



أرامكو السعودية  
Saudi Aramco

# Setting New Standards

## Our Legacy, Our Future

Annual Review 2008





Setting new standards for 75 years



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**King 'Abd Allah Ibn 'Abd Al-'Aziz Al Sa'ud**  
THE CUSTODIAN OF THE TWO HOLY MOSQUES



**His Royal Highness Amir Sultan Ibn 'Abd Al-'Aziz Al Sa'ud**  
THE CROWN PRINCE, DEPUTY PRIME MINISTER, MINISTER OF DEFENSE AND  
AVIATION, AND INSPECTOR GENERAL

# Key Figures

<b>Oil reserves and production</b>	Recoverable crude oil and condensate reserves	259.9 billion barrels
	Crude oil production (average per day)	8.9 million barrels
	Crude oil production (annual)	3.26 billion barrels
<b>Gas reserves and production</b>	Gas reserves	263 trillion cubic feet
	Gas production (raw gas to gas plants) (average per day)	8.3 billion cubic feet
	Gas production (annual)	3.0 trillion cubic feet
<b>Natural gas liquids (NGL)</b>	NGL production (average per day)	1.0 million barrels
	NGL production (annual)	402.2 million barrels
<b>New discoveries</b>	Oil fields	Niyashin
	Gas fields	Rabib, Arabiyah
<b>Wells completed</b>	Oil exploration	11
	Gas exploration	12
	Oil development	396
	Gas development	78
<b>Workovers</b>	Oil workovers	113
	Gas workovers	8
	Water workovers	55

## ABBREVIATIONS USED IN THIS REVIEW:

bpd	= barrels per day
scfd	= standard cubic feet per day
ppb	= parts per billion
tpy	= tons per year
LPG	= liquified petroleum gas
NGL	= natural gas liquids
MRC	= maximum reservoir contact
EXPEC	= Exploration and Petroleum Engineering Center
KAUST	= King Abdullah University of Science and Technology
KFUPM	= King Fahd University of Petroleum and Minerals

# Board of Directors



## Seated from left:

H.E. Dr. Khaled S. Al-Sultan  
H.E. Dr. Abdul Rahman A. Al-Tuwaijri  
H.E. Dr. Ibrahim A. Al-Assaf  
H.E. Ali I. Al-Naimi  
Abdallah S. Jum'ah  
H.E. Dr. Mohammed I. Al-Suwaiyel

## Standing from left:

Abdulaziz F. Al-Khayyal  
Peter L. Woicke  
James W. Kinneer  
Sir Mark Moody-Stuart  
Khalid A. Al-Falih  
Salim S. Al-Aydh

# Chairman's Message



Setting new precedents for excellence is part of Saudi Aramco's dual imperative to leverage the nation's rich petroleum resources to stimulate progress and prosperity here at home and around the globe.

The exploration concession that led to the founding of Aramco, our legacy company, was signed less than one year after the establishment of the Kingdom of Saudi Arabia in 1932. Our enterprise and the Kingdom "grew up" together, with the company managing the Kingdom's vast energy resources for national and global benefit, literally fueling much of the 20<sup>th</sup> century's progress and helping build our new nation.

The company's 75<sup>th</sup> Anniversary in 2008 contrasted this proud past with our dynamic present, as Saudi Aramco continues to set new industry standards while helping to grow and diversify our domestic economy, create jobs and develop the Saudi workforce.

Saudi Aramco's prudent management of the world's largest oil reserves and fourth-largest gas reserves was showcased this anniversary year through the company's ongoing, record capital program to expand oil and gas production capacity, a highlight of which was the rapid progress made on the Khurais development program. With 1.2 million barrels per day of production capacity, Khurais is the single largest integrated oil project not only in company history but in the history of the oil industry

The basis of Saudi Aramco's leadership, in my view, however, lies not in petroleum energy, but in the energy of people. This continuum begins with the Custodian of the Two Holy Mosques, King Abdullah, and with Crown Prince Sultan,

whose confidence empowers Saudi Aramco to derive the greatest benefit from the Kingdom's resource wealth, and with the company's board of directors, whose wisdom directs the company's steps.

The next link in this human-energy chain is the company's hard-working, dedicated men and women, themselves characterized by a culture of continually seeking new levels of creating value.

For nearly 14 years, the people of Saudi Aramco were led by Abdallah S. Jum'ah, Saudi Aramco's president and CEO, who concluded an illustrious, four-decade career with the company in December. His standard-defining leadership capably bridged the company's proud past and the secure, sustainable energy future that the company is helping to build.

Mr. Jum'ah's successor, Khalid A. Al-Falih, together with his able management team and supported by the most talented and productive workforce the industry has ever known, will lead Saudi Aramco to new heights in the quest to leverage our energy for better lives, here at home and around the world.

A handwritten signature in black ink, reading "Ali I. Al-Naimi". The signature is fluid and cursive, with a prominent initial "A".

**Ali I. Al-Naimi**

**Minister of Petroleum & Mineral Resources,**  
The Kingdom of Saudi Arabia  
**Chairman of the Board of Directors,**  
Saudi Aramco



# President's Foreword



At Saudi Aramco, we have a history of setting new standards for energy. From the concession signing in 1933 that ultimately led to the discovery and production of the world's largest proven conventional oil reserves to our present-day industry leadership, Saudi Aramco has continually raised the bar for operational excellence, responsiveness and reliability, innovation and stewardship.

The year 2008 was marked by turbulence in the global economy and by volatility in the energy sector. In these uncertain times, Saudi Aramco continued to be a rock of stability.

Our activities reflected Saudi Aramco's unrivalled position as the world's most reliable energy provider. This Review showcases our continued success in exploration, production, refining and new forays into petrochemicals. The past year was notable for the solid progress made on our historic program to expand our maximum sustainable crude oil production capacity to 12 million barrels per day.

In addition to bringing the Khursaniyah oil increment online and the progress made on our Khurais crude oil program, we reached significant milestones on such complex projects as the gas plant at Khursaniyah and the production capacity expansion of our Shaybah oil field. We also marked major achievements in our initiatives to increase production capacity of gas and gas products and in our plans to expand refining capacity and develop integrated petrochemical facilities at home and abroad, particularly in China.

We marked 2008 with a renewed commitment to safety, both on and off the job, at every level of the enterprise. We also offered a host of programs to foster a culture of safety in the families of employees and the general public.

The past year witnessed significant research and development work in both the upstream and downstream sectors. On the upstream side, company scientists are exploring the application of novel technologies to enhance breakthroughs in reservoir management and enhancements in the computer modeling of hydrocarbon reservoirs. Downstream, we are targeting game-changing technologies in cleaner fuels and carbon management.

Of course, our continued success depends on a resource even more valuable than oil and gas: our people. For 75 years, supporting our people to reach their highest potential through training, education and self-development has been a core value. Our educational focus extends beyond traditional, operational focuses to our growing partnership with King Fahd University of Petroleum and Minerals and our work to develop King Abdullah University of Science and Technology, a university like no other in the world.

This landmark year was a window onto a proud past, and an open doorway to our next 75 years — and beyond. Our legacy is a benchmark against which Saudi Aramco will continue to set new standards of excellence as we respond to the world's energy needs reliably, responsibly and sustainably.

A handwritten signature in black ink, appearing to read 'Khalid A. Al-Falih'.

**Khalid A. Al-Falih**  
President and Chief Executive Officer,  
Saudi Aramco

# Saudi Aramco

at  
**75**

1933 - 2008

"King 'Abd al-'Aziz was keen that [the original concession agreement] included the best terms to ensure that the interests of the people of the Kingdom were paramount, including the recruitment and training of their sons to run this giant company in the future."

— King Abdullah, the Custodian of the Two Holy Mosques

The story of Saudi Aramco begins with the vision of King 'Abd al-'Aziz Al Sa'ud, who foresaw the potential of his country's natural resources, and with two signatures, those of Shaikh 'Abd Allah al-Sulayman and Lloyd Hamilton, who signed a concession agreement authorizing Standard Oil of California (Socal, today's Chevron) to explore for oil in Saudi Arabia.

The agreement signed by the Saudi Minister of Finance and the Socal contract lawyer on May 29, 1933, guided the way to the discovery of the greatest energy reserves the world has ever seen and the rapid transformation of Saudi Arabia from desert kingdom to modern nation.

In November 1933, Socal created the California Arabian Standard Oil Co. (Casoc) to manage the concession. Later, in January 1944, the company was renamed the Arabian American Oil Co. (Aramco), whose partners included the Texas Co. (later Texaco), Socal, Standard Oil of New Jersey (later Exxon) and Socony-Vacuum Oil (later Mobil). Between 1973 and 1980, the Saudi government acquired an economic interest in Aramco's operations in stages through a negotiated agreement.

In 1980, essentially all of Aramco's assets were transferred to the Saudi government. From that time until 1988, Aramco operated the assets on behalf of and for the benefit of the government. In November 1988, the Saudi Arabian Oil Company, or Saudi Aramco, was created by Royal Decree and the assets were contributed to the new company's capital.

Today, Saudi Aramco oversees the largest conventional reserves of crude oil, is the world's largest producer and exporter of crude oil, leads the world in exporting natural gas liquids

(NGL) and is a major player in refining and natural gas.

The path to success has not always been easy. The first oil prospectors arrived in September 1933, but it took two years of surveying, exploration and groundwork before the first well was drilled, in April 1935, and it was three more years before Well No. 7 produced oil in commercial quantities, in March 1938.

Not long after oil was discovered in Dhahran, World War II broke out, and the company, despite shortages of manpower and material, was still able to ship 12,000 to 15,000 barrels of oil per day (bpd) by barge to a refinery in Bahrain. With the end of the war, the company expanded at a rapid pace, and by 1949, production hit 500,000 bpd.

In the early 1950s, the company discovered Ghawar, the world's largest onshore oil field, and Safaniya, the largest offshore field. A shortcut to markets in the Western Hemisphere became reality in 1950, when the Trans-Arabian Pipeline, or Tapline, was completed. The 1,700-km pipeline, at the time the longest pipeline in the world and the largest privately financed construction project ever, connected the oil facilities in the Eastern Province to a terminal in Sidon, Lebanon.

The company's production and reserves grew steadily through the 1950s and 1960s, and with the declines in production elsewhere, combined with the steady rise in demand, the 1970s witnessed a period of tremendous growth for the company. Between 1972 and 1974, oil production climbed 70 percent to 8.2 million bpd.



King 'Abd al-'Aziz visits Dhahran, 1947.

In 1975, the government asked Aramco to design, develop and operate a gas-gathering and processing system, the Master Gas System (MGS), to fuel the country's burgeoning industrial network. When completed in 1982, the system harnessed about 3.5 billion standard cubic feet of gas per day (scfd). Today, the MGS has the capacity to process more than 9 billion scfd of gas and deliver more than 7 billion scfd of net sales gas to industrial customers around the Kingdom.

In 1983, the year marking the 50<sup>th</sup> anniversary of the concession signing, another milestone was reached: Ali I. Al-Naimi, currently the Minister of Petroleum & Mineral Resources, was elected the first Saudi president of Aramco.

The company began to evolve from a crude oil production powerhouse into an integrated international petroleum enterprise in the early 1990s, forging downstream joint and equity ventures in the United States, Europe and Asia. Another sign of the company's global emergence was the completion in 1995 of the program to build 15 supertankers, undertaken by the company's shipping subsidiary, Vela International Marine Limited.

As the 20<sup>th</sup> century ended and the 21<sup>st</sup> began, Saudi Aramco completed a list of mega-projects in oil and gas — Shaybah, Haradh, Qatif and Hawiyah — with other, even larger projects on the near horizon: Khursaniyah, Khurais and Petro Rabigh. The company continued its international growth, entering ventures in China and exploring additional refining and petrochemical opportunities at home.

As the company looks ahead, its efforts will focus on several aspects: expanding investment in research and development to enhance petroleum recovery and the formulation of more environmentally friendly fuels; developing production capacity; leveraging the Kingdom's hydrocarbon resources to add value through downstream and associated industries; boosting growth of the private sector; and, most importantly, enhancing the development of the company's and the country's human resources.

Over the course of its first 75 years, Saudi Aramco has built an unmatched record of reliability, and it remains committed to providing energy to the world and to maximizing the value of its petroleum reserves for the benefit of the Kingdom's citizens.

**“Saudi Aramco has a magnificent past, but its best days and greatest achievements still lie ahead.”**

— Abdallah S. Jum'ah, then Saudi Aramco President and CEO



On May 20, 2008, Saudi Aramco celebrated its 75<sup>th</sup> anniversary.



# { Celebrating 75 years }

Saudi Aramco celebrated its 75<sup>th</sup> anniversary in a big way in 2008, with activities throughout the year in Saudi Arabia and at the offices of its affiliates around the world.

The centerpiece of the year's festivities was King Abdullah's visit to Dhahran on May 20 in remembrance of historic visits to company facilities in the Eastern Province in 1939 and 1947 by his father, King 'Abd al-'Aziz Al Sa'ud, the Kingdom's founder. On both occasions, when King 'Abd al-'Aziz visited the fledgling oil camp at Dhahran, among many other activities, he received the expatriate employees, their wives and children.

In 2008, the company brought 29 of those "1947 Kids," some now accompanied by their spouses or grown children, back to Dhahran to meet King Abdullah. On his visit, King Abdullah also presided over a ceremony launching the King Abdulaziz Center for Knowledge and Culture, a multi-use facility that Saudi Aramco is building as a gift to the people of Saudi Arabia.

The company's pioneering spirit and work ethic are a living part of Saudi Aramco today, and a source of inspiration as the company builds upon its reputation for reliability in the future. The 75<sup>th</sup> anniversary was thus a time to celebrate the company's legacy and reaffirm its commitment to provide the indispensable energy at home and around the world that enables much of modern life, and by extension, human progress.



**"Today, our employees, both Saudi and expat, recall 75 years of dedication and hard work to build and develop Saudi Arabia's oil industry, an industry that has spread its wealth and prosperity throughout the Kingdom, from north to south and east to west."**

— Ali I. Al-Naimi, Minister of Petroleum & Mineral Resources and Chairman of the Board of Saudi Aramco

# Setting New Standards



The year 2008 witnessed extraordinary events in both the global energy and financial sectors. The petroleum industry in particular faced stiff challenges on a variety of fronts, including evolving energy policies in consumer countries and widely fluctuating costs in manpower, materials and services. At Saudi Aramco, we are staying the course with our long-term investment plans for oil and gas production capacity expansion and a variety of related initiatives that will help increase the world's energy supply capacity. Despite the uncertain climate, we continue to set new standards — for ourselves and for the industry — in the exploration for and production of oil and gas, and in technology, safety, environmental protection and human resources.

The developments taking place in petroleum markets and in the wider global economy are important, but to a large degree, short-term in nature. As the world's population continues to rise and living standards continue to improve, the world's energy requirements will continue to grow apace. Forecasts made both by the International Energy Agency (IEA) and the U.S. Department of Energy predict that the share of fossil fuels in the supply of global energy will remain in the range of 82 to 87 percent over the next two decades. Petroleum will remain an important component in this mix, with oil and gas together estimated to meet nearly 60 percent of global energy needs in 2030.

Today, and for many years to come, petroleum is and will be the lifeblood of modern civilization. Petroleum enables the movement of people and materials, helps grow our food, heal the sick, manufacture goods, and make our surroundings safer, more vibrant and more comfortable. Petroleum fuels the growth and development of our economies, powers the prosperity of our societies, and helps raise the living standards of billions of people.

Because petroleum is such an important component in the world's energy mix, we at Saudi Aramco are keenly aware of the role we play in enabling prosperity for the world's population and for the people of Saudi Arabia. The hydrocarbon reservoirs entrusted by the Kingdom to Saudi Aramco's stewardship contain roughly a fifth of the world's total proven

reserves of crude oil, and we currently produce about one in every ten barrels of oil the world consumes.

We also manage the planet's fourth largest reserves of natural gas, which we produce and process largely for domestic consumption, powering Saudi Arabia's economic development and diversification, and fueling and feeding a wide range of industries and utilities. In addition, as an integrated petroleum company, our operations extend into the refining, sales and marketing, and shipping of oil, besides the manufacturing of petrochemicals.

Saudi Aramco is thus a force for market stability and a critical contributor to sustained economic growth and development, given the impact of our petroleum exports on markets in both the East and the West. We are the number one supplier of crude oil to major economies such as China, Japan, Korea and India, in addition to being a major supplier to the world's biggest crude oil consumer and its single largest economy, the United States. We are also the world's leading exporter of natural gas liquids (NGL).

The task before us is significant: Our ability to provide a reliable supply of energy to the world is crucial for continued global economic growth. It's a challenge we have met in the past and will continue to do so for many years to come.

