

RESTMAC



“Creating Markets for Renewable Energy Technologies EU RES Technology Marketing Campaign”



Bioethanol Production and Use



Supported by the European Commission - FP6

Brochure produced as part of the Project: RESTMAC

Project Coordinator

EREC - European Renewable Energy Council

Project Partners

EWEA - European Wind Energy Association

EPIA - European Photovoltaic Industry Association

ESHA - European Small Hydropower Association

AEBIOM - European Biomass Association

EUBIA - European Biomass Industry Association

EGEC - European Geothermal Energy Council

ADEME - Agence de l'Environnement et de la Maîtrise de l'Energie

NTUA - National Technical University of Athens

ECB - Energy Centre Bratislava

GAIA - Consultores en gestion ambiental

ESTIF - European Solar Thermal Industry Federation

Contents:

Introduction	p. 3
Bioethanol Production	p. 4
1. Cereal & Sugar Crop Production	p. 4-5
2. Lignocellulosic Production	p. 6
European Bioethanol Production	p. 7
Bioethanol Co-Products	p. 7-9
Bioethanol Use	
- Chemicals	p. 9
- Transport Fuel	p. 10-13
- Fuel Cells	p. 14
Bioethanol Engineering Companies	p. 15
Politics & Concluding Remarks	p. 16
Project Overview	p. 18



This publication is supported by the European Commission and Co-funded by the European Commission under the Sixth Framework Programme (FP6).

CONTACT NO: TREN/05/FP6EN/S07.58365/020185



Brochure produced by

EUROPEAN BIOMASS INDUSTRY ASSOCIATION

63-65 Rue d'Arlon

B-1040 Brussels

Tel : +32 2 400 10 20 Fax : +32 2 400 10 21

eubia@eubia.org www.eubia.org

Images on front cover from left: TEREOS (Sugar Cane), TEREOS (Bioethanol Plant) and UK Agriculture.com (Wheat).

Legal Notice

The sole responsibility for the content of this publication lies with the authors. It does not represent the opinion of the Community. The European Commission is not responsible for any use that may be made of the information contained therein.



Introduction

In recent years, largely in response to uncertain fuel supply and efforts to reduce carbon dioxide emissions, bioethanol (along with biodiesel) has become one of the most promising biofuels today and is considered as the only feasible short to medium alternative to fossil transport fuels in Europe and in the wider world. The current EU commitment under Directive 2003/30/EC on the promotion of biofuels for transport set a target of 5.75% of all transport fuels by 2010. The recent European Commission energy roadmap has now increased this to 10% by 2020.

Bioethanol is seen as a good fuel alternative because the source crops can be grown renewably and in most climates around the world. In addition the use of bioethanol is generally CO₂ neutral. This is achieved because in the growing phase of the source crop, CO₂ is absorbed by the plant and oxygen is released in the same volume that CO₂ is produced in the combustion of the fuel. This creates an obvious advantage over fossil fuels which only emit CO₂ as well as other poisonous emissions. In the 1970s, Brazil and the USA started mass production of bioethanol - grown from sugarcane and corn respectively. Smaller scale production started more recently in Spain, France and Sweden mostly from wheat and sugar beet.

In recent years the concept of the bio-refinery has emerged, whereby one integrates biomass conversion processes and technology to produce a variety of products including fuels, power, chemicals and feed for cattle. In this manner one can take advantage of the natural differences in the chemical and structural composition of the biomass feed stocks. The Commission document "[An EU Strategy for Biofuels](#)"¹ reports on this concept of the "bio-refinery" within the Seventh Framework Programme (FP7) and it will give it high priority support. In the framework of the RESTMAC project ("Creating Markets for Renewable Energy Technologies EU – RES Technology Marketing Campaign") which aims to develop and employ a comprehensive and well thought-out thematic approach to encourage the uptake of selected RES technologies in the market, this brochure will present information about the production of bio-ethanol and its co-products, but will also focus the use of bioethanol and on some political issues. In this brochure you can also find a list of the main actors in the bioethanol sector

¹ "An EU Strategy for Biofuels", European Commission,
http://ec.europa.eu/agriculture/biomass/biofuel/com2006_34_en.pdf

Bioethanol Production

The production of bioethanol from traditional means, or **1st Generation Biofuels** is based upon starch crops like corn and wheat and from sugar crops like sugar cane and sugar beet. However, the cultivation of alternative sugar crops like *sweet sorghum* opens up new possibilities in Europe, especially in hotter and drier regions, such as Southern and Eastern Europe. Sweet sorghum requires less water or nutrients and has a higher fermentable sugar content than sugar cane as well as a shorter growing period which means that in some regions like in Africa you can get 2 harvests a year from the same crop. In addition to this, the development of lingo-cellulosic technology has meant that not only high energy content starch and sugar crops can be used but also woody biomass or waste residues from forestry. This development is seen as the **2nd Generation of Biofuels**.



