallets, packaging containers and housewares. Extrusion grades are used in pipes and conduit.

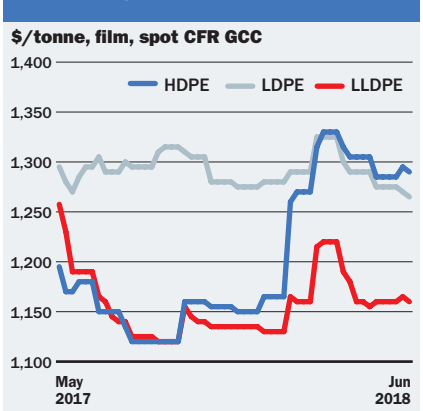
SUPPLY/DEMAND

The Middle East is a major producer and exporter of PE. Buyers in the Gulf Cooperation Council (GCC) source the bulk of material from suppliers based within the region, with cargoes transported to buyers' warehouses via trucks. Imports into the East Mediterranean market of Jordan also go by trucks from Saudi Arabia and the UAE, while buyers in Lebanon source PE cargoes via sea from GCC ports. The difficult political landscape in Iraq and Syria has led to PE imports remaining weak in these regions.

The standoff between Qatar and the rest of the GCC countries led by Saudi Arabia and the UAE since June 2017 has led to a ban on Qatar-origin PE within the GCC. The East Med continues to source material from Qatar via sea following the closure of Qatar's borders with GCC countries other than Oman.

Demand in the GCC and East Med is primarily driven by food packaging which strengthens ahead of the fasting month of Ramadan. Demand is also stronger ahead of the Eid ul-Adha holiday and is soft during the summer holiday months of July and August.

MIDDLE EAST PE



PRICES

Prices to the Middle East are often driven by suppliers' netbacks in other markets such as Asia. HDPE prices have risen since early 2018 following the steep rise in demand for HDPE pipe in China, driven by its move from coal to gas as the source of energy. A number of GCC-based sellers switched to producing more pipe, in view of significantly higher netbacks and cut back on HDPE film and blow moulding.

This has led to HDPE film and blow moulding prices remaining high since early this year. LDPE film prices in the region initially saw upward gains in mid-2017, prompted by the absence of Qatar-origin product within the GCC. However, a typically small market for this grade, coupled with buyer resistance, limited any sustained increase. Ample supply from regional producers has capped LLDPE film gains, despite the absence of Qatar-origin cargoes in the GCC.

TECHNOLOGY

LDPE is made from the polymerisation of ethylene in autoclave or tubular reactors at very high pressures (up to 50,000 lb/square inch). The process can be used to make copolymers with polar comonomers, such as ethylene vinyl acetate (EVA) polymer.

HDPE is produced by the catalytic polymerisation of ethylene in three types of processes: slurry (suspension), solution and gas-phase reactors. LLDPE is produced by adding alpha olefins (butene, hexene or octene) during ethylene polymerisation to produce a resin with a similar density to LDPE, but with the linearity of HDPE. Many processes can swing between LLDPE and HDPE production.

The development of metallocene catalysts also allows slurry-loop operators to enter the LLDPE sector. Bimodal processes claim to produce resins competitive to those from metallocene.

MIDDLE EAST PE CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Saudi Polymers	Jubail, Saudi Arabia	1,100
Qatar Chemical	Mesaieed, Qatar	865
Yansab	Yanbu, Saudi Arabia	400
Saudi Kayan	Jubail, Saudi Arabia	400
Saudi Ethylene and Polyethylene	Jubail, Saudi Arabia	400
Jam Petrochemical	Asaluyeh, Iran	300
Ilam Petrochemical	Ilam, Iran	300
Arya Sasol Polymers	Asaluyeh, Iran	300
Kermanshah Polymer	Kermanshah, Iran	300
Marun Petrochemical	Mahshahr, Iran	300
Petro Rabigh	Rabigh, Saudi Arabia	300
Mehr Petrochemical	Asaluyeh, Iran	300

NOTE: Does not include swing HDPE/LLDPE plants

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

OUTLOOK

Polyolefins demand in the Middle East is likely to be limited going into Q3, though an uptick is possible in late Q3 or early Q4 onwards. Summer holidays and high daytime temperatures seen in July and August are likely to cap purchasing as many people travel outside of the GCC for a break.

Players in the GCC are also uncertain of HDPE prices sustaining, as a slowdown in China piping projects from delays in government funding has been the trend since May.

If China pipe demand remains sluggish, suppliers would be pushed to switch to other HDPE grades.

Demand in the East Med remains weak because of political instability in Iraq and Syria, and poor finished goods sales. ■

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MELISSA HURLEY LONDON

MEG

USES

Monoethylene glycol (MEG) is predominantly used in the production of polyester fibres, resins and films, which accounts for roughly 80% of global MEG consumption. Polyester fibres is the main consumer and the second largest use is in polyethylene terephthalate (PET) resin. The next major outlet is in automotive antifreeze. Additional EG applications include de-icing fluids, surface coatings, unsaturated polyester resins (UPR), polyester polyols and natural gas dehydrogenation. Diethylene glycol (DEG) is used in polyols, unsaturated polyester resins and plasticisers. Triethylene glycol (TEG) is mainly used in natural gas dehydration and as a dehumidifier. DEG and TEG are by-products of MEG.

SUPPLY/DEMAND

MEG demand from the downstream PET sector is expected to improve during peak summer season once the shortages ease and run rates return to more normal levels. The coolant sector traditionally restocks in early summer in preparation for peak winter demand. Availability in the bulk spot market has not been ample and previously the US market proved more attractive.

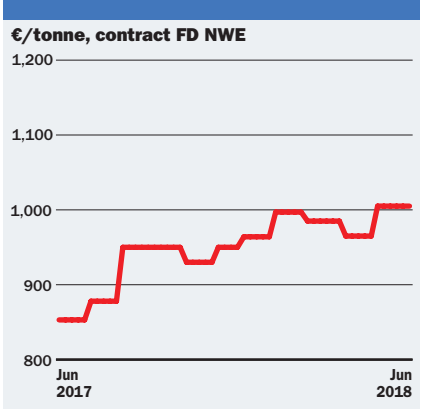
EU imports and exports of EG dropped year on year in 2017, which tightened European supply in the first half of the year. Europe is a net importer of glycols and is reliant on volumes from other regions. At the start of 2017, prices soared amid increasingly tight conditions caused by a lack of imports into Europe because Asia was a more attractive destination for product due to higher prices in the region. In the fourth quarter, import levels were higher year on year as supply levels eased in Europe, which coincided with MEG prices in Asia also coming under pressure during the last quarter of 2017.

DEG demand has been rather lacklustre in 2018 and has fallen short of expectations. Demand in the second quarter is usually higher especially in the construction sector but the market has been consistently quiet for some weeks.

This largely stems from shortages seen last year in the methyl di-p phenylene isocyanate (MDI) market, which impacted polyol demand. MDI demand is lower year on year for crude MDI with participants attributing this to a switch by end users to alternative products after upward price trends in 2017.

TEG supply was tighter earlier in the year but the market has balanced out more towards the middle of the year.

EUROPE MEG



PRICES

European prices were firm at the beginning of 2018 but saw a substantial correction around the end of the first quarter, in line with the drops seen in Asia. Price rises fell short of seller expectations in the first quarter, mainly due to lacklustre demand. European seller fortunes reversed towards the beginning of April and prices started shooting up once again.

The declines in Asia corresponded with a noticeable influx of imported cargoes in Asia, which weighed on supply. Europe is a net importer and is sensitive to market developments in other regions so this development also affected European pricing levels. Towards the end of May, Europe spot prices stabilised with further price rises were somewhat capped due to downstream PET and PTA supply constraints dampening MEG feedstock demand in the second quarter.

TECHNOLOGY

Ethylene oxide (EO) is produced by the direct oxidation of ethylene in the presence of oxygen or air over a silver oxide catalyst. A crude EG mixture is then produced by the hydrolysis of EO with water under pressure. Fractional distillation under vacuum separates the MEG from DEG and TEG.

EUROPE MEG CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
BASF	Antwerp, Belgium	325
INEOS Oxide	Antwerp, Belgium	290
INEOS Oxide	Dormagen, Germany	160
Shell Chemicals	Moerdijk, Netherlands	155
Clariant	Gendorf, Germany	140
Petkim Petrokimya	Aliaga, Turkey	90
PKN Orlen	Plock, Poland	85
Industrias Quimicas Del Oxido De Etileno	Tarragona, Spain	75
AkzoNobel	Stenungsund, Sweden	20

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

Japan's Mitsubishi Chemical developed a catalytic process while in China, a coal-based technology via synthesis gas and oxalic acid.

OUTLOOK

MEG demand in the short term is likely to improve as PET production run rates are set to return to normal after various supply disruptions, specifically in the PTA market. PTA is consumed in polyester production including polyester fibre, PET bottle resin and polyester film.

Several planned EO turnarounds are happening at the end of the third quarter or beginning of the fourth but this is not expected to impact glycol supply significantly.

The real long-term challenge facing the European market is the onset of new capacity in China, the Middle East and the US from next year. China is the likely destination for additional MEG, with the largest appetite for MEG due to 60% of global polyester capacity, but Saudi Arabia capacity expansions are likely to place pressure on the China market. Equally, it looks unlikely that the US will be able to absorb all the new MEG capacity set to enter the market and could shift to a net exporter. ■

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KATHERINE SALE LONDON

MMA

USES

The largest use for methyl methacrylate (MMA) is to make polymethyl methacrylate (PMMA), which once cast or moulded is clear, hard, UV transparent and resistant to gamma rays. Another major application is in surface coatings. Methacrylate butadiene styrene resins are used as a modifier for polyvinyl chloride (PVC) and in food and pharmaceutical packaging.

SUPPLY/DEMAND

Supply in the European MMA market has been on a path to shortness since April 2016, with constraints in Asia starting a global crisis.

A series of planned and unplanned outages came when demand in the region was higher than expected, particularly in South Korea and India.

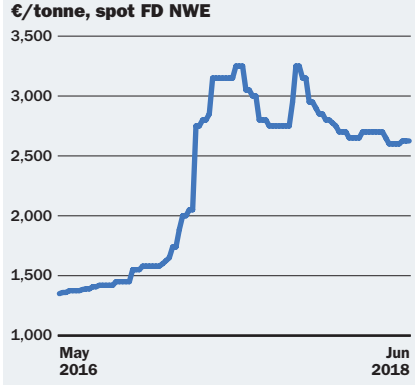
This was the start of an unprecedented number of outages for MMA producers globally, with prices reaching a historic high at the start of 2018. Players expected relief from the new capacity in the Middle East, with 340,000 tonnes/year of MMA coming on stream in 2018.

The Saudi Methacrylates (SAMAC) plant, a joint venture between Mitsubishi Chemical (MCC) and Sabic, was initially expected on line in 2017, but commercial operations were achieved in April 2018. The delays to the new capacity, and the continued production outages for other producers, elongated global constraints well into mid-2018.

European supply eased at points in the first half of 2018, with higher prices attracting imports from other regions. However, this then exerted pressure on the exporting destinations, with supply squeezed in the US and Asia, highlighting the fragility of the global supply/demand balance.

Lower coatings demand also helped to ease tightness in Europe, with poor weather and over-inflated growth targets resulting in a disappointing start to the coatings season. Plastics demand continues to perform well, with good levels from the automotive and construction sectors.

EUROPE MMA



PRICES

European monthly MMA contract prices increased 68% in 2017, amid global supply constraints, good demand and low imports.

Production problems in Asia were a key driver of the shortage, with spot prices in Asia increasing 112% between April 2016 and May 2018. With prices at a historic high at the start of 2018, decreases were widely expected, once supply stabilised and normality resumed in the market.

Both April and May contracts in Europe settled at a stable-to-soft level, with supply constraints easing amid lower demand. However, further production outages and forces majeures in May slowed any decreases. Lucite International declared force majeure at its Cassel, UK facility after an unsuccessful restart of the plant after a two-month maintenance shutdown. Prices are not at a sustainable long-term level, with prices globally at historical highs in 2018.

Although prices may be close to the top of the pricing cycle, they are not expected to fall to the historical lows seen in 2016. It was the very low prices in 2016 that contributed to the many production outages, with reinvestment in the plants not taking place.

TECHNOLOGY

Many plants are based on the acetone cyanohydrin (ACH) route, but with problems in disposing the bisulfate waste, much effort has been spent on finding alternatives.

Japan's Mitsubishi Gas Chemical commercialized an ACH route that produces a hydrocyanic acid by-product that can be recycled. Germany's Evonik Industries has further developed the ACH route by using a new catalyst and removing the need for sulphuric acid.

EUROPE MMA CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Evonik	Worms, Germany	225
Lucite International	Billingham, UK	200
Evonik	Wesseling, Germany	95
Arkema	Rho, Italy	90
Basf	Ludwigshafen, Germany	36
DOS	Dzerzhinsk, Russian	25

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

Lucite, part of Japan's MCC, developed its Alpha process based on ethylene, methanol and carbon monoxide. The 250,000 tonne/year plant that came on stream in April 2018 uses this technology, with a further plant expected post 2020 by the producer.

Evonik also announced in late 2017 that is would be working on an ethylene based MMA production method.

Some Japanese plants use isobutylene or tertiary butanol (TBA). Evonik is using technology based on isobutylene in a plant in China. In the US, Eastman Chemical, Bechtel and the Research Triangle Institute developed a three-step synthesis gas process.

OUTLOOK

Supply remains the main driver in the market for the rest of 2018, although there has been some relief in comparison to levels in 2017.

There will be planned stoppages at Wesseling for Evonik and Arkema at Rho, in H2 2018. However, outages outside of the region are the main factor to watch for European players, with heavy stoppages in the US and Asia.

Supply is expected to tighten in the US and Asia during the stoppages, which could divert product away from Europe, which requires imports to remain balanced.

Demand traditionally grows at approximately 3% globally for MMA each year, although some applications have higher levels. ■

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DANIELLE GOH SINGAPORE

ABS

USES

Acrylonitrile butadiene styrene (ABS) is used to make items that require impact strength, rigidity, chemical resistance and a glossy surface.

Its biggest application is in the automotive industry, followed by the electronic sector. Other applications include consumer electronics, toys, pipes and domestic appliances.

ABS resins are also combined with other polymers such as polycarbonate or polyvinyl chloride (PVC) to form alloys such as polycarbonate (PC)-ABS for the consumer electronics sector.

ABS is used in many diverse applications due to its flexibility of composition and structure. ABS is composed of 50% styrene and varying amounts of butadiene and acrylonitrile. Styrene provides rigidity and ease of processing, acrylonitrile gives chemical resistance and heat stability, and butadiene offers toughness and impact strength.

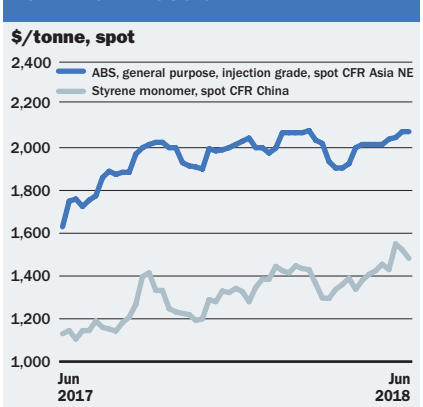
SUPPLY/DEMAND

ABS demand was fairly strong at the start of the year but demand fell in March and subsequently picked up in April.

There was an increase in ABS consumption in northeast Asia after China announced a ban on scrap plastics imports on 1 January. For the first quarter, there has been about a 5-6% increase in total consumption of ABS, compared with the previous quarter.

Demand was expected to strengthen in March after the Lunar New Year, which was in February, but it did not materialise.

ASIA ABS VERSUS SM



Market sentiment was dampened in March, forcing ABS makers to sell their stocks at lower prices, given weak end-user demand and falling key feedstock styrene monomer (SM) prices. Makers and buyers also took a cautious stance to discussions amid fears of a trade war between the US and China.

Environmental checks in China have also hampered end-user demand.

Demand for ABS has improved gradually since April, marking the start of the production season in the second quarter. However, a spike in feedstock SM prices has impeded any further uptake of demand in June.

ABS supply has tightened in June due to limited feedstock SM supplies and rising SM costs. Suppliers are under pressure to hike ABS prices due to the rising feedstock prices.

In June PetroChina Jilin Petrochemical shut its 100,000 tonne/year ABS plant for annual maintenance. As a result, demand has tapered off, as buyers were reeling from the rising ABS prices.

PRICES

ABS prices were largely stable throughout the first quarter, as spot prices have largely remained above $2,000/tonne CFR NE Asia.

Spot prices had a slight uptick in January and February, on stronger demand after the ban on scrap plastic imports in China and relatively stable feedstock SM prices.

However, in March and April, ABS spot prices dipped below $2,000/tonne CFR NE Asia due to weak demand and cautious buying amid the US proposal in March to impose tariffs on imports from China.

Prices strengthened in late April, reaching a peak of $2,085/tonne CFR NE Asia in June. ABS spot prices surged in June, on a spike in feedstock SM prices due to tight supply.

TECHNOLOGY

ABS is a thermoplastic polymer. It is made by polymerisng styrene and acrylonitrile in the presence of butadiene.

ABS resins are classified under terpolymer, as they are made from three monomers. ABS resins consist of around 60% styrene, 25% acrylonitrile and 15% butadiene.

OUTLOOK

ABS capacity in Asia continues to grow, with demand in the key China market expected to grow by about 5-6% this year. China is the key market for ABS, with about one-third of global capacity, and makes up about more than half of global consumption.

Out of all the sectors, the automotive and consumer electronics are expected to drive ABS demand growth.

ABS demand in Asia is expected to remain healthy. Capacity additions are projected for China and South Korea this year.

LG has announced that it will expand the capacity of its ABS Huanan plant in Guangdong, China, by 150,000 tonnes/year by the end of 2018. With this expansion, output will be doubled from its current capacity of 150,000 tonnes/year to 300,000 tonnes/year.

Several producers in China are also expected to increase their capacity, with Keyuan and Shandong Haili Chemical planning to build new plants this year.

Margins for ABS have generally been positive, but the recent spike in feedstock SM costs could temporarily narrow margins. ■

ASIA ABS CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Chi Mei	Tainan Hsien, Taiwan	1,250
LG Chemical	Yeosu, South Korea	850
Zhenjiang Chimei Chem.	Zhenjiang, China	820
Lg Yongxing Chemical	Ningbo, China	800
Lotte Advanced Materials	Yeosu, South Korea	590
PetroChina Jilin	Jilin, China	580
Formosa Plastics	Ningbo, China	450
Formosa Chemicals & Fibre	Hsinkang, Taiwan	410
Dagu Chemical	Lingang, China	400
Toray Plastics Malaysia	Penang, Malaysia	350

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

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ADAM YANELLI HOUSTON

Isopropanol

USES

Isopropanol (IPA) is a clear, colourless, mobile liquid with an alcoholic odour. It is miscible with water and ethyl alcohol and reacts with strong oxidants.

IPA, also known as isopropyl alcohol, is a low-cost solvent used in many industrial and consumer products and as an extractant. Outlets include cosmetics and personal care products, deicers, paints and resins, pharmaceuticals, food, inks and adhesives. It is also used as a solvent for oil and gums and in the manufacture of fishmeal concentrates. Low-grade IPA is used in motor oils.

Other applications include as a cleaning and drying agent in the manufacture of electronic parts and metals, and as an aerosol solvent in medical and veterinary products. It can also be used as a coolant in beer manufacture, a coupling agent, a polymerisation modifier, a deicing agent and a preservative.

Some chemical compounds are manufactured from IPA, in particular derivative ketones, such as methyl isobutyl ketone (MIBK), isopropylamines and isopropyl esters.

SUPPLY/DEMAND

Demand for US IPA has been steady to strong, with supply readily available. US April imports rose by 5.8% year on year, largely on increased material from Germany and South Korea, according to the latest data from the International Trade Commission (ITC).

Year to date, imports are up by 6%. Material from Canada, the top source for IPA imports, has fallen by 27% over the first four months of this year compared to the same time period last year.

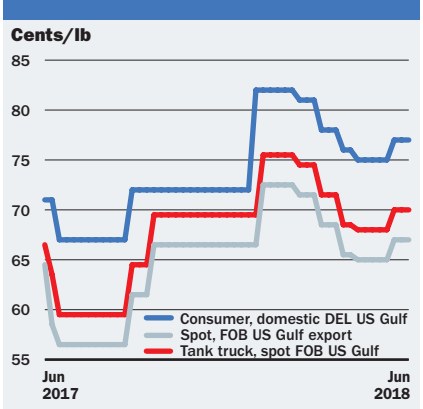
The US is a net exporter of IPA. April exports fell by over 34% year on year, largely because of a steep decline in product sent to Belgium, the top destination for US IPA.

Mexico and Brazil also took significantly less material year on year.

The decreases were partially offset by increased volumes to Venezuela, Germany, Argentina and the Dominican Republic. Year to date, exports are up by 5%.

Because IPA is used in paints and resins, there can sometimes be increased demand at the start of the summer construction season. So far this year, some market participants have said they have yet to see an uptick in demand from the construction season.

US IPA



PRICES

With supply and demand fundamentals in balance, IPA values have been tied more directly to feedstocks. Propylene is the primary feedstock for IPA and a primary driver of prices.

US IPA prices are almost 7% lower than recent highs seen in the first quarter of the year. The steady decrease has been largely in line with upstream costs for chemical grade propylene (CGP).

But IPA producers are pushing for higher prices as the third quarter begins. After three months of falling propylene contracts, May propylene settled up by 5 cents/lb, and June propylene contracts settled higher by 8 cents/lb.

Talks of a drastic increase in propylene caught many market participants by surprise, and the IPA increase initiatives are likely indicative of producers getting out ahead of the higher upstream costs.

Buyers could point to ample supply to push back against the increases. It is too early to tell whether all or part of the increases will go through.

TECHNOLOGY

There are two commercial routes used in manufacturing IPA. One is an older method based on indirect hydration of refinery-grade propylene (RGP). This process uses sulphuric acid to form isopropyl sulphate, which is then hydrolysed with steam to form sulphuric acid and IPA. The crude IPA is then distilled to the desired purity.

The second route uses the direct hydration of CGP (90-99%). This method eliminates the need for sulphuric acid. Instead, propylene and water are heated and the liquid-vapor mixture is pressurised, and passed into a trickle flow reactor containing sulphonated polystyrene (PS) ion-exchange resins.

Alternatively, the reaction can be carried out in a gas phase over a phosphoric acid-based fixed-bed catalyst.

There is also a liquid-phase route employing a soluble tungsten catalyst. The IPA is distilled from the aqueous solution.

AMERICAS IPA CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Dow Chemical	Texas City, Texas, US	430
ExxonMobil	Baton Rouge, Louisiana, US	380
Shell	Sarnia, Ontario, Canada	95
Carboclor	Campania, Argentina	48
LyondellBasell	Channelview, Texas, US	30

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OUTLOOK

The IPA market is expected to remain steady throughout the summer and into the fall. With supply and demand expected to remain largely in balance, IPA prices are likely to continue following upstream propylene values.

Propylene demand had been strong in recent months since rebounding in March after an early 2018 slump due to a previous spike in propylene prices. Production in recent months had been limited from crackers due to a move to lighter feedstocks amid low ethylene prices, and from refineries due to spring turnarounds.

The combination had tightened propylene supplies and pushed prices higher heading into June. ■

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LEANNE TAN SINGAPORE

TiO2

USES

Titanium dioxide (TiO2) is primarily used as a white powder pigment because of its brightness and high refractive index. It is used in paints and coatings, including glazes and enamels, plastics, paper, inks, fibres, foods, pharmaceuticals and cosmetics.