To meet future supply challenges, we have embarked on the largest capital program in our history. Part of our project portfolio is the addition of more than 4 million barrels per day (bpd) of oil production capacity and 3.3 billion standard cubic feet per day (scfd) of gas processing capacity. Some of this crude oil production capacity will be utilized to offset the natural decline of oil fields, while the rest will be employed to expand our maximum sustainable production capacity to 12 million bpd by year-end 2009.

Tight construction market conditions adversely impacted the industry as a whole in 2008, including Saudi Aramco. Nonetheless, we made significant progress on a long slate of oil, gas and petrochemical projects in 2008, setting new standards for ourselves and the industry along the way.

## { Setting New Standards in INNOVATION }

Since 2002 was declared the “Year of Innovation,” our Web-based **Idea Management System** has yielded a rich harvest of benefits. In 2008, more than 4,900 employees submitted 11,131 ideas, bringing the total number of submissions to more than 65,400. The number of approved ideas was 1,311 and fully implemented ideas amounted to 687.

Our Intellectual Assets Management organization reviewed 300 of the ideas and prepared 43 new patent applications for filing with the United States Patent & Trademark Office. Corresponding applications were also filed in other national and regional patent offices. As a company, we were granted 22 new patents in 2008, bringing the cumulative total to 86 — a dramatic increase in one year and evidence of the growing culture of innovation in the enterprise.

We held an Innovation Exhibit in June to recognize top innovators from the company and the local community. As part of the event, one of our employees, Patrick Flanders, received a check for \$50,000 in recognition of his contribution to a patented emergency isolation valve that resulted in cost avoidance of more than \$10 million in one year. The invention, known as Smart ZV, uses a smart valve positioned to improve the safe operation of emergency isolation valves through simplified proof testing and improved diagnostics.

Among the new technologies issued patents in 2008 were ones for a real-time earth model for collaborative geosteering and another for a comprehensive reporting and control matrix for the management of our pipeline system.



For the 20<sup>th</sup> year in a row, Saudi Aramco was named the No.1 oil company in the world by *Petroleum Intelligence Weekly*.



Saudi Aramco fosters a culture of innovation where value is placed on the ideas generated by groups and individuals alike.

# Exploration



The company's oil and gas reserves are contained in more than 104 fields, only 23 of which were in production in 2008, encompassing 354 different reservoirs. Overall, Saudi Arabia has more than 742 billion barrels of discovered oil resources, including proved, probable and possible reserves and contingent resources (oil-in-place that requires new methods and technologies to be produced). Remaining proved reserves compose roughly 260 billion barrels of the total. In 2008, our exploration program discovered two gas fields and one oil field and also struck six new reservoirs in existing fields.

The gas discoveries were both offshore. The **Rabib** field is located 125 km northeast of Dhahran where gas was discovered in the pre-Khuff Devonian zone. The **Arabiyah** field is 185 km northeast of Dhahran.

The **Niyashin** oil field was discovered 450 km northwest of Dhahran. Oil was struck at a depth of 3,619 meters in the Upper Fadhili reservoir and flowed 36.9° API crude oil at a rate of 2,000 bpd.

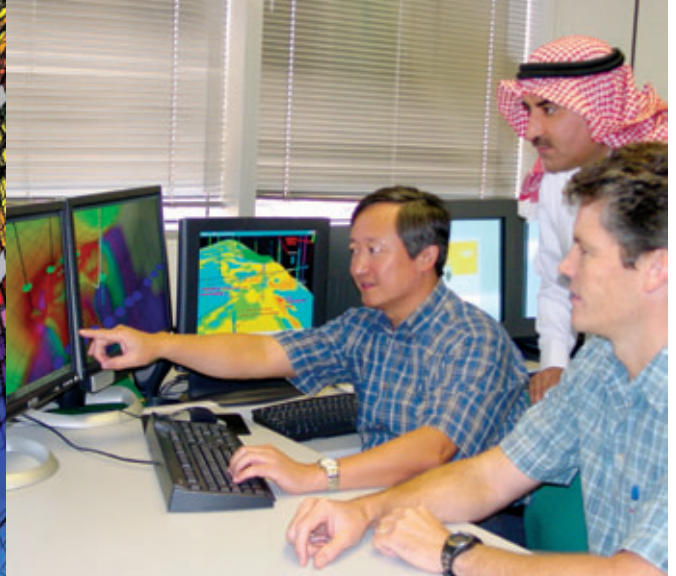
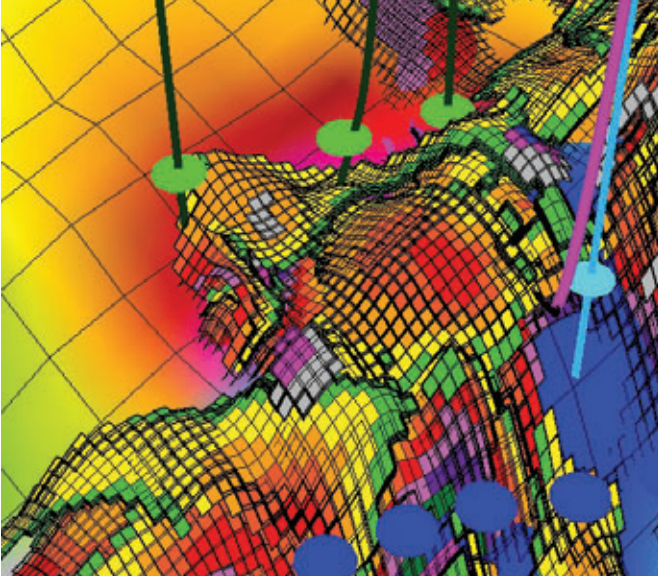
In addition, we added to our oil and gas reserves by finding new reservoirs and delineating extensions of existing fields. We found additional reserves in the Arab D reservoir in the Niban structure, 37 km east of our Tinat gas field. We also added new reservoirs in the Rimthan, Manifa and Khursaniyah fields. Offshore, in the Jurayd field, we tested oil from the Hith stringers and the Shu'aiba and Upper Khafji reservoirs. In our Hasbah gas field, we tested gas from the Khuff B reservoir. Gas delineation wells in the southern part of the Midrikah and Nujayman gas fields resulted in significant extension of the fields.

The likelihood of discovering additional reserves is high, with more than half of Saudi Arabia's potential hydrocarbon-bearing areas still relatively unexplored. We support an aggressive and wide-ranging **exploration program**, with three new seismic crews commencing work in 2008. One 3-D seismic crew was operating in the Arabian Gulf and one 2-D seismic crew in the Red Sea, and a 2-D seismic operation in the Manifa field that started in August acquired more than 1,000 km of data.

As our exploration activities expand, so too does our seismic processing environment. The **Computer Center** of our EXPEC organization uses PC cluster technology, and in 2008, we added quad core processor technology, expanding storage capacity for seismic processing by 600 terabytes, bringing our overall storage capacity to roughly 2,000 terabytes.

Even more critical than the deployment of new technology is the development of the people who will use these advanced tools. We continue to make substantial investments in our Exploration & Producing talent pool, including a project to build a 13,000-square-meter **Upstream Professional Development Center** to promote hands-on learning in an intensive, immersive and integrated setting. When completed in 2010, the Center will feature 3-D visualization rooms, drilling and intelligent-field simulators, and other learning facilities designed to keep our geoscientists and petroleum engineers on top of the latest developments in their fields. The project was launched in November with the signing of a construction contract with a local company.





Saudi Aramco's patented GeoMorph system provides a better "road map" for petroleum reservoirs.

## { Setting New Standards in EXPLORATION Technology }

The continuing advancement of oil exploration technologies means we can grow reserves in known fields by delineating additional oil and gas pockets, as well as exploring for new fields. To this end, we have challenged our earth scientists and engineers to add nearly 200 billion more barrels of oil-in-place to our resource base — in the past five years, we have already added more than 35 billion barrels — and to recover up to 70 percent of the original oil-in-place from our major producing fields.

At Saudi Aramco, two organizations are devoted to original research, introducing new technologies and providing specialized technical services. Research in surface upstream and downstream operations is undertaken by the **Research & Development Center**. Research in subsurface upstream activities is conducted by the Advanced Research Center of the company's Exploration and Petroleum Engineering Center, or **EXPEC ARC**. In the field of exploration technology, the strategic goals are to increase reserves and improve recovery rates.



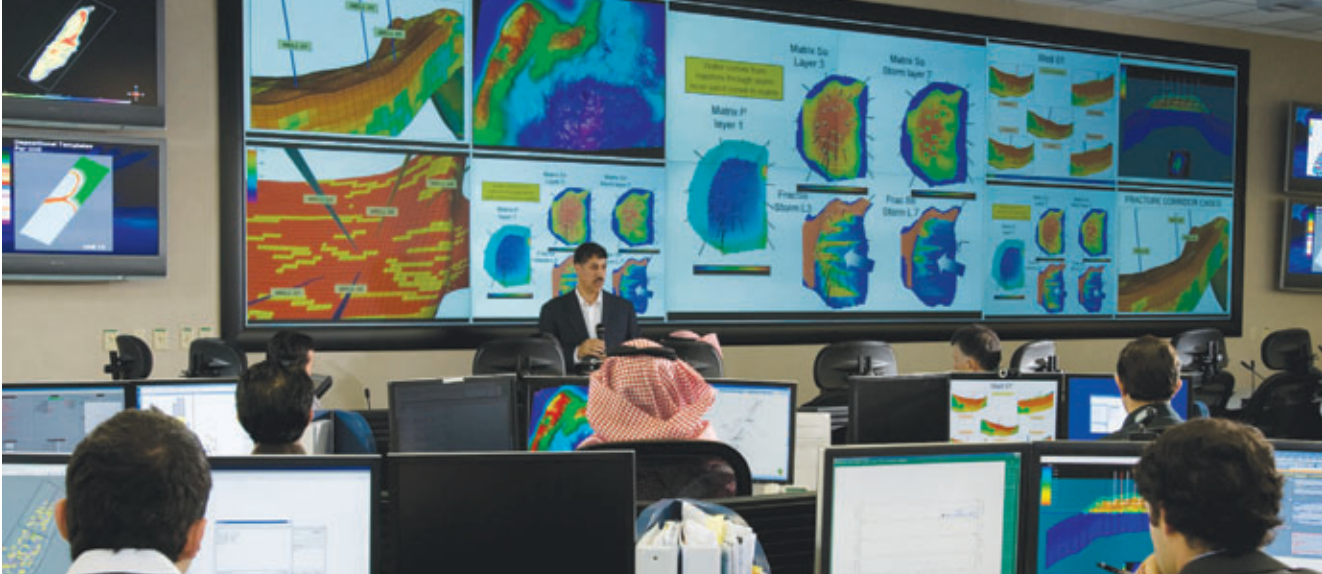
Two years ago, EXPEC ARC introduced the concept of Reservoir Nano-robots, known as **Resbots™**. Nano-scale Resbots would be deployed with the fluids injected into a hydrocarbon reservoir to record reservoir pressure, temperature and fluid type, storing the information in on-board memory that can be retrieved to better manage the reservoir and pave the way for increased recovery rates.

Resbots may help delineate the extent of the reservoir, map fractures and faults in the rock, define areas of higher permeability, identify bypassed oil, optimize well placement and help us design even more precise geological models of the reservoir.

Since the introduction of the concept, the company has researched several important aspects necessary for Resbots to be realized, including size, concentration, chemistry, interactions with rock surfaces, pore-scale movement and speed of transport in the reservoir. Research in 2008 culminated with the first successful laboratory demonstration of the injection of nano-particles into reservoir rocks and the recovery of the nano-particles at rates comparable to field conditions and at low concentration. The next phase will focus on adding sensing capabilities to the Resbots.

For the Resbots concept, EXPEC ARC won the prestigious New Horizons Idea Award at the 2008 World Oil Awards.





Our Event Solution Center focuses the collective skills of multi-disciplinary teams to solve reservoir production issues. Their work has significantly reduced completion time for studies, compressed major decision cycles and reduced uncertainty.

One of the most important tools in the petroleum engineering toolbox is reservoir simulation, which is used to calculate the number of wells to be drilled to develop a field, select well locations, estimate facility requirements, calculate reserves depletion, and develop and optimize reservoir management strategies.

In 2000, the company developed its first parallel reservoir simulator, POWERS, a mega-cell simulator capable of using millions of cell grid blocks. At the time, POWERS provided a 10-fold increase in computing capacity and speed. However, since then, the growing use of 3-D seismic data and sophisticated modeling algorithms has resulted in high resolution reservoir models. Most of that detail is lost when the models are used for reservoir simulation because current simulators have to upscale the models, which significantly reduces image resolution.

On November 1, 2008, the company completed its first giga-cell (billion cell) reservoir simulation run. The achievement was made using **GigaPOWERS**, the next-generation parallel reservoir simulator. To aid in the development of the simulator, we deployed a new 256 CPU Symmetric Multi Processor (SMP) system and a 512 node PC cluster using quad core processors. The new GigaPOWERS simulator, in prototype, has produced a full field model of the Safaniya reservoir, covering the entire 50-year history of the field and 500 wells. Results of the tests show improved accuracy and resolution.

Overall, in 2008 we developed a total of 90 reservoir simulation models, essentially covering all of our major oil and gas assets.



The interpretation of reservoir geology is key to geosteering drill bits into the most productive areas of the reservoir. What's required is a good "road map," and that's what the **GeoMorph** application provides. The GeoMorph system, invented by Saudi Aramco, uses logging-while-drilling data sent directly from drilling rigs and enables geoscientists and petroleum engineers to update their geological model of the reservoir within minutes of penetration. The system, which earned a U.S. patent, has significantly enhanced geosteering efficiency.



EXPEC ARC was granted U.S. Patent No. 7,363,206 for new techniques developed to better assess data from **drill cuttings and core samples** in order to characterize the variability of organic matter found in reservoir rock samples. In this process, a powdered rock sample is heated, releasing organic material that is analyzed to obtain data on hydrocarbon quantity and characteristics, key indicators of reservoir performance. The principal value of this process lies in applications at the well site. By measuring characteristics such as the presence of tar and fluid mobility, real-time data can be fed directly to the Geosteering Operations Center in EXPEC, helping engineers to direct horizontal wells to the optimum reservoir sections.



In an example of cross-department collaboration, two geologists and a computer and electrical engineer created **GeoVoice**, a voice-recognition technology that enables geologists to dictate their findings to the GeoVoice application, which stores it immediately on a computer. This streamlines geological characterization work, freeing geologists' hands and eyes to focus on the rock samples rather than having to write or type notes after completing their analysis. The application received a U.S. patent in 2008.

# Oil Operations



At Saudi Aramco, we understand that the people of the Kingdom and billions of people around the globe rely on us to remain a reliable supplier of petroleum now and far into the future. This is why we develop production strategies for our oil and gas reservoirs with a 50- to 100-year time horizon, rather than just a decade or two, because we know that with slow depletion, those extensive reserves will still be part of our production portfolio more than a half-century from now. This long-term approach to our reserve base is also important because it will allow yet-to-be-developed production technologies to be applied to a greater proportion of the oil in place, and thus help to maximize ultimate recovery, meaning more oil for future generations.

Against a year-long backdrop of volatile oil prices, we adhered to our long-range vision, steadily preparing for a future of rising demand for petroleum, at home and abroad. We believe a holistic, interdependent approach will be necessary to meet future energy demand, with a combination of initiatives to improve conservation and energy efficiency and contributions from alternative energy sources in order to satisfy growth. Such collaborative efforts need to be undertaken against a backdrop of healthy oil prices, which improve the economics of previously marginal plays, technical concepts and geological provinces, besides encouraging more efficient use of precious energy supplies.

The company is responsible for managing the Kingdom's oil reserves, which in 2008 stood at nearly 260 billion barrels, the largest conventional reserves on the planet. For the year, daily oil production averaged 8.9 million bpd, with our premium grades (Arabian Super Light, Extra Light and Light) composing 75.5 percent of total production. Water injection to maintain reservoir pressure averaged 13.7 million bpd. We replaced our yearly production of crude oil through exploration, development and delineation drilling with additions from geological and engineering studies.

We continued our strategy to optimize water management in all producing areas, particularly the Ghawar field, for efficient pressure maintenance and sweep conformance.

Using horizontal sidetrack and infill horizontal wells, advanced completion technologies and other techniques, we have been able to exploit the "bottom-up" sweep mechanism of the Ghawar field. In the period from 2000 to 2008, we lowered the average water cut from 36 percent to 27 percent.

We continue to set new standards in the industry in the combined application of 3-D seismic and horizontal drilling to maximize recovery. In our offshore Zuluf, Safaniya and Marjan fields, we coupled 3-D seismic with horizontal drilling to extract oil from the thin Khafji stringer sands. Using 3-D seismic, company geophysicists were able to discern individual sand beds as small as 11 meters thick. The seismic imaging was then used to geosteer horizontal wells into the oil-bearing sandbeds.

We made significant progress during the year on a number of oil production capacity increments, any one of which would be considered a major project on its own.