Abengoa's Ecocarburantes Españoles plant in Cartagena, Spain, produces 100 million litres of bioethanol

This process is still expensive by comparison to traditional bioethanol production. Bioethanol, or rather ethanol, itself belongs to the chemical family – alcohols – and has a structure of C_2H_5OH . It is a colourless liquid and has a strong odour.

Südzucker Bioethanol, based in Mannheim, Germany supplies E85 grade bioethanol from their recently commissioned plant (Feb 2006) at Zeitz which cost 200 million Euros. It produces 260 million litres of bioethanol a year from high value protein feed, mostly wheat.



Depending on the biomass source the steps generally include:

- | | |
|--|--------------------------------------|
| 1. Storage | 6. CO2 storage and ethanol recapture |
| 2. Cane crushing and juice extraction | 7. Evaporation |
| 3. Dilution | 8. Distillation |
| 4. Hydrolysis for starch and woody bio | 9. Waste water treatment |
| 5. Fermentation with yeast and enzym | 10. Fuel Storage |

Sugar Cane

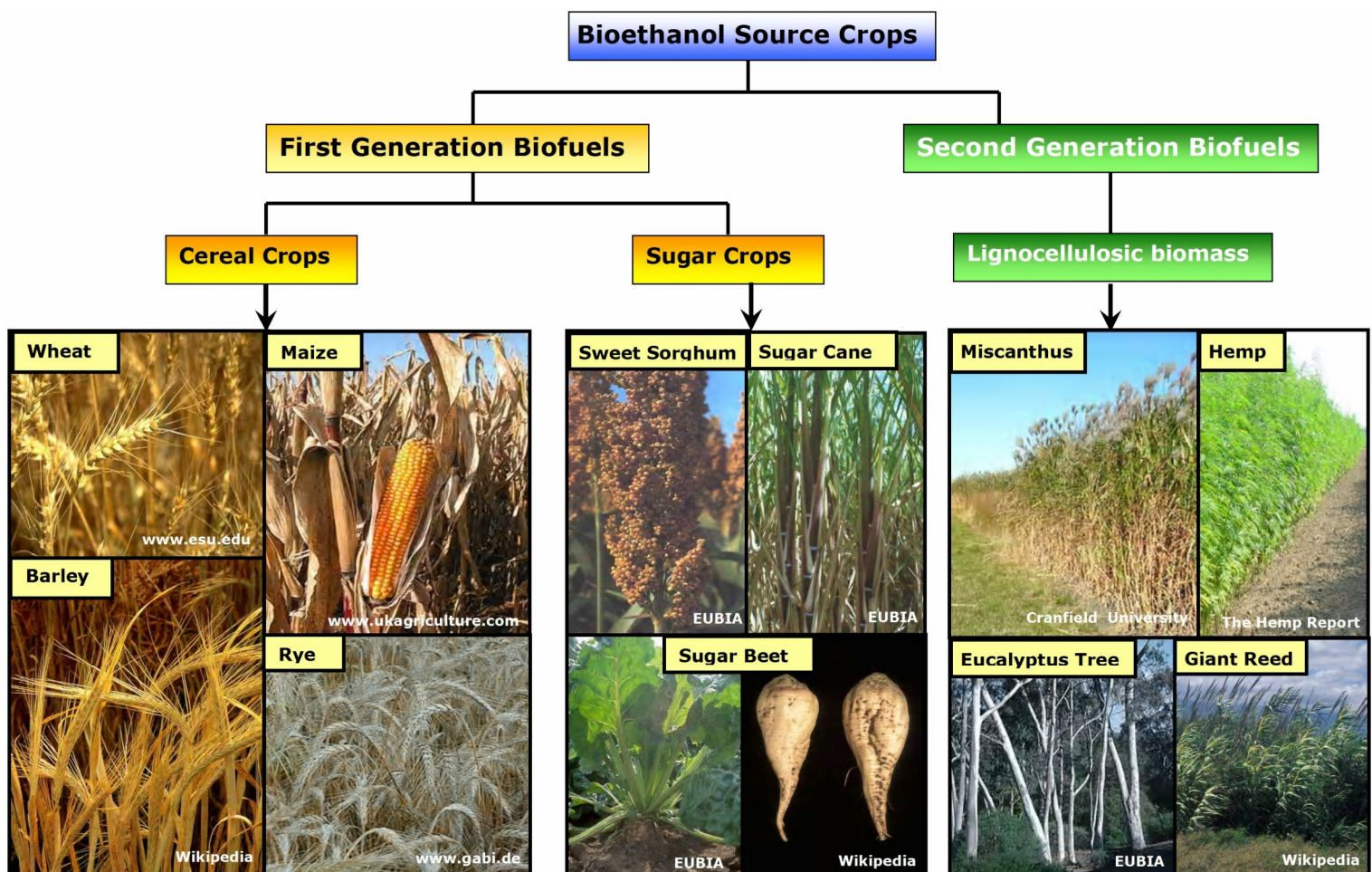
Today the processes of milling (cutting of cane into regular pieces) and raw sugar refining are usually done together on one site. During the milling the sugar cane is washed, chopped and shredded by revolving knives. The shredded cane (20-25cm) is fed into mill combinations which crush and extract the cane juice. The juice is filtered and pasteurised (treatment of heat to kill micro-bacterial impurities) along with chemicals. Bagasse, the waste matter from the cane sugar