TiO2 resists discolouration under ultraviolet light and is often used in plastics and sunscreens. It is used in photocatalysts found in light-emitting diodes (LEDs), liquid crystal displays (LCDs) and electrodes for plasma displays.

SUPPLY/DEMAND

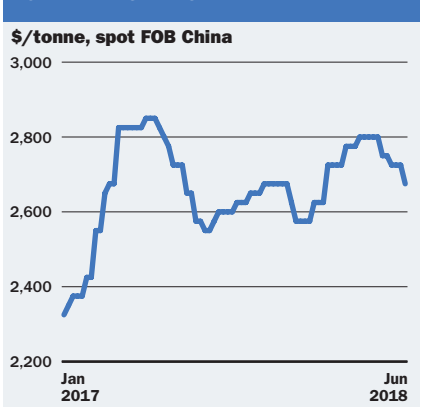
Asia's TiO2 supply continues to be profoundly impacted by production cuts taking place in China, brought about by an unprecedented clampdown on industrial polluters.

The Chinese government recently has made significant changes to its environmental supervision systems, promising tougher targets on industrial polluters, and the TiO2 industry has not been spared. The push to cut air pollution and wastewater levels has been effective thus far, with the shutdown of inefficient factories and detailed government-led inspections.

The Chinese government has not forced the more established and modern TiO2 production plants with good emissions standards to shut. However, smaller producers with high emissions face fines and temporary plant closures.

Operating rates of downstream paint manufacturers and other factories that buy TiO2 pigments have also been impacted by the environmental clean-up measures, resulting in declining domestic demand. In other parts of Asia, demand is expected to remain weak in the near term as the market remains in its seasonal lull.

ASIA TITANIUM DIOXIDE



PRICES

Asia's TiO2 prices have been on a consecutive rise since early 2016, as producers sought to recoup lost profitability following previous price erosion. The situation was exacerbated in 2017, with suppliers implementing price hikes throughout the year on the back of tight global supply of the pigment.

Quarterly TiO2 contract prices in Asia are approximately 28% higher than in January 2017, according to ICIS data. While spot prices of Chinese TiO2 exports have experienced more volatility, current weekly spot prices on a free on board (FOB) China basis have risen by 15% since the start of 2017.

TECHNOLOGY

TiO2 is produced from ilmenite, rutile or titanium slag. Titanium pigment is extracted by using either sulphuric acid (sulphate process) or chlorine (chloride route). The sulphate process employs simpler technology than the chloride route and can use lower-grade, cheaper ores. It generally has higher production costs and with acid treatment is more expensive to build that a chloride plant. But the latter may require construction of a chlor-alkali unit.

The chloride route produces a purer product with a tighter range of particle size, but anatase pigments can only be produced by the sulphate route.

Most production plants in China continue to use sulphuric acid as the solvent in producing TiO2. However, chloride-based TiO2 production looks set to be the main driver behind China's potential capacity expansions in the future. More producers in China have acquired infrastructure for chloride-based production in the last few years.

OUTLOOK

With the government's embrace of a more environment-friendly approach to manufacturing, TiO2 supply in the key Chinese market is likely to remain curtailed in the short-to-medium term. With further waves of environmental inspections set to come, smaller, less efficient manufacturers will have to upgrade existing pollution-control equipment to be in line with anti-pollution requirements, or face the prospect of being shut indefinitely.

Sulphate-based TiO2 production plants are especially susceptible. Production via the sulphate-route can produce wastewater which requires treatment to eliminate traces of sulphuric acid. Some smaller Chinese producers could face difficulties passing down the extra cost required to manage waste disposal, leading to a reduction in overall capacity. TiO2 production growth in China via the sulphate route is expected to be limited, as it becomes increasingly difficult to obtain permissions.

Chloride-based production will be the main driver behind China's capacity expansions in the future. TiO2 Chinese major Lomon Billions plans to construct two chloride lines at its existing production site in Jiaozuo, Henan province. Capacity is around 200,000 tonnes/year, with commercial production expected in 2019.

Snug global supply is likely to be offset by lacklustre demand. Buy-side resistance has grown, as downstream margins for TiO2 users become increasingly squeezed. ■

ASIA TIO2 CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Lomon Billions	Chengdu, China	700
CNNC Huayuan Titanium Dioxide	Lanzhou, China	200
Shandong Dongjia Group	Zibo, China	160
Ishihara Sangyo Kaisha Ltd - (ISK)	Yokkaichi, Japan	155
Chemours Taiwan	Kuan Yin, Taiwan	140
Bluestar Jinan Yuxing Chemical	Jinan, China	100
Shandong Dawn Group	Yantai, China	100
Panzhihua Dongfang Titanium Industry	Panzhihua, China	100

NOTE: Selected plants ordered by capacity

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JANE MASSINGHAM LONDON

MA

USES

Maleic anhydride (MA) is mostly used to make unsaturated polyester resins (UPRs), which are used in a wide range of applications, including pleasure boats, bathroom fixtures, automobiles, tanks and pipes.

Other outlets for MA include 1,4- butanediol (BDO), tetrahydrofuran (THF) and gamma-butyrolactone (GBL). MA is available in liquid (molten) and solid (flake) forms. Liquid accounts for 90-95% of all material sold.

MA is produced commercially by the oxidation of benzene or butane. The butane-based process is considered to have superior economics and is preferred by most Europe producers.

SUPPLY/DEMAND

2018 started with supply restrictions. A combination of both planned and unplanned production issues along with reduced imported volumes saw a tight spot market in particular, though contractual obligations were covered.

While overall availability was improved compared to the start of the year, spot volume remained limited in April, but increased through the course of May and June, with fresh imports arriving from Asia and improved output at European plants.

There was no planned maintenance within Europe during the second quarter, though a couple of producers were preparing for Q3 turnarounds.

Demand was fairly robust early in the year, in part exacerbated by supply restrictions. By the end of the first quarter, demand for some was not as healthy as expected, as typically the market is building up to its strongest period in the second quarter.

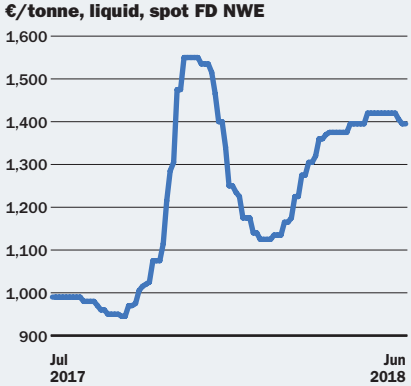
Part of this was attributed to the cold snap across much of Europe, which saw downstream demand hampered.

Although Q2 demand levels were good, various sources noted that offtake was not as strong as had been predicted for 2018.

Nevertheless, June volumes had shown improvement compared to April and May for some players.

EUROPE MALEIC ANHYDRIDE

€/tonne, liquid, spot FD NWE



PRICES

Those customers agreeing quarterly contracts incurred large rises in the first half of 2018. Triple-digit jumps were seen for many in the first quarter, due to supply restrictions, and the momentum continued for the second quarter, but to a lesser extent.

This lesser move was both on the back of slightly better supply, but also due to strong resistance from some customers that had incurred the steepest Q1 rises.

Spot prices also followed an upward trajectory, peaking around April/May before easing was seen in June, on improved supply for both domestic and imported product.

Q3 talks tended to focus on a rollover in many cases, though in some instances small moves up and down were also agreed. Producers felt pressure from higher prices for feedstock butane, while customers described a much improved demand/supply balance.

TECHNOLOGY

MA is produced commercially by the oxidation of benzene or butane. The butane-based process is considered to have superior economics and is the preferred route used by most producers in Europe.

Butane-based MA production can be done by either the fixed-bed or fluidised-bed processes. The fluid-bed process has some advantages over the fixed-bed route, such as lower air-to-hydrocarbon concentration in the feedstock and no need for premixing. The disadvantages include abrasion of the catalyst, conversion rates and by-product formation.

In the fixed-bed route, air is mixed with superheated butane and fed to a reactor containing a catalyst of vanadium phosphorous oxide supported on silica.

EUROPE MALEIC ANHYDRIDE CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Sasol Huntsman	Moers, Germany	105
Polynt	Ravenna, Italy	66
Polynt	Bergamo, Italy	36
Esim Chemical	Linz, Austria	36
Mol Hungarian Oil And Gas Co	Szazhalombatta, Hungary	22
Cepsa	Algeciras, Spain	13
Gikil	Lukavac, Bosnia/ Herzegovina	10
LANXESS	Uerdingen, Germany	10
BASF	Ludwigshafen, Germany	6
Ostend Basic Chemicals	Ostend, Belgium	3
Orgachim	Ruse, Bulgaria	2

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

OUTLOOK

There was planned maintenance for MA due in the third quarter from ESIM for a catalyst change, and Polynt and Gikil for regular summer turnarounds. All contractual obligations were expected to be met during that time, but would reduce spot volume.

Fresh imports are expected in July and with the summer season kicking in, good Q3 availability is anticipated, pending any unplanned issues. Decent demand is expected to remain through most of July, but then the seasonal slowdown is expected, as various customers have summer closures.

September, though, can be a fairly strong month, as sources replenish inventories, so some were confident of a buoyant end to the quarter and a good start to the fourth quarter.

Manufacturers stated margins were under pressure and were determined to avoid any further erosion through the second half of the year. Customers felt good supply against a natural pattern of demand would allow for some respite from the higher prices they incurred during the first half of the year. ■

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AMANDA HAY HOUSTON

Paraxylene

USES

Paraxylene (PX) is predominantly used to produce purified terephthalic acid (PTA). Other outlets include dimethyl terephthalate (DMT), di-paraxylene, herbicides and solvents. Both PTA and DMT are used to make polyethylene terephthalate (PET). DMT is also used to manufacture polybutylene terephthalate (PBT) resin.

Approximately 97% of PX demand comes from the polyester chain via PTA or DMT. The breakdown for polyester demand is 65% from fibre, 27% from PET bottle resin and 8% from film and other plastic end-uses.

SUPPLY/DEMAND

The largest PX producers in the US are BP Chemicals and Indorama Ventures, which produce PX for internal use in the production of PTA to be used in the manufacture of PET bottle resin. ExxonMobil, Flint Hills Resources and Chevron Phillips Chemical also produce PX to sell to the merchant market.

US PX supply tightened significantly in the second quarter of 2018 when a BP PX unit in Texas City, Texas, experienced an unplanned outage in early April and was down until the end of June. The unit's capacity is 450,000 tonnes/year. The outage pushed BP into the spot market to buy product.

Additionally, it became cheaper to purchase PX than to produce it, as prices for feedstock mixed xylenes (MX) soared during the quarter on tight supply. STDP (selective toluene disproportionation) units were largely uneconomic to run during the quarter.

US PARAXYLENE

Demand was high during the quarter amid the tight supply situation. The second quarter also marked the start of peak consumption season in the downstream PET market, which was experiencing higher-than-usual demand amid PET resin supply insecurity.

Reduced PET resin production capacity in the US amid the continued outage of a 360,000 tonne/year plant in West Virginia offset the PX supply crunch, as there was muted demand for PTA in the US.

As the quarter closed, PX supply lengthened when BP's PX unit returned to production at the end of June. Demand was somewhat muted despite the peak PET season because a BP acetic acid force majeure caused a chain reaction for PTA, which was put on sales allocation through July.

PRICES

US PX contract prices are at their highest levels since 2015 amid tightened supply, higher feedstock costs and firm crude values.

PX contract prices began rising in February, pressured by a tight MX market. The refinery turnaround season added pressure. Rising crude prices also helped to keep prices firm.

Spot PX prices have risen sharply since the beginning of the year – by about $100/tonne – amid the same factors that drove up contract prices.

Tight supply sent BP into the spot market to buy product, which resulted in US spot values peaking in early June.

Under normal conditions, US spot prices are usually around Asia prices minus shipping rates. The tight US market caused a disconnect from Asia that has yet to resolve.

Contract prices came down slightly in June, while spot prices have fallen by about $50/tonne. Spot prices remain firm, tracking gains in Asia.

TECHNOLOGY

Conventional technology is based on the isomerisation of MX from refinery reformate streams or from pyrolysis gasoline (pygas). High-purity product can be obtained using crystallisation or selective adsorptive separation.

Alternative methods are toluene disproportionation (TDP) and STDP. STDP produces a PX-rich stream of MX – over 90% purity. TDP and STDP co-produce benzene.

US PX CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
BP	Galveston Bay, Texas	1,200
Indorama Ventures	Decatur, Alabama	1,000
Flint Hills Resources	Corpus Christi, Texas	590
ExxonMobil Chemical	Baytown, Texas	545
Chevron Phillips Chemical	Pascagoula, Mississippi	495
ExxonMobil Chemical	Beaumont, Texas	275

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Processes have also been developed using a zeolite catalyst for the alkylation of toluene with methanol to produce PX without a benzene co-product.

The Cyclar process by US-based technology company UOP converts propane and butane to PX and benzene. A bio-based route to making PX has also been developed.

OUTLOOK

PX should be well supplied with the restart of BP's Texas City unit, and supply is expected to lengthen in Asia as a number of turnarounds are completed.

Demand in the US will remain muted through July as PTA is expected to remain on sales allocation through the month.

MX prices are falling, which has created more favourable margins for PX producers. The PX-MX spread is above the $125/tonne break-even threshold.

Peak PET season remains in full swing, and Far Eastern New Century (FENC) was expected to start up its West Virginia PET plant by mid-July, creating additional demand.

The US PET market will remain tight through late 2019, when the integrated PET/PTA project begun by bankrupt US PET producer Mossi & Ghisolfi (M&G) is expected to start up under new owners CC Polymers, a joint venture of Alpek, Indorama and FENC. ■

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MATTHEW CHONG SINGAPORE

MPG

USES

The primary outlet for industrial grade propylene glycol (PGI) is unsaturated polyester resin (UPR), which is used in the manufacture of a wide range of products, including surface coatings and glass fibre reinforced resins. End-user segments are in the pipes and tanks, sanitaryware and marine industries. Other downstream segments comprise industrial coolants and antifreeze, de-icing fluids, hydraulic brake fluids, heat transfer fluids, paints and coatings and detergents.

US pharmaceutical grade propylene glycol (USP) has a variety of uses in solvents, emulsifiers and humectants. Final end-user segments include food and flavourings, pharmaceuticals, fragrances, cosmetics, personal care and animal foodstuffs.

SUPPLY/DEMAND

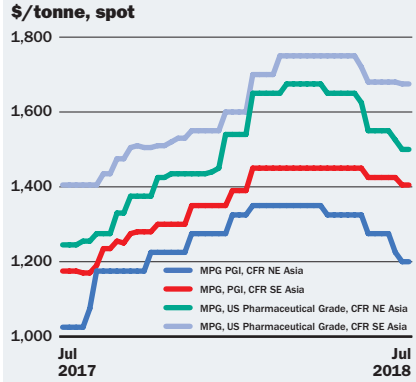
MPG supply increased in the second quarter. This was the result of a restart at a major southeast Asia-based producer in April following a turnaround. Supply from other Asian producers in South Korea, southeast Asia and a Middle East-based producer was relatively stable. However, import availability from the US was reduced because a regular exporter of MPG into Asia cut export volumes due to a shortage of feedstock propylene oxide (PO) in the US.

South Korea's SKC expanded its propylene glycol (PG) capacity by 50% to 150,000 tonnes/year in the fourth quarter of 2017, but the unit has not been running at full capacity since the expansion due to a shortage of PO in the country.

Sadara Chemical – the only MPG producer in the Middle East – is a joint venture between US-based giant DowDuPont and state energy firm Saudi Aramco. It started up its 70,000 tonne/year PG and upstream PO plants in Al Jubail, Saudi Arabia, in the second half of 2017. The bulk of Sadara's PGI export cargoes appear to be headed to China.

Demand was largely lower in the second quarter due to the traditional lull in demand season which takes place every May and June. Buyers were non-committal in their purchases and bought on a need-to basis. Market activity was especially subdued in southeast Asia due to Ramadan. The Muslim fasting month, which started in mid-May and continued until the Eid ul-Fitr holiday in mid-June, is widely celebrated in Malaysia and Indonesia.

ASIA MPG



PRICES

MPG prices have been on a steady uptrend since August 2017, supported by firm PO prices in China. The gap between USP and PGI prices widened as USP prices rose faster than PGI prices. The average price of both USP and PGI peaked in March/April amid tighter supply before retreating as supply recovered. This coincided with the onset of the traditional lull in demand season.

In China, PGI prices produced via the dimethyl carbonate (DMC) process hit year-highs in early January and May, in tandem with the rise in PO prices during this period.

TECHNOLOGY

MPG is produced by the hydration of PO. The reaction also produces dipropylene glycol (DPG), tripropylene glycol (TPG) and small quantities of higher glycols. MPG production is typically driven by PO availability and extra MPG can be produced to balance PO. MPG can also be produced from renewable resources such as glycerine – a by-product in biodiesel manufacture.

Most local producers in China produce PGI as a by-product of DMC. Plants producing PGI via this process are not included in the plant capacity table. PGI produced this way has a narrower range of sales outlets and clientele because it is unable to be used by certain downstream segments which have more stringent specification requirements on final products, according to market participants.

ASIA/MIDDLE EAST PG CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Dow Chemical	Map Ta Phut, Thailand	150
SK Chemicals	Ulsan, South Korea	150
Shell Eastern Petroleum	Seraya, Singapore	80
Sadara Chemical	Al Jubail, Saudi Arabia	70
CNOOC & Shell Petrochemicals (CSPC)	Huizhou, China	60

NOTE: Top five listed (does not include China plants using DMC process)

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

OUTLOOK

MPG prices are expected to be stable to softer in the third quarter of 2018, with the extent of any downside curbed due to generally strong feedstock PO prices in China.

Overall supply is likely to continue to be ample in the third quarter as there are no known scheduled plant turnarounds for major Asian producers scheduled during this period. PGI import volumes from Sadara are expected to remain constant as the majority of its Asian exports will continue to be China-bound.

Demand is expected to improve slightly in the third quarter with the onset of the traditional peak demand season in August/September. The gradual decline in MPG prices since the second half of May may also entice buyers to replenish stocks as they have been purchasing on a need-to basis since the first quarter when prices were firm.■

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VICKY ELLIS LONDON

Methanol

USES

Methanol's main derivatives are formaldehyde, acetic acid, methyl tertiary butyl ether (MTBE), dimethyl ether (DME), biodiesel and, in China, direct methanol blending and methanol-to-olefins (MTO) production. Other derivatives are dimethyl terephthalate (DMT), methyl methacrylate (MMA), methylamines, chloromethanes, glycol ethers and methyl mercaptan. It also has many general solvent and antifreeze uses.

SUPPLY/DEMAND

Europe remains reliant on overseas methanol, and consequently is at the mercy of increasingly volatile global trends led by China's giant methanol consumption and crude oil price swings. This affects European pricing, which must adjust to attract spot material. Local supply squeezes can outweigh China in times of tightness.

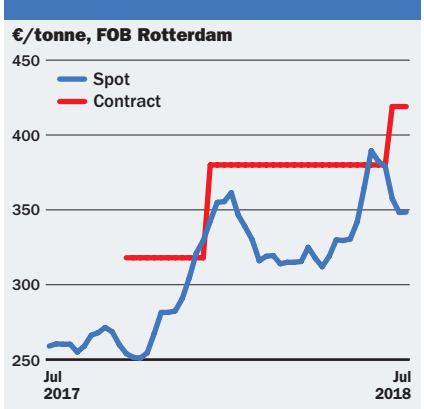
Net EU imports fell 8.5% to roughly 6.2m tonnes in 2017 according to Eurostat. Greater flows from Egypt, Norway and Trinidad & Tobago could not pick up the slack of dented imports from Saudi Arabia (hit by a major unplanned shutdown), Equatorial Guinea and the US.

The Mediterranean was a pinchpoint in the first half of 2018, on patchy output at some local plants. Methanex's Damietta plant in Egypt is currently one of the plants believed to have steady output.

Mergers and acquisitions (M&A) activity has not had a major impact. In February 2017, Japan's Sojitz agreed to buy Germany's Solvadis, a key methanol distributor. In July 2018 all of Helm's European methanol team relocated to Switzerland in a new venture with Proman and SCC, and were understood to have carried over their activities into the new business.

Traditional chemical consumers of methanol such as formaldehyde and acetic acid march a steady beat in Europe. An international trade battle over biodiesel duties was the lone dark spot amid steady European economic growth.

EUROPE METHANOL



PRICES

Prices were supported in 2018 as European methanol supply was unexpectedly squeezed. Unusually low stock levels in Rotterdam were blamed, following vessel delays and a hangover from Saudi outages in late 2017, delayed extra capacity in the US, Russia and Iran, and optimisation towards Asia which diverted or drew molecules out of Europe. A lull midway through the first quarter came from China's Lunar New Year holiday, reducing global demand.

European Q2 methanol prices were rolled over. Quarterly pricing was eclipsed by spot values amid World Cup chemical movement restrictions temporarily freezing methanol exports from Russia, despite OCI's joint venture 1.285m tonne/year Natgasoline plant in the US hitting commercial production in the last days of June.

TECHNOLOGY

Most production of methanol is based on natural gas, naphtha or refinery light gas (excluding China, where coal is the primary feedstock). The two main processes are from synthesis gas (syngas) in a reformer and from methane by steam and catalytic autothermal reforming.

Plants of 5,000-10,000 tonnes/day based on cheap gas are being developed to produce low-cost methanol for fuel uses and light olefins production. Such developments tend to be restricted to Asia, however, while Europe remains focused on traditional applications.

Netherlands-based producer BioMCN has developed a process for making biomethanol from glycerin, which is a by-product in the production of biodiesel.

OUTLOOK

Tighter factors on supply, from local European methanol turnarounds in the second quarter and a hangover from low stocks in early 2018, are expected to be countered by commercial production at OCI's new methanol plant in Texas, US in the third quarter, once material arrives in Europe.

Domestic production is also set to rise with new Russian capacity at Tschekinoazot. And late in 2018 BioMCN will roughly double capacity by reviving a mothballed Dutch unit.

Traditional downstream demand in segments such as formaldehyde are expected to be healthy in line with EU growth. After a depressed first half of 2018 for biodiesel, there is renewed optimism following EU moves to reduce the impact of newly lower-duty imports.

China's growing methanol appetite remains a key driver globally. Volatility comes from global energy prices. Crude prices affect China's methanol-to-olefins (MTO) prices due to the so-called MTO ceiling, which puts methanol in competition with oil-derived naphtha as a feedstock. Burgeoning trade disputes between the US and nations such as China and Iran could shift trade flows. If China blocks US methanol, it may need to seek the shortfall elsewhere. The US would have to find other markets, potentially filling in a gap left by Middle Eastern volumes in Europe. ■

EUROPE METHANOL CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Metafrax	Gubakha, Russia	1,100
Togliatti Azot	Togliattigrad, Russia	1,000
Equinor Tjeldbergodden	Tjeldbergodden, Norway	900
Tomskneftekhim	Tomsk, Russia	750
SOCAR	Karadagh, Azerbaijan	720
Mider Helm Methanol	Leuna, Germany	660
BioMCN	Delfzijl, Netherlands	500
Shchekinoazot	Shchekino, Russia	450
Shell	Wesseling, Germany	400
BASF	Ludwigshafen, Germany	350

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

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ANGELINE SOH SINGAPORE

Solvents

USES

Isopropanol (IPA) is used as a solvent in both industrial and personal care sectors. For industrial usage, IPA is used in pharmaceuticals, paints, inks and coatings. For personal care usage, it is used in hygiene and cosmetics products. Acetone is used as a feedstock for IPA. It is similarly used as a solvent in pharmaceuticals, laboratories, and hygiene and cosmetics. It is commonly associated with chemical peeling and nail polish removers.