Our **Khurais** development, the largest integrated oil project in company history — and the largest in the history of the industry — is on track for completion of the producing facility in summer 2009. The development will add 1.2 million bpd of Arabian Light crude oil production capacity and also dehydrate 320 million scfd of gas and produce 80,000 bpd of NGL.

In 2008, the project component to expand Southern Area seawater injection capacity by 4.5 million bpd to support increased production from the Khurais and Ghawar fields was completed, marked by the inauguration of the water injection plant of the central oil processing facility in November.

The **Khursaniyah** program includes facilities to process and stabilize 500,000 bpd of Arabian Light crude oil blend from the Abu Hadriya, Fadhili and Khursaniyah fields and a grassroots gas plant to process 1 billion scfd of associated gas. The facility also has the capacity to inject 1.1 million bpd of non-potable water for reservoir pressure maintenance. The utility area is in operation, and the first oil train started test production in August 2008.



Left: Our 500,000-bpd Khursaniyah crude oil increment started test production in 2008.  
 Right: As part of our Manifa project, we built a causeway and drilling islands in the Gulf.

Significant progress was made on the program to increase production capacity at **Shaybah** from 500,000 bpd to 750,000 bpd of Arabian Extra Light crude oil. The new facilities include a gas-oil separation plant (GOSP), gas compression and injection facilities and a 217-km pipeline.

The **Nuayyim** crude oil increment is the first major GOSP project with preliminary design performed by an in-Kingdom engineering firm. This project is being developed using the I-Field, or **Intelligent Field**, approach to streamline reservoir management processes and facilitate real-time decision making. The complex, which includes drilling 44 new wells, a new grassroots GOSP, and gas gathering, water handling and associated downstream facilities, will have the capacity to produce 100,000 bpd of sweet Arabian Super Light crude oil. The project also includes construction of a new gas pipeline to transport 100 million scfd of associated sweet gas.

The program to develop the **Manifa** field is a complex challenge, requiring the construction of 41 km of causeway and laterals, 27 drilling islands for oil producing wells and water injection wells in shallow water, and 13 offshore platforms for oil producing and injection wells. Onshore facilities include 14 drill sites, a central oil and gas processing facility, water supply wells and injection facilities, and crude oil gathering, water injection, and product distribution pipelines. The causeway and drilling islands are under construction and are 60 percent completed. All 11 offshore jackets have been fabricated and six jackets have been installed, with the remaining five jackets scheduled for installation by May 2009.

When complete, the Manifa project will add 900,000 bpd of Arabian Heavy crude oil production capacity, 90 million scfd of associated gas and 65,000 bpd of condensate. Assessment of project timing and economics is ongoing, and a decision on project optimization will be made in the first quarter of 2009.

The company's ongoing Onshore **Maintain Potential Program**, designed to maintain production capacity levels in currently developed oil and gas fields, was very active in 2008. A key

element of the Offshore Maintain Potential Program provides for facilities to maintain the crude oil production potential from offshore fields through installation of platforms, pipelines, electric submersible pumps, subsea power cables and other facilities. A record number of offshore producing facilities were fabricated and installed during the year.

The sharp increase in offshore activities mandated exceptional support from our **Marine** organization during 2008. As part of the overall company effort to increase local market participation, we instituted a revised fleet strategy to charter vessels rather than purchasing them. In 2008, 16 chartered vessels joined the fleet, including 12 ships to support offshore drilling, two diving ships, one utility boat and one trash collection vessel.

Saudi Aramco's enormous storage tank farms and shipping terminals supply crude oil, NGL and refined products to customers around the globe. Every year, thousands of tankers call at company terminals at Ras Tanura and Ju'aymah on the Arabian Gulf, and at Yanbu', Jiddah and Rabigh on the Red Sea. In 2008, a total of 3,704 ships called at company terminals, exporting more than 2.5 billion barrels of crude oil, of which 52.7 percent was destined for the Far East, 5.2 percent for Europe, 20 percent for the United States and 15.1 percent for other destinations.

Ras Tanura's offshore **Sea Island Terminal** is a complex of man-made islands, each featuring a loading station for crude oil and bunker cargo and two berths. Six supertankers of up to 500,000 deadweight tons can load simultaneously. In February 2008, Sea Island No. 4 was placed back in service after the completion of three significant capital projects and a scheduled Test & Inspection servicing.

**Vela International Marine Limited**, Saudi Aramco's wholly owned shipping subsidiary, is a leader in the maritime transportation industry and renowned for its safety and operational efficiency. In 2008, Vela's fleet of 23 Very Large Crude Carriers (VLCCs), one Aframax class vessel and four product carriers completed more than 1,000 voyages, transporting more than 1.7 million bpd of crude oil to

## Setting New Standards in OIL PRODUCTION Technology

A key element in the goal to meet anticipated future demand for petroleum is to extract a higher percentage of the oil from currently produced fields. At Saudi Aramco, we have set the goal of raising recovery rates in some fields to the level of 70 percent of original oil-in-place through the use of cutting-edge technologies such as maximum reservoir contact wells, intelligent completions and geosteering, combined with better reservoir description and improved monitoring, and reservoir management strategies that emphasize long-term performance.



A new method to predict hydrocarbon potential is **advanced mud logging**, which uses geochemical techniques for the real-time detection of oil and gas in drill cuttings. Mud logging provides the first look at a hydrocarbon reservoir and can reveal a wealth of data such as gas ratios, rock typing, hydrocarbon potential and reservoir compartmentalization. We performed advanced mud logging on a number of wells drilled in 2008 and, in one instance, were able to identify a zone that tested 38 million scfd of gas and 16,000 bpd of condensate.



We successfully completed the first **casing while drilling** project in Saudi Arabia in 2008. The benefits of this approach include minimizing the risk of hole collapse, drilling trouble associated with loss of circulation, and swelling of shale.



Corrosion is one of the principal challenges in the petroleum industry, creating high maintenance and pipe replacement costs, among other problems. In 2008, we installed our first **nonmetallic piping** in two sour crude oil pipelines that connect 'Ain Dar GOSPs with Abqaiq Plants. This nonmetallic piping, manufactured by two local firms, eliminates corrosion and replacement concerns and also reduces the demand for steel. The success of this installation paves the way for the application of nonmetallic piping in flowlines, trunklines, gas gathering lines and other lines throughout the company. Scheduled installation of nonmetallic piping for 2009 is projected to be ten times greater than the amount installed in 2008.



In 2008, some 600 wells were steered by the geoscientists and petroleum engineers who remotely guide the drill bits from the Geosteering Center in Dhahran.



Left: Vela, our shipping subsidiary, received five double-hulled supertankers in 2008.

Right: More than half of our crude oil exports in 2008 were destined for the Far East.

customers primarily in the United States and Europe. The domestic fleet carried more than 600,000 bpd of crude oil and refined products between domestic ports within the Kingdom. Vela continued to transport dry cargo in 2008, completing eight voyages and moving nearly 280,000 metric tons of sulfur.

The program to replace single-hull ships with double-hull models made significant progress in 2008 as Vela took delivery of five double-hulled VLCCs, leaving one ship yet to be delivered from the current construction program. The new ships are the *Al-Butain Star*, *Sirius Star*, *Vega Star*, *Almizan Star* and *Janah Star*. Late in the year, the *Sirius Star* and its crew were seized by Somali pirates. The situation was resolved in early 2009 with the crew and the ship released unharmed.

During the year, six cadets and 12 apprentices graduated from ongoing training programs and joined Vela as officers and ratings, or non-officer ranks, respectively. The first two Saudis to captain Vela VLCCs were appointed in 2008, and the company, as a whole, reached a seagoing Saudization rate of 16 percent by year's end.

Vela joined with the IMO (International Maritime Organization) and the United Nations Development Program as a founding member of the "Global Industry Alliance," a group dedicated to developing solutions for bio-security and ballast water management technologies — such as Vela's patented AUBAFLOW system — to protect marine environments and lessen the marine industry's environmental footprint.

Each year, Vela, along with a number of Saudi Aramco organizations and affiliates and domestic and international government agencies, participates in security and disaster drills to ensure the preparedness of all the concerned parties. In 2008, drills were conducted in U.S. waters in March, in Portugal in May and in Yanbu' in June. Vela also conducted more than 40 notification drills in U.S. waters to test emergency call-out procedures. Also in June, Vela won the Jones F. Devlin Award, issued by the Chamber of Shipping of America, in recognition of 16 Vela ships operating a total of 63 vessel years with no lost-time injuries.

In recent years, Saudi Aramco has been increasing its **refining** capacity, through grassroots projects, expansion programs, and joint and equity ventures at home and overseas. This buildup is designed to fulfill three major objectives.

First, this new capacity is part of our long-term strategy to move further downstream into higher value and job-rich sectors. Second, additional domestic refining capacity will help to provide fuels and feedstocks for energy-intensive industries, thereby promoting local economic development and diversification, and helping to meet growing global demand for minerals, commodity and specialty chemicals, and consumer goods. In addition, these associated industries have high potential for the creation of jobs and investment opportunities.

Finally, expanded and new domestic refineries will also be able to take advantage of export opportunities for refined products and chemicals in major markets, especially in Asia, given our location between East and West.

Currently, Saudi Aramco's **four domestic refineries**, at Riyadh, Ras Tanura, Yanbu' and Jiddah, have a combined capacity of nearly 1 million bpd. Adding the company's two domestic joint-venture refineries, with ExxonMobil in Yanbu' (SAMREF) and Shell in Jubail (SASREF), and the company's share of the Rabigh Refinery, transferred in 2008 from Saudi Aramco to the Petro Rabigh joint venture, brings in-Kingdom refining capacity to 1.49 million bpd.

In July 2008, our Netherlands-based subsidiary, Aramco Overseas Company B.V. (AOC), completed the sale of its 40 percent shareholding in **Petron Corporation**, a refining and marketing company in the Philippines. The sale ends a long-standing and mutually rewarding partnership with the Philippines National Oil Company and public investors.

In 2008, a variety of refining projects and plans in the Kingdom and abroad set new standards in the region and the industry.

In the United States, work continued on the project to expand Motiva's Port Arthur, Texas, refinery from 325,000 bpd to 600,000 bpd. **Motiva Enterprises LLC**, a joint venture between



The first cargo of Saudi Arabian crude oil bound for a petrochemical company in China arrived in August 2008. Saudi Arabia is the number one supplier of crude oil to China, Japan, Korea and India, and a major supplier to the United States.

our Houston-based affiliate Saudi Refining Inc. and Shell, is scheduled to bring the new refinery units on-stream in 2010. The refinery expansion, when complete, will make Port Arthur the largest refinery in the United States and will process heavy sour crude oil and produce gasoline and diesel fuel for the U.S. market.

China is one of Saudi Aramco's most important markets and our Fujian Integrated Project is a key component of our business in Asia. The project includes a manufacturing arm and a marketing venture and came into being in 2007 when a company subsidiary, **Saudi Aramco Sino Co. Ltd.** (SASC), signed agreements forming two joint ventures with ExxonMobil, Sinopec Corp. and the Fujian provincial government in the Fujian Province of China.

The two integrated joint ventures are the **Fujian Refining and Petrochemical Company Ltd.** (FREP), a refining and petrochemicals venture, and **Sinopec SenMei (Fujian) Petroleum Co. Ltd.** (SSPC), a marketing venture.

In 2008, as part of the FREP venture, work to expand the existing Fujian refinery was well advanced with completion anticipated in mid-2009. The SSPC venture completed its first full year of operations in 2008, and recorded 4.3 million tons in total sales volume, equivalent to 110,000 bpd. SSPC has undertaken a rebranding program for its retail stations that encompasses a full refurbishment of each outlet and includes the Saudi Aramco logo as part of its new brand. As of September 2008, a total of 129 stations had been rebranded, and another 150 stations are scheduled for rebranding in 2009.

FREP is the first fully integrated refining and petrochemical project with foreign participation in China. The venture, located in Quanzhou, Fujian Province, includes the expansion of the existing sweet crude oil refinery from 80,000 bpd to 240,000 bpd and a facility upgrade to process and crack sour Arabian crude oils. In addition, this project includes a naphtha steam cracker with an ethylene production capacity of 800,000 metric tons per year, polyethylene and polypropylene units, and an aromatic complex designed to produce paraxylene.

Saudi Aramco will supply much of FREP's crude oil feedstock. FREP sells all of its production of gasoline, diesel and illuminating kerosene — products regulated by the Chinese government — to SSPC, but is free to market its own production of unregulated products such as LPG, paraxylene, benzene and sulfur. In 2008, FREP signed an agreement with a subsidiary of Saudi Arabia Basic Industries Co. (SABIC) to handle the marketing of SASC polyolefins produced by FREP. The mutual cooperation agreement was inked with SABIC Shenzhen Trading Co. Ltd. and covers 25 percent of FREP's polyolefin output.

SSPC sells wholesale and retail motor gasoline, diesel and illuminating kerosene to customers in Fujian Province and the eastern part of the adjacent Guangdong Province through roughly 740 retail sites and 14 distribution terminals, seven of which are owned by the joint venture.

In the Republic of Korea, AOC is an equity partner in **S-Oil Corp.**, which marked 1 million man-hours of zero accidents in early March. This is the 31<sup>st</sup> time S-Oil has achieved this milestone. In mid-March, a signing ceremony was held for the formation of the S-Oil Total Lubricant joint venture. The 50:50 joint venture will utilize S-Oil's lubricants plant, with plans to boost the production volume from 1,100 bpd to 2,500 bpd in 2009.

Domestically, we have commenced preliminary engineering for a new crude oil refining facility within our existing **Ras Tanura Refinery**. The new facility is planned to process a mix of Arabian Heavy and Arabian Medium crude oils and will add 400,000 bpd of refining capacity, increasing total refining capacity of the Ras Tanura facility to 950,000 bpd. The project will increase the supply of refined products (gasoline, diesel, fuel oil and asphalt) to the domestic market and provide 290,000 bpd of feedstocks to the proposed Ras Tanura Integrated Refining & Petrochemical (RTIP) complex, to be constructed nearby. The expansion project includes a 400,000 bpd crude and vacuum distillation unit, two 70,000 bpd diesel hydrotreating units, a 130,000 bpd naphtha hydrotreating unit and two 50,000 bpd continuous catalytic reformer units, along with associated support units and a tank farm.



The On-San refinery of S-Oil Corp., an equity venture of a Saudi Aramco subsidiary, helps satisfy the Republic of Korea's need for refined products.

Two **export refinery projects** are also in the works. In May 2008, the Boards of Directors of Saudi Aramco and Total gave final approval to the planned development of a 400,000 bpd world-class, full-conversion export refinery in Jubail. The refinery will process Arabian Heavy crude oil to produce high-quality refined products that will meet the most stringent global product specifications. As a full-conversion refinery, the Jubail refinery will maximize the production of diesel and jet fuels. In addition, the project will produce 700,000 metric tons per year (tpy) of paraxylene, 140,000 tpy of benzene and 200,000 tpy of polymer grade propylene.

On June 22, Saudi Aramco and Total signed the Shareholders Agreement and other core agreements for the establishment of the **Saudi Aramco Total Refining and Petrochemical Company (SATORP)** joint venture. Despite the global economic downturn experienced in late 2008, Saudi Aramco and Total remain committed to the project.

In late December, SATORP awarded the main contract for executing the temporary construction facilities complex required for supporting the construction phase. The contract, awarded to a domestic construction company, covers the development of a site 6 square km in size to accommodate 30,000 workers and support facilities. To capture market opportunities in engineering, procurement and construction, Saudi Aramco and Total agreed to extend the bid closing date for other major contracts.

Currently, Saudi Aramco owns 62.5 percent of the company and Total owns the remaining 37.5 percent. Subject to required regulatory approvals, Saudi Aramco is planning to offer 25 percent of the company to the Saudi public, while the two founding shareholders each intend to retain a 37.5 percent ownership interest. Saudi Aramco and Total will share the marketing of the refinery's production.

The second export refinery project involves a proposed **joint venture with ConocoPhillips** to build a 400,000 bpd full-conversion refinery on the Red Sea at Yanbu'. In May 2008, Saudi Aramco and ConocoPhillips approved incremental

monies to be used to fund activities through to the final investment decision in the first quarter of 2010 and subsequent joint venture project company formation, which is currently forecast to occur in May 2010. The original formation date of the project company was deferred as a result of the current worldwide financial situation. The engineering, procurement and construction contracts will be rebid to take advantage of falling commodity and service prices, and the rebids are planned to be issued in the second quarter of 2009.

Like the Jubail refinery, the Yanbu' facility will process Arabian Heavy crude oil to produce ultra low-sulfur diesel, gasoline and benzene. Currently, Saudi Aramco holds a 50 percent interest in the venture and ConocoPhillips holds the remaining 50 percent. Subject to required regulatory approvals, the parties plan to offer up to 25 percent ownership of the project company to the Saudi public while the founding shareholders will each retain a 37.5 percent ownership interest.