is used as a fuel for the bioethanol plant boilers and it can produce heat and steam on a self-sufficient basis. The cane juice is filtered to remove vinasse – the unwanted non alcoholic black-red liquid. Vinasse has been considered an annoying waste product and as a burden and environmental hazard due to its viscous nature and high acid content. Some uses include combustion and use as potassium fertilisers. After the vinasse is removed the syrup is then put through evaporation and cooling crystallisation. It leaves clear crystals and molasses. The molasses are separated from the crystals by centrifugation. And further pasteurisation and fermentation processes take place before distillation to a higher concentration of alcohol. Fermentation takes between 4-12 hours normally.

Cereal crops

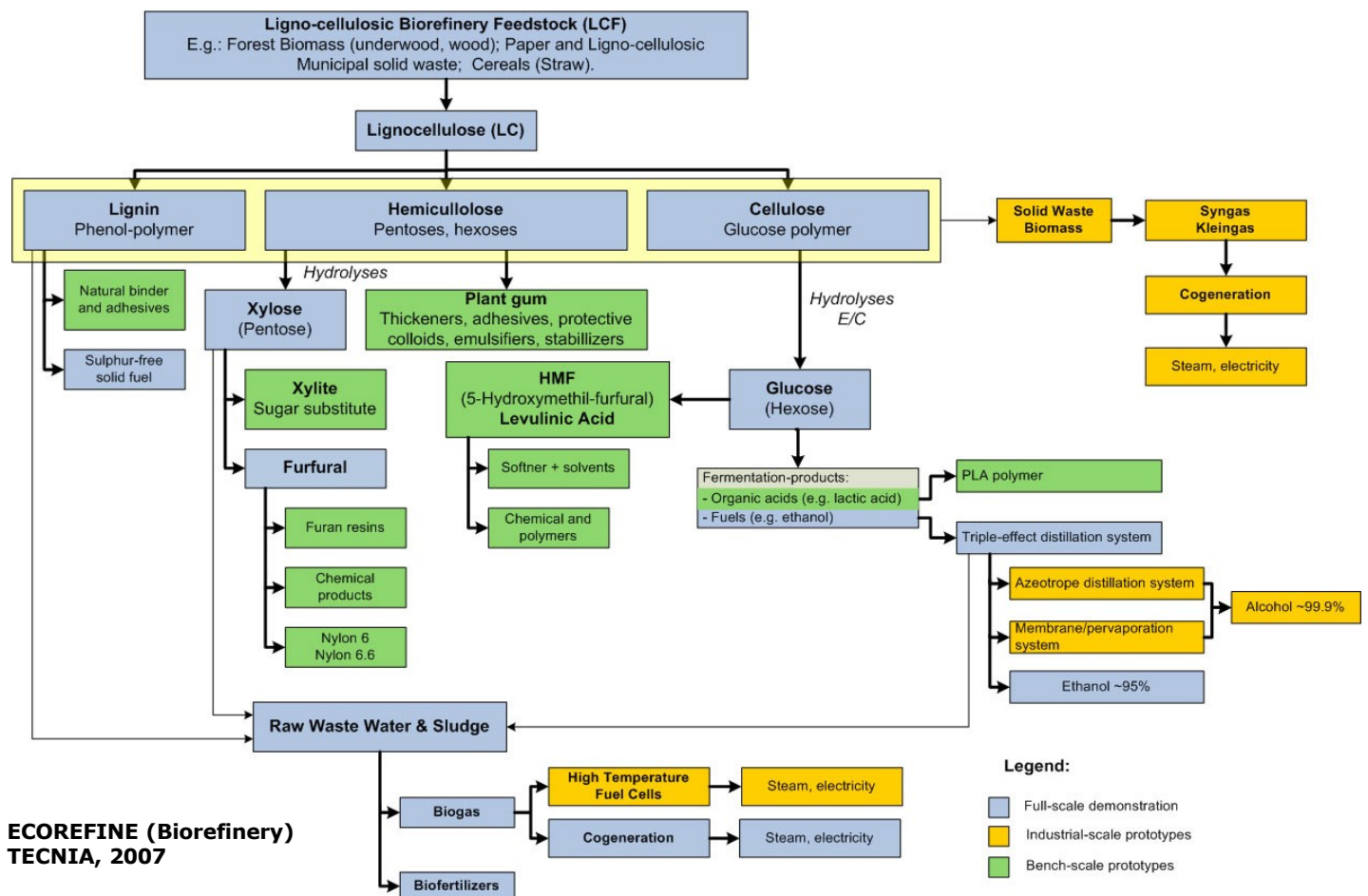
For starch (cereal) based crops the procedure is similar to sugar crops but with the added process of hydrolysis to break down the polymers into monomers which can then be broken down into simple C6 sugars. From the milling of the grain to release the starch, it is then diluted into water to adjust the volume of sugar in the mash. The mixture is cooked with yeast and all the water soluble starches dissolve into the water. And through either acid hydrolysis or enzymes, the starch is converted into sugars. The unrefined fermented liquid known as “beer”, is produced and through various evaporation and distillation stages fuel grade ethanol can be produced.