Other than IPA, its downstream products include bisphenol A (BPA), methyl methacrylate (MMA) and methyl isobutyl ketone (MIBK). In the Middle East, IPA, acetone and ethyl acetate (etac) are used for paints, coatings and inks.

SUPPLY/DEMAND

IPA demand is about 140,000-150,000 tonnes/year in India. It may hit above 170,000 tonnes/year in 2019 and beyond.

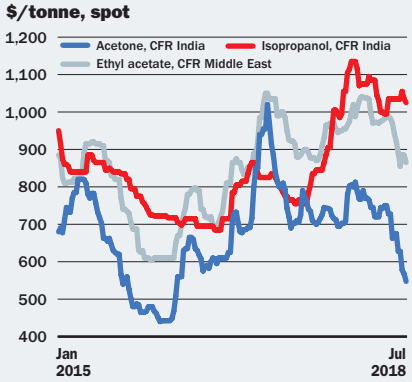
Local producer Deepak Fertilisers & Petrochemicals, with its nameplate capacity of 70,000 tonnes/year, supplies about half of the country's demand. It is set to expand its capacity to 170,000 tonnes/year in the first quarter of 2019. In the meantime, 50% and more of demand is met by imports. Acetone demand is slightly above 180,000 tonnes/year in India.

There are two domestic producers in India – SI Group produces 20,000 tonnes/year, and Hindustan Organic Chemicals produces about 25,000 tonnes/year. The acetone market is heavily reliant on imports. There are anti-dumping duties (ADDs) imposed on many origins. The import market is split into usage within India and overseas. For usage within India, buyers prefer to seek imports with no or low ADD. This market takes up 70% of the acetone demand. For use outside India, buyers can seek imports with high ADD, as they are reimbursed after the finished products are exported. This market, termed the advance licence market, takes up 30% of acetone demand.

In the Middle East, imports of IPA, acetone and etac are largely subdued as the region has sufficient from its own production. For IPA and acetone, demand is further curbed by the absence of pharma manufacturing companies. Acetone and etac are capped at less than 30,000 tonnes/year each and IPA is at less than 40,000 tonnes/year.

Since regional producer Sipchem started up in 2015, the need for etac imports has fallen. It is a swing plant which can produce 100,000 tonnes/year of etac or butyl acetate (butac). Prior to this, China and India had regularly exported to the Middle East.

MIDDLE EAST/INDIA SOLVENTS



PRICES

Price trends in India are influenced by China. As of the second half of July 2018, acetone prices in China were at their lowest for more than two years.

Local acetone producer Deepak Phenolics, with a nameplate capacity of 120,000 tonnes/year, is due to start up in early August. Many players have waited for the plant and abstained from import trades.

The monsoon weighed on downstream paint, ink and coating consumption. A weakened India rupee against the US dollar also kept importers on the sidelines. Domestic prices were at their lowest since the quote was launched by ICIS on 1 March 2017.

Etac prices have been largely stable to soft since the start of the year. Import trades have been minimal in the Middle East, and largely followed FOB China prices as a price direction, since there used to be Chinese producers exporting to the region.

Etac prices also took direction from feedstock acetic acid and ethanol prices.

TECHNOLOGY

IPA can be produced via acetone or propylene. There are three methods: hydrogenation of acetone in the liquid phase; direct hydration of chemical grade (90-99%) propylene, where there is no need for sulphuric acid; and a third method which is older and less commonly used. It involves indirect hydration of refinery-grade propylene using sulphuric acid. Propylene and benzene are used to produce cumene, which in turn produces phenol and by-product acetone. About 0.62 tonnes of acetone is made with each tonne of phenol produced.

In China and India, producers use the esterification of ethanol with acetic acid to produce etac.

MIDDLE EAST/ASIA ACETONE CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Kumho P&B	Yeosu, S Korea	330
PTT Phenol	Map Ta Phut, Thailand	309
Formosa Chemicals	Mailiao, Taiwan	250
Taiwan Prosperity	Kaohsiung, Taiwan	220
Mitsui Phenols Singapore	Pulau Sakra, Singapore	188
Chang Chun Plastics	Kaohsiung, Taiwan	186
Chang Chun Plastics	Changchun, China	180
LG Chem	Daesan, S Korea	180
LG Chem	Yeosu, S Korea	180
Mitsubishi Chemical	Kashima, Japan	150
Petro Rabigh	Rabigh, S Arabia	150

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

OUTLOOK

India's IPA import prices are expected to pick up after September, marking the end of the monsoon lull. Downstream paint, ink and coating demand typically strengthens for year-end purchases ahead of next year.

For feedstock acetone, prices are set to be low from August, as Deepak Phenolics starts up. The stronger demand post-monsoon is not likely to offset the increase in supply. Etac import trades in the Middle East are subdued and prices would depend on export prices from Asia. ■

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BILL BOWEN HOUSTON

EDC

USES

Ethylene dichloride (EDC) is an intermediate chemical toward the production of polyvinyl chloride (PVC), with some incidental uses. It is a clear colourless liquid with a sweet odour. More than 98% of production goes to the manufacture of vinyl chloride (VCM) to make PVC. Other outlets for EDC include the production of chlorinated solvents, including trichloroethylene (TCE), ethylene amines, vinylidene chloride and trichloroethane. It is an intermediate in the production of perchloroethylene and used as a catalyst in hexachlorophene production. EDC gas is also used as a solvent in the textile, metals and adhesives industries.

SUPPLY/DEMAND

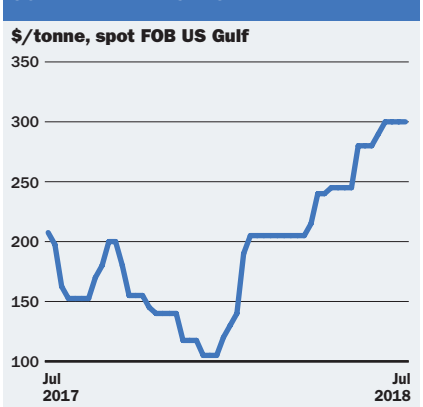
EDC is mostly produced at integrated plants that make PVC. Because of the close connection to PVC, with its many uses in construction applications, EDC demand is also closely tied to construction activity. Demand for EDC is expected to increase at 4-5%/year through 2020 on growth and construction demand for PVC in developing countries and continued, but maturing, demand growth in developed countries.

Supply growth is expected to continue with the US being the low-cost producer on inexpensive ethane from shale-derived natural gas. Five ethane crackers are now under construction or just completed in the US with total additional capacity of more than 6.5m tonnes/year. Most of the new production capacity is expected to be up and running by the end of 2018 and others are in the pipeline.

The US produces about 27% of total global EDC output, estimated at about 37m tonnes in 2015, according to a report by Merchant Research Consulting. Europe produces about 30% and Asia-Pacific countries contribute about 20%. The US exported 1.35m tonnes of EDC in 2017, mostly to markets in Asia, where almost half of demand resides. That was up from 766,000 tonnes in 2008, according to the US International Trade Commission.

Higher production in Asia has reduced US exports to that region. But the closure of some chlor-alkali plants in Europe have created demand for US EDC in that market to support PVC production in some Mediterranean markets. That region is also receiving EDC from the Middle East, where plentiful natural gas production has given that market a significant low-cost production advantage.

US ETHYLENE DICHLORIDE



PRICES

Global ethylene prices declined through the last half of 2017 as prices for liquid caustic soda rose sharply. US producers capitalised on high caustic soda prices by ramping up production of chlorine, of which caustic soda is a byproduct. The excess chlorine was exported in EDC, sending global values lower on long supply. Prices recovered slightly during the first half of 2018 to about $300/tonne FOB US Gulf. Greater domestic demand for PVC is helping to firm EDC in global markets.

TECHNOLOGY

EDC is usually produced through one of two main production methods: direct chlorination of ethylene and pure chlorine or oxychlorination, where ethylene is introduced to anhydrous hydrogen chloride. Many EDC plants use a combination of the processes to consume the HCl byproduct made in the polymerisation of EDC to make VCM.

EDC is toxic and flammable in both its liquid and vapour forms. Incidental contact induces eye, skin and throat irritation. It is a carcinogen with prolonged and repeated exposure and can cause death if inhaled in concentration. Production is conducted in closed loop systems to prevent worker exposure.

OUTLOOK

The price and demand outlook for EDC is closely tied to PVC. US PVC and EDC were caught up in escalating tariff threats between the US and China during Q2 2018, clouding the outlook, as China is the largest buyer of US EDC exports.

Meanwhile, US producers are incrementally expanding US PVC production capacity to keep up with global export demand. That long-term, overarching trend is likely to also maintain moderate upward pressure on EDC prices in global markets as US producers work to serve the domestic market where they get greater returns, leaving less EDC available for spot export.

Environment concerns about some of the plasticizers used in PVC may also tend to hamper demand growth, but newer and safer plasticizers are being introduced to counter those concerns.

Demand for plastic pipe made from PVC is expected to grow at 5% or more a year as developing countries update water utilities and irrigation systems, likely leading to greater EDC consumption.

Any significant change in global construction activity would have a direct impact on PVC demand and prices. ■

US EDC CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Westlake Chemical	Lake Charles, Louisiana	1,550
OxyMar	Ingleside, Texas	1,350
Olin	Freeport, Texas	1,180
OxyVinyls	La Porte, Texas	1,180
OxyVinyls	Deer Park, Texas	805
Occidental Chemical	Ingleside, Texas	750
Westlake Chemical	Calvert City, Kentucky	700
Westlake Chemical	Geismar, Louisiana	550
Formosa Plastics USA	Baton Rouge, Louisiana	530
Occidental Chemical	Geismar, Louisiana	315

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

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ZACHARY MOORE HOUSTON

Polyols

USES

The primary use for polyols is in the production of polyurethane (PU) foams. Polyurethane foams are produced by the combination of a polyol and an isocyanate. The two most common commercial isocyanates are methyl di-p phenylene isocyanate (MDI) and toluene di-isocyanate (TDI).

Rigid PU foams are used mainly in insulation, refrigeration, packaging and construction, while flexible PU foams have applications such as upholstery, mattresses and seats. Polyols can also be used in elastomers, adhesives, coatings and fibres.

There are two main types of polyols – polyether polyols and polyester polyols, with polyether polyols more widely used. Polyester polyols compete with polyether polyols and may be preferred in some rigid foam applications because of their low cost and improved flame retardant properties. In addition, they can provide improved wear resistance and chemical resistance in elastomers, coatings, sealants and adhesives.

SUPPLY/DEMAND

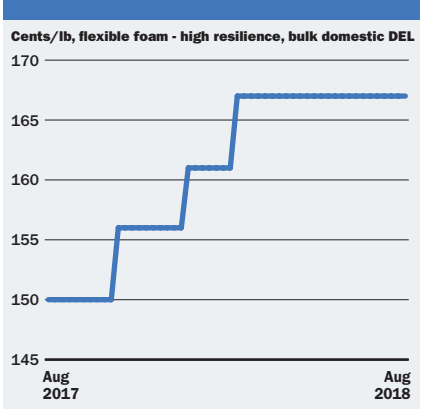
The North American polyols market is structurally long, with usage capped by the availability of PU co-feedstock such as isocyanates rather than polyol supply issues.

Persistent supply shortages for MDI and TDI during 2017 and the first quarter of 2018 along with a steep escalation of prices led to some slowdown in polyols demand. However, improving supply for MDI and TDI is likely to lead to an increase in polyols consumption in the second half of 2018.

Trade tensions between the US and China may alter the supply picture as polyols are included among the items listed for the application of additional tariffs. The US imports polyols from China.

Demand for PU foams has seen healthy growth in North America in recent years as the insulating properties of PU foams provide energy efficient solutions. According to a survey from IAL Consultants, PU production in the countries comprising the North American Free Trade Agreement (NAFTA) rose 4.4% from 2014 to 2016 to eclipse levels last seen prior to the 2008 recession.

US POLYETHER POLYOLS



PRICES

US polyether polyols have been firming in recent months, driven by higher prices for propylene feedstock. During May and June, propylene contracts posted a cumulative jump of 13 cents/lb ($287/tonne), prompting increase initiatives for polyols ranging from 8-13 cents/lb.

US prices for polyether polyols are largely driven by feedstock costs and typically follow movements in propylene contract prices with a lag of one to two months.

Prices may find support throughout the second half of the year as propylene feedstock supplies are expected to remain tight given the shift to lighter cracker feedslates and operational issues at propane dehydrogenation (PDH) plants.

Higher logistics costs are also supporting higher polyols prices. An acute shortage of truckers has prompted US trucking companies to implement multiple freight increases while several chemical producers have either raised their freight adders or cited rising transportation costs as a factor in announced product price increases.

TECHNOLOGY

Polyether polyols are produced by the catalysed addition of epoxides, mainly propylene oxide (PO) or ethylene oxide (EO), to an initiator having active hydrogens. The most common catalyst is potassium hydroxide.

The reaction is carried out by a discontinuous batch process at raised temperatures and pressures in an inert atmosphere. After polymerisation, the catalyst is neutralised and removed by filtration. The polyol is then purified.

The choice of epoxides, initiator, reaction conditions and catalyst determines the physical properties of the polyol, which can range from low molecular weight polyglycols to high molecular weight resins.

US POLYOLS CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
Dow Chemical	Freeport, Texas	535
BASF	Geismar, Louisiana	350
Covestro	Channelview, Texas	340
Covestro	South Charleston, West Virginia, US	180
Carpenter	Bayport, Texas	125
Monument Chemical	Brandenburg, Kentucky	120
Covestro	New Martinsville, West Virginia	50

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

OUTLOOK

US polyols demand is expected to continue to gain ground in the coming years along with the anticipated rise in demand for polyurethane systems.

The excellent insulating properties of polyurethane foams are likely to ensure demand increases as end-users seek more energy efficient products while new polyurethane foams are being developed for applications in athletic shoes and liners for truck trailers.

Polyols production technologies may also witness some changes as newer and more sustainable production methods are being pioneered by several companies. Saudi Aramco and Covestro are working on commercialising processes to produce polyols from carbon dioxide, while Emery Oleochemicals has launched a new line of polyols with a high level of bio-based content.

No new polyols plants have been announced in the North American market. ■

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LINDA NAYLOR LONDON

LDPE

USES

Low density polyethylene (LDPE) is used principally in film and sheet applications, and extrusion coating and injection moulding applications. It is used mainly as a packaging film either on its own or blended with linear low density PE (LLDPE) to improve mechanical properties.

Blown film can be easily processed and can be used in food, medical and pharmaceutical packaging, as well as in agricultural films. LDPE is also used in sheathing for wires and cables, extrusion coating of paper and boards for packaging liquid and in moisture barrier applications.

SUPPLY/DEMAND

LDPE has been increasingly replaced by LLDPE. New LDPE investments globally are overshadowed by those in LLDPE and in high density polyethylene (HDPE), but there have been major investments in recent months, and a couple are still due on stream in North America.

Additionally, over 500,000 tonnes of LDPE capacity was brought on stream in China in 2017, using mainly the coal- or methanol-to-gas technologies.

Sources perceive some oversupply in the LDPE sector in Europe, but not enough to lead to significant impact on pricing.

The tit-for-tat tariff battle between the US and China has had no impact in Europe so far, but this cannot be ruled out in future. LDPE was removed from China's list of US imported chemicals to be given a 25% tariff from 23 August. However, most grades of LLDPE were included.

PRICES

Spot LDPE prices are slightly up from their very low point in May, but still low compared with prices in the past three years.

Shortages and the swift upward price moves of 2015 are a distant memory, and there are no supply shortages in Europe. The monomer/polymer spread for gross LDPE pricing has fallen to what some producers say is unsustainable long term.

Net spot numbers are now trading at levels not far from the current ethylene contract, while cracker margins remain relatively strong.

TECHNOLOGY

Two processes are available – stirred autoclave or tubular. Both can produce LDPE as well as copolymer with polar co-monomers like ethylene vinyl acetate (EVA). The two polymerisation techniques differ in terms of maximum capacity per line, operating conditions, yields and properties.

Autoclave was the first LDPE process, but it is more expensive in terms of power consumption and maintenance costs. The share of autoclave LDPE in the world is declining, and the capacity of a line is low, typically 50,000-60,000 tonnes/year. They are able to produce premium polymer grades, with consistent quality, good clarity and toughness, appreciated for heavy-duty film. Grades from these plants are also suitable for extrusion coating.

Less efficient capacity has been closed, being replaced by plants of 300,000 tonnes/year and more. Tubular processes offer better economic return and technical advantages that allow easier processing in extrusion.

OUTLOOK

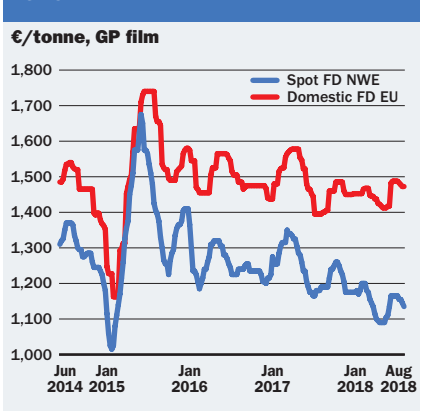
LDPE prices are closely linked to grades in the wider polyethylene (PE) market, with upstream ethylene and naphtha the main price drivers.

Imports from North America are expected in volume only in 2019, but it is in the LLDPE and HDPE sectors that most volumes are expected. Prices in these markets will inevitably affect sentiment in LDPE, however.

Some sources point to the arrival of material from the Middle East, when a tsunami was expected but imports arrived in a more orderly fashion, nonetheless changing the European market definitively. Some sources expect a sedate introduction of North American material to Europe, with a reduction of cracker rates to accommodate new capacity.

As trade tensions rise between the US and China, the prospect of a trade war has wide-ranging implications for the chemical industry, including polyethylene. ■

EUROPE LDPE



LDPE PROJECTS BOOST SUPPLY

Company	Location/start-up	Capacity ('000 tonnes/year)
Sadara	Saudi Arabia/ Q4 2016	350
Slovnaft (Mol)	Bratislava, Slovakia/2017	40 (net increase)
Dow	Plaquemine, Louisiana, US/ Q4 2017	350
Reliance	Jamnagar, India/2017	400
Formosa Plastics	Point Comfort, Texas, US/H2 2018	400
Sasol	Lake Charles, Louisiana, USA/2019	420

EUROPE LDPE CAPACITY '000 TONNES/YEAR

Company	Location	Capacity
SABIC	Geleen, Netherlands	645
ExxonMobil	Meerhout, Belgium	500
LyondellBasell	Wesseling, Germany	430
SABIC	Wilton, UK	400
INEOS	Cologne, Germany	400
Petkim	Aliaga, Turkey	355
Borealis	Stenungsund, Sweden	350
LyondellBasell	Aubette, France	320
ExxonMobil	Antwerp, Belgium	300
Dow	Terneuzen, Netherlands	260

A full list of plants and projects capacities, forecasts, production volumes and operating rates are available on the **ICIS Supply and Demand database**

Click here to see the latest news and analysis on the US China trade war

VALUE CHAIN CHLORINE

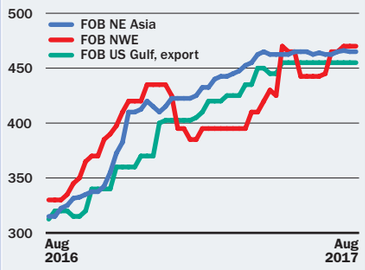
CHLORINE

CO-PRODUCT

CAUSTIC SODA

GLOBAL CAUSTIC SODA

$/dmt, liquid, spot



- Used for pulp and paper; to refine alumina; to neutralise acid; and for water treatment
- Lower production in Europe and fewer exports from China on greater domestic demand are cutting global supply, pushing prices up
- Cheap production in the US will provide more to Europe and Asia
- Demand growth slow in developed countries; rising faster in Africa, Latin America, India and southeast Asia
- Europe tight in 2017 on lack of arbitrage from US plus H1 production issues
- Europe mercury closures expected to tighten market from Q4, especially in the Mediterranean
- Supply to be tight in northeast Asia with no new capacity expansions
- Demand strong from Australia aluminium producers and southeast Asia buyers
- Chinese export volumes and prices dependent on its domestic market conditions

CAUSTIC SODA PROJECTS

Company, location	Capacity*	Start-up
Vencorex, Pont de Claix, France	190	Ramping up Q3 2017
Karpatneftekhim, Ukraine	180	Q3 2017
Ercros, Vila-seca, Spain	30	2017
Ercros, Sabinanigo, Spain	15	Before 2020

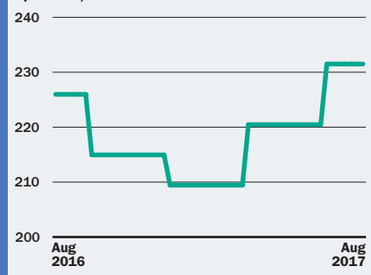
FEEDSTOCK

CHLORINE

- Derived from salt, it is a key ingredient in vinyls, isocyanates, and epichlorohydrin
- Chlorine and caustic soda are co-products of the electrolysis of brine. The process creates 1.1 tonnes of caustic for every 1 tonne of chlorine produced
- The technology is membrane (newest and most efficient), diaphragm, and mercury cell (being phased out in Europe)
- Production often located next to derivative production and moved by pipe
- Demand comes from construction activity and demand for polyvinyl chloride (PVC), a derivative plastic with many uses in construction

US CHLORINE PRICES

$/tonne, contract FOB



CHLORINE PROJECTS

Company, location	Capacity*	Start-up
Vencorex, Pont de Claix, France	169	Ramping up Q3 2017
Karpatneftekhim, Ukraine	163	Q3 2017
Ercros, Vila-seca, Spain	28	2017
Ercros, Sabiñánigo, Spain	12	Before 2020

29%

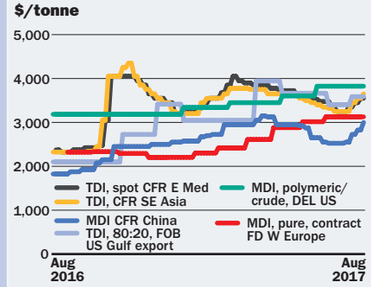
ISOCYANATES

ISOCYANATES

- Methyl di-p-phenylene (MDI) and toluene di-isocyanate (TDI) for polyurethane (PU) foams for automotive, construction, furniture
- Prices soared due to global supply tightness caused by production issues. Supply should recover on new capacity
- Demand growing in line with GDP growth
- MDI is gaining market share from TDI
- Europe MDI prices driven by supply and demand following production issues
- Low operating rates at BASF's TDI Ludwigshafen, Germany, plant in 2017 helped firm Europe prices
- Asia import prices may rise in Q4 with surge in China prices on tight supply
- Short supply of MDI in Asia will likely ease with new capacity from Huntsman Polyurethanes Shanghai and Kumho Mitsui Chemicals expected by end-2017
- Asia supply set to lengthen further as Sadara starts sales of polymeric MDI (PMDI) in Q4 2017, TDI in end-2017 or early 2018