Much of this new capacity will process heavy, sour crudes, which will help address the mismatch between available crude oil supplies and refinery configurations that complicates today's market situation.



## Setting New Standards in DOWNSTREAM RESEARCH & TECHNOLOGY

Research, technology development and deployment in surface upstream and downstream operations are undertaken by the **Research & Development Center**. In addition, the Center is responsible for these issues on the corporate strategic level. The Center has adopted a portfolio approach in devising research programs, targeting near-, medium- and long-term market needs. The first priority is the desulfurization of crude oil. In the medium-term, the company is investigating clean fuels. The management of carbon release is the third research focus. On the behalf of Engineering Services, the Center administers the Technology Program for the testing and deployment of cutting-edge technologies that enhance operational reliability, efficiency and safety.



The objective of the **whole crude oil desulfurization** research project is to develop low-cost technologies to desulfurize crude oil and provide a new sweetened grade of crude oil to the market. Six desulfurization treatment approaches are being pursued, namely: hydrotreating of whole crude oil; reaction in supercritical conditions with water; separation; bio-desulfurization; utilization of ionic liquids; and microwave radiation. Each approach will be compared to the capital and operating costs of the available technologies. Our goal is to demonstrate at least one technology route that can reduce sulfur content by 80 percent by 2010.

Long-term tests in whole crude oil desulfurization began in early 2008. Three pilot plants, operating on Arabian Heavy and Arabian Light crude oils, accumulated several thousand hours of operation to study process development. The objective was to establish a basis for the design of a new process while calibrating the company's units with performance levels obtained from outsourced results. In-house testing showed our results are in alignment with outsourced testing.



The company is enlisting the aid of an unusual ally in its efforts to improve hydrocarbon processing and quality: bacteria. In **bio-desulfurization**, the overall objective is to develop a biocatalyst capable of removing sulfur from crude oil at low temperatures and pressures. Sulfur reduction can be enhanced by boosting the bacterial activity through genetic manipulation and optimum design of the bioreactor. Potential application areas of bio-desulfurization are during oil production at the wellhead or GOSP, or during the refining process.

We have deployed bacteria operationally as part of a **Nitrate Treatment** in the Hawtah oil field. Some kinds of bacteria are detrimental to crude oil, for example, by increasing the amount of sulfides in oil and water. To combat this problem, biocides have been used to kill off the bacteria in oil, but the biocides are toxic and also corrosive. In a pioneering move, company scientists used desirable bacteria and nitrates to control colonies of undesirable bacteria in the Hawtah oil field, thereby controlling a sulfide problem in an environmentally friendly fashion.



New ways of burning fuels inside internal combustion engines are under investigation by many of the world's leading car manufacturers. Such technology offers the promise of greater efficiency and reduced emissions.

Through our understanding of the way petroleum fuels burn inside engines and by developing new techniques to engineer future fuels, our **Petroleum Fuel Formulation** project aims to gain a position of partnership with the automotive industry to help bring new combustion technologies to the market. The company's approach involves the development of new fuel formulations for use in demonstration vehicles to engage potential partners from the automotive industry as well as developing the fundamental science needed to support the formulation of fuels derived from crude oil. These activities represent significant investment in both in-house capability development and the establishment of external research partnerships, and both are expected to grow significantly over the next five years.



The R&D Center is also engaged in research activities to investigate and develop industrial processes and applications for better **carbon management**, including reducing carbon dioxide emissions. In addition, the Center supports joint industry programs in Europe and the United States. The following are areas that Saudi Aramco seeks to further explore, alone or through collaboration:



Company scientists in our Research & Development Center investigate such topics as the desulfurization of crude oil and carbon management. The R&D Center is also involved in testing technologies that enhance operational reliability, efficiency and safety.

- Managing carbon release from refineries in a responsible and value-enhancing manner.
- Reducing the carbon footprint of oil-fueled transportation and promoting and investigating on-board vehicle carbon capture.
- Capturing industrial carbon dioxide in processes suited to the petroleum industry, integrating that with subsurface geological storage or enhanced oil recovery.
- Undertaking basic research into carbon chemistry and conversion into benign usable materials, chemicals and products and new industrial applications that prohibit carbon dioxide release.



Targeting the lower (heavier) third of a barrel of oil, Saudi Aramco, in cooperation with KFUPM, Nippon Oil and Japan Cooperation Center, Petroleum (JCCP), has developed a proprietary **high severity fluid catalytic cracking** (HS-FCC) process for on-purpose manufacture of propylene and gasoline, with ethylene derivative byproducts. HS-FCC is an emerging process for the conversion of heavy oils into lighter hydrocarbon products and light olefins. The HS-FCC process has been successfully demonstrated in a 30-bpd pilot plant at our Ras Tanura Refinery and in a 500-bpd cold-flow model at Nippon Oil's refinery in Yokohama. Pilot plant results showed an increase in the yield of light olefins and reduced dry gas and coke formation.

Plans are to continue to develop refinery and chemical industry integration prospects founded on this HS-FCC process technology by incorporating new pre- and post-process technology options to further enhance propylene and gasoline product yields or manufacture new derivatives from feedstocks. Saudi Aramco was awarded the best invention prize by the International Federation of Inventors Association for inventions related to the HS-FCC technology.



Company scientists in the R&D Center have earned an excellent reputation for developing the company's intellectual capital and are responsible for nearly 40 percent of the company's active and pending patents, including patents for an accelerated degradation evaluation method and apparatus, liquid hydrocarbon-based fuels for fuel-cell on-board reformers, and an absorption trap for the detection of surface-active agents in gas streams. Other patents have been granted or are pending for new fuel formulations and associated refinery processes.



Saudi Aramco was awarded the National Oil Companies (NOC) Environmental Stewardship Award for its groundbreaking research on **Electron Beam Flue Gas Treatment** (EBFGT) technology. For the first time, EBFGT has been successfully demonstrated to remove air pollutants from flue gases generated by crude and fuel oil fired at boilers for the generation of steam and electricity. Our Environmental Protection organization, in collaboration with other in-Kingdom and out-of-Kingdom institutions, conducted the research.

The laboratory tests conducted as part of the research simultaneously removed more than 90 percent of sulfur oxides (SO<sub>x</sub>) and more than 80 percent of nitrogen oxides (NO<sub>x</sub>) from flue gas generated by burning Arabian Heavy and Arabian Medium crude oils supplied by Saudi Aramco and heavy fuel oil. EBFGT is currently the only technology that can remove SO<sub>x</sub> and NO<sub>x</sub> simultaneously.

## { Setting New Standards in REFINING OPERATIONS }

In addition to research in refining and combustion, Saudi Aramco improved a number of refining processes and products in 2008, part of our ongoing efforts to improve operational efficiency and better serve our customers.



Yanbu' Refinery completed the implementation of web-based **Uninterrupted Power Supply (UPS) Remote Monitoring Technology** in September, the first company plant to do so. This technology enables the monitoring of all electrical measurements over the company's intranet in real time from the client's desktop. It also enhances reliability by providing alert signals for abnormal operating conditions for quick troubleshooting.



In May 2008, Ras Tanura Refinery started blending hydrocracker heavy naphtha into the gasoline pool, **increasing gasoline production** by an average of 12,000 bpd. Paving asphalt production capacity was increased by 20 percent, from 20,000 bpd to 24,000 bpd.



At the Jiddah Refinery, adjustments were made while processing Arabian Heavy crude oil to **optimize diesel production**. Also, to help meet domestic demand, 19,000 bpd of Arabian Heavy crude oil was processed to make available an additional 5,000 bpd of paving asphalt, eliminating planned imports with a cost avoidance of nearly \$2 million.



The company's downstream research projects include studying the performance of industrial materials under simulated production conditions. Here, company researchers monitor the progress of a corrosion simulation experiment utilizing a unique corrosion flow loop apparatus.

# Gas Operations



Saudi Aramco is responsible for the development of the Kingdom's gas reserves, the fourth largest in the world, which stood at 263 trillion cubic feet at year-end. In 2008, daily gas production (raw gas to gas plants) averaged 8.3 billion scfd.

The company's Master Gas System (MGS), a gas gathering and processing system built in the mid-1970s, has been the backbone of the country's industrial network since its completion in 1982. The MGS enables Saudi Aramco to use or market nearly all the gas associated with oil production and all non-associated gas produced from deep gas reservoirs.

In the company's overall gas operations, natural gas is processed to produce clean fuel (methane, or sales gas) and feedstock (methane, ethane, propane, butane and natural gasoline). Methane and ethane are consumed entirely by the Kingdom's utilities and industry. Excess propane, butane and natural gasoline (also known as natural gas liquids, or NGL) that are not used by the domestic petrochemicals industry are exported to world markets.

The Kingdom's demand for sales gas is expected to continue to grow at 5 percent per year as the country's domestic and industrial bases expand. Gas is used to generate electricity, as fuel gas and feedstocks for the petrochemical industry, for desalination and to support oil and gas operations.

At Saudi Aramco, we are currently managing several major multi-billion dollar projects to boost natural gas processing capacity. When complete, these projects will increase our processing capacity for associated and non-associated gas from 9.3 billion scfd to 12.5 billion scfd.

The drilling activities of our four **Upstream Gas Joint Ventures** — South Rub' Al Khali Company (SRAK), Luksar Energy Limited (Luksar), Sino Saudi Gas Limited (SSG) and EniRepSa Gas Limited (EniRepSa) — reached a peak in 2008 with eight active drilling rigs during the year completing nine exploratory wells. To date, the four ventures have completed 18 out of the 27 exploration wells required in the first exploration period. At year-end, four of the remaining nine wells were being drilled.

A core-based tight-gas reservoir study was initiated with the four ventures, select service companies and expert consultants in the field of tight gas exploitation to assess the best approach to exploit the tight gas discovered to date in the exploration areas.

In the first quarter of 2008, Total exercised its right under the terms of the agreement to withdraw from the SRAK venture. Saudi Aramco became a 50-50 equity interest partner with Shell by acquiring a portion of Total's shares in SRAK.

The **Hawiyah NGL Recovery Plant** started up in the second half of 2008. The associated pipelines were completed in November 2007 and are ready to deliver the ethane plus NGL (C2+NGL) products to end users. The plant has the capacity to process nearly 4 billion scfd of sales gas to yield 310,000 bpd of NGL products that will be used as feedstock for the Kingdom's expanding petrochemical industry.

The transport capacity of the existing **East-West NGL Pipeline** is being increased from 425,000 bpd to 555,000 bpd to meet demand on the west coast for ethane and NGL.

The **Khursaniyah Gas Plant**, with a processing capacity of 1 billion scfd of associated gas, is scheduled for completion in mid-2009. The plant will have the capacity to produce 560 million scfd of sales gas and 280,000 bpd of ethane plus NGL.

The **Hawiyah Gas Plant** expansion to process an additional 800 million scfd of non-associated gas is forecast for completion in the first half of 2009, raising the plant's capacity to 2.4 billion scfd.

The expansion of the **Ju'aymah Gas Plant** to fractionate additional NGL products will be in service in the first half of 2009. The project will add 260,000 bpd of ethane plus NGL capacity and 260,000 bpd of propane plus NGL (C3+NGL) capacity for a total of 815,000 bpd and 715,000 bpd, respectively, of fractionating capacity.

Expansion of the **Yanbu' Gas Plant** will increase its existing NGL fractionation capacity from 370,000 bpd to 555,000



**Left:** A production platform takes shape in our offshore Karan gas field.  
**Right:** Our Hawiyah NGL Recovery Plant commenced operations in 2008.

bpd to meet increasing demand for ethane as a petrochemical feedstock, specifically at the Yanbu' and Rabigh petrochemical complexes. The project will be on-stream in mid-2009.

The **Karan gas field** was discovered in 2006 east of Jubail as Saudi Aramco's first non-associated offshore gas field. Drilling has commenced, and ultimately 23 wells on five producing platforms are planned. The program to develop the field will provide offshore platforms, pipelines, new gas treating and upgraded facilities at Khursaniyah Gas Plant. The output from the Karan field is projected to be roughly 1.6 billion scfd. Combined with associated gas from the Manifa project, the net production increase of gas processing

at the Khursaniyah plant is forecast at 1.8 billion scfd. Offshore gas production is slated for early 2012.

Saudi Aramco's **Master Gas System (MGS)** has the capacity to process more than 9 billion scfd of gas and deliver more than 7 billion scfd of net sales gas to industrial customers around the Kingdom. A project to expand the transmission system in the Eastern region, funded in 2007, is ongoing with completion anticipated in 2010. This project will expand the MGS with 215 kilometers of 56-inch pipe paralleling existing lines in order to serve future demand in Jubail and Ras az-Zawr, and a total of seven stations will be installed to protect critical equipment from black powder corrosion.

## *Setting New Standards in GAS OPERATIONS Technology*

Two years ago, we piloted **electromagnetic aquatic transducer (EMAT) technology**, and in 2008, we became the first company in the world to deploy the technology in gas and liquid pipelines. EMAT technology is used to detect stress corrosion cracking and coating disbandment in pipelines, and is crucial for inspecting conditions in underground pipelines. The first extensive scraping run with EMAT technology was performed on a pipeline that transports NGL from Shedgum to Yanbu'. This technology should improve leak detection while reducing maintenance costs and enhancing reliability and safety.



Gas plants such as this one at Haradh are integral to the Kingdom's Master Gas System which processes over 9 billion scfd of gas.

# Petrochemical Projects & Projections

Perhaps even more significant than our portfolio of domestic and international refinery projects is our shift to integrate refineries with petrochemical facilities, creating an economic multiplier effect. More of our liquids production can travel farther down the value chain rather than being exported as crude oil, refined products or natural gas liquids. Leveraging the country's hydrocarbon assets in this fashion will create more opportunities for industries and associated businesses to contribute to the economic development and diversification of the Kingdom.

**Petro Rabigh**, our joint venture with Sumitomo Chemical Co. of Japan, successfully executed its initial public offering of 25 percent of the company's capital in January 2008 and raised 4.6 billion riyals (\$1.223 billion) for the company's operations. During the subscription process, over 5 million retail investors contributed more than 16.5 billion riyals (\$4.4 billion), translating to the offering being three times oversubscribed. Eleven receiving banks participated in the IPO, providing ample opportunity for public participation. The listing of Petro Rabigh on the Saudi stock market, Tadawul, marks a first for a Saudi Aramco venture to be listed on the Kingdom's stock exchange.

Progress was made on the implementation of the **Rabigh Conversion Industrial Park (RCIP)**, which will provide business opportunities for industries to convert raw materials from the plant into manufactured goods. In 2008, work on the contracts for engineering, procurement and construction for the industrial park utilities and support facilities was nearly complete.

The **Ras Tanura Integrated Project (RTIP)** is a proposed joint venture with The Dow Chemical Co. to integrate a world-scale chemicals and plastics production complex with our Ras Tanura Refinery. Scoping of the project was completed in 2008. In addition to the chemicals and plastics production units, the proposed complex will include power and utilities facilities to support the project and an associated Value Park for local and foreign private sector companies to build industries to utilize products produced at RTIP. Ownership of the joint venture will be divided among Saudi Aramco, Dow and public investors, with a portion of the equity to be offered to the Saudi public through a proposed IPO.



Our Petro Rabigh joint venture integrates a petrochemical plant with a refinery to capture additional value from the Kingdom's petroleum resources.

## Setting New Standards in CUSTOMER RELATIONS



The Saudi Aramco brand can now be found on gas pumps in China's Fujian and Guangdong provinces.

At Saudi Aramco, we understand that our exploration and production expertise is of little worth if we do not meet the needs of our customers at home, overseas and within the enterprise. Over the course of the last seven decades, we have built an unmatched record of reliability. To add to our legacy of customer focus, we continually seek new ways and opportunities to strengthen our business relationships.



In Saudi Arabia in 2008, we completed the expansion of our **Distribution Operations Customer Care Center**, added agents and extended working hours to 24 hours a day to better serve our customers. The center is fully automated and provides real-time data from bulk plants. We also held six meetings with product customers and three meetings with product haulers from around the country to promote safety and environmental protection and to address quality control issues. In addition, we conducted our first **Hauler and Customer Safety Awareness Campaign** at 19 locations in the Kingdom and more than 3,000 hauler and customer drivers participated. A number of capital projects involving new or expanded product pipelines and bulk plants were accelerated to meet expected demand.

Our Oil Supply, Planning and Scheduling (OSPAS) organization held discussions with **major domestic customers** such as the Saudi Electric Co. (SEC) and the Saline Water Conversion Corp. (SWCC). OSPAS also met with the Saudi Aramco Lubricating Oil Refining Company (Luberef), our base oil joint venture, to investigate ways to increase asphalt production and de-bottleneck production and truck loading. In December, a meeting was held with our gas and NGL customers on the west coast to discuss issues of supply and demand, among others. Similar meetings are under way with our east coast customers.



Internationally, our network of affiliates, subsidiaries and joint and equity ventures uphold our commitments to customers and help meet the world's demand for petroleum energy. The **World Energy Cities Partnership** is a non-profit organization whose board members are the mayors of 15 internationally recognized energy cities from Saudi Arabia, the United States, Canada, the United Kingdom, China, Angola, Equatorial Guinea, Nigeria, Trinidad & Tobago, Norway, Mexico and Australia. The group held its annual meeting in May in Houston, hosted by our affiliate Aramco Services Company (ASC), and discussed ways of improving cooperation and increasing trade.

In **Europe**, our London-based affiliate, Saudi Petroleum Overseas Ltd. (SPOL), participated in International Petroleum Week, the most important annual gathering in the European oil industry. During the conference, held in late February, SPOL staff met with crude oil, LPG and refined products customers from Europe, Africa and South America. SPOL also hosted its annual customer reception for roughly 500 guests, including representatives from energy institutes and think tanks. The reception also marked Saudi Aramco's 75<sup>th</sup> anniversary and celebrated the company's six decades of affiliated company presence in Europe.

In the **Far East**, product sales and marketing staff from Saudi Aramco and our Saudi Petroleum Ltd. (SPL) Tokyo office gave a joint presentation at the 11<sup>th</sup> Saudi-Japan LPG Seminar in Tokyo. The seminar, held in late February, was attended by some 500 LPG experts from approximately 15 countries. Representatives from SPL-Tokyo also attended the annual International Seminar hosted by Japan Cooperation Center, Petroleum (JCCP) in Tokyo and the World LPG Association's 2008 Forum, held in Seoul, Republic of Korea. In November, the company participated in the "Energy in the 21<sup>st</sup> Century" symposium in Japan. Also in November, in Japan and Korea, affiliate offices hosted celebrations for regional customers to mark the company's 75<sup>th</sup> anniversary.

# Business Processes & Support Services Technology



Operations is not the only area in which we raised our performance in 2008. We are continually looking for ways to improve the way we do business all across the enterprise.

In 2008, we continued efforts to **optimize business processes**, in part by further leveraging SAP and other systems. In January, we rolled out an expenditure request workflow system to improve the approval process to release funds for capital projects. The new system provides real-time tracking of funds, increasing manpower efficiencies and improving internal control. For the year, roughly 1,200 release transactions, valued at nearly \$2 billion, were processed.

We are working to **streamline procurement activities** by shifting to managing services rather than providing them. To this end, we executed several procurement agreements in which the seller's materials catalog is loaded into our B2B system, thus allowing automatic placement of materials orders. For example, a corporate procurement agreement was signed in September with a major supplier of large pumps, such as those used for water injection. This agreement covers the supplier's complete product portfolio for seven years and has lowered transaction costs.

Other significant procurement agreements include 30 agreements to provide laboratory equipment to King Abdullah University of Science and Technology (KAUST), the world-class research university we are building for the government, and two-year contracts signed with local engineering contractors to perform spare parts cataloging services.

As is the case with the petroleum industry worldwide, Saudi Aramco is facing a human resource challenge as many professionals near retirement age. We have been proactive in defining technical competencies for key positions in engineering and other disciplines to identify potential gaps in qualified personnel and then plan accordingly. During 2008, 66 additional **competency maps** were tailored for critical positions, and by year-end, 104 discipline-based competency maps were defined and assigned to 3,400 professionals.

On the corporate level, we launched a knowledge-sharing initiative that aims to consolidate all knowledge resources across the company. The initiative is called **ShareK**, or Share Knowledge, from the Arabic word for share or collaborate. The ShareK portal is currently used by several organizations for collaboration and knowledge sharing via communities of practice, and best practices and lessons learned workspaces.

We initiated a corporate engineering drawing and data web system known as **iPlant**, which provides fast and easy access to engineering drawings and plant data for operations, maintenance and engineering personnel. Having the information in one system enables staff to locate data more efficiently and make better decisions. The number of users accessing the system increased by more than 20 percent.

Fast and efficient business and financial transactions are crucial to our operations. We improved performance in this area by installing SWIFT (Society for Worldwide Interbank Financial Telecommunication) connectivity between our corporate network and the **SWIFT networks** at the offices of our affiliates ASC and AOC.

SWIFT allows us to exchange all of our financial information through a single, highly secure standardized communication gateway to banks and other financial institutions in-Kingdom and internationally, as opposed to using multiple connections to each bank via an Internet connection. In March, we began using the SWIFT infrastructure landscape to conduct financial transactions with two international banks and one local bank. This has enhanced our timeliness and efficiency in processing financial transactions. We are now working to add the remaining local and international banks to the system.

Efforts to eliminate manual invoice processing continued in 2008 with 309 material vendors and 234 contractors now employing the evaluated receipts settlement system for invoicing. Hard copy invoices have been eliminated for 76 percent of material invoices and 14 percent of contractor invoices.

Nearly as important as advances in upstream and downstream technologies are improvements in the technologies and





We added five new Westland AW-139 helicopters to our aviation fleet in 2008. The aircraft will serve onshore and offshore transportation needs.

equipment deployed by support services such as **aviation, communication and utilities**, among others.

On November 15, we marked the arrival of five new Agusta Westland AW-139 **helicopters**, which will serve our onshore and offshore transportation needs. These five are the first phase of a total of 14 new helicopters. The twin-engine rotary-wing aircraft can carry 12-15 passengers and can reach speeds in excess of 300 km per hour with a service ceiling of more than 5,000 meters. The AW-139s join our fleet of smaller AW-109s, added in 2005. A total of 25 pilots and 40 mechanics and engineers attended the manufacturer's school to begin certification.

In March, we completed a project to implement a new **Very Small Aperture Terminal (VSAT) satellite system** that provides high-speed voice, video and data communications to drilling rigs, seismic exploration teams and marine vessels Kingdom-wide. Two fully redundant auto-tracking VSAT gateways were installed at Tanajib and Haradh communication centers supporting 210 VSAT remote terminals.

The support of our advanced drilling and seismic technologies requires higher bandwidth and improved data throughput, and the new VSAT system is up to eight times faster for remote terminal uplink speeds and 12 times faster for downlink speeds, compared with the VSAT system it replaces.

The new VSAT system is crucial for the success of our **Real-Time Operations Center (RTOC)** in Dhahran, where geoscientists and engineers remotely monitor and guide drilling activities 24 hours a day. VSAT is the key communications link from the rig floor to the RTOC, where roughly 50 separate drilling rig operations are monitored each day. The integration of RTOC services through VSAT has resulted in wells being drilled faster and more cost effectively, improving production rates while lowering exploration costs. This VSAT network also allows exploration seismic teams to perform online seismic data quality checks, improving analytical efficiency and accuracy.

We introduced the **Terrestrial Trunked Radio (TETRA)** system in 2008 to provide secure and reliable radio coverage for more than 2,000 users along a 2,000-km stretch of pipelines, covering the East-West, Hawtah, Riyadh-Khuraish and Rabigh pipeline corridors. TETRA enhances the availability of various applications and improves the overall efficiency of the company's radio communications network. The system offers features such as group voice communications, mobile telephony and data services, all accessible from one radio device, and can interface with existing radio infrastructures such as GSM, SMS, command and control systems, automatic vehicle location, database queries, image transfer and others. The current plan envisions TETRA coverage throughout all company facilities Kingdom-wide by 2016.

# Human Resources



Even more important than our investments in capital projects and technology are our investments in our people. We continually strive to nurture the new generation of petroleum engineers, geoscientists and other professionals and to ensure our existing workforce has the skills and knowledge to thrive in an increasingly complex business environment.

The overall excellence of our **Training and Career Development** organization was confirmed by the renewal of its five-year accreditation by the U.S.-based Accrediting Council for Continuing Education and Training (ACCET). This agency has conducted audits of our training organization and benchmarked it since 1993 against international quality standards. Our Professional Engineering Development Division also received accreditation by ACCET in 2008.

Overall, in 2008, we drew upon the expertise of roughly 2,400 trainers and support staff in developing, coordinating and conducting our training programs. Training recipients included more than 5,000 in developmental positions, nearly 6,600 in non-employee training programs and 1,500 full-time equivalent regular employees in academic, job skills, supervisory and on-the-job training programs.

The development of the company's leadership is a serious undertaking at Saudi Aramco. We run a series of **leadership development programs** that, in 2008, assisted more than 10,350 employees in improving targeted leadership competencies, an increase of more than 1,200 participants from 2007.

Our **Management Development** organization sent a delegation of 17 promising employees to the Far East as part of our Asian Business and Culture Program, designed to familiarize future company leaders with Asian business environments and cultural practices to better prepare them, and the company, for new business development in the region. In conjunction with Management Development, our Finance organization provided four sessions of the nine-day Business Acumen Program to managers and high potential employees from across the company.

We promote **self-development** in a variety of ways and means, including e-Learning, libraries and learning centers,

and through various initiatives and programs such as our education refund plan, degree recognition, external courses and business events. At year-end, our e-Learning site had more than 3,240 courses, compared to 2,750 at the end of 2007. Approximately 48,160 employees enrolled in online courses, each completing an average of roughly five courses in 2008, compared to 40,891 employees with an average of four course completions the previous year.

For more than five decades, we have sponsored selected students to study in more than 500 universities at home and around the world. The success rate of these students is made possible in part by the year-long **College Preparatory Program (CPP)** that assists Saudi students in gaining admission to universities and enhancing their study skills. The academic program includes courses in English, mathematics, chemistry, physics, geology, computer science and business. The program also equips students with university success skills such as academic research, time management, critical thinking and intercultural proficiency. In 2008, 338 students (257 males and 81 females) successfully completed this program.

Our **College Degree Program for Non-Employees (CDPNE)** assists company-sponsored students attending university degree programs in-Kingdom and abroad. For 2008, in-Kingdom participants included 192 at KFUPM and 34 at King Faisal University. Out-of-Kingdom participants included 634 in North America, 334 in the United Kingdom, 64 in Australia, two in the Middle East and 28 in the Far East, for an overall total of 1,298. These assignments not only strengthen our international business relations, they also serve to improve understanding between cultures.

In July 2008, the second group of female Saudi CDPNE students completed the College Preparatory Program, which, in this case, also included an extensive co-curricular program of sports and physical fitness, club activities, site visits and guest speakers.

This female class of 2008 joined the first group of women sent to out-of-Kingdom universities in 2007, with majors ranging from geology and geophysics to accounting and



The Road to Success program run by Aramco Services Co., our U.S.-based affiliate, helps company-sponsored students get the most out of their international education.

human resource management. These students are setting new standards for the next group of 71 female CDPNEs who joined the program in September 2008, as well as for future generations of young Saudi women.

The company's **Apprenticeship Program** offers eligible Saudi high school graduates and post-high school vocational college graduates the opportunity to receive training in technical, craft, operator, services and clerical career tracks to meet the company's staffing requirements. Upon successful completion of the program, participants may be offered employment with the company. During the year, the company recruited 2,521 new apprentices, including 333 graduates from vocational colleges. At year-end, around 4,897 were enrolled and roughly 2,567 had successfully completed the program.

Over the years, not only has Saudi Aramco outsourced many of its non-core activities to the local economy, we recently have begun working with domestic training institutions to raise their capabilities. For example, the objective of the **Saudi Aramco Training Partnership** program is to forge strategic training relationships between the company and local training providers such as technical, industrial and community colleges and private sector training vendors. Graduates of these programs are hired as apprentices through the company's **Vocational College Graduates Non-Employee Program** (VCGNEP).

Over the past five years, about 950 students have participated in the program in crafts such as air conditioning and refrigeration, electrical, communications, electronics, clerical, non-destructive testing and surveying. In 2008, a local institution provided English and math training to 168 apprentices. An additional 1,541 regular and 1,709 contractor employees have been certified in helicopter underwater escape training.

The creation of a **culture of safety** throughout the company begins even before young Saudi men and women join the company. Participants in the programs for apprentices and for students in colleges and vocational colleges (APNE, CDPNE and VCGNEP, respectively) now undergo a 54-hour safety course, with instructions in driving safety, fire safety,

and personal health and wellness. All participants must pass the final exam in this course to graduate from their respective programs. In addition, apprentices also attend a Safety Boot Camp that, over two days, covers driver safety training, Loss Prevention minimum safety standards, fire safety training and smoking cessation.

The company has implemented developmental programs to broaden expertise in **supply chain management**. Our Materials Supply organization pioneered the introduction of the Penn State Graduate Certificate in Supply Chain Management (SCM) for its employees and other stakeholders. The first phase was successfully completed in September 2008, graduating 25 company employees and two from local companies. An additional 88 employees earned professional SCM certifications, and a training and education symposium drew roughly 300 stakeholders, including representatives from company organizations, customers, suppliers and academia.

Our Saudi Employment group participated in a number of **recruitment campaigns** at major universities in the Kingdom to promote the company's educational sponsorship programs and showcase career opportunities with Saudi Aramco. Campaigns were conducted at KFUPM, Hafr Al Batin Community College, King Saud University, King Abdulaziz University and an international education and training exhibition.

As a global enterprise, Saudi Aramco draws talent from around the world. In 2008, about 13 percent of our workforce was expatriate. Finding and retaining international talent in an increasingly competitive environment for talent requires a sustained effort on the part of our **Expatriate Employment** organization, which works in tandem with our affiliates ASC and AOC. In 2008, we participated in more than 138 conferences, workshops and exhibits in the Middle East, the United States, the United Kingdom, Europe, India, Australia, Africa, South America, and the Far East to source the best-qualified candidates.

Our Marine organization is fast becoming a learning organization where basic and specialized **maritime training courses** are provided for company employees and the Saudi



**Left:** We are closely involved with the development of the Saudi contractor workforce, both onshore and offshore.  
**Right:** Forums to discuss safety issues are common events throughout the company.

contractor workforce. We are working with the Ministry of Transport to attain recognition by the International Maritime Organization (IMO). With recognition from the Ministry, we can issue endorsements for Standards for Training, Certification and Watchkeeping (STCW) qualifications for seafarers. We are also introducing upgrade courses for maritime officers. This curriculum is under review by the Ministry of Transport, and upon approval, our Marine Training Center at Ras Tanura will be transformed into a Marine Training Academy qualified to provide the STCW courses leading to the issue of officer certification for both engine and deck disciplines.

English is the language of the international petroleum industry, and the company exerts continuous efforts to improve the proficiency of its employees for whom English is a second language. The **English program** offered by the company's Industrial Training Centers was revised in 2008 with updated content and new learning technologies.

**Computer education** is also a key element of our training activities. In 2008, we conducted 42 courses with 495 sessions, with a total enrollment of more than 4,100. We

also offered courses in enterprise resource planning applications, and more than 5,000 end-users attended 536 classroom sessions.

In addition to traditional training formats, we also place employees in **internships** and send others for **specialized training**. We began an internship program in refining in 2004, and since then, 18 engineers have completed developmental assignments. In 2008, we placed eight engineers on internships with business partners Chevron, Motiva, S-Oil, ExxonMobil and Total, and with other vendors and equipment suppliers.

We created a specialist development program in our Finance organization, and 11 young professionals were selected for the first group. Professionally certified employees in Finance increased from 17 percent in 2005 to 23 percent in 2008, and two Treasury employees completed their certification requirements mandated by the CFA (Chartered Financial Analysts) Institute, a process in which only one in five candidates succeeds.

# Local Economic Development



In the domestic arena, Saudi Aramco is a key source of revenue for the state and by extension, Saudi society. We are also an important driver of industrial growth, economic development and diversification, and job creation. Some of our impact comes from the petroleum products and natural gas supplies we deliver throughout the Kingdom, while some stems from the business we do with the local private sector, and from the wages we pay and the training we provide to our people. We are also committed to sharing knowledge and expertise with other institutions in both the public and private sectors.

In 2008, as in years past, we made significant contributions to the **development of the domestic economy** by procuring goods and services through local contractors and vendors.

We executed 2,194 contracts and amendments valued at \$19.25 billion in 2008, with 74 percent of the total value of contracts and amendments awarded to local contractors. Our year-end estimate for our worldwide purchasing level of activity was \$5.2 billion, with local participation accounting for 94 percent, or \$4.8 billion of the total.

We continued to support the development of the local economy by awarding the majority of our contracts to fully Saudi-owned or joint venture companies. Eight hundred contractors were registered with Saudi Aramco in 2008, most of which were domestic contractors or Saudi-owned subsidiaries.

Our Material Supply organization monitored Contractors Procurement Level of Activities (CPLA) by commodity to enhance local content by pursuing new in-Kingdom suppliers and expanding purchase agreement coverage. The CPLA covered 52 major projects, with local content procurement reaching \$751 million, equal to more than 27 percent of contractor procured materials. Eight major commodities were highlighted as having excellent potential for local content procurement, with an estimated total value of \$1.7 billion.