GLOBAL ISOCYANATES PRICES

$/tonne



ISOCYANATES PROJECTS

Company, location	Capacity*	Start-up
MDI projects		
Huntsman, China	240	Q4 2017
Kumho Mitsui, S. Korea	100**	End 2017
Covestro, Germany	400	End 2018
Wanhua, Louisiana,US***	400	Q2 2020
BASF, Louisiana, US	300**	Q2 2020
TDI projects		
Wanhua Chemical, China	300	2018
Gansu Yinguang, China	80	2018

** Expansions; *** Final location undisclosed

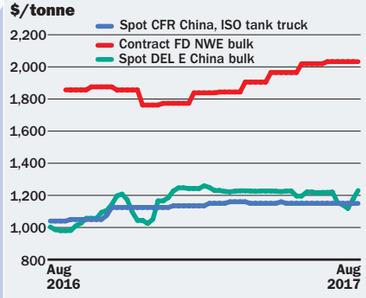
5%

DERIVATIVE

EPICHLOROHYDRIN

EU, ASIA EPICHLOROHYDRIN

$/tonne



- About 90% of epichlorohydrin (ECH) output goes into the manufacture of epoxy resins as well as specialty resins for water and paper treatment and ion exchange
- In Asia demand for ECH is largely dependent on downstream epoxy resins. End uses of epoxy resins include coatings, paint and adhesives as well as applications in electronics
- In China, domestic prices have been softening amid weak demand
- Demand for spot import cargoes into China has also stagnated amid a persistent buy-sell gap
- In Europe higher glycerine prices have applied upward price pressure
- European prices have strong correlation to key feedstock propylene

34%

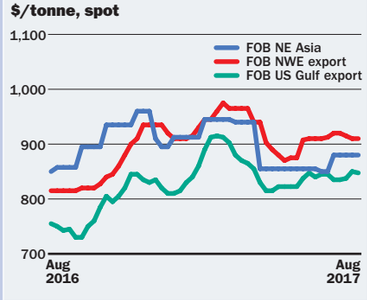
DERIVATIVE

PVC

- Polyvinyl chloride (PVC) is used to make water pipes, seat covers,intravenous bags for hospitals, siding, flooring, decking plus door and window profiles
- Half of PVC goes to construction
- Rising construction in North America has constrained US exports, where 37% of North American production is sold
- The European PVC market has been balanced to tight for most of 2017 with prices increasing relative to feedstocks
- Strong domestic demand has balanced relatively weak import demand in Turkey
- Carbide-based PVC from China surged in price due to shortages of feedstock calcium carbide, which drove up overall Asian PVC prices
- Stricter environmental inspection expected in China throughout the rest of the year, which will put pressure on feedstock supply, and is likely to sustain high prices in China
- Demand in India expected to be good after the monsoon season

GLOBAL PVC

$/tonne, spot



PVC PROJECTS

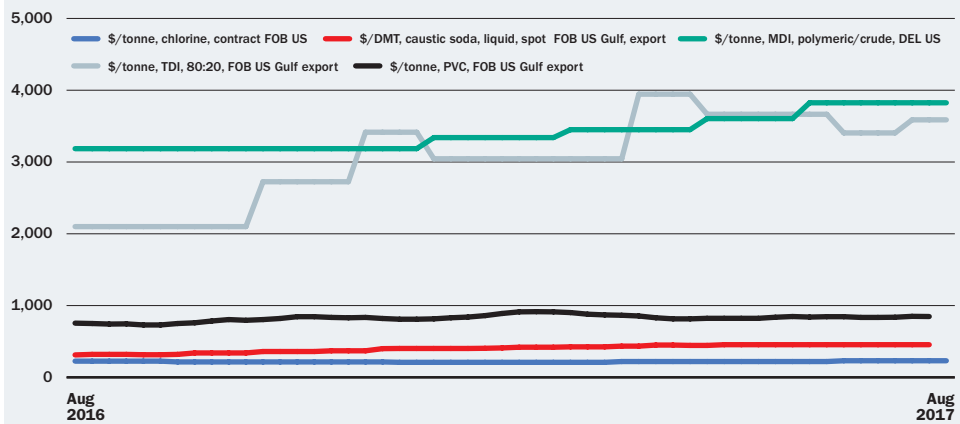
Company, location	Capacity*	Start-up
Jinchuan Group, China	300	Q3 2017
Karpatneftekhim, Kalush	300	Q3 2017
Qingdao Haiwan, Shandong, China	300	Expected 2019

COORDINATED BY:
GLOBAL LEAD
BILL BOWEN HOUSTON
CHLORINE
BILL BOWEN HOUSTON
CAUSTIC SODA
CHRIS BARKER LONDON
PATRICK HAN SINGAPORE
BILL BOWEN HOUSTON
EPICHLOROHYDRIN
AMY TAN SINGAPORE
LUKE MILNER LONDON
ISOCYANATES
PAVLE POPOVIC LONDON
ZACHARY MOORE HOUSTON
MATT CHONG SINGAPORE
POLYVINYL CHLORIDE
CHRIS BARKER LONDON
PATRICK HAN SINGAPORE
BILL BOWEN HOUSTON

*Capacity '000 tonnes/year

CHLORINE VALUE CHAIN – REGIONAL PRICE BREAKDOWN

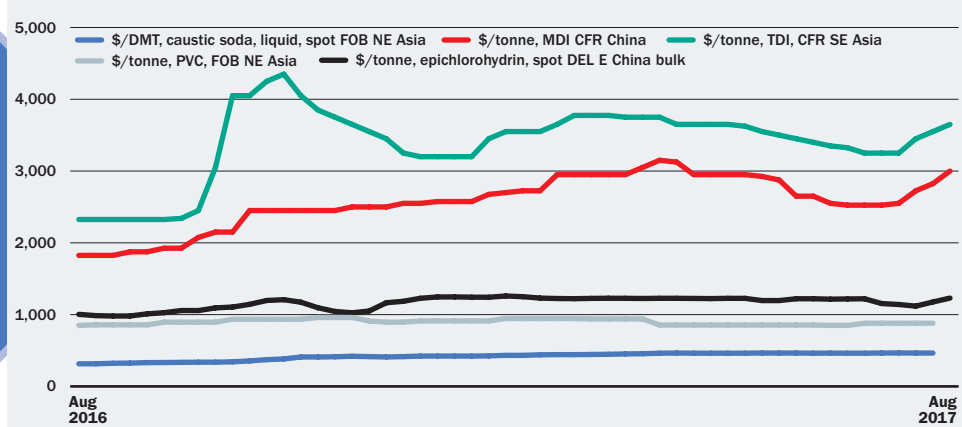
CHLORINE VALUE CHAIN - US PRICES



88%

Hike in US TDI prices during the period, peaking at $3,945 on global shortages

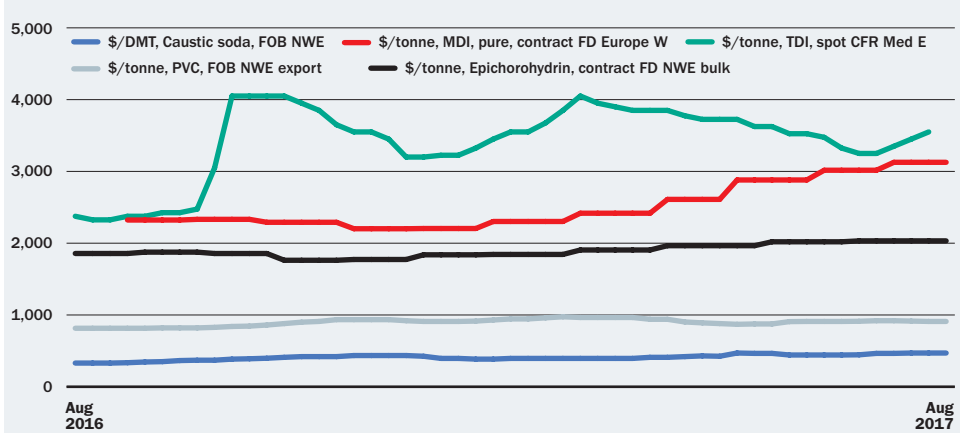
CHLORINE VALUE CHAIN - ASIA PRICES



$3,150

Peak price in the period for Asia MDI from lows of $1,825 in August 2016

CHLORINE VALUE CHAIN - EUROPE PRICES

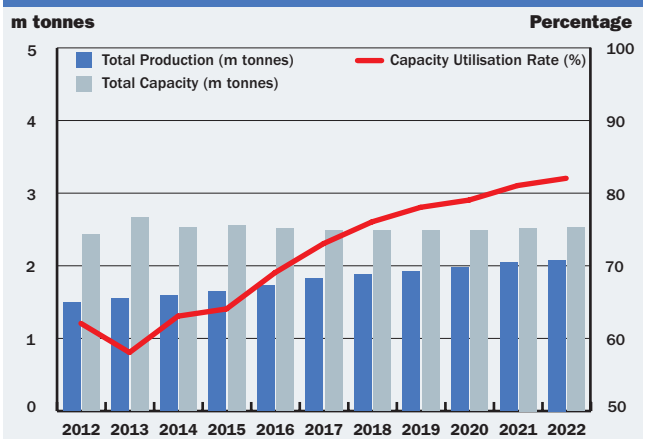


$4,050

Europe TDI peaks twice at this price as supply shortages rock the global market

SUPPLY & DEMAND FORECAST FOR CHLORINE VALUE CHAIN

EPICHLOROHYDRIN SUPPLY & DEMAND FORECAST



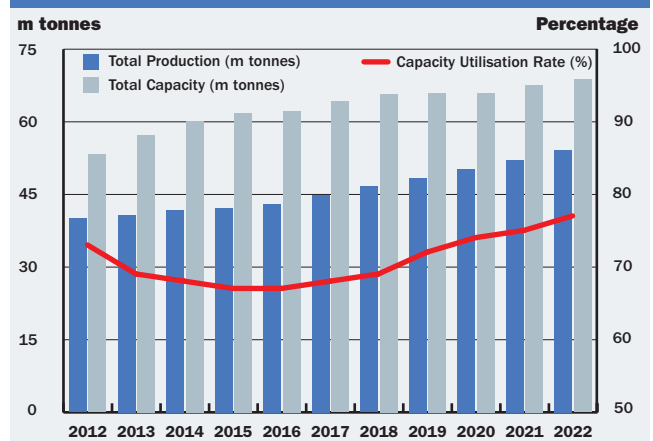
SOURCE: ICIS Supply & Demand Window, ICIS Dashboard

58%

2013 operating rate for global epichlorohydrin before steady rise to 82%

- Over the period production increases by 39% to reach 2.08m tonnes/year
- Capacity declines gently to plateau at 2.48m tonnes/year 2017-19 before increasing to reach 2.53m tonnes in 2022

PVC SUPPLY & DEMAND FORECAST



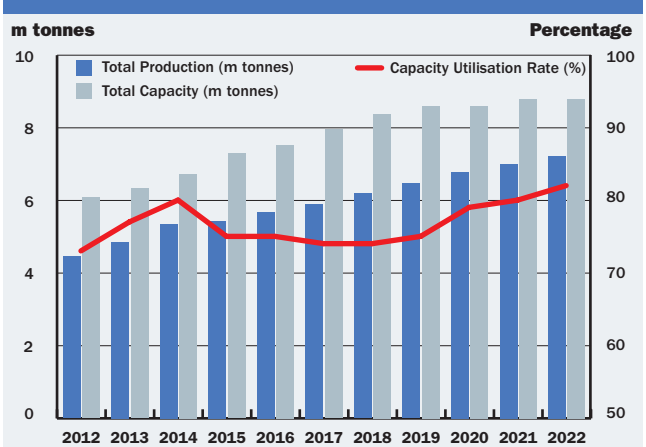
SOURCE: Supply & Demand Window, ICIS Dashboard

67%

PVC capacity utilisation slumped to this level in 2015/16 then will rise gently

- Production reaches 54.13m tonnes/year by 2022 from 44.86m tonnes/year in 2017
- Capacity is forecast to rise only 7% from 2017 until 2022 to reach 68.8m tonnes/year

MDI SUPPLY & DEMAND FORECAST



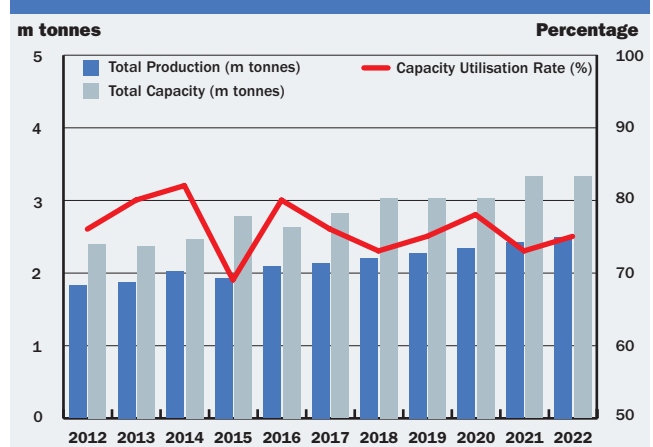
SOURCE: Supply & Demand Window, ICIS Dashboard

74%

MDI operating rate slumps in 2017/18 before recovering to 82% in 2022

- Production peaks at 7.23m tonnes/year in 2022 following a steady rise from 5.91m tonnes/year in 2017
- Capacity rises strongly from 2012 to reach 8.6m tonnes/year in 2019/20

TDI SUPPLY & DEMAND FORECAST



SOURCE: Supply & Demand Window, ICIS Dashboard

80%

TDI operating rate peaked in 2016 and is forecast to slump to 73% in 2018

- Production rises by 37% from 2012 to 2022 as it increases from base of 1.83m tonnes/year
- 2015 collapse in operating rate was caused by a 13% hike in capacity that year

ICIS SUPPLY AND DEMAND DATABASE

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14%
DERIVATIVE

GASOLINE BLENDING

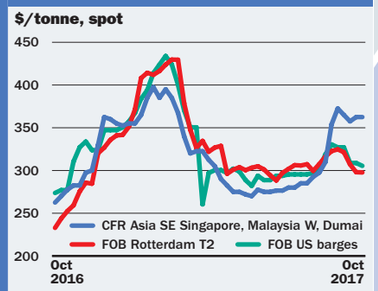
- China methanol consumption in the gasoline sector was around 7.95m tonnes in 2016, up by 7% YOY
- Use of methanol as a blending additive remains only significant in the provinces of Shanxi, Shaanxi, Jiangsu, Guangdong and Shandong. Market players do not expect provincial governments to encourage more methanol to be blended into gasoline in the near term
- Market players expect to see stagnant growth for methanol blended into gasoline for the near future due to a lack of clear support from the Chinese government. Gasoline blending policies for methanol have been unchanged since 2015
- The National Standard for M15 Methanol Gasoline remains in limbo, and market players are unsure of when the unified technical indicators for M15 methanol gasoline will be implemented, if ever

FEEDSTOCK

METHANOL

- Apart from the uses listed, formaldehyde (a precursor for adhesives and resins) consumes 30% of global production
- Europe is a net importer, new projects due onstream in US, Russia, Iran and Netherlands
- Europe prices closely driven by China, an alternative destination for key producers such as Middle East
- Europe consumption healthy in 2017 and modest growth expected in 2018, led by eastern Europe
- US production poised to hit 7.5m tonnes/year after OCI project starts up
- US methanol exports continue to grow while imports fall
- Natural gas has made US methanol competitive to Middle East
- China is the largest Asia consumer, Asia prices tend to track China
- Price direction in China dictated by futures when supply/demand stable

GLOBAL METHANOL PRICES



METHANOL PROJECTS

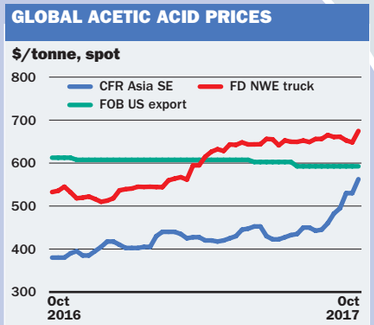
COMPANY, LOCATION	CAPACITY*	START-UP
OCI, Beaumont, Texas, US	1,750	Q1 2018
Shchekinoazot, Russia	450 (expansion)	Q1 2018
Kaveh Methanol, Iran	2,400	H1 2018
Marjan Methanol, Iran	1,700	H1 2018
BioMCN, Netherland	430	Nov-18
US Methanol (Liberty One), West Virginia, US	195	H2 2018

9%
DERIVATIVE

ACETIC ACID

- Used in the production of vinyl acetate monomer (VAM), ethyl acetate, butyl acetate, purified terephthalic acid (PTA), acetic anhydride and monochloroacetic acid
- European prices are mainly influenced by the regional methanol contract
- Damage to US production means supply to Europe will be limited in near term
- Europe relies on imports. More Saudi product could enter the market in 2018
- Spot prices started to decline after the spikes caused by Hurricane Harvey
- Onset of the winter wash and anti-freeze season should keep Europe stable
- The main price drivers in Asia are caused by tight supply, plant shutdowns, planned and unplanned, and spikes in methanol feedstock costs
- Extended price rally in China and tight export availability, despite fewer plant outages compared to previous years, suggests sustained demand growth from the downstream PTA and acetic-to-ethanol sector

GLOBAL ACETIC ACID PRICES



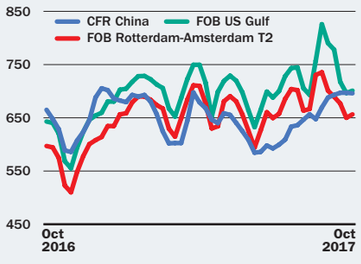
ACETIC ACID PROJECTS

COMPANY, LOCATION	CAPACITY*	START-UP
Bushehr Petrochemical, Iran	300	2018

13%
DERIVATIVE

MTBE

GLOBAL MTBE PRICES



MTBE PROJECTS

COMPANY, LOCATION	CAPACITY*	START-UP
S-Oil, Onsan, South Korea	350	by Q2 2018
FPCC, Mailiao, Taiwan	200	end-Q3 2018
Luoyang Hongli, Henan, China	100	by Q2 2018
Shandong Huachao, Shandong, China	200	by Q2 2018
Sinochem Quanzhou, Fujian, China	80	by Q3 2018
Sinopec Yanshan Petrochemical, Hebei, China	100	by Q3 2018

- Europe MTBE consumption guided by fuel market, as it is blended into gasoline as an octane booster
- Key driver is switch between summer and winter gasoline with less MTBE
- Europe drivers include tighter feedstock Raffubate-1, turnarounds, higher demand in Latin America and fellow octane booster ethyl tertiary butyl ether (ETBE)
- In US, used as gasoline additive, mostly exported, so driven by global factors
- US MTBE exported to Mexico, Venezuela, Chile and Europe, especially Belgium
- Hurricane Harvey affected US production at the end of August and early September
- Chinese MTBE supply affected by feedstock costs, environment inspections
- Chinese demand driven by gasoline blending which absorbs 90% of production
- Elsewhere in Asia, demand is driven by gasoline blending in Singapore and prices of other blendstocks such as aromatics products. Asia supply determined by price spread to Europe

9%
DERIVATIVE

METHANOL-TO-OLEFINS

- There are nine methanol-to-olefins (MTO) plants in China, with a combined capacity of around 4.455m tonnes/year as of October 2017, according to ICIS China. Their consumption of methanol was estimated at 9.254m tonnes/year in 2016
- Four MTO projects in China with capacity of 1.27m tonnes/year are under construction. If completed, MTO capacity will reach 5.725m tonnes/year in 2017, leading to 11.3m tonnes/year of methanol consumption, or 45% of the China total.
- The MTO industry is the single largest consumer of methanol in China. Near term consumption growth is expected to be led along by the MTO industry, with other industries only expected to see modest growth.
- Persistently high import methanol prices in China seen since Q3 2016 were supported by new MTO capacities that came online in 2016 and 2017.

MTO PROJECTS

COMPANY, LOCATION	CAPACITY (C2/C3)*	START-UP
Shandong Luxi, Shandong, China	200	Nov,2017
Jilin Connell, Jilin, China	300	Nov,2017

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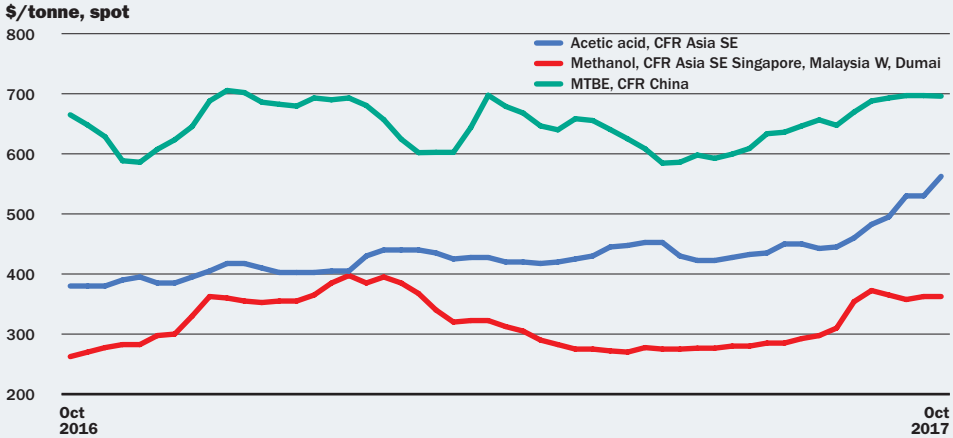
TRIXIE YAP SINGAPORE
RACHEL QIAN SINGAPORE