During 2008, as work intensified on our slate of oil, gas and petrochemical mega-projects, the **contractor workforce**

increased by almost 24,000 for a total of 166,058. The level of Saudis in the contractor workforce was 16 percent, or 27,134 workers. Concurrent with the rise in contractor employees, we increased our contractor training programs. By year-end, the total course completions reached 4,000, with more than 3,200 contractors in safety training, 410 in academic training and the rest in certification and job skills courses.

We transformed the way in which we procure production facilities, including platforms, pipelines and cables, for our offshore Maintain Potential program. In 2008, we awarded **long-term offshore fabrication and construction agreements** for a total of 65 new offshore oil and gas production platforms and structures planned for execution over the next five years. These agreements also include approximately 400 km of pipelines and 225 km of subsea cables to connect these offshore facilities to onshore processing plants.

This new era in offshore fabrication was also heralded by the establishment of a new fabrication yard in the Dammam Port area. Previously, we relied on out-of-Kingdom fabricators for this work. Roughly 40,000 tons of material for the fabrication of jackets and decks has been received at the in-Kingdom yard, and material transfer is progressing rapidly.

We are working with domestic and international engineering and construction firms to foster **local engineering, procurement and construction** firms capable of managing the execution of our largest projects. Multiple local construction, engineering and manufacturing firms have already formed the required local subsidiaries and joint ventures to bid on major projects.

Saudi Aramco has a proud legacy of strengthening education in Saudi Arabia. Our relationship with KFUPM goes back to the university's founding in 1963 and has evolved over the years. In 2008, we established the **SA-KFUPM Partnership Liaison Office** to strengthen the relationship and create a model of cooperation between the petroleum industry and academia in the region.



The Gulf Flight Safety Committee is just one example of Saudi Aramco's many partnerships with regional industry and business associations.

Our collaboration with KFUPM focuses on four areas: quality of academic programs; research and development; social outreach programs; and the Dhahran Techno Valley.

The Liaison Office engaged in a variety of activities during the year in pursuit of its goals, including coordinating the appointment of Saudi Aramco subject matter experts to sit on all of KFUPM's advisory committees in its colleges and academic departments and sharing the company's engineering learning objectives to align the university's curriculum with the company's needs. A business line advisory committee was established to conduct a comprehensive review of KFUPM's academic curriculum, and contacts were initiated to establish partnerships with Xiamen University in China, the Hong Kong University of Science and Technology, and Seoul National University.

The Liaison Office also sponsored five KFUPM students to attend an international petroleum conference and coordinated the participation of 40 students in an educational survey with the University of Houston.

Other strategic activities with KFUPM in 2008 included the establishment of the **Saudi Aramco Corporate Finance Chair** at the university's College of Industrial Management. Our Finance organization also performed a comprehensive review of the college's finance curriculum. In June, we signed a memorandum of understanding with the university to endow three faculty positions in the Petroleum Engineering Department with the aim of attracting international scholars to the school.

We also established the **Saudi Aramco Fund for Petroleum Engineering and Earth Sciences** Advanced Degree Grants at KFUPM for 20 students. The fund supports the development of future faculty for KFUPM and represents a long-term commitment by Saudi Aramco to maintain the quality of the petroleum engineering and earth sciences disciplines at the university.

We also strengthened our relationships with other universities in the Kingdom in a variety of ways. We participated in two strategic planning workshops with **King Saud University** and **King Faisal University** and completed a study to identify internationally recognized measures for evaluating university graduates and shared the results with Saudi universities. We also endowed two electrical engineering chairs at King Saud University and signed a collaborative agreement with King Faisal University.

Saudi Aramco has also nurtured the formation and growth of **industry and business associations** in the region. For example, representatives of regional airlines and aviation professionals met in October with personnel from our Aviation organization in the first **Gulf Flight Safety Committee** (GFSC) quarterly meeting to be held in Saudi Arabia. GFSC was formed in 2005 out of a need for regional flight safety professionals to have a forum in which to discuss issues that affect flight operations. Members include all major airplane and helicopter operators in the region plus a growing number of support organizations.

The meeting was also the launching pad for a new organization: the **Regional Aviation Association of the Middle East** (RAAME) and its new Web site, [www.RAAME.com](http://www.RAAME.com). RAAME was established in November 2007 by our Industrial Services group during the first regional aviation symposium, hosted by Saudi Aramco. RAAME's mission is to advocate the growth, safety and development of the aviation industry in the region by aligning resources among members and exchanging knowledge.

In addition to the RAAME aviation association, our Industrial Services group in 2008 founded the **Arabian Gulf Workboats Association** (AGWA) to create a forum for the development of expertise in maritime human resources and to provide a focus for seafarer education in the region. The free membership in AGWA provides marine operations employees

in the Arabian Gulf the opportunity to participate in a variety of activities, including seminars, conferences, networking, training and others.

Through the action of our Finance organization, we were one of the founding corporate partners of the **GCC Board Directors Institute**, which aims to increase the understanding and awareness of directors about issues and challenges facing boards in the region. The Institute is working to strengthen board member capabilities, create a regional network of board members and build greater regional awareness of the importance of corporate governance.

In October, our Fire Protection Department participated in an **earthquake disaster drill** at King Faisal University in al-Hasa, providing technical support and advice to Civil Defense authorities.

We partnered with the Dammam Municipality in an initiative to improve **environmental health** knowledge and practices. A total of 100 food hygiene inspectors and specialists from local municipality offices in the Eastern Province were sponsored to complete a series of internationally recognized food safety training modules to enhance their knowledge of inspection procedures in order to maintain a higher overall level of sanitation among food retailers and vendors. Also, local government inspectors and specialists were introduced to Saudi Aramco's auditing procedures and advised on a food safety quality-assurance program for food manufacturers.



Industrial cities such as Jubail receive fuel and feedstocks from Saudi Aramco and provide growth opportunities for domestic businesses and jobs for the Kingdom's citizens.

# Environment & Community



Since its inception 75 years ago, the company's **social responsibility activities** have evolved to match the development of the Kingdom.

From its first days, the company was involved in developing the nation in the broadest sense, far beyond its commitments as an oil concessionaire. In the early years, the company not only managed its own core business, but also was responsible for everything related to supporting itself: health care, power generation, water supply, schooling, road and port building, laundry and food preparation. As the company and the Kingdom grew, Aramco's social responsibility initiatives expanded, to public health and safety, television programming and transmission, school building and industrial development.

As the years passed, the company was woven into the economic and social services fabric of the country: Aramco supported or complemented services provided by the government, and the company's support of the private sector paid dividends as it became a purchaser of goods and services, rather than a provider. Today, Saudi Aramco's social responsibility efforts take many forms but the goals are the same: to make the facilities and communities in which we operate cleaner, healthier and safer places to work and live.

Lightening the environmental footprint of our industry is a priority for us, and in 2008, we set new standards for **protecting the air, water and land** even as our operations expanded.

A major challenge we face in the execution of an offshore mega-project such as the Manifa program is to **balance development, environmental protection and sustainable resource conservation**. In the Manifa project, a particular challenge is the near-shore and offshore shrimping grounds in Manifa and Tanajib bays. Company marine specialists worked with the project team during the conceptual stage and mitigated potential environmental impacts in a number of ways. For example, a significant number of large openings were added to the design of the causeway that connects the drilling islands, allowing better water circulation and movement of marine life in and out of the bays. The route of the causeway and location of the drilling islands were chosen to avoid coral reefs and dense sea-grass meadows.

During project development, a comprehensive Environmental Impact Assessment (EIA) was conducted and its recommendations included a number of measures to minimize the impact of construction, dredging and land-filling. An Environmental Monitoring Program (EMP) is now in place to oversee the implementation of the mitigation measures and to monitor the impact of ongoing construction. The EMP will continue for the life of the project and for three years after project completion, a strategy that is now a requirement for all large projects.

Before the start of the summer, when demand for electricity is at its highest, our **energy conservation** committee worked to minimize power consumption without impacting the operation or safety of facilities. A list of action plans were implemented during the summer, resulting in a total reduction of 200 megawatts, equivalent to a cost avoidance of \$3.5 million.

The third **diesel hydrotreater** project at Ras Tanura Refinery was funded in October and is planned for completion in 2010. When operational, all diesel fuel produced in the Kingdom will have residual sulfur levels of 0.05 percent, reducing emissions from burning diesel by 95 percent. The Ras Tanura Refinery expansion project will also produce low-sulfur diesel.

Two projects to **upgrade sulfur plants** at our 'Uthmaniyah and Shedgum gas plants were ongoing in 2008 and scheduled for completion in 2009 and 2010, respectively. The upgrades are the largest turnkey upgrades undertaken by a Saudi contractor and will significantly reduce sulfur emissions to comply with government standards.

Every company process facility, including drilling sites, GOSPs, major pump stations, gas plants and refineries, has a flare system that functions as the single most important element in the safe disposal of flammable and toxic substances generated by operations or in the event of an emergency release. Though flare systems are designed to receive large quantities of hydrocarbons during emergency situations, regular daily flaring is limited to purging gas necessary to ensure no air ingress into the flare headers, plus any unusual operational requirements.





Established in 1983, the year-long College Preparatory Program readies scholarship recipients for company-sponsored college attendance. Here, a team of students in the program practice critical thinking skills at the 2008 annual Grand Quiz.

In 2008, we established a corporate **flaring minimization program** with the ambitious goal of reducing total flaring by 50 percent from the current level by the end of 2012. Three flare gas recovery projects have been approved and, when operational, will reduce unburnt hydrocarbons and other emissions such as sulfur oxides and nitrogen oxides. In addition, comprehensive site-specific flaring minimization programs have also been initiated, which will also significantly reduce carbon dioxide emissions.

At our Ras Tanura Refinery, we commissioned a 110,000-bpd **mercury removal unit**. The unit has the capability to reduce the mercury content of the condensate splitter light naphtha stream from 20 parts per billion (ppb) to less than 1 ppb, eliminating the presence of mercury from the refinery's gasoline pool and satisfying naphtha export specifications.

We upgraded the **wastewater treatment facilities** at our Jiddah Refinery. This follows new or upgraded wastewater treatment plants at Ras Tanura and Ju'aymah terminals and at Abqaiq Plants. Engineering and construction activities on seven more wastewater treatment plants are ongoing, with completions planned by 2010.

The **coral reefs** of Jurayd, Jana and Karan islands in the Gulf have been significantly degraded by the careless deployment of anchors by fishing and recreational vessels. These islands and their coral reefs are centers of biodiversity in the Gulf, and are crucial nesting sites for birds and endangered species of marine turtles. In 2008, our Environmental Protection organization installed and will maintain permanent mooring buoys near the islands. The buoys are connected to special anchors that can withstand 20,000 to 60,000 pounds of pull, providing safe mooring for small to medium boats 2 to 20 meters long.

In 2008, seven company gas plants received the international Gas Processors Association (GPA) award for their **outstanding safety performance** in 2007. Our Ju'aymah plant was honored for reaching 5.5 million work-hours without a lost-time incident, our Shedgum plant reached 1.5 million work-hours, Haradh and Yanbu' plants each notched 1 million

work-hours, and 'Uthmaniyah, Hawiyah and Berri plants each achieved 500,000 work-hours.

Our Refining, Marketing & International organization established safety programs for contractor employees, including a "Back to Basics" workshop attended by more than 1,000 employees at Ras Tanura Refinery.

Every year, our Marine organization participates in a number of oil spill and International Ship & Port Security (ISPS) drills in domestic waters. In 2008, drills were held in coordination with the government at Ras Tanura, Jiddah, Yanbu', Duba and Jaizan.

The large majority of company employees are Saudi citizens who live outside of company communities, and for more than five decades, we have made it easier for them to afford their own home through our **Home Ownership Program**. During the year, 1,273 new home loans were granted and 57 free lots were distributed to eligible employees. Over the life of the program, more than 57,058 new homes have been financed.

We offer a number of **educational and safety programs** to our employees and their families, and to the general public. In the summer, we offer two programs for Saudi students. Summer Program A is for male and female high school students. The seven-week course, conducted at our Industrial Training Centers in different regions around the Kingdom, includes field trips to company facilities and classes in English, math, science, technical skills, computer training and special safety programs. High-potential students are offered a special academic program to help them better prepare for college admission requirements.

Summer Program B is for qualified male and female college students who have successfully completed at least 60 credit hours of study. The students are offered full-time job assignments for eight weeks in different organizations and work locations in the company, according to their fields of study.

In 2008, Summer Program A accommodated 1,950 high school students while 718 university students participated in Summer Program B.



**Left:** Saudi Aramco firefighters won medals at the World Firefighter Games in Liverpool. **Right:** The spirit of volunteerism is widespread among employees and their families, as seen here at a Habitat for Humanity project in Jordan.

In addition, 73 boys and 29 girls participated in the company's month-long **Gifted Students Program** which accommodates high school students selected from the different regions of the Kingdom by the Ministry of Education and the King Abdulaziz & His Companions Foundation for Giftedness & Creativity. The program content includes mathematics, natural sciences, computer applications, English, and health and safety practices. In addition, study skills, problem-solving, creative thinking, methods of scientific inquiry, teamwork and other areas are covered. The program also includes physical fitness and field trips to company facilities and local business foundations.

Saudi Aramco Schools' **Community Education** Programs support the self-development needs and interests of our multicultural communities. As in 2007, almost half of the more than 3,400 Community Education adult students participated in English classes. Others participated in a wide variety of foreign language, computer, history, art, exercise, history and business courses.

The **TESOL Language Enrichment** Program delivers an English-language immersion experience for Saudi students from kindergarten through seventh grade. The program is open to dependents of professional employees living in company communities who meet the entrance criteria. In 2008, the program was fully enrolled with 250 students.

Other educational programs include a summer program open to professional employees and their dependents 13 years and older, with 691 participants, and a voluntary foreign language program for fourth- and fifth-grade students in company schools. Classes in Arabic, Spanish and French, at two skill levels, were offered at lunch and after school, and the program was fully enrolled with 126 students

Traffic safety is one of the paramount concerns in the Kingdom, and Saudi Aramco has been active in various education and safety campaigns for a number of years. Chief among these campaigns was our support of the **GCC Traffic Week**, for which we conducted traffic safety presentations for local schools, participated in a number exhibitions

organized by traffic authorities in major cities, and developed and distributed safety publications.

In 2008, we also initiated a program to teach 150,000 Saudi high school and university students about defensive driving practices. The company is developing the program in collaboration with the Sultan Bin Abdul Aziz Science & Technology Center (SciTech) in al-Khobar, KFUPM and the Eastern Province Traffic Police. In the program's first phase, 200 students will be enrolled, while in the second phase, 60 policemen will be qualified to train their colleagues.

The **safety and well-being** of the people who work and live in our communities is essential to our continued ability to remain the world's most reliable supplier of petroleum. In 2008, our Industrial Security organization introduced new security controls at plant facilities and communities, deployed new security systems and technology and introduced a rigorous training regimen for security personnel, among other enhancements.

We first offered the World-Class **Safety Workshop** to supervisors in 2007, and by the end of 2008, a total of 140 sessions for more than 1,500 supervisory personnel had been conducted. A host of specialized safety courses were offered to employees through both classroom training and e-learning in areas such as hydrogen sulfide safety, hazard and operability studies, use of personal protective equipment, root cause analysis and injury investigation.

We opened two new **fire stations**, in Berri and Ju'aymah, replacing older stations, and received seven new hazmat fire trucks, assigned to Abqaiq Plants, the Haradh Gas Plant, Riyadh Refinery, Dhahran Fire Station No. 1, and Yanbu', Jiddah and Ras Tanura refineries.

We also implemented a fire fighter physical fitness program that yielded spectacular results when the Saudi Aramco team won seven medals — two golds, four silvers and a bronze — in the World Firefighter Games held in Liverpool in the United Kingdom in the summer. This marked the first time in the 20-year history of the games that a team from Saudi Arabia had participated.

## *Setting New Standards in OIL SPILL FIGHTING Technology*

We have improved our ability to respond to oil spill incidents with the implementation of several cutting-edge systems and techniques. One example is using remote laser-sensor technology to “fingerprint” the type of oil spilled, the actual time of spillage and the source. Knowing this information helps oil spill personnel quickly determine the appropriate response. This new technology has generated two U.S. patents for Saudi Aramco.

Laser-based oil fingerprinting is a patented novel spectroscopic technique that characterizes petroleum oils according to their time-resolved laser-induced fluorescence signals. This technique is superior to conventional analytical methods because it does not require sample preparation; it produces spectral fingerprints in an exceptionally accurate and fast manner; and it dramatically reduces the cost of oil identification analysis. These advantages, combined with the directionality characteristic of laser beams, make this technique suitable for remote sensing applications.

Recently, we have successfully carried out tests on remote fingerprinting of crude oil samples. In addition to the remote sensing tests, we have also carried out extensive research on the weathering of crude oil when spilled in open seawater.

The company is investigating the creation of a commercial instrument that will combine both technologies on a platform for airborne and marine operations.



Saudi Aramco participates in oil spill drills throughout the year, in domestic and international locations, to be prepared for any eventuality.



Promoting a lifelong love of reading and reaching out to the less fortunate members of local communities are just two examples of the company's outreach activities.

Our **recycling program** in Dhahran was expanded to all company communities, buildings, facilities, refineries and bulk plants in the Eastern, Central and Western provinces. An estimated 870 tons of paper, 30 tons of glass, 30 tons of plastic and 2 tons of aluminum were recycled in 2008. We also partnered with municipalities and universities in local communities and conducted a recycling competition in 425 schools in the Eastern Province.

In 2008, thousands of people were made a little healthier, safer and happier through the company's **community outreach programs**, many of which were made possible with help from volunteer employees and members of their families. These programs fall into four broad categories: health, safety, children and families, and the elderly, orphans and people with special needs. Some of the more notable activities included the following.

In Rabigh, more than 120 employees answered the call for blood donors to help a local hospital prepare for Hajj. In February, the company, in coordination with the Saudi Cancer Foundation, staged a one-day symposium and workshop designed to improve the early detection and treatment of breast cancer. In attendance were 130 newly graduated medical doctors, primary medical care practitioners and clinical nursing staff. The following month marked the start of the company's Oral Health Program, a partnership with the Ministry of Education in the Eastern Province. Each week, 90 Saudi students in grades 1-3 were educated in oral health practices at locations in Dhahran and Ras Tanura. Since the program's inception, 150 schools and 4,370 students have participated.

"One Nation, One Heart" was the theme of the 28<sup>th</sup> **Saudi Aramco Children's Art Contest**, which concluded with the company hosting 250 guests from across the Kingdom at an event in Dhahran. The contest, open to all students in grades 1-12 in the Kingdom, encourages creativity and innovation.

In December, an environmental awareness and clean-up campaign focused on a three-kilometer stretch of the al-Khobar corniche on the Arabian Gulf.

The Muslim festivals associated with the end of Ramadan and the end of Hajj, known as 'Id al-Fitr and 'Id al-Adha, respectively, are joyful occasions and also times of charity. The company stages public festivals at Saudi Aramco Exhibit in Dhahran during both 'Ids and stages a variety of folklore, educational and safety activities as well. The 'Id al-Fitr program, held in October, drew nearly 65,000 visitors, while the 'Id al-Adha festival in December hosted more than 63,000.

Saudi Aramco bought and distributed 30,000 SciTech admission tickets to students in the Eastern Province. In September, a campaign to raise money to purchase school supplies for needy families concluded with more than 7,000 employees contributing more than 1.8 million riyals, nearly double the total in 2007. The money purchased 13,800 school kit bags that were distributed to families in the Eastern, Central and Western provinces. The company's Mobile Library program visited boys and girls schools in the regions of Taif, Jiddah and al-Baha'. A total of 14 schools were visited and more than 1,500 students borrowed roughly 2,300 books.

Each summer, the company offers a range of programs and events to employees and their families and to the general public. In July, the company hosted a festival at the company's beach on the Gulf for the families of prisoners. In attendance were 1,200 people, representing 240 families. We participated in a summer outreach program held at a Riyadh shopping mall that featured educational and entertainment events promoting health, safety and environmental topics. More than 89,150 visitors attended the 12-day event.

The company's own Summer Program, held at Saudi Aramco Exhibit, opened July 1 and ended September 12, drawing more than 175,000 visitors, nearly double the number of visitors in 2007. This is in addition to the 374,000 people who visited Saudi Aramco Exhibit during the year.

The elderly, orphans and people with special needs are a particular focus for the company. In 2008, for the seventh consecutive year, volunteer employees and their families paid two visits during 'Id al-Adha to a senior citizens home



Left: Providing high-quality health care to employees and their families is a priority for the company.  
Right: Saudi women have excellent opportunities for professional development in Saudi Aramco.

in Dammam, providing lunch, folklore entertainment and gifts. Also during the 'Id, a celebration for elderly care home residents was held at the King Abdulaziz Historical Center in Riyadh. A festival for 400 people with special needs was held at the same time in Dhahran.

Also for the seventh consecutive year, the company hosted two recreation days in the spring, one in Dammam and the other in Dhahran, for more than 300 boy and girl orphans. In partnership with the General Directorate of Social Affairs in the Eastern Province, the company honored 200 distinguished male and female orphan students for the second consecutive year.

In the Central Province, the company, in cooperation with the INSAN Society for Orphans, organized a celebration day at four locations in Riyadh and one in al-Kharj for roughly 2,500 orphans. In the Western Province, the company held its 8<sup>th</sup> Summer Festival for orphans and children with special needs, offering health, safety, fire protection and entertainment shows for 1,500 children and 30 charitable societies from Jiddah, Makkah and Taif.

For the 'Id al-Fitr, the company hosted festivals for orphans and charitable societies around the Kingdom: In the Central Province, more than 1,500 gifts were distributed; festivals were held in Jiddah and Yanbu' in the Western Province; in Dhahran, 350 boys and 560 girls were invited to a celebration at Saudi Aramco Exhibit; and gifts were distributed to boys and girls in Turaif and al-Hasa.

Our New York City-based affiliate, Saudi Petroleum International Inc. (SPII), sponsored a fund-raising dinner that raised more than \$278,000 for research to find a cure for a histiocytosis, a rare blood disease that affects mostly children. The dinner is an annual event hosted by SPII, and more than \$3 million has been raised over the last decade.

On the morning of September 13, Hurricane Ike slammed into Galveston, Texas, and other towns on the Gulf of Mexico, including Bridge City, about 100 miles west of Galveston, where a wall of water up to three meters high swept through

town. Bridge City is home to more than 100 employees of Motiva Enterprises, the joint venture between our Houston-based affiliate Saudi Refining Inc. (SRI) and Shell, and their families. In the days after the disaster, Motiva employees, with the support of SRI, assisted in the massive clean-up effort.

The health of our employees and their dependents, including education, prevention and intervention, is managed by our Saudi Aramco Medical Services Organization (SAMSO). In 2008, we focused **preventive health activities** in three areas, the first of which was education.

SAMSO's diabetic registry identified more than 18,800 patients at risk for cardiovascular disease. In addition, a survey of more than 20,000 employees found a high prevalence of risk factors for cardiovascular disease. Our focus here was education, screening and improved awareness. By year-end, we had conducted cardiovascular disease awareness campaigns in 22 locations and screened 13,500 people.

Our second area of focus was screening for the early detection of diseases. For example, congenital hearing loss affects three out of every 1,000 infants. Early detection and intervention are keys to avoiding this disabling condition. In 2008, we began screening 100 percent of newborns in the Dhahran Health Center. Our programs in **occupational health** included 80 site visits to company facilities to screen for hearing, respiratory, vision and other work-related hazards. More than 700 cardiac catheterizations were performed in our cardiac center, and 284 patients received cardiac stent grafts.

The third area of focus was more aggressive disease management, an example of which was the establishment of a pediatric obesity clinic at Dhahran Health Center. Roughly 20 percent of Saudi youth are overweight or obese, a condition that can lead to serious diseases such as diabetes and hypertension. This clinic complements our adult obesity clinic, where 1,500 patients are receiving treatment.

Diabetes is one of the principal health concerns in the Kingdom, and 20 percent of our primary care visits are related to diabetes. Our **Diabetic Care Center** now serves



A group of international students previews their new school, the King Abdullah University of Science and Technology (KAUST). Saudi Aramco is building the graduate research university on the Red Sea north of Jiddah.

more than 3,200 patients, and our efforts to manage the disease have resulted in measured improvements in blood sugar control and an overall reduction in diabetes-related emergency, urgent care and inpatient admissions.

We also recognize that our obligations to Saudi society transcend the realms of health, safety and the environment, and one area where we have been playing an expanding role is the **promotion of knowledge, education and the exchange of ideas**.

On May 20, 2008, during festivities in Dhahran to mark Saudi Aramco's 75<sup>th</sup> anniversary, King Abdullah laid the symbolic cornerstone for the **King Abdulaziz Center for Knowledge & Culture**, or Ithra, Arabic for "enlightening." Ithra is the company's anniversary gift to the people of Saudi Arabia and will feature a world-class museum, public library, historical archives, children's educational center, conference and performance facilities and more. The Center, to be located near the Saudi Aramco Exhibit in Dhahran, is dedicated to honoring Arab heritage and will also bring world cultures to the Kingdom. Preliminary engineering started in August of 2007. Partial funding has been secured and Ithra is scheduled to open to the public in 2012 with a full schedule of exhibits, programs and events.

In the summer of 2006, the government directed us to lead the development of the **King Abdullah University of Science and Technology**, or KAUST, a decades-long vision of King Abdullah. KAUST is setting new precedents in a variety of areas for research universities. The university's organization and endowment, its interdisciplinary approach and partnerships with other institutions, its physical campus and unique setting, and its approach to recruiting faculty and students from around the world have all set new standards in higher education.

The project is situated on a site of more than 36 million square meters on the Red Sea approximately 80 km north of Jiddah. KAUST will be an international, graduate-level research university open to men and women from around the world and dedicated to inspiring a new age of scientific achievement in the Kingdom that will also benefit the region and the world.

In June 2008, we signed a memorandum of understanding with KAUST to create a partnership to support carbon emissions research, advanced petroleum reservoir and oil recovery technologies, and energy conservation and marine environment studies.

Construction activities were at a high pitch in 2008, with a workforce of some 35,000 readying KAUST for its September 2009 opening. At year-end, the academic campus buildings were nearly enclosed, intense electrical and mechanical finishing activities were ongoing and the central utilities plants were undergoing pre-commissioning. Scientific equipment for the laboratories is scheduled to arrive in the first quarter of 2009. In the community area, all 2,088 residential units are structurally complete and in various stages of finishing. Community recreational, educational and support facilities are on target for occupancy in late summer 2009.

During the project development phases, Saudi Aramco provided environmental consulting to ensure the creation of an environmentally responsible campus. We played a crucial role in the design of the master plan to conserve sensitive marine habitats and embrace environmental sustainability. The adoption of a policy of a zero-footprint on the marine environment will preserve adjacent coastal and marine areas, part of which will be set aside as a marine sanctuary. A number of "green" construction and operational practices are in place, including solid waste reuse during construction, energy conservation, water reuse, rainwater collection and xeriscaping.

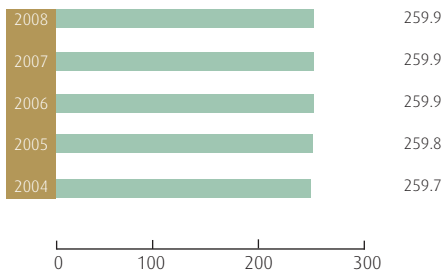


On the occasion to mark Saudi Aramco's 75<sup>th</sup> anniversary, King Abdullah laid the symbolic cornerstone for Ithra, the King Abdulaziz Center for Knowledge and Culture, in Dhahran. Ithra will showcase Arab heritage and culture and also bring world cultures to the Kingdom.

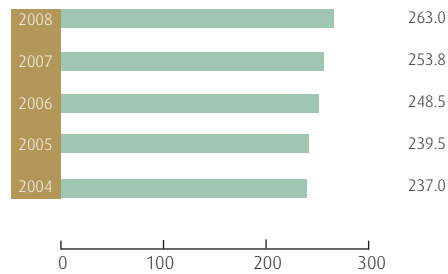
# Saudi Aramco

## by the Numbers

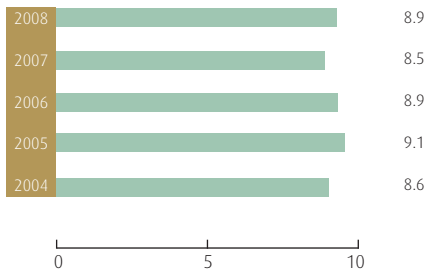
### Recoverable Crude Oil & Condensate Reserves (billions of barrels)



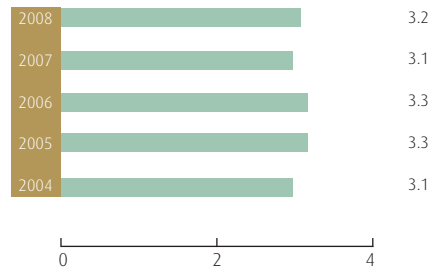
### Recoverable Gas Reserves: Associated & Non-Associated (trillions of cubic feet)



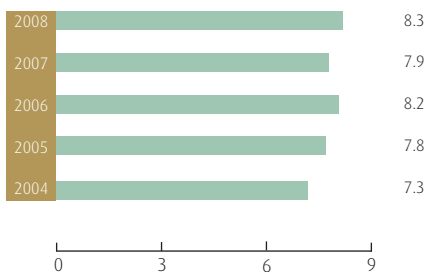
### Crude Oil Production (millions of barrels per day)



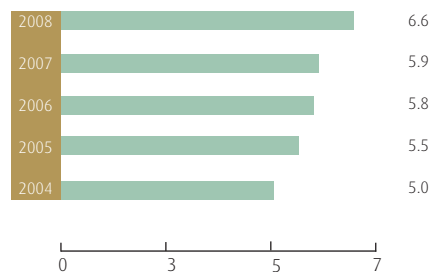
### Crude Oil Production (billions of barrels per year)



### Raw Gas to Gas Plants (billions of scfd)



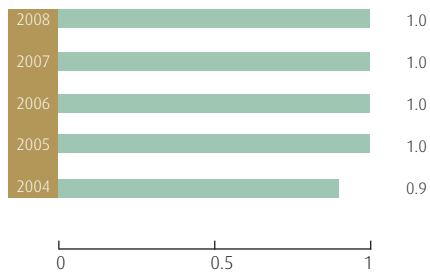
### Delivered Sales Gas (trillions of BTUs per day)





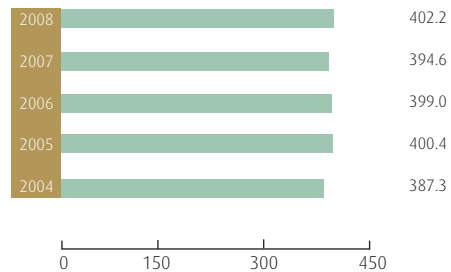
### Delivered Ethane Gas

(trillions of BTUs per day)



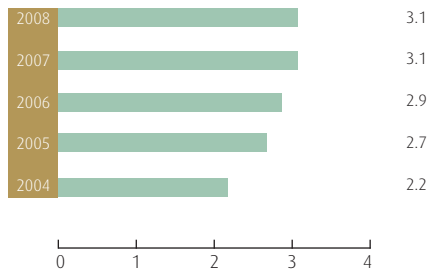
### NGL from Hydrocarbon Gases

(millions of barrels)



### Sulfur Recovery

(millions of metric tons)



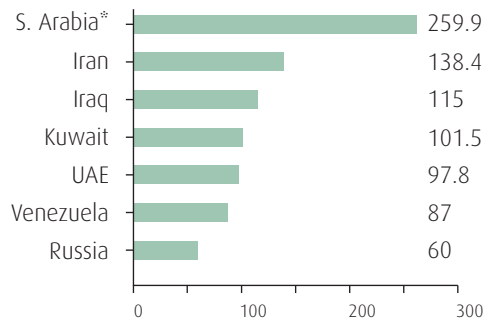
### Classification of Saudi Crude Oil



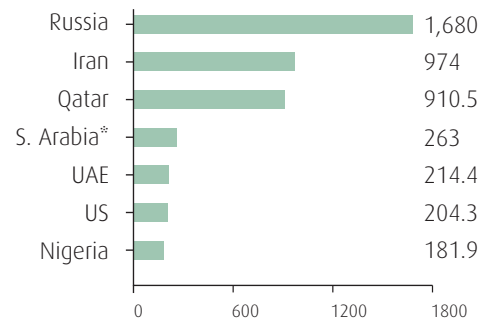
### Estimated Worldwide Crude Oil and Gas Reserves as of January 1, 2009

Source: Oil & Gas Journal

Conventional Crude Oil Reserves (billion barrels)



Natural Gas Reserves (trillion cubic feet)