*Capacity '000 tonnes/year
**Total ethylene and propylene capacity combined

METHANOL

METHANOL VALUE CHAIN – REGIONAL BREAKDOWN

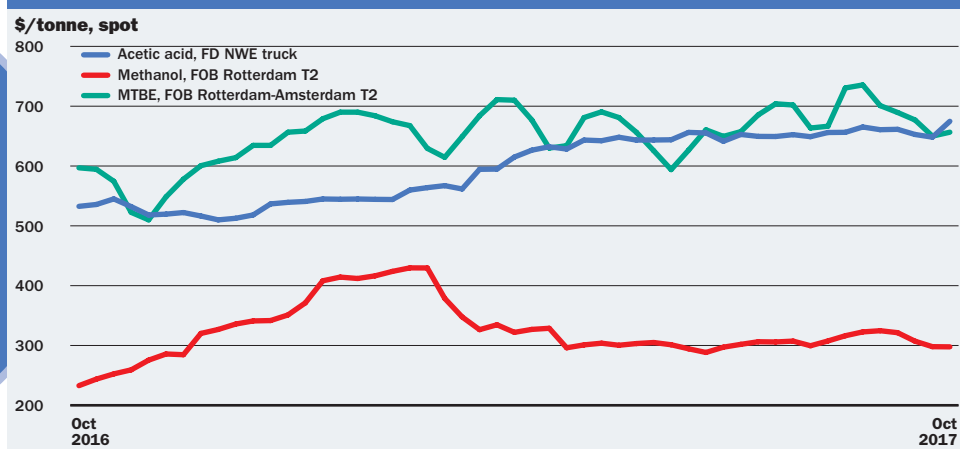
METHANOL VALUE CHAIN - ASIA PRICES



16%

increase in Asia MTBE prices from mid-period lows to reach $697/tonne

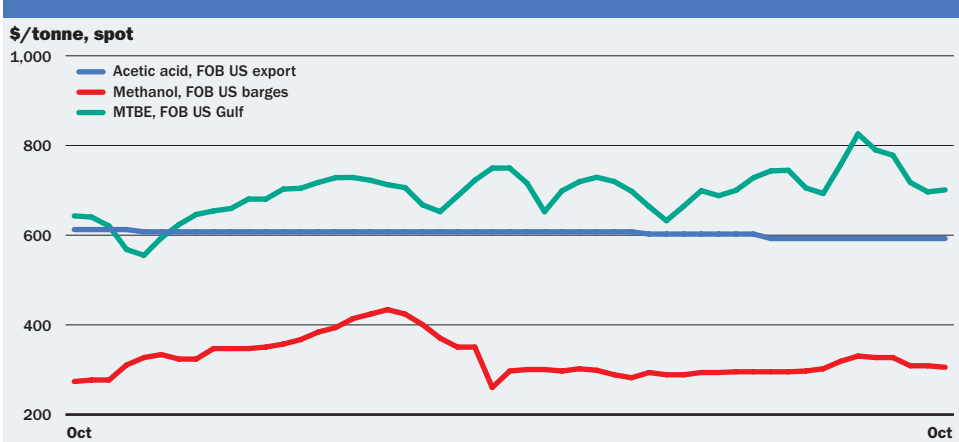
EUROPE PRICES - METHANOL VALUE CHAIN



$430

Peak Europe methanol price, rising from $233/tonne at the start of the period

METHANOL VALUE CHAIN - US PRICES

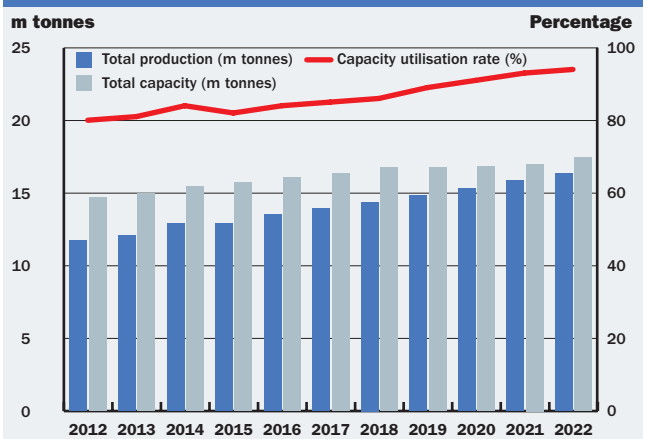


$600

US acetic acid price remains range-bound for 12 months on an FOB US export basis

METHANOL VALUE CHAIN – SUPPLY & DEMAND FORECASTS

ACETIC ACID GLOBAL FORECAST



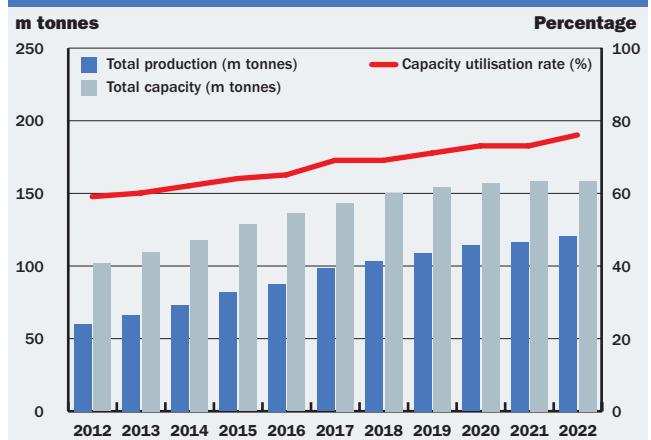
SOURCE: ICIS SUPPLY & DEMAND WINDOW, ICIS DASHBOARD

94%

Acetic acid global operating rate in 2022 from 85% in 2017

- Capacity edges up from 16.7m tonnes in 2018 to reach 17.5m tonnes in 2022
- From 2012, production goes from 11.7m tonnes to 16.4m tonnes leading to a tighter supply/demand balance

GLOBAL METHANOL FORECAST



SOURCE: ICIS SUPPLY & DEMAND WINDOW, ICIS DASHBOARD

69%

Operating rate in 2017, advancing to 76% in 2022

- Production is 98.4m tonnes in 2017 and then jumps rapidly to 108.9m tonnes in 2019
- Capacity also advances quickly during the same period, from 143.5-154.3m tonnes

Imagnechina/REX/Shutterstock

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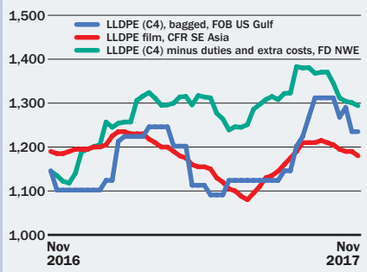
VALUE CHAIN ETHYLENE

66.5% DERIVATIVE
POLYETHYLENE

GLOBAL POLYETHYLENE



POLYETHYLENE PROJECTS

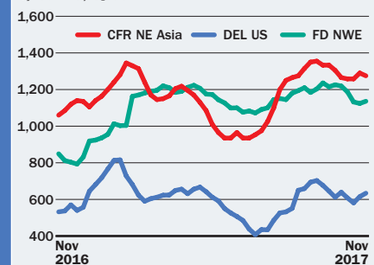
Company, location	Capacity*	Start-up
INEOS Sasol, US	470	End 2017
DowDuPont, US	350	Q1 2018
Formosa Plastics, US	800	H2 2018
Sasol, US	470	H2 2018
DowDuPont, US	125	2018
LyondellBasell, US	500	Mid-2019
Sasol, US	420	2019

- Used in packaging such as plastic bags, films, containers and bottles and also in agriculture.
- Europe reliant on imports, expecting more from new North America capacities. Impact on pricing expected in 2018.
- US PE sellers gearing up for greater exports in 2018 after 3.6m tonnes/year of new capacity in 2017.
- Ethane cost advantage keeps US plants competitive although costs may rise on higher demand.
- Limited new capacity growth in Asia in 2018 as most projects are to be completed in 2020 and beyond.
- Middle East PE exporters poised to see increased competition, market shares in Asia to come under pressure.
- US supply to be main driver for Latin America with prices expected to drop.
- US exports may hurt integrated PE operations in Asia from H2 2018.

FEEDSTOCK
ETHYLENE

- Europe market buoyed by low oil prices, healthy cracker margins and robust demand, but benefits could diminish in 2018 on higher oil prices and US start-ups.
- Demand for ethylene derivatives in Europe could be boosted in the short to medium-term following Hurricane Harvey in the US.
- Hurricane Harvey in late August caused multiple outages in the US Gulf region with most resolved by the end of Q3 and some extending into November. Several projects delayed into 2018.
- Asia market expected to be structurally tight in 2018 on heavy turnaround schedule in Japan and new downstream capacities in Thailand, South Korea and China.

GLOBAL ETHYLENE



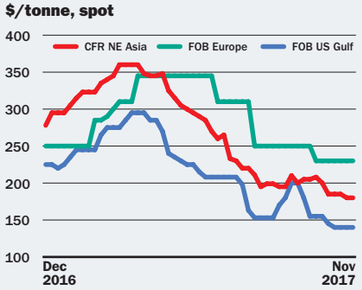
ETHYLENE PROJECTS

Company, location	Capacity*	Start-up
Indorama, US	440	Early 2018
CNOOC/Shell (CSPC), China	1,000	Q1 2018
Chevron Phillips, US	1,500	Q1 2018
S-Oil, South Korea	200	Q2 2018
Formosa Plastics, US	1,200	Q2 2018
Shintech, US	500	Q2 2018
ExxonMobil, US	1,500	Mid-2018
Sasol, US	1,500	H2 2018
Zhong'an Lianhe Coal Chemical, China	350	H2 2018
Lotte, South Korea	200	Dec 2018

10.9% DERIVATIVE
ETHYLENE DICHLORIDE

- Europe market to become structurally tighter on mercury cell, therefore feed-stock chlorine, closures.
- Increased level of imports to Europe expected from the Middle East and US.
- Most global EDC demand driven by downstream polyvonyl chloride (PVC).
- Asia demand for imported EDC hinges on profitability of caustic soda for regional producers.
- Southeast Asia buyers may face higher prices versus their northeast Asia counterparts due to closure of Europe mercury cell capacity.
- Much of global PVC demand driven by construction activity and demand for resin to make PVC construction materials.
- US producers exported 1.3m tonnes of EDC in 2016 and sales to international markets were running about 3% ahead of that pace for 2017.

GLOBAL EDC

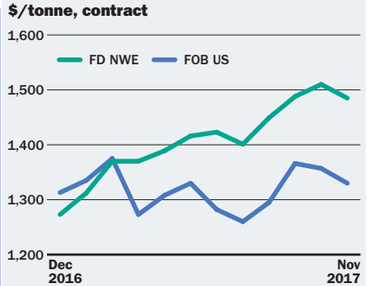


EDC PROJECTS

Company, location	Capacity*	Start-up
Shintech, US	Unspec	2020

16.0% DERIVATIVE
ETHYLENE OXIDE

GLOBAL ETHYLENE OXIDE



EO/MEG PROJECTS

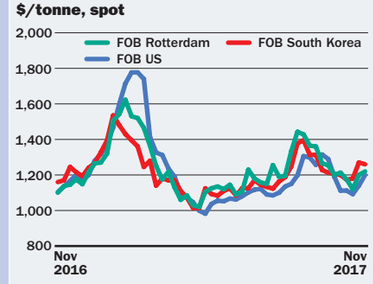
Company, location	Capacity*	Start-up
Sasol, US	300 (crude EO)	Late 2018
MEGlobal, US	750 (MEG)	H1 2019
Lotte/Westlake, US	700 (MEG)	2019
PTT Global Chemicals, US	500 (MEG)	2021

- In Europe, EO typically reflects 80-85% of the ethylene price movement. ICIS uses an average of 82%. An adder or conversion fee is included.
- Main derivative MEG prices soared at the start of 2017 on limited supply. Stable-to-soft Europe pricing seen in Q4 on easing import supply.
- Most US EO contracts are formula based on 80% of the change in ethylene plus an adder.
- US contract prices started to decline recently as the markets normalise after Hurricane Harvey.
- US demand was soft in Q2 but picked up in Q3, driven by the peak MEG/PET season and higher exports to Asia.
- US MEG margins improved, particularly from H2 2017 onwards amid strong China polyester growth rates.
- MEG demand improved in 2017 on higher import levels into China.
- Reliance started up 750,000 tonnes/year of capacity in India in Oct 2017.

6.6% DERIVATIVE
STYRENE

- Europe poised for short supply in Q1 2018 until April due to a heavy local and US, Middle East maintenance schedule.
- Europe players concerned about ongoing anti-dumping investigation for imports coming from the US, Taiwan and South Korea into China while a preliminary rate could be announced as soon as February.
- China's anti-dumping investigation is impacting US styrene exports to Asia. The US will ship more styrene to Europe until the investigation is completed in Q1.
- Downstream EPS and PS players do not expect big changes in demand in 2018.
- China remains the largest importer of styrene at over 3m tonnes/year and is expected to import at these levels in 2018 despite the increase in local capacity with three projects.
- Downstream PS and EPS margins may be threatened by rising styrene prices, although ABS margins are wide enough to cushion a styrene spike.
- No new production capacity is being planned for North America.

GLOBAL STYRENE



STYRENE PROJECTS

Company, location	Capacity*	Start-up
Qingdao Soda Ash Industry, China	500	Early 2018
Anhui Haoyuan Chemicals, China	260	2018
Dalian Hegli Petrochemicals	720	2018

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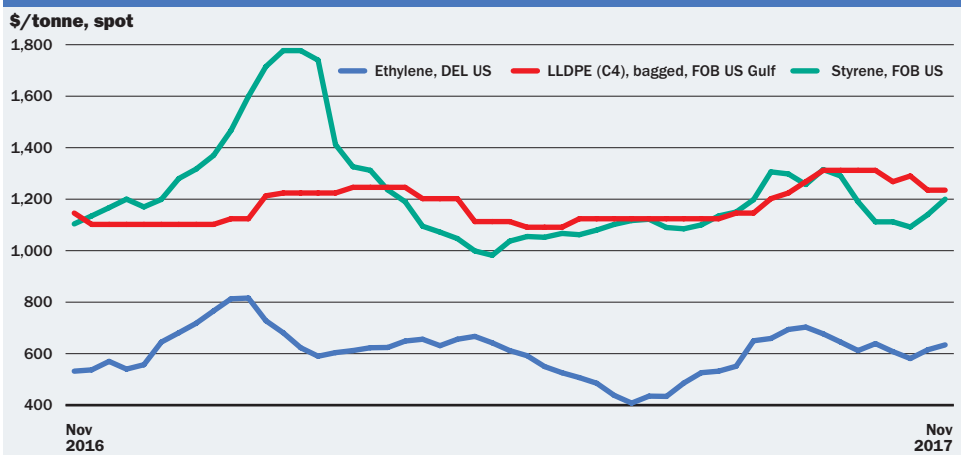
SUPPLY & DEMAND FORECASTS
PAOLO SCAFETTA VERGIATE, ITALY
JAMES WILSON LONDON

NOTES: *Capacity '000 tonnes/year

ETHYLENE

ETHYLENE VALUE CHAIN – REGIONAL PRICES

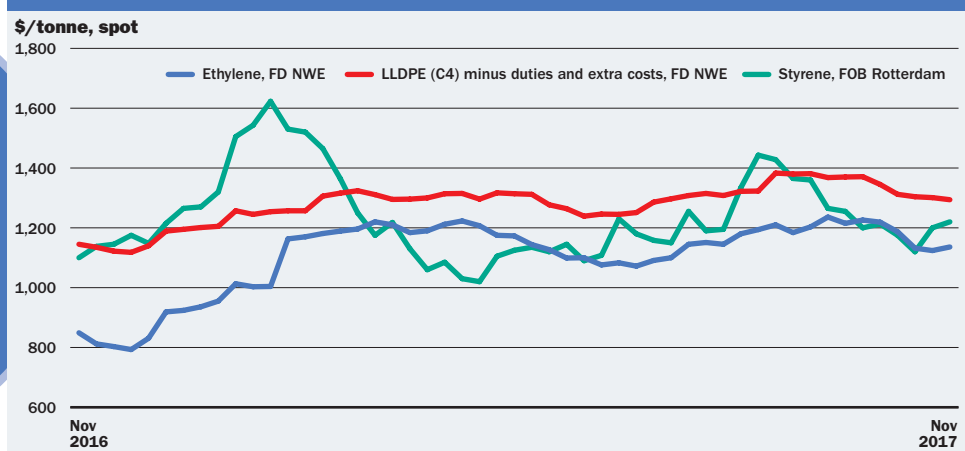
ETHYLENE VALUE CHAIN - NORTH AMERICA



$1,312

Peak price for US LLDPE in 2017, which was 20% higher than its low

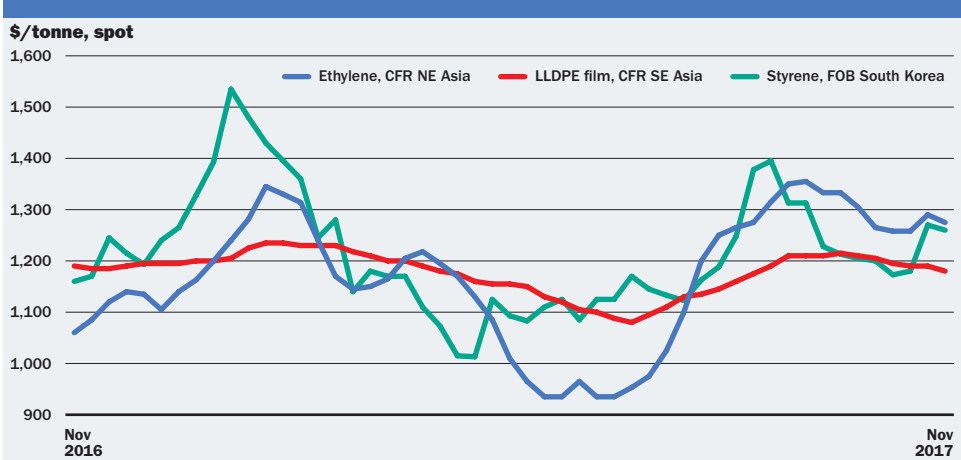
ETHYLENE VALUE CHAIN - EUROPE



56%

Increase in Europe ethylene prices at their peak of $1,236/tonne in Oct 2017 from the low in Dec 2016

ETHYLENE VALUE CHAIN - ASIA

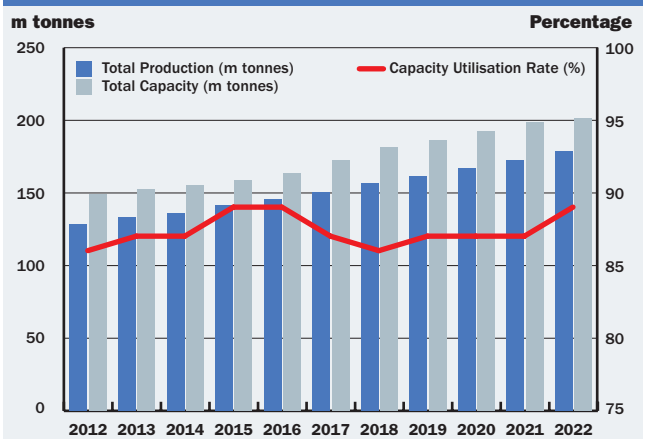


34%

Plunge in Asia styrene prices from their peak in Feb 2017 to the low in May 2017

ICIS ETHYLENE VALUE CHAIN SUPPLY & DEMAND FORECAST

ETHYLENE SUPPLY & DEMAND FORECAST



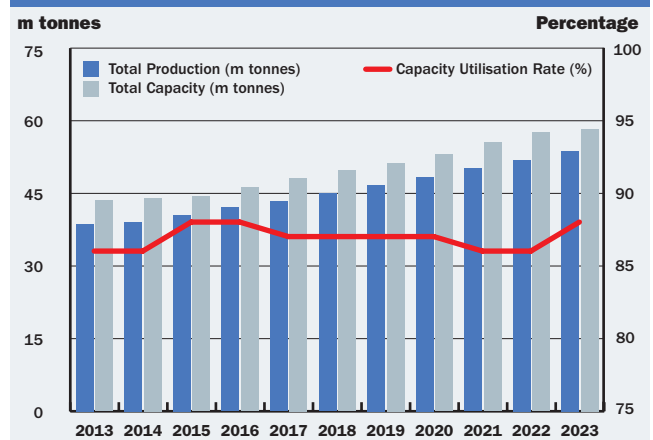
SOURCE: Supply & Demand Window, ICIS Dashboard

87%

Average operating rate between 2017-2021, down 2% on 2016

- Excessive capacity additions scheduled by the US, the Middle East and China are responsible for the drop in operating rates
- Asia will see highest increase in demand for plastics while Europe remains weak

HDPE SUPPLY & DEMAND FORECAST



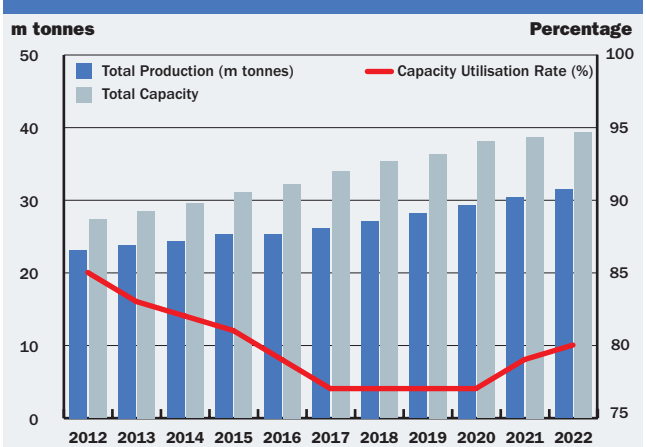
SOURCE: Supply & Demand Window, ICIS Dashboard

87%

Flat operating rate from 2017 until 2020 then decline to 86% to 2022

- Production increases steadily from 43m tonnes/year in 2017 to hit 54m tonnes/year in 2023
- 22% hike in production capacity from 2013 to reach 58m tonnes/year in 2023

ETHYLENE OXIDE SUPPLY & DEMAND FORECAST



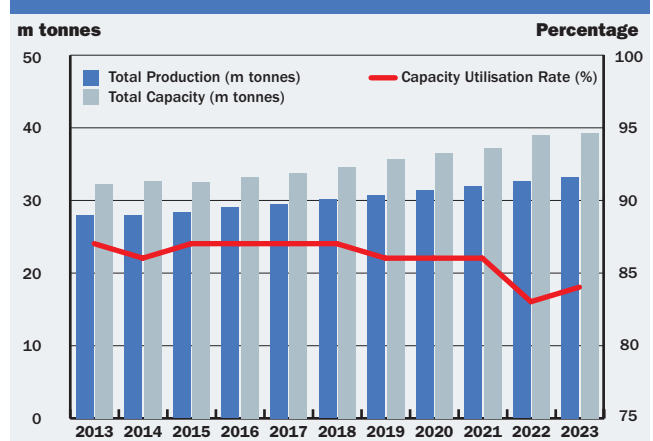
SOURCE: Supply & Demand Window, ICIS Dashboard

77%

Flat operating rate from 2017-2020 followed by gentle rise to 80%

- Production ramps up to 31.5m tonnes/year in 2022 from 26m tonnes/year in 2017
- Capacity peaks at 39m tonnes/year from lows of 27m tonnes/year in 2012

STYRENE SUPPLY & DEMAND FORECAST



SOURCE: Supply & Demand Window, ICIS Dashboard

83%

Operating rate declines from 2017 to bottom out at 83% in 2022

- Production rises steadily from 28m tonnes/year in 2013 to peak at 33m tonnes/year in 2023
- By 2018 capacity increases from 35m tonnes/year to hit 39m tonnes/year in '23

ICIS SUPPLY AND DEMAND DATABASE

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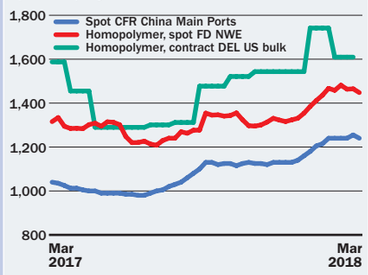
VALUE CHAIN PROPYLENE

PROPYLENE

64% DERIVATIVE
POLYPROPYLENE

GLOBAL PP PRICES



- Polypropylene (PP) is used in consumer and industrial products, key applications in packaging, fibres and automotive parts
- Europe PP demand to remain healthy
- Europe producers confident for at least H1 2018
- US propylene supply disruptions result in volatile PP prices
- US producers hope to expand margins after flat 2017
- US imports may rise if domestic prices continue to rise
- Asia PP rises above linear low-density polyethylene (LLDPE) in Asia because of scarce Middle East supply
- China capacity to grow as country strives for self-sufficiency
- Southeast Asia upbeat on growth in demand from untapped markets like Cambodia, Laos and Myanmar

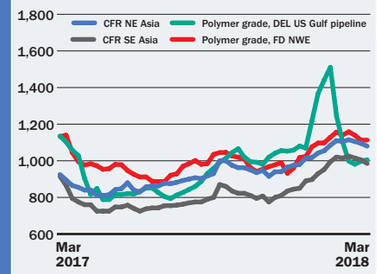
POLYPROPYLENE PROJECTS

Company, Location	Capacity*	Start-up
CNOOC Huizhou, China	400	Mar-18
Haiwei, Hebei, China	200	Mar-18
Nghi Son, Vietnam	400	H1 2018
Huating Coal, China	200	Jun-18
Yanchang Yan'an, China	250	Jul-18
Chandra Asri, Indonesia	80	Q3 2018
Hengli Petrochemical, China	440	Nov-18
Zhong'an Lianhe Coal, China	350	Nov-18
Lotte Titan, Malaysia	200	2018

FEEDSTOCK
PROPYLENE

- Europe maintenance to keep supply balanced-to-tight through May
- Derivative maintenance will offset a little but robust demand to persist
- US imports could ease tight supply
- US production expanding as new PDH ramps up
- US demand set to rise as prices fall from highs
- Heavy US turnaround season may slow inventory recovery
- In Asia heavier turnaround schedule expected to support spot prices
- Production losses up 8.6% year-on-year in northeast Asia (excluding China) peak in October but March, June losses high
- China imported 3.01m tonnes in 2017. 2018 expected similar
- China imports from southeast Asia grow, Japan to slow

GLOBAL PROPYLENE



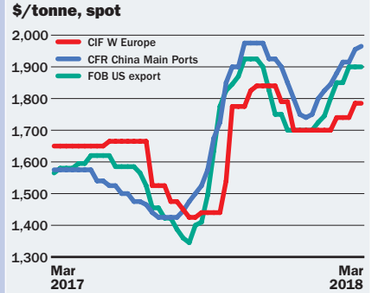
PROPYLENE PROJECTS

Company, Location	Capacity*	Start-up
Enterprise, Mont Belvieu, Texas	750	Now
CNOOC, Shell, Guang Dong, China	580	Q1 2018
Connell Chemical, Ji Lin, China	150	Early 2018
Borealis, Antwerp, Belgium	740	2020
Grupo Azoty, Police, Poland	400	2022

7% DERIVATIVE
ACRYLONITRILE

- Used for polyacrylonitrile, acrylonitrile butadiene styrene (ABS), SAN and synthetic rubber
- European acrylonitrile (ACN) supply tight with little relief expected until summer following repeated production problems at INEOS's Seal Sands plant
- Europe maintenance in March/April leave little extra material available and spot tight
- Demand strong in early 2018 likely to persist until summer as buyers try to catch up from 2017 shortages
- US supply expected to remain snug
- Global demand expected to see continued strength
- Asia prices gain support from supply constraints. Heavy turnaround season in April-May
- Tight global supply limits deep-sea imports to Asia so no respite to tight supply
- Demand is expected to hold steady.

GLOBAL ACN PRICES

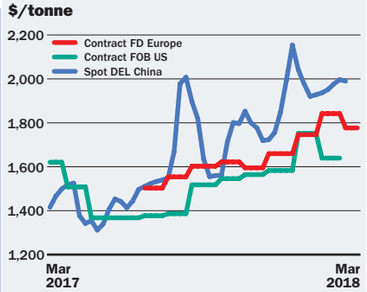


ACRYLONITRILE PROJECTS

Company, Location	Capacity*	Start-up
Shandong Haili Chemical, China	130	2017, delayed

8% DERIVATIVE
PROPYLENE OXIDE

GLOBAL PROPYLENE OXIDE



- Europe demand expected to closely follow GDP (gross domestic product) and seasonality
- Despite Sadara propylene oxide (PO) and MPG coming on stream in mid-2017, Europe has not seen new volumes
- 2018 contract adders higher, because PO is expected to be finely balanced to tight, structurally, in 2018 thanks to robust demand and higher captive requirements
- Polyether polyol demand expected to grow in excess of GDP
- Propylene glycol demand strong at the start of the year during the antifreeze and de-icing season
- China's domestic prices likely to find support in H1 as Q2 plant turnarounds tighten supply
- Sumitomo Chemical and Asahi Glass have turnarounds in May and June so Saudi-origin material will be diverted
- Regional tight supply in Asia is expected to be alleviated in the second half of the year from additional capacity from South Korea's S-Oil, which is due to come on stream in late-Q2 or Q3

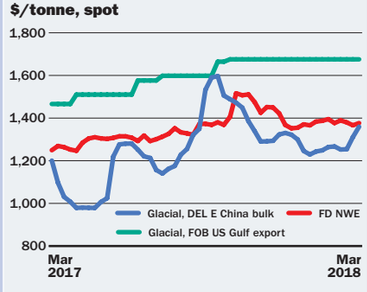
PROPYLENE OXIDE PROJECTS

Company, Location	Capacity*	Start-up
Nanjing Hong Bao Li, China	120	H1 2018
S-Oil, South Korea	300	Q3 2018
Blue Planet Eco New Materials, China	400	2018
Jinling Chemical, China	200	2018
Jiangsu Yida Chemical, China	220	2018 or later
Tianjin Dagu, China	200	2018 or later
Fujian Lianhe Chemical, China	300	2019 or later

4% DERIVATIVE
ACRYLIC ACID

- Used in paints and coatings, adhesives, super-absorbent polymers (SAP) plus water-treatment chemicals
- Europe demand flat to slightly up largely in line with GDP (gross domestic product)
- Nippon Shokubai is bringing a 100,000 tonne/year acrylic acid (AA) plant on line at Antwerp in 2018, along with an SAP plant of the same capacity
- Europe market largely balanced
- US demand moderately outpacing domestic supply, imports are competitive
- US seasonal and pent-up demand will peak in the second and third quarters
- US contract, spot pricing will largely track major feedstock propylene trends
- Asia suppliers bullish on pricing, cite upward cost pressure
- Supply/demand largely balanced in southeast Asia
- Amid talk of planned maintenance in Asia, supply concerns loom

GLOBAL ACRYLIC ACID PRICES



ACRYLIC ACID PROJECTS

Company, Location	Capacity*	Start-up
Wanhua, Shandong, China	100	2018
Shandong Nuoer, Shandong, China	80	2018
Shandong Hongxin, Shandong, China	80	2018
Shengke Chemical, Jiangsu, China	160	2018
Jiangsu Sanmu, Jiangsu, China	160	2018
Gazprom Neftekhim Salavat, Bashkortostan, Russia	80	2018

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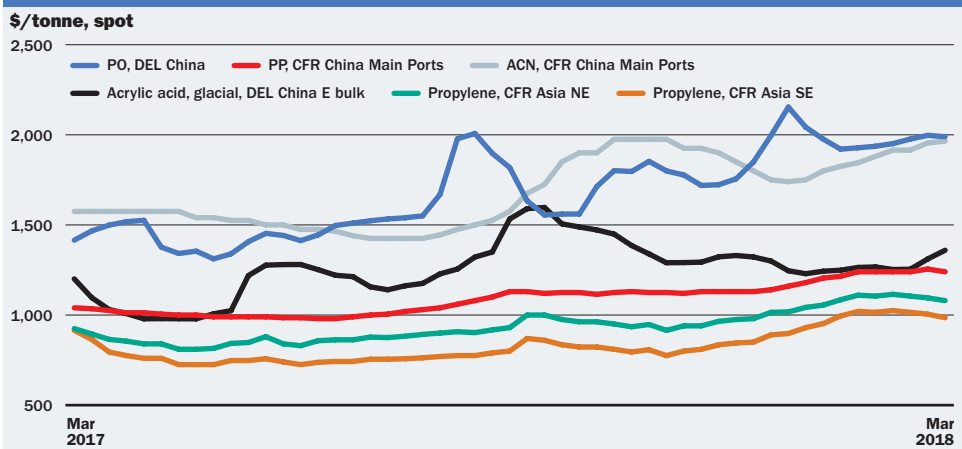
PROPYLENE OXIDE
TARUN RAIZADA HOUSTON
ACRYLIC ACID
LARRY TERRY HOUSTON

*Capacity '000 tonnes/year

REGIONAL BREAKDOWN OF PROPYLENE VALUE CHAIN PRICES

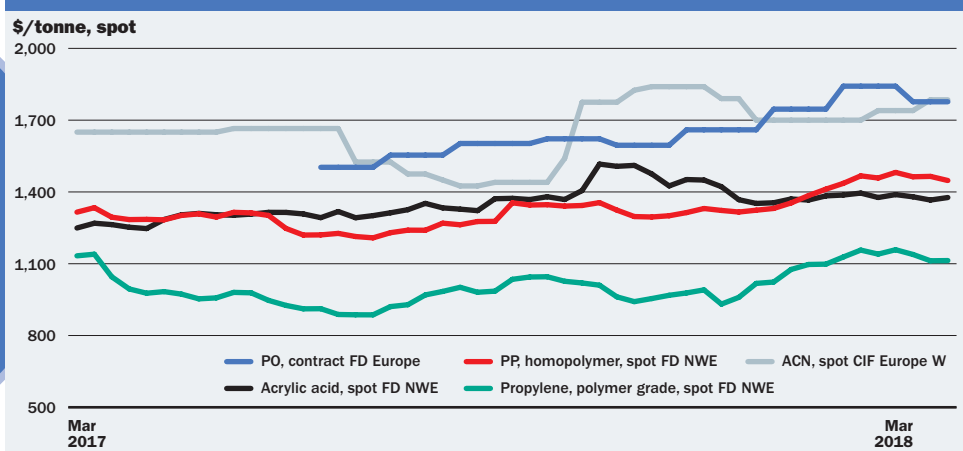
PROPYLENE VALUE CHAIN - ASIA



64%

Hike in China PO prices from lows of $1,311.65 to reach $2,153.77/tonne

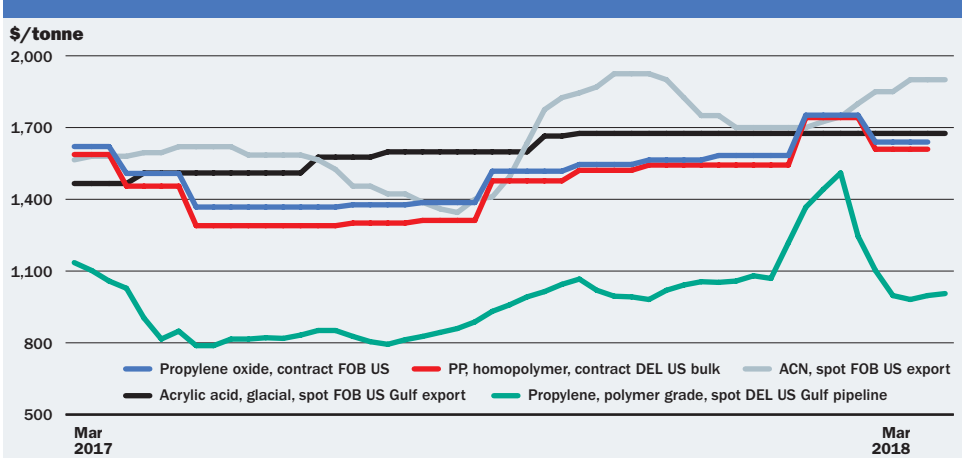
PROPYLENE VALUE CHAIN - EUROPE



$886

Lowest Europe propylene price followed by rise to $1,158.45/tonne as oil prices increased

PROPYLENE VALUE CHAIN - US

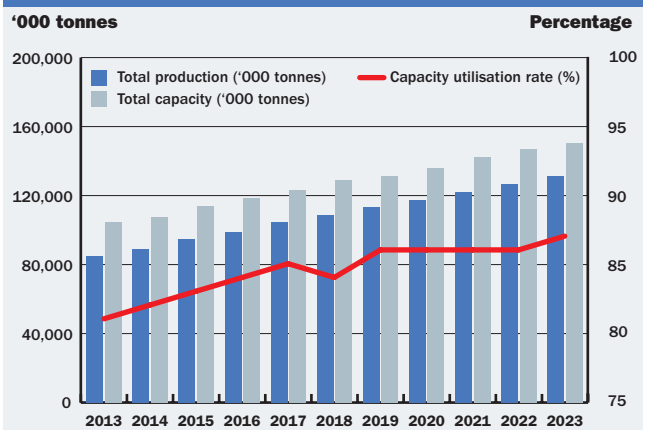


$1,925

Peak ACN price following steep rise from $1,345/tonne

SUPPLY & DEMAND TRENDS FOR PROPYLENE VALUE CHAIN

GLOBAL PROPYLENE SUPPLY & DEMAND



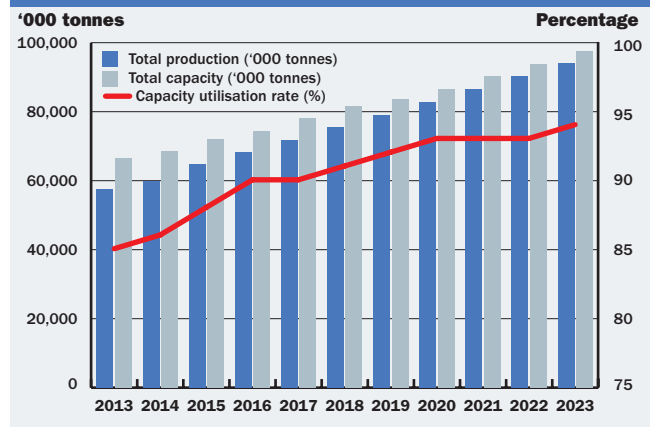
SOURCE: Supply & Demand Window, ICIS Dashboard

1%

dip in operating rate from 2017 to 84% in 2018 from lows of 81% in 2013

- Capacity peaks at 150m tonnes/year by 2023 after a steady rise from just 105m tonnes/year in 2013
- 20% rise in production from 2018 to reach 131m tonnes/year in 2023

GLOBAL PP SUPPLY & DEMAND



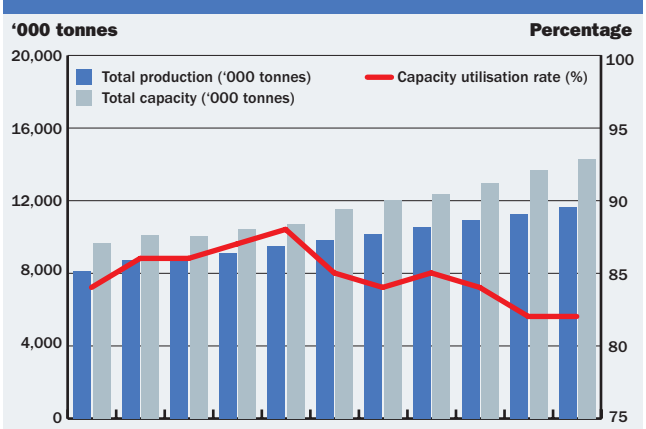
SOURCE: Supply & Demand Window, ICIS Dashboard

94%

capacity utilisation in 2023 as polypropylene gets tighter

- PP capacity is 81.5m tonnes/year in 2018 as it increases steadily to reach 97.5m tonnes/year by 2023
- Production is 75.4m tonnes/year in 2018, up from just 57.5m tonnes in 2013

GLOBAL PROPYLENE OXIDE SUPPLY & DEMAND FORECAST



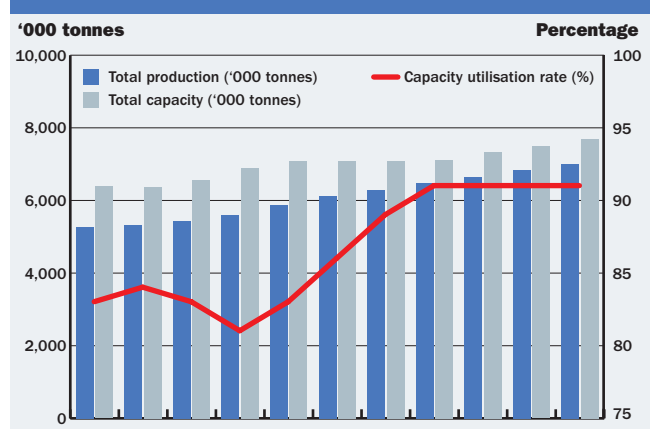
SOURCE: Supply & Demand Window, ICIS Dashboard

81%

Operating rate in 2022-23 following an uneven decline from 88% in 2017

- 24% increase in capacity from 2018 until 2023 to reach 14.2m tonnes/year
- Production rises from 9.8m tonnes to reach 11.7m tonnes/year in 2023

GLOBAL ACN SUPPLY & DEMAND FORECAST



SOURCE: Supply & Demand Window, ICIS Dashboard

81%

lowest operating rate for global ACN followed by gentle rise to 91%

- Capacity is stable at 7.1m tonnes 2017-2019 with rise to 7.7m tonnes/year by 2023
- Production rises by 14% between 2018 and 2023 to peak at 7m tonnes

ICIS SUPPLY AND DEMAND DATABASE

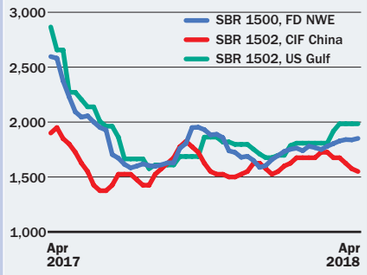
The ICIS Supply and Demand database provides a comprehensive picture of global supply and demand for the full spectrum of products from oil to chemical intermediates. Its range of product selection options help explain historical price movements, changes in company ownership and illustrates changing supply patterns in the future. It allows you to refine, sort, slice and export data, or create graphs and charts to illustrate your findings more easily and support your strategic planning. For more information or to request more information, please visit **www.icis.com/supplydemand**

BUTADIENE

36% DERIVATIVE SBR

GLOBAL SBR PRICES

$/tonne, spot non-oil



GLOBAL SBR PROJECTS

Company, location	Capacity*	Start-up
SRI (Michelin Chandra Asri JV), Cilegon, Indonesia	120	Q2 2018

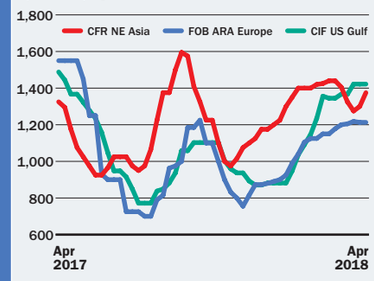
- Main use is tyre products. Other uses include conveyor belts, gaskets, hoses, floor tiles, footwear and adhesives
- Asia styrene butadiene rubber (SBR) prices to stay firm in Q2 on demand
- Higher feedstock butadiene (BD) costs to bolster SBR price
- Rising natural rubber price to support SBR demand
- Poor export opportunity to Asia in first quarter of 2018
- Increased Europe exports to South Africa following closure in April
- 2018 domestic supply in Europe is more balanced than in 2017
- US SBR prices facing upward pressure, little demand destruction from surging BD
- SBR demand from automotive sector mixed: new equipment strong, replacement steady to soft
- US producers running hard, import volumes at attractive prices, but activity thin

FEEDSTOCK BUTADIENE

- Asia BD supply constrained by spate of plant turnarounds
- Regional and deep-sea cargoes from Europe diverted to the US
- CSPC's new 180,000 tonne/year BD plant to ease supply in May
- Europe supply constrained through planned and unplanned outages and light feedstock cracking
- European domestic demand healthy, but export focus shifts to US
- European spot prices expected to remain firm and on steady uptrend
- US – snug supply form lighter cracking as crude oil rises
- Steady but low demand growth in US
- Continued need for imports of BD to US, crude C4 from Europe

GLOBAL BD PRICES

$/tonne, spot



GLOBAL BUTADIENE PROJECTS

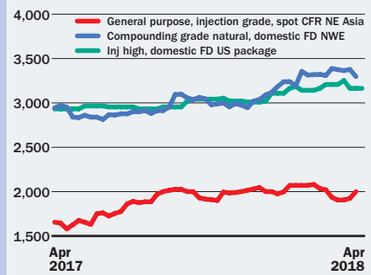
Company, location	Capacity*	Start-up
CSPC (CNOOC Shell JV), Huizhou, China	180,000	Late April

12% DERIVATIVE ABS

- Acrylonitrile-butadiene-styrene (ABS) is used in consumer electronics, toys and car components
- US ABS contracts down in Q2 linked to lower upstream, weaker Asia prices
- Demand in China not recovered after Lunar New Year, more exports to US
- US imports and exports climbed in 2017 led by South Korea and Taiwan (together 64% of total)
- Northeast Asia consumption rose after China scrap plastic ban. China demand expected to grow 5-6% this year, lower than last year (11%)
- China plants to maintain high operating rates on good margins. Asia capacity set to rise on China projects
- Europe April contracts drop on raw material declines
- Further decreases expected for Europe in May if styrene falls
- European supply expected to remain healthy
- Sellers in Europe see strengthening demand in May, other views vary

GLOBAL ABS PRICES

$/tonne



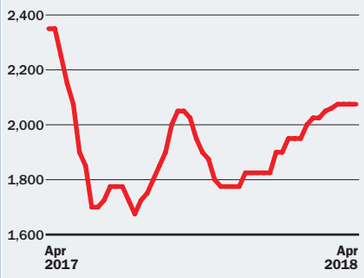
GLOBAL ABS PROJECTS

Company, location	Capacity*	Start-up
LG, Guangdong, China	150	End 2018
Keyuan, Guangxi, China	100	Q2 2018
Shandong Haili Chemical, Shandong, China	200	2018

27% DERIVATIVE PBR

ASIA PBR PRICES

$/tonne, low-CIS grade, spot CFR SE Asia



- Polybutadiene rubber (PBR) is used for tyre treads, as well as belts, hoses, gaskets and other automotive parts, as it resists cold temperatures better than other elastomers
- Asia PBR prices to stay firm in Q2 on demand
- Higher feedstock BD costs to bolster PBR price
- Rising natural rubber price to support PBR demand

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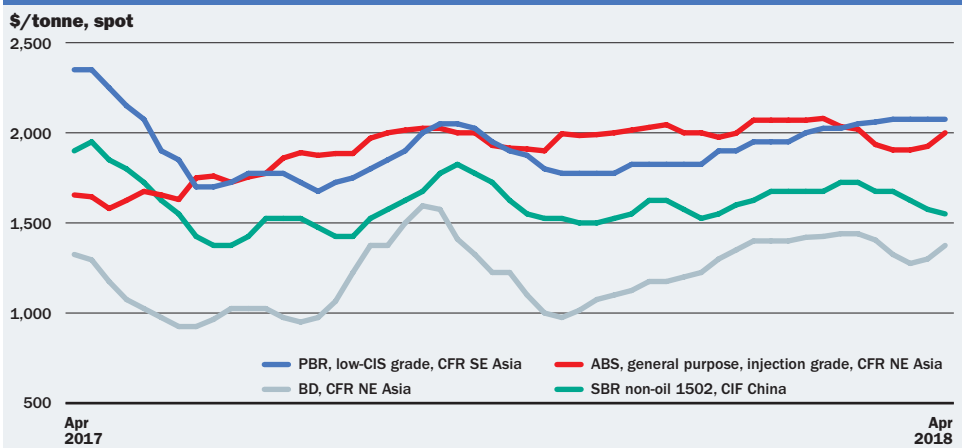
HELEN YAN SINGAPORE
US ABS
DAVID LOVE HOUSTON