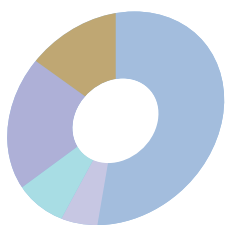


\* Source: Saudi Aramco

# Saudi Aramco

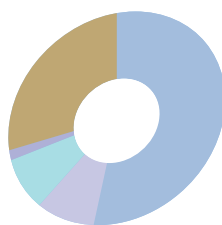
## by the Numbers

### 2008 Exports by Region



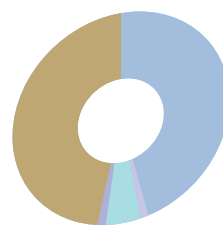
#### CRUDE OIL

- Far East: 52.7%
- Europe: 5.2%
- Mediterranean: 7.0%
- US: 20%
- Other: 15.1%



#### REFINED PRODUCTS

- Far East: 53.4%
- Europe: 8.2%
- Mediterranean: 7.4%
- US: 1.4%
- Other: 29.6%



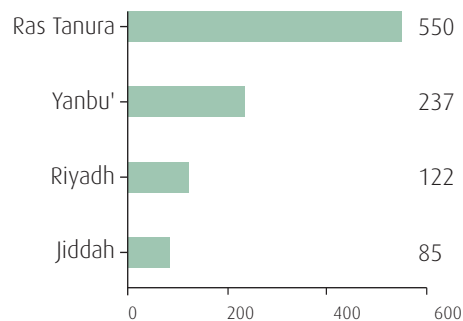
#### NGL\*

- Far East: 45.6%
- Europe: 1.3%
- Mediterranean: 5.4%
- US: 1.2%
- Other: 46.5%

\* includes sales on behalf of SAMREF & SASREF

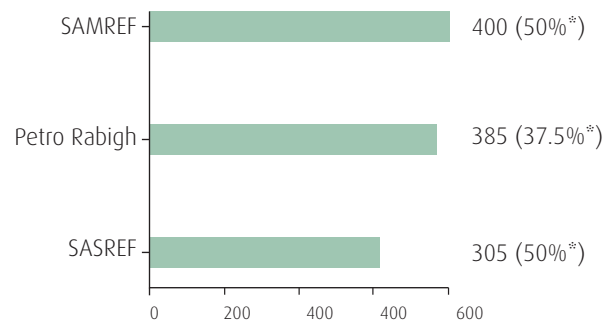
### Domestic Refining Capacities

(thousands of barrels per day)



### Domestic Joint & Equity Venture

Refining Capacities (thousands of barrels per day)



\* Saudi Aramco ownership

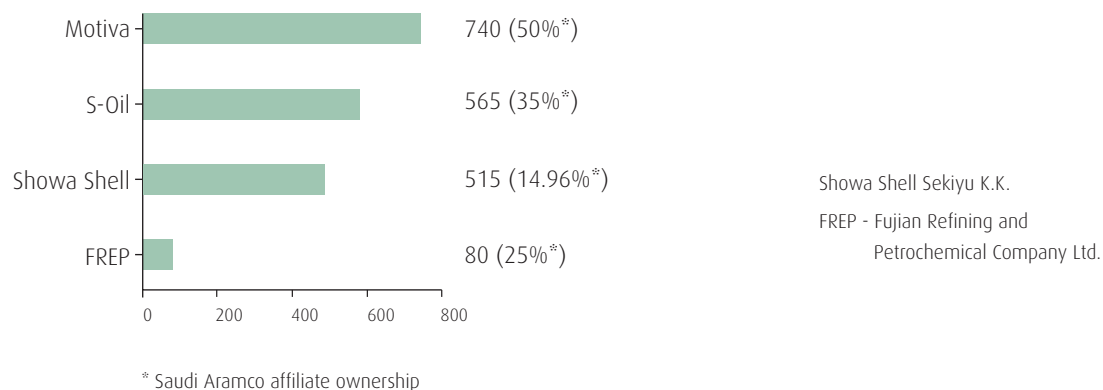
Total domestic refining capacity (including 50% share of SAMREF and SASREF and 37.5% share of Petro Rabigh):  
1.49 million barrels per day

SAMREF - Saudi Aramco Mobil Refinery Co. Ltd., Yanbu'

SASREF - Saudi Aramco Shell Refinery Co., Jubail

## International Equity and Joint Ventures Refining Capacities

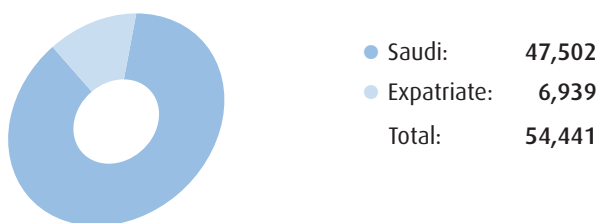
(thousands of barrels per day)



Total international equity and joint venture refining capacity: 644.79

Total worldwide refining capacity (company-owned/operated and equity and joint ventures): 2.15 million barrels per day

## Workforce as of December 31, 2008



## Saudi Development Programs

Number enrolled at year-end 2008

Two-year apprenticeship <sup>1</sup>	4,897	Associate Degree Program Non-Employees	52
College Degree Program (CDPNEs) <sup>2</sup>	1,298	Advanced degree	281
Co-op Students	117	Advanced medical/dental	20
College Preparatory Program	346	Two-year technical diploma	56

1. plus 100 apprentices at SASREF

2. excluding College Preparatory Program

# Saudi Aramco

## by the Numbers

### Crude Oil, Natural Gas & Refined Products

#### PRODUCTION / EXPORTS

Crude Oil & Refined Products (barrels)	2007	2008
Crude Oil Production, excl. NG blended	3,114,147,623	3,266,236,505
Crude Oil Exports	2,407,956,412	2,509,577,626
Crude Oil Transported Using Company or Chartered Vessels	599,906,000	607,471,000
Refined Products Production	571,060,897	577,941,454
Refined Products Exports	136,010,203	132,088,155

Natural Gas	2007	2008
Raw Gas to Gas Plants (billions of SCF daily)	7.998	8.336
Delivered Gas (trillions of BTUs daily)		
Sales Gas (methane)	5.990	6.588
Ethane	1.033	1.022
<b>Total Delivered Gas</b>	<b>7.023</b>	<b>7.610</b>

Natural Gas Liquids - Production	2007	2008
NGL Production from Hydrocarbon Gases (barrels)		
Propane	143,681,301	146,047,764
Butane	92,683,812	94,483,405
Condensate	94,273,950	93,478,781
Natural Gasoline	63,925,885	68,195,019
<b>Total NGL Production</b>	<b>394,564,948</b>	<b>402,204,969</b>

Natural Gas Liquids - Exports	2007	2008
NGL Exports from Hydrocarbon Gases (barrels)		
Propane	134,426,569	136,484,296
Butane	79,642,853	80,703,859
Condensate	20,009,344	11,337,903
Natural Gasoline	52,635,009	55,399,248
<b>Total NGL Exports</b>	<b>286,713,775</b>	<b>283,925,306</b>

#### SULFUR

Sulfur	2007	2008
Sulfur Recovery (metric tons)	3,089,223	3,163,346
Sulfur Exports (excl. sales on behalf of SAMREF and SASREF, metric tons)	2,583,536	2,866,764

## PRINCIPAL PRODUCTS MANUFACTURED AT IN-KINGDOM REFINERIES (BARRELS)

2008	LPG	Naphtha	Gasoline	Jet Fuel/ Kerosene	Diesel	Fuel Oil	Asphalt & Misc.	Total
Ras Tanura	2,760,998	22,608,640	35,096,304	5,827,277	79,125,490	34,481,674	8,131,697	188,032,080
Yanbu'	3,151,644	(1,339,348)	16,004,810	(758,884)	33,246,708	32,086,668	0	82,391,598
Riyadh	2,585,768	0	12,750,442	4,666,025	20,772,094	102,452	6,934,333	47,811,114
Jiddah	562,351	3,594,471	4,889,647	(451,383)	8,603,958	5,356,944	2,894,111	25,450,099
Rabigh	9,958	18,095,525	0	9,286,815	33,417,098	37,741,167	0	98,550,563
<b>Total Domestic</b>	<b>9,070,719</b>	<b>42,959,288</b>	<b>68,741,203</b>	<b>18,569,850</b>	<b>175,165,348</b>	<b>109,768,905</b>	<b>17,960,141</b>	<b>442,235,454</b>

\*Negative figures primarily indicate products that were reprocessed into other refined products.

## SAUDI ARAMCO SHARE

2008	LPG	Naphtha	Gasoline	Jet Fuel/ Kerosene	Diesel	Fuel Oil	Asphalt & Misc.	Total
SAMREF	(525,000)	0	25,749,000	11,912,000	19,636,000	14,228,000	0	71,000,000
SASREF	1,641,000	13,452,000	1,885,000	11,576,000	11,745,000	12,830,000	0	53,129,000
Petro Rabigh	0	2,525,000	0	1,549,000	3,567,000	3,936,000	0	11,577,000
<b>Total JV</b>	<b>1,116,000</b>	<b>15,977,000</b>	<b>27,634,000</b>	<b>25,037,000</b>	<b>34,948,000</b>	<b>30,994,000</b>	<b>0</b>	<b>135,706,000</b>
<b>Grand Total</b>	<b>10,186,719</b>	<b>58,936,288</b>	<b>96,375,203</b>	<b>43,606,850</b>	<b>210,113,348</b>	<b>140,762,905</b>	<b>17,960,141</b>	<b>577,941,454</b>

## DOMESTIC PRODUCT SALES BY REGION (BARRELS)

2008	Central	Eastern	Western	Total
LPG	2,623,283	4,865,116	5,517,106	13,005,505
Gasoline	49,713,501	27,451,603	59,531,359	136,696,463
Jet Fuel/Kerosene	7,162,001	2,865,292	12,607,278	22,634,571
Diesel	63,686,615	45,953,657	98,541,006	208,181,278
Fuel Oil	609,864	9,223,992	103,484,969	113,318,825
Asphalt & Misc.	7,314,453	8,942,001	6,508,872	22,765,326
<b>Total</b>	<b>131,109,717</b>	<b>99,301,661</b>	<b>286,190,590</b>	<b>516,601,968</b>
2007	Central	Eastern	Western	Total
LPG	2,261,313	4,709,624	5,484,688	12,455,625
Gasoline	45,798,084	25,097,392	55,818,517	126,713,993
Jet Fuel/Kerosene	6,761,959	2,575,009	11,748,255	21,085,223
Diesel	59,621,125	42,330,610	89,948,138	191,899,873
Fuel Oil	42,900	4,967,600	103,159,308	108,169,808
Asphalt & Misc.	7,173,852	6,168,659	5,432,372	18,774,883
<b>Total</b>	<b>121,659,233</b>	<b>85,848,894</b>	<b>271,591,278</b>	<b>479,099,405</b>

# Domestic Operations



- Saudi Aramco Refinery
- Integrated Refinery & Petrochemical Plant
- Joint Venture Refinery
- KAUST: King Abdullah University of Science and Technology
- Terminal
- Bulk Plant

# International Operations



- |                            |  |                         |   |
|----------------------------|--|-------------------------|---|
| 1. <b>HOUSTON</b>          | Aramco Services Co., Saudi Refining Inc.<br>Aramco Associated Co., Motiva Enterprises LLC. | 13. <b>DUBAI</b>        | Vela International Marine Limited   |
| 2. <b>WASHINGTON, D.C.</b> | Aramco Services Co.  | 14. <b>JUBAIL</b>       | Saudi Aramco Shell Refinery Co.<br>Marafiq                                  |
| 3. <b>NEW YORK</b>         | Saudi Petroleum International, Inc.  | 15. <b>AL-KHAFJI</b>    | Aramco Gulf Operations Co. Ltd.   |
| 4. <b>BERMUDA</b>          | Stellar Insurance Ltd.   | 16. <b>BEIJING</b>      | Saudi Petroleum Ltd.  |
| 5. <b>CURAÇAO</b>          | Bolanter Corp. N.V., Pandlewood Corp. N.V.   | 17. <b>SEOUL</b>        | S-Oil Corporation<br>Aramco Overseas Co. B.V.                               |
| 6. <b>LONDON</b>           | Saudi Petroleum Overseas Ltd.<br>Aramco Overseas Co. B.V.                                  | 18. <b>TOKYO</b>        | Saudi Petroleum Ltd.<br>Aramco Overseas Co. B.V.<br>Showa Shell Sekiyu K.K. |
| 7. <b>ROTTERDAM</b>        | Texaco Esso AOC Maatschap<br>TEAM Terminal B.V.<br>Texaco AOC Pumpstation Maatschap        | 19. <b>SHANGHAI</b>     | Aramco Overseas Co. B.V.  |
| 8. <b>LEIDEN</b>           | Aramco Overseas Co. B.V.   | 20. <b>FUJIAN</b>       | FREP, SSPC  |
| 9. <b>EGYPT</b>            | Sumed Arab Petroleum Pipelines Co.   | 21. <b>HONG KONG</b>    | Aramco Overseas Co. B.V.<br>Saudi Aramco Sino Co.                           |
| 10. <b>RABIGH</b>          | Petro Rabigh   | 22. <b>SINGAPORE</b>    | Saudi Petroleum Ltd.  |
| 11. <b>YANBU'</b>          | Saudi Aramco Mobil Refinery Co. Ltd.<br>Marafiq  | 23. <b>KUALA LUMPUR</b> | Aramco Overseas Co. B.V.  |
| 12. <b>JIDDAH</b>          | Luberef, Jiddah Oil Refinery Co.   |                         |   |

**Marafiq:** Electricity and Water Utility for Jubail and Yanbu'  
**FREP:** Fujian Refining and Petrochemical Co. Ltd.  
**SSPC:** Sinopec SenMei (Fujian) Petroleum Co. Ltd.

# 75 years of setting new standards



The tools used in the search for petroleum have evolved to take advantage of breakthroughs in the computer and imaging sciences.



From a single airplane in 1934, Saudi Aramco now operates one of the world's largest corporate aviation fleets.



In its early years, Saudi Aramco helped eradicate malaria in the Eastern Province and supported the development of education and civil infrastructure. Community Outreach programs today focus on topics such as environmental education.





On May 1, 1939, the first shipment of Saudi crude oil left Ras Tanura aboard the tanker *D.G. Scofield*. Modern supertankers such as the *Capricorn Star* in the fleet of Vela, Saudi Aramco's shipping subsidiary, have a capacity more than 20 times as large.

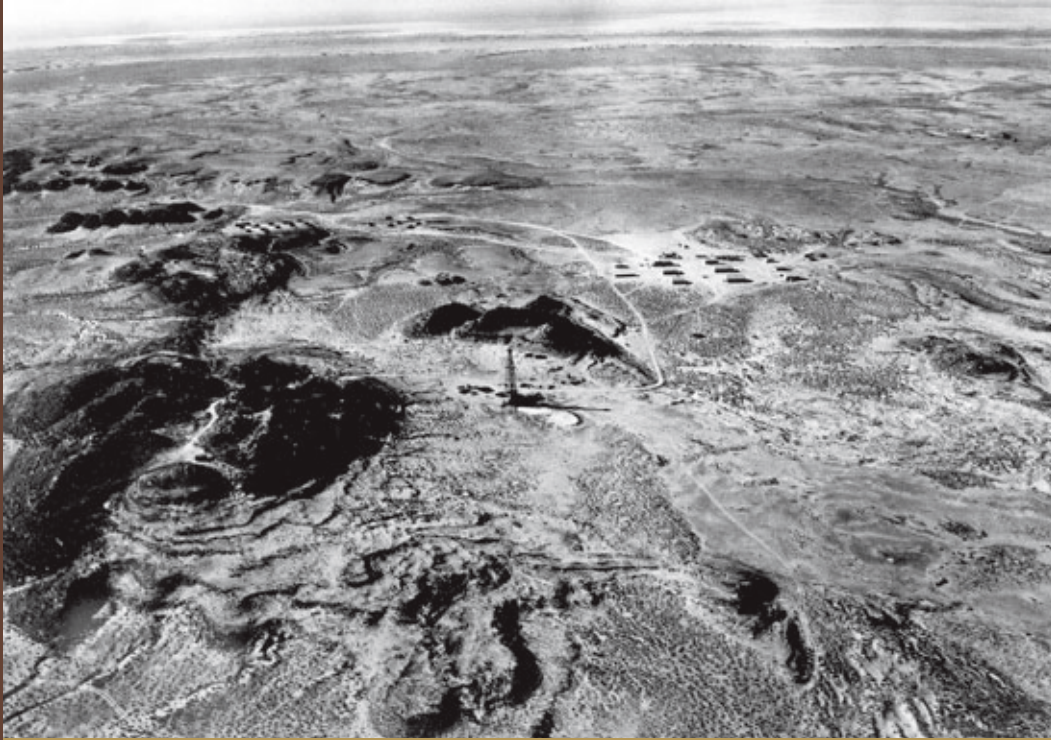


Saudi Aramco's first refinery at Ras Tanura was a 3,000-bpd "tea kettle" facility. Today, Ras Tanura's refining capacity is more than 500,000 bpd.



Development of the Saudi workforce, one of the conditions of the original concession agreement, is still a core value for the company.

# Dhahran



These two views of Dhahran, one taken in 1935 and the other more than 70 years later, are of the same location. In the 1935 photograph, Dammam Well No. 1 and the fledgling oil camp of Dhahran can be seen. In the contemporary image, Dhahran has grown considerably and the site of Well No. 1 is in the desert to the left of the crossroads. In the foreground, in the brick plaza set in the grassy park, is Dammam Well No. 7, the discovery well, which in March 1938 ushered in the era of commercial oil production in Saudi Arabia.