*Capacity '000 tonnes/year

REGIONAL PRICES – BUTADIENE VALUE CHAIN

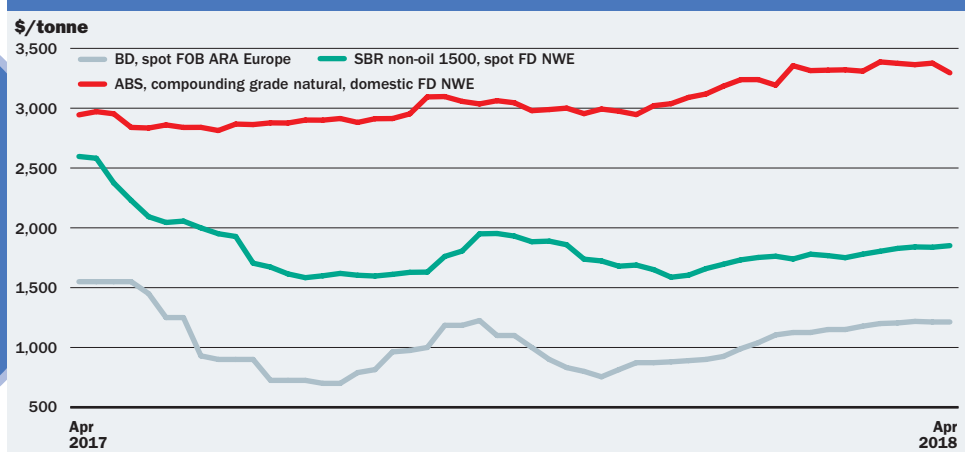
GLOBAL VALUE CHAIN: ASIA



$1,595

Peak price for Asia BD before a slump to lows of $975/tonne

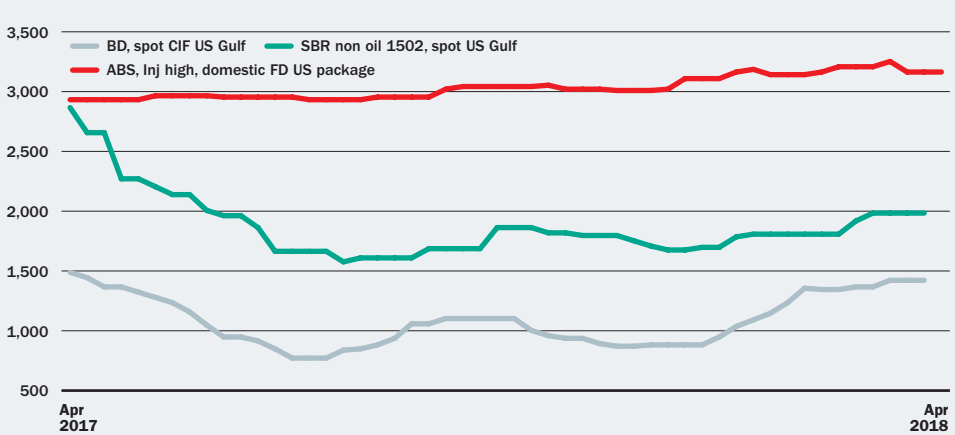
BUTADIENE VALUE CHAIN: EUROPE



$3,386

Top price for Europe ABS followed by decline to $3,295 in April 2018

BUTADIENE VALUE CHAIN: US

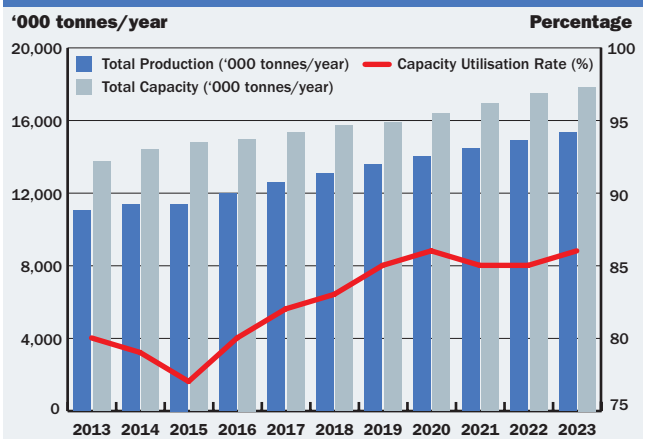


$1,742

Spread between US ABS and butadiene in April 2018

SUPPLY & DEMAND OUTLOOK FOR BUTADIENE VALUE CHAIN

GLOBAL BUTADIENE SUPPLY & DEMAND



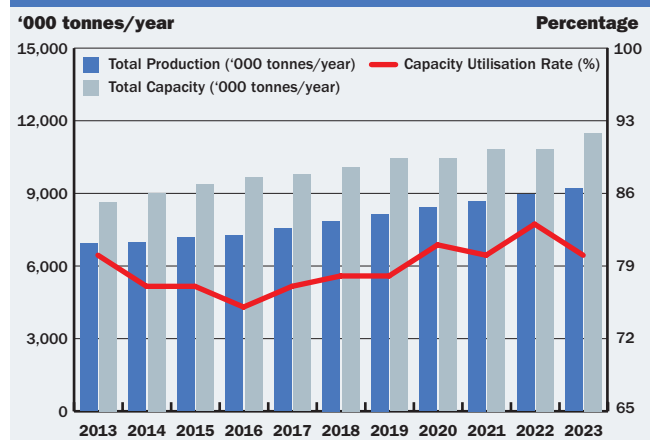
SOURCE: ICIS Supply & Demand window, ICIS Dashboard

77%

Trough operating rate for global BD in 2015 before reaching 83% in 2018

- Capacity peaks at 17.85m tonnes/year in 2023 from 13.8m tonnes in 2013
- Production reaches 15.3m tonnes/year in 2023 from 11m tonnes in 2013

GLOBAL SBR SUPPLY & DEMAND



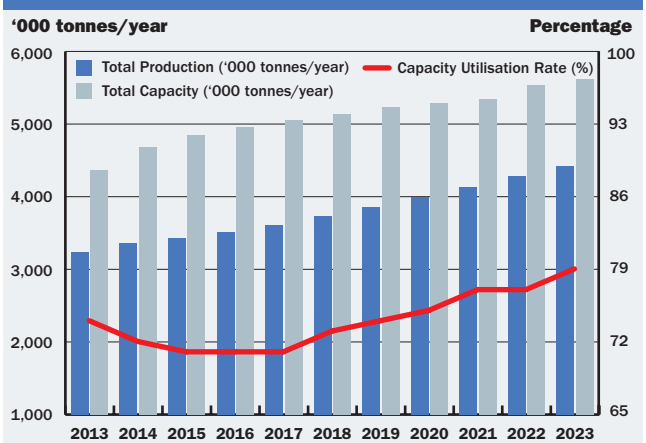
SOURCE: ICIS Supply & Demand window, ICIS Dashboard

83%

Peak operating rate in 2022 after steady rise from 78% in 2018

- Production reaches 7.8m tonnes/year in 2018, rising from 6.9m tonnes in 2013
- Capacity is 10.1m tonnes in 2018 after steady increase from 8.6m tonnes in 2013

GLOBAL PBR SUPPLY & DEMAND



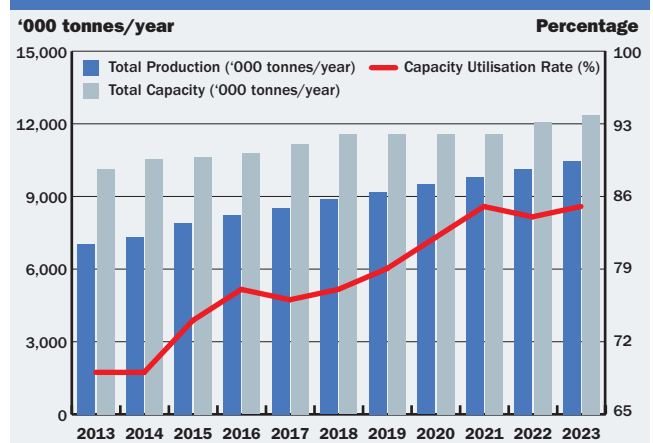
SOURCE: ICIS Supply & Demand window, ICIS Dashboard

71%

Bottom capacity utilisation 2015-2017, followed by steady rise to 79% in 2023

- Capacity rises 9% in total from 2018 to 2023 to reach 5.6m tonnes/year
- Production reaches 3.7m tonnes/year in 2018, then rises steadily to 4.4m tonnes/year in 2023

GLOBAL ABS SUPPLY & DEMAND



SOURCE: ICIS Supply & Demand window, ICIS Dashboard

69%

Operating rate for ABS in 2013, then gradual rise to peak at 85% in 2021

- ABS capacity is 11.6m tonnes/year in 2018 and remains stable until 2021
- Production is 8.9m tonnes/year in 2018 and rises to 9.8m tonnes/year in 2021

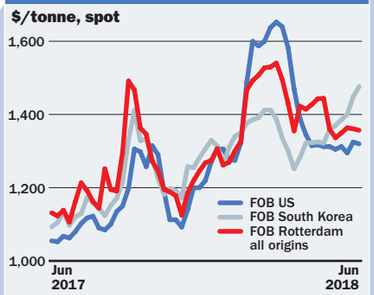
ICIS SUPPLY AND DEMAND DATABASE

The ICIS Supply and Demand database provides a comprehensive picture of global supply and demand for the full spectrum of products from oil to chemical intermediates. Its range of product selection options help explain historical price movements, changes in company ownership and illustrates changing supply patterns in the future. It allows you to refine, sort, slice and export data, or create graphs and charts to illustrate your findings more easily and support your strategic planning. For more information or to request more information, please visit **www.icis.com/supplydemand**

VALUE CHAIN BENZENE

51% DERIVATIVE STYRENE

GLOBAL STYRENE PRICES



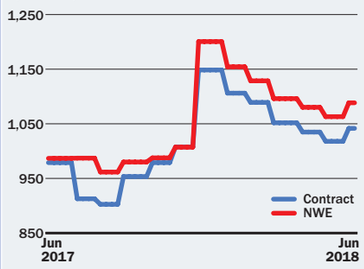
STYRENE PROJECTS

Company, location	Capacity*	Start-up
Anhui Hao Yuan Chemicals, Fuyang, Anhui, China	260	2018
YNCC, China	80	H1 2018
Zhejiang Petrochemical phase 1, Zhousan, Zhejiang, China	1,200	2018/19
Maoming Shihua, Beihai, Guangxi, China	250	2018-19
Fujian Gulei Chemicals, Zhangshou. Fujian, China	600	2018-19
Abel Chemicals No. 2 line, Taixing, Jiangsu, Huizhou, China	250	2019

- Main uses polystyrene and expandable polystyrene, about two-thirds of global consumption. Also styrene butadiene rubber, acrylonitrile-butadiene-styrene and styrene acrylonitrile resins.
- Supply improves in Europe as planned turnaround season finishes; US imports to support supply.
- Demand picks up in summer for construction; packaging flat.
- June's Europe backwardation suggests prices could correct; Q3 outlook unclear.
- US restricted all year with two plants down in January and back on line by May.
- US demand strong due to peak season in EPS and ABS.
- Asia to see expansion, mostly in China, which reduces reliance on imports.
- China antidumping on South Korea, US, Taiwan since February.
- New Asia downstream capacities planned for products like ABS.

12% DERIVATIVE CYCLOHEXANE

US AND EUROPE CYCLOHEXANE



CYCLOHEXANE PROJECTS

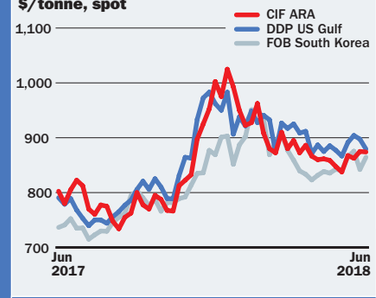
Company, location	Capacity*	Start-up
Hengshen Technology, China	420	2018
Sinopec Baling Pc, China	230	2018
Shanxi Jintaoyuan, China	210	2019
Abel Chemical	110	2019
Fujian Jinjiang Pc Comp. Lim, China	220	2020
Hengshen Technology, China	630	2020

- The vast majority of cyclohexane (CX) is used to produce nylon intermediates caprolactam (capro) and adipic acid, which are in turn made into nylon 6 and nylon 6,6.
- Northeast Asia remains the largest consumer of CX, driven mostly by China, followed by Europe and then the US.
- Consolidation in the European market over the last two years has led to structural undersupply, with imports from the US and Middle East making up for the reduced capacity.
- Production issues in various units in the US and Europe have led to tightening supply in Europe.
- Downstream nylon 6 and 6,6 demand is expected to increase globally, especially in the engineering plastics sector, which is likely to increase demand for CX, although competing feedstock phenol is likely to make up much of the additional demand.
- In Europe, demand is expected to remain broadly stable with 2017 levels.

FEEDSTOCK BENZENE

- Demand in Europe from downstream styrene to pick up once turnaround season ends.
- Crude oil at multi-year highs, little impact on benzene due to long supply.
- Prices expected to strengthen from end of Q2.
- US benzene prices softened over the first quarter of 2018 on lengthening global supply
- US contract prices see five consecutive months of decreases after hitting a 2017 peak in December.
- First-quarter US consumption subdued amid a number of downstream styrene shutdowns.
- Long supply in Asia to persist in the near term; inactive east-west arbitrage worsens supply glut.
- Weak demand in China, Taiwan and southeast Asia.

GLOBAL BENZENE



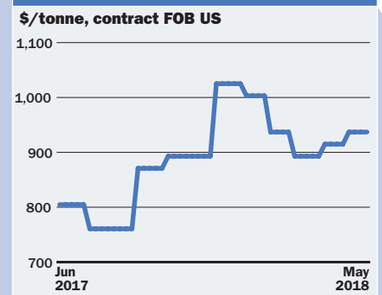
BENZENE PROJECTS

Company, location	Capacity*	Start-up
Nghi Son Refinery and Petrochemicals, Thanh Hoa Province, Vietnam	250	Jun-18
Dragon Aromatics, Fujian Province, China	520	H2 2018
Sichuan Petrochemicals, Sichuan Province, China	130	H2 2018
Maoming Petrochemicals, Guangdong Province, China	100	End May 2018

21% DERIVATIVE CUMENE

- Around 98% of cumene is used to produce phenol and its co-product acetone. However, the outlook for cumene is largely dependent on the performance of phenol's derivatives which have resulted in healthy growth rates for cumene. The largest phenol derivative is bisphenol-A (BPA), which supplies the growing polycarbonate (PC) sector.
- US production will likely remain at levels designed to closely match consumption. Structurally, supply will remain long given downstream capacity rationalisation in the past three to four years.
- Demand is expected to grow slightly in the coming months, but only domestically. Export opportunities for US cumene will be limited by ample supply in other regions.

US CUMENE



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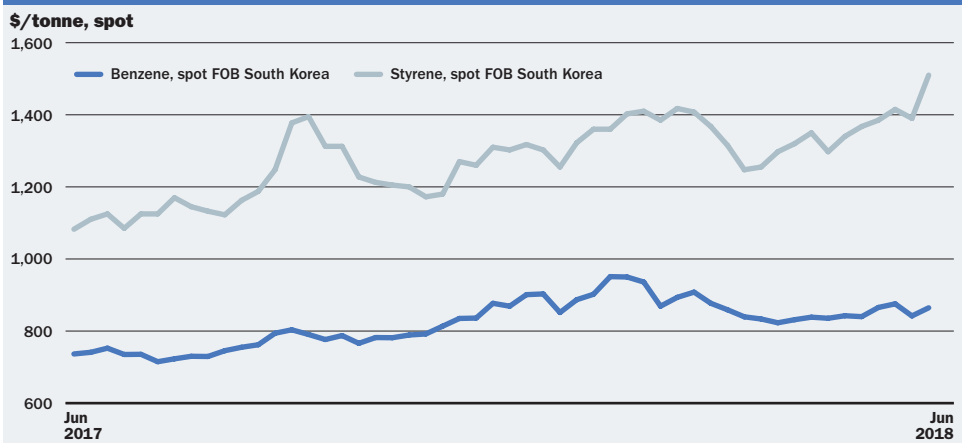
*Capacity '000 tonnes/year

BENZENE

BENZENE VALUE CHAIN – REGIONAL BREAKOUTS

BENZENE VALUE CHAIN – ASIA



NOTE: ICIS does not report Asia cumene or CX prices

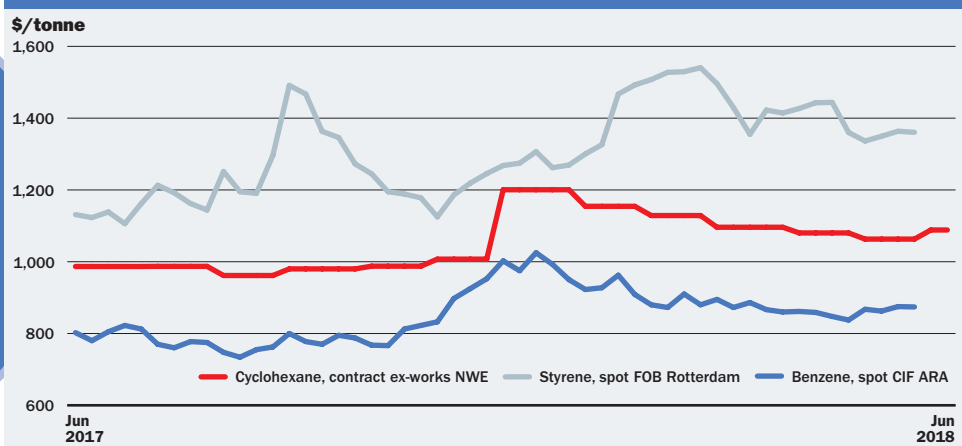
$1,510

Peak styrene price in June 2018 from lows of $1,082/tonne a year earlier

19%

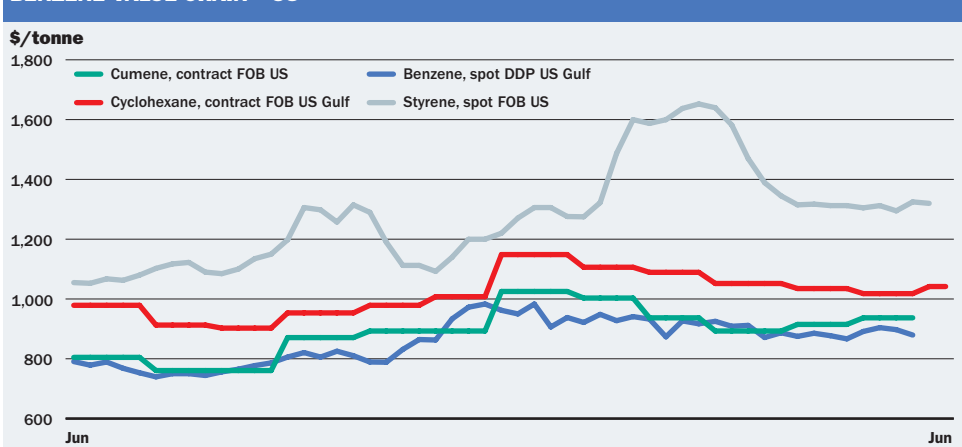
Jump in Europe CX in December following steep rise in benzene prices

BENZENE VALUE CHAIN – EUROPE



NOTE: ICIS does not report Europe cumene prices

BENZENE VALUE CHAIN – US

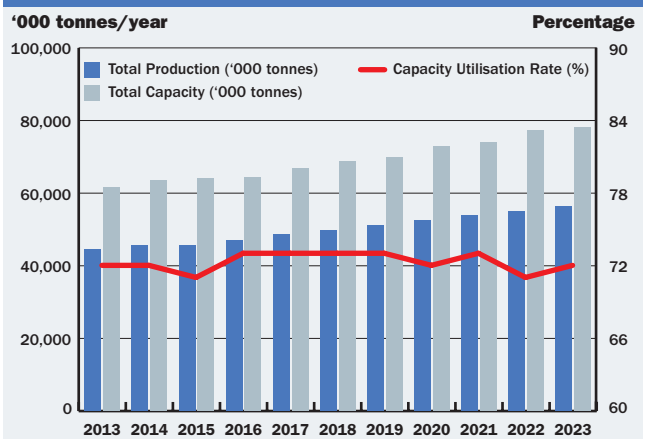


$983

Peak benzene price in the period, from earlier lows of $739/tonne

SUPPLY AND DEMAND FORECAST FOR BENZENE VALUE CHAIN

GLOBAL BENZENE SUPPLY AND DEMAND



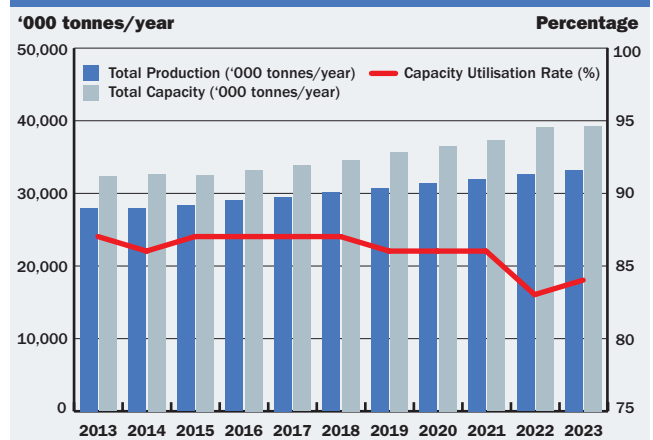
SOURCE: Supply & Demand Window, ICIS Dashboard

73%

Flat operating rate globally from 2016-2019, with further drops beyond that

- 14% rise in global benzene capacity from 2018 to 2023 to reach 78m tonnes/year
- Production rises by just 13% during the same period to reach 56m tonnes/year

GLOBAL STYRENE SUPPLY AND DEMAND



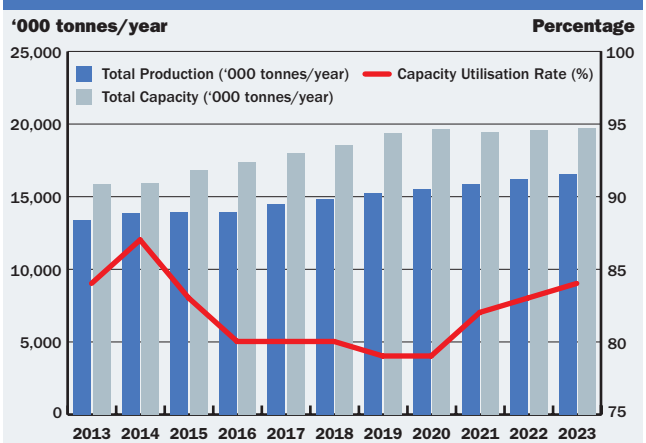
SOURCE: Supply & Demand Window, ICIS Dashboard

83%

Operating rate dips in 2022 from 87% peak between 2015 and 2018

- 13% hike in styrene capacity globally from 2018 to 2023 to reach 39.3m tonnes/year
- Only 10% increase in production over the same period, helping to explain the drop in operating rates

GLOBAL CUMENE SUPPLY AND DEMAND



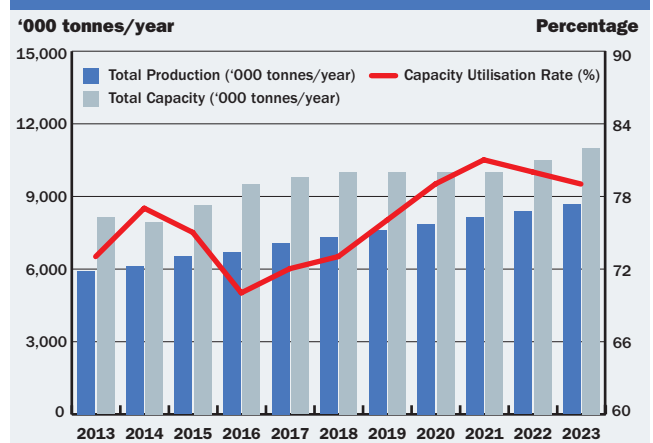
SOURCE: Supply & Demand Window, ICIS Dashboard

79%

operating rate bottoms out during 2019-2020 before recovering quickly to 84%

- Just a 6% rise in capacity from 2018 to 2023 to reach 19.7m tonnes/year
- Production increases by 12% over the same period, leading to a tightening in capacity utilisation

GLOBAL CYCLOHEXANE SUPPLY AND DEMAND



SOURCE: Supply & Demand Window, ICIS Dashboard

70%

Lowest operating rate in the period followed by peak of 81% in 2021

- No new capacity planned globally from 2018 to 2021 – flat at 10m tonnes/year
- However, production rises by 19% over the same period, tightening the market considerably and pushing up operating rates

ICIS SUPPLY AND DEMAND DATABASE

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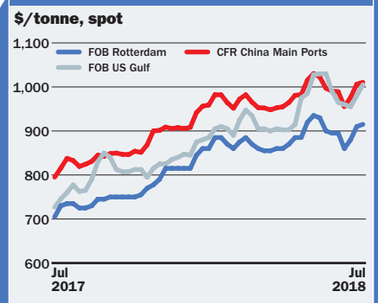
VALUE CHAIN PARAXYLENE

PARAXYLENE

FEEDSTOCK

PARAXYLENE (PX)

GLOBAL PARAXYLENE



PX PROJECTS

Company, Location	Capacity*	Start-up
Fuhaichuang PC, China	1,600	Q3/Q4 2018
Hengli PC, China	4,000	H1 2019
Zhejiang PC, China	4,000	H1 2019
Saudi Aramco, Saudi Arabia	800	Q2 2019

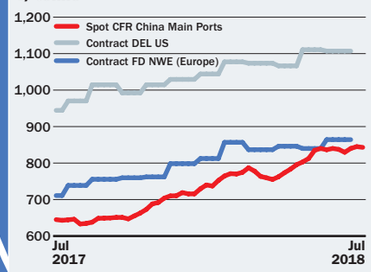
- About 97% of PX demand comes from the polyester chain via intermediate PTA. The polyester demand breakdown is 65% from fibre, 30% from PET resin and the rest from film and other plastic end-uses.
- Europe and US spot generally a netback from Asia, follow Asia price movements.
- Europe spot availability limited by tight supply conditions and a large proportion of business is covered by contracts.
- Europe supply to tighten when Indorama PTA plant in Sines, Portugal, restarts in July (largely idle since 2014).
- Tight US supply easing after BP outage in Q2; downstream capacity to increase with FENC PET resin plant restart.
- Price difference between Asia PX and naphtha narrows to around $300-350/tonne on oversupplied conditions.
- China to require around 1.3-1.4m tonnes/month of imports, until new local units start up.

97%
DERIVATIVE

DERIVATIVE/FEEDSTOCK

PURIFIED TEREPHTHALIC ACID (PTA)

GLOBAL PTA



PTA PROJECTS

Company, Location	Capacity*	Start-up
Sichuan Chengda, China	1,000	end 2018
JBF, India	1,250	end 2018
Xinfengming, China	2,200	Q3 2019
Hengli, China	2,500	Q4 2019
CC Polymers, US	1,300	Q4 2020

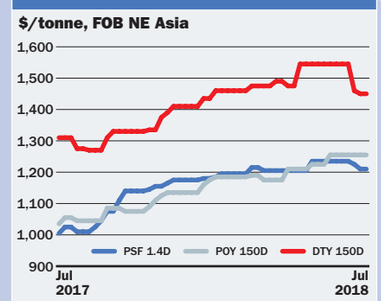
- PTA is primarily used in polyester fibre and PET resin for packaging, bottle and film applications.
- Europe prices based on raw material plus conversion fee lagged behind spot in H1 2018.
- Exceptional tightness in Europe through H1 2018. Suppliers may seek to increase margins in 2019 contracts.
- Globally tight market should lengthen in H2 2018, as new capacities start up in Asia, PTA plant in Portugal reopened in July.
- US contract and spot prices driven up by tight supply, higher upstream costs and firm crude.
- US supply tightened amid BP acetic acid force majeure.
- US downstream demand to increase with FENC PET resin plant restart.
- Asia tight market to ease, with majority of units back in operations.
- China polyester demand growth estimated at 6-7% for 2018.
- Non-China PTA margins positive, keeping run rates at high levels.
- Weakening rupee, credit tightening in India limits demand growth.

65%
DERIVATIVE

POLYESTER FIBRE

- Polyester stable fibre (PSF) is derived from the polymerisation of PTA and MEG, or from PET fibre chips, as is polyester filament yarn (PFY). Partially oriented yarn (POY) is derived from melting and spinning fibre chips. POY is then extruded and texturised into drawn texturised yarn (DTY). PSF is spun into yarn, then woven into fabric for apparel, upholstery and curtains. It is also used as stuffing for toys and pillows and in bedding and furniture.
- Asia polyester demand growth will remain moderately strong and will largely be driven by growth in the China market with new polyester capacities coming onboard in China.
- Asia polyester operating rates largely stabilised at above 80% in 2017, expected to be maintained in 2018.
- Asia polyester inventory levels have been managed at moderately low levels in 2018 which have lent support to polyester prices and kept margins at generally healthy levels.

ASIA POLYESTER FIBRE



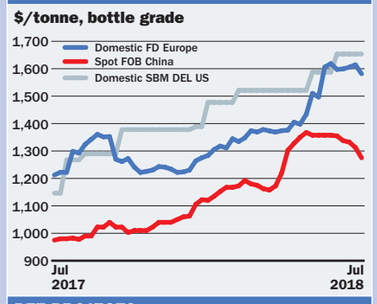
POLYESTER FIBRE PROJECTS

Company, Location	Capacity*	Start-up
Yizheng, China (PSF)	100	H2 2018
Xin Feng Ming, China (PFY)	300	H2 2018
Tongkun, China (PFY)	300	H2 2018
Yizheng, China (PSF)	100	H2 2018
HuaHong Chemical Fibre, China (PSF)	100	H2 2018
Xin Feng Ming, China (PFY, fibre chip)	300	H2 2018
Tongkun, China (PFY)	600	H2 2018
Hua Xi Cun, China (PSF)	200	H2 2018
Lu Yu, China (fibre chip)	100	H2 2018

30%
DERIVATIVE

POLYETHYLENE TEREPHTHALATE (PET)

GLOBAL PET



PET PROJECTS

Company, Location	Capacity*	Start-up
Far Eastern Petrochemical, Vietnam	400	Jul 2018
CC Polymers, US	1,100	Q1 2020

- PET can be made into a resin, fibre or film. Largest outlet is synthetic fibres followed by bottle resin. Film is used in electrical applications and packaging.
- Europe PX and MEG drive PET price when market is balanced.
- Exchange rates, global supply/demand determine PET flows into Europe.
- Security of supply in Europe paramount after period of availability difficulties, mostly stemming from PTA outages.
- New trade restrictions in Europe unlikely to be imposed in medium term.
- US prices pressured higher amid reduced domestic production capacity on M&G bankruptcy, import probe.
- US supply relief expected on FENC restart of former M&G project.
- Asia PET driven up by global tight supply and producers achieving good margins.
- New and restarting plants in Asia soften buying sentiment.

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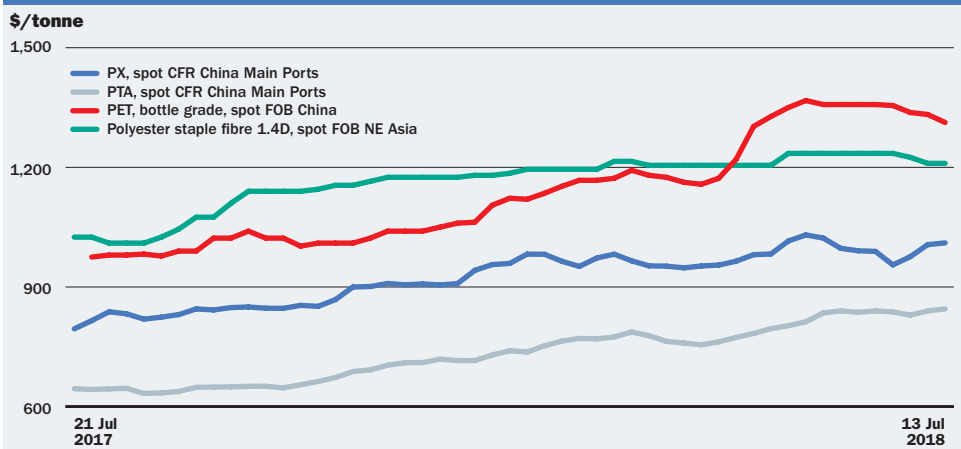
PET, POLYESTER SUPPLY & DEMAND
SUSAN MAIR LONDON

*Capacity '000 tonnes/year

REGIONAL PRICES – PARAXYLENE VALUE CHAIN

ASIA PARAXYLENE CHAIN



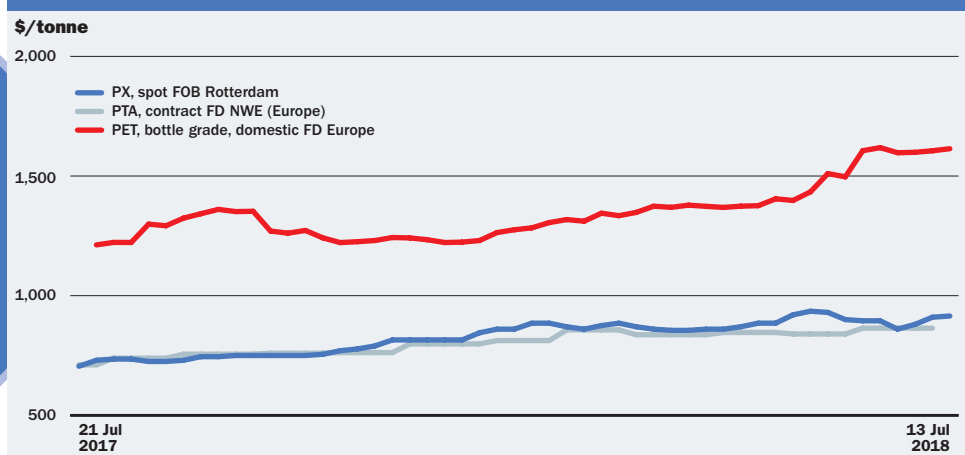
$1,235

52-week high for Asia polyster staple fibre prices, 22% higher from their low

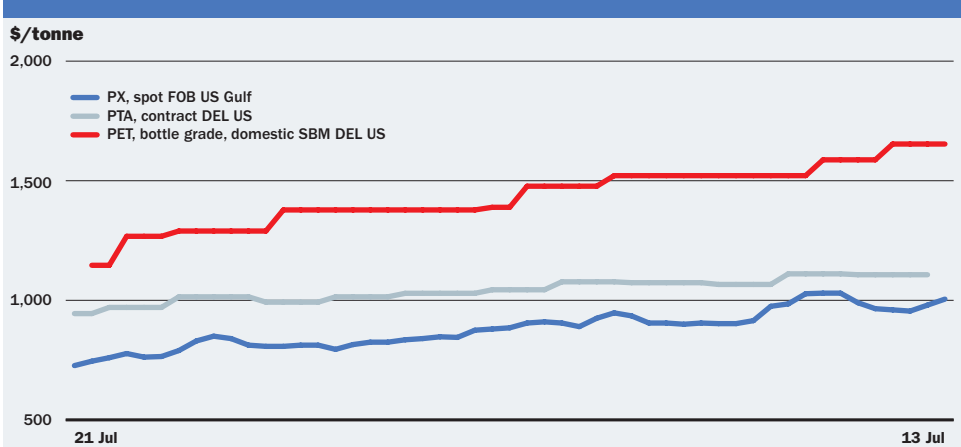
34%

Surge in Europe PET price from 52-week low of $1,212 to the recent $1,619

EUROPE PX CHAIN



US PARAXYLENE CHAIN

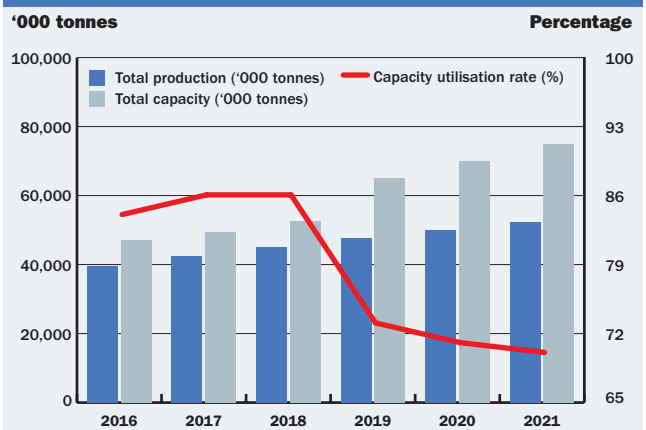


$1,111

52-week high for US PTA prices, up 18% from their low

SUPPLY & DEMAND OUTLOOK FOR PARAXYLENE VALUE CHAIN

GLOBAL PARAXYLENE SUPPLY & DEMAND



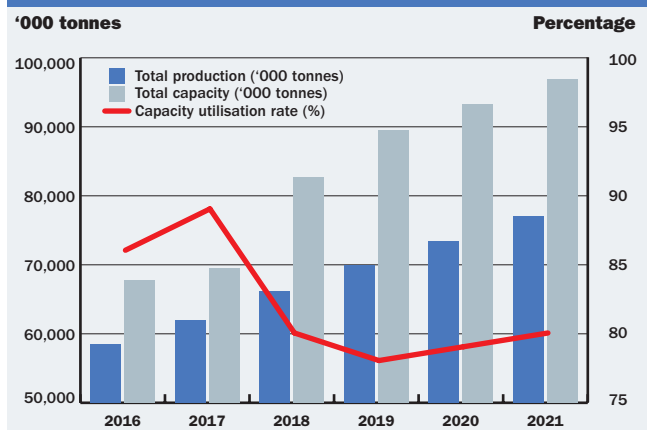
SOURCE: ICIS Supply & Demand Database

70%

Projected operating rate by 2021, falling precipitously from 86% in 2018

- Paraxylene production to rise steadily to over 52m tonnes by 2021
- Paraxylene capacity to jump in 2019, and continue rising to almost 75m tonnes by 2021

GLOBAL PTA SUPPLY & DEMAND



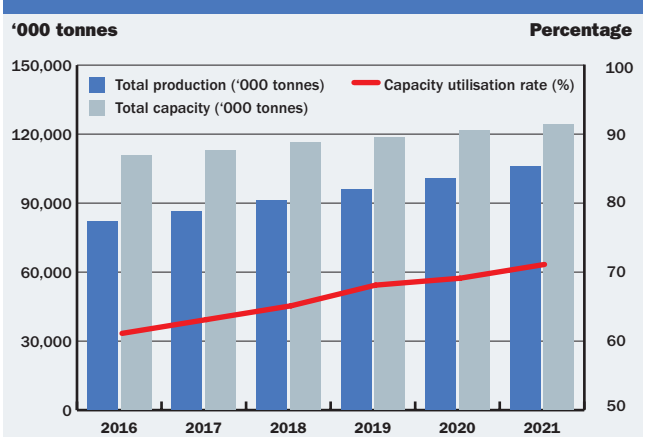
SOURCE: ICIS Supply & Demand Database

80%

Projected operating rate by 2021 after peaking at 89% in 2017

- PTA production to rise to around 77m tonnes by 2021
- PTA capacity to increase at a much higher rate, especially in 2018, reaching almost 97m tonnes by 2021

GLOBAL PET SUPPLY & DEMAND



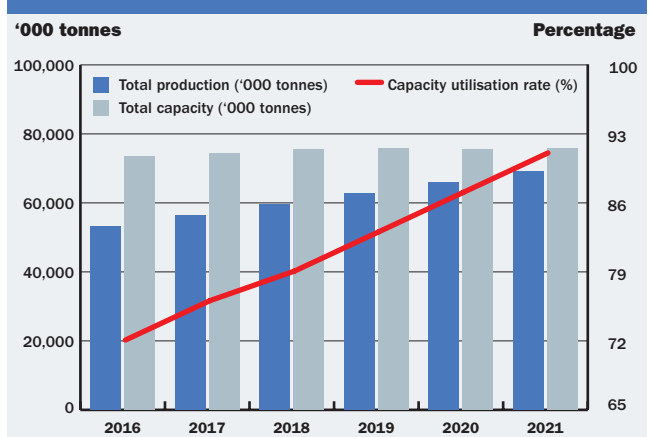
SOURCE: ICIS Supply & Demand Database

71%

Projected operating rate by 2021 after multiple years of steady gains

- PET production to grow strongly to reach nearly 106m tonnes by 2021
- PET capacity to increase at a slower pace, especially after 2018, to around 124m tonnes by 2021

GLOBAL POLYSTER FIBRE SUPPLY & DEMAND



SOURCE: ICIS Supply & Demand Database

91%

Projected operating rate by 2021 after multiple consecutive years of gains

- Polyster fibre production to rise consistently to over 69m tonnes by 2021
- Polyester fibre capacity to increase much more gradually after 2018, reaching almost 76m tonnes by 2021

ICIS SUPPLY AND DEMAND DATABASE

The ICIS Supply and Demand database provides a comprehensive picture of global supply and demand for the full spectrum of products from oil to chemical intermediates. Its range of product selection options help explain historical price movements, changes in company ownership and illustrates changing supply patterns in the future. It allows you to refine, sort, slice and export data, or create graphs and charts to illustrate your findings more easily and support your strategic planning. For more information or to request more information, please visit **www.icis.com/supplydemand**

ICIS

The 3rd ICIS Pan American Oleochemicals Conference

October 25 - 26, 2018 // Fontainebleau, Miami Beach // USA

Analysing the role of the Pan American market within shifting dynamics in global oleochemicals supply and demand

KEY TOPICS FOR 2018

- Analysing **trends in US glycerine** and what this means for the market going forward
- Looking at the **role of South American glycerine** in the Pan American region
- **End-Users** and the role they play within the industry
- **Updates on feedstocks** and their implications on the market
- Overview of **oleochemical trends**

CONFIRMED SPEAKER INCLUDE:

- Deborah Baldwin, *Product Manager - Glycerine*, **Vantage Group**
- Ravi Shaheed, *Business leader*, **Acme-Hardesty Co**
- Dan Strechay, *US Representative, Outreach and Engagement*, **RSPO**
- Joe Emuang, *Vice President*, **Acidchem (USA)**
- Caroline Midgley, *Director of Bio-based Chemicals Research*, **LMC International**

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12 COUNTRIES

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EVENTS

www.icis.com
WHAT'S ON

The 7th ICIS African Base Oils & Lubricants Conference

30 October – 1 November, Cape Town. This market has faced consistent challenges including a lack of infrastructure, regulations, quality control and investment, but things are starting to look up. As it continues to make steps in the right direction, what is next for the African market? With over 90 attendees, a seminar on re-refining oil and conference sessions looking at a variety of challenges and opportunities facing the market, this year's event will ensure you stay ahead of the game. Save up to £200 by registering before 31 August with promo code AFB018W0.
www.icisevents.com/africanbaseoils

11 – 12 October 2018 // The Leela Mumbai // India

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DATES FOR YOUR DIARY

POLYURETHANES TECHNICAL CONFERENCE

1-3 October 2018
Atlanta Marriott Marquis
Atlanta, Georgia, US

The Center for the Polyurethanes Industry's (CPI) annual Polyurethanes Technical Conference offers the unique convergence of industry expertise, professional networking and regulatory insight. Fostering both technical and professional development, the meeting is the premier destination to preview the polyurethanes technology of tomorrow and key information for today.

For more details, contact Elizabeth Bailey at ACC
Tel: +1 202 249 6605
Email: assistantfecc@fecc.org
polyurethane.americanchemistry.com

EUROPEAN PETROCHEMICAL ASSOCIATION 52nd ANNUAL MEETING

7-10 October 2018
Vienna, Austria

EPCA's Annual Meeting, with its thought-provoking programme featuring world-class speakers, is a platform where members can meet their peers in Europe, showcase their successes and stay abreast of international market developments as well as technological, geopolitical and societal trends

For more details, contact EPCA
Tel: +32 2 741 86 60
Email: meetings@epca.eu
www.epca.eu

38TH LATIN AMERICAN PETROCHEMICAL ANNUAL MEETING

10-13 November 2018
Grand Fiesta Americana Coral Beach Hotel, Cancun, Mexico

APLA's Annual Meeting is a focal point for leaders and decision-makers in the petrochemical and chemical industry in Latin America. Over the years it has established itself as the venue in which to develop and consolidate business, exchange knowledge and make valuable contacts, as well as learn about market trends, challenges and solutions.

For more details, contact APLA
Tel: +54 11 4325 1422
Email: reunionanual@apla.com.ar
www.reunionesapla.lat

13TH ANNUAL GPCA FORUM

26-28 November 2018
Madinat Jumeirah, Dubai, UAE

The theme of this year's meeting is "Executing transformation and investing in growth". It will build on the 2017 theme of the imperative for transformation in the chemical industry and examine strategies, case studies and the steps companies can take to enhance their transformational journey.

For more details, contact Jill Raine at co-organiser ICIS
Tel: +44 20 852 3233
Email: gpca.registrations@rbi.co.uk
www.gpcaforum.net

WHAT'S ON
FORTHCOMING ICIS EVENTS WORLDWIDE

Conferences

The 11th World Chemical Purchasing Conference
6-8 September
Hyatt Boston Harbor, Boston, US
Tel: +44 20 7570 8417
Email: conal.ellis@icis.com
www.icisevents.com/worldchemicalpurchasing

The 7th ICIS European Butadiene and Derivatives Conference
12-13 September
Novotel Munchen City, Munich, Germany
Tel: +44 20 8652 3616
Email: benjamin.caveen@icis.com
www.icisevents.com/europeanbutadiene

The 7th ICIS European Surfactants Conference
19-20 September
Amsterdam Marriott, the Netherlands
Tel: +44 20 8652 4627
Email: saniya.maralova@icis.com
www.icisevents.com/europeansurfactants

The 3rd North American Industrial Lubricants Congress
19-20 September
InterContinental Chicago Magnificent Mile, Chicago, US
Tel: +44 20 7570 8417
Email: conal.ellis@icis.com
www.icisevents.com/uslubricants

The 2nd ICIS Indian Surfactants Conference
11-12 October
Mumbai, India
Tel: +44 20 8652 4627
Email: saniya.maralova@icis.com
www.icisevents.com/indiansurfactants

Training

Global LNG Markets & Pricing
4 September
Singapore

Advanced Purchasing Skills
4-5 September
Boston, US

Petrochemicals: An In-Depth Introduction
10-11 September

Fundamentals of Petrochemical Plant Economics & Forecasting
12 September

Fundamentals of the Polymers Business
13-14 September

Surfactants Business Essentials
18 September
Amsterdam, the Netherlands

Petrochemicals: An In-Depth Introduction
17-18 September

Fundamentals of Petrochemical Plant Economics & Forecasting
19 September

Fundamentals of the Polymers Business
20-21 September
Mumbai, India

Advanced Purchasing Skills
9-10 October
London, UK

Surfactants Business Essentials
10 October
Mumbai, India

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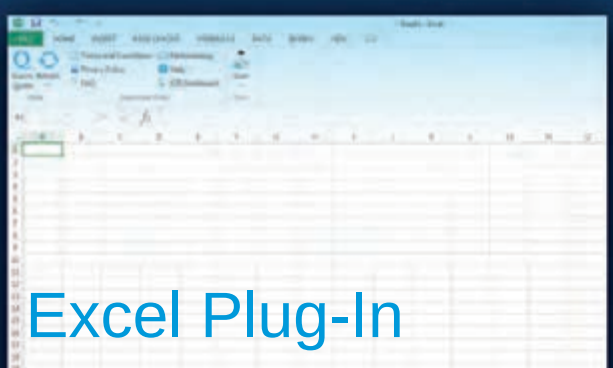

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