Below is a diagram showing examples of the main crop sources for bioethanol. They can be naturally divided into cereal crops, sugar crops and woody/lignocellulosic biomass. Any sort of wood, crop residues or forestry waste like sawdust and chips can be used for 2nd Generation bioethanol. Miscanthus and the other examples below are of some fast growing grasses which are proving more and more popular for heating fuel. They could also be used for lignocellulosic bioethanol.



Lignocellulosic Bioethanol

The difference in process steps between starch and lignocellulosic feedstocks is that lignocellulosic biomass requires a more complicated hydrolysis stage. The reason for this is that cellulose in the wood contains carbohydrate polymers called cellulose. Cellulose is made up of long chains of glucose and a more complex set of enzymes are required to break the long chains. Therefore lignocellulosic bioethanol is technically more demanding and thus more expensive. Work at the moment is ongoing to enhance the pre-treatment methods such as steam explosion, ammonia steam explosion, acid processing and synthesising more efficient enzymes. Another area for development is fractionation technology so one can use more variable biomass, such as agriculture and forest crop residues and urban waste. The chemical structure of the crop and forest residues are highly variable which creates added complexity compared to the homogeneity of starch or sugar crops.



The concept of the biorefinery is seen as a very promising venture for the future. The diagram above shows the complexity and substantial potential available from the production point of view. The possibility of many different co-products and chemicals from lignocellulosic bioethanol production has caught some attention. The costs of large scale production are said to be 8-12 years away from realisation. Much investment is going into the enzymatic study of breaking down the cellulosic material and separating it from lignin. Syngenta, a Swiss company, has signed a 10 year contract worth \$16m with American company, Diversa, for research and development of enzymes for biofuels (Bioenergy Business, Feb 2007).

European Bioethanol Production

Producer	Country	Capacity (litres/yr)	Website	Feedstock
Saint-Louis Sucre	France	15,000,000	www.saintlouis-sucre.com	Beet or Molasses
Cristal Union	France	120,000,000	www.cristal-union.fr	Beet
Tereos	France	50,000,000	www.tereos.com/	Wheat and sugar beet
Südzucker	Germany	260,000,000	www.suedzucker.de	Wheat
Sauter	Germany	310,000,000	www.sauter-logistik.de	Rye
Kwst	Germany	30,000,000	www.kwst.com	Sugar Beet or molasses
Abengoa Bioenergy	Spain	510,000,000	www.abengoabioenergy.com	Wheat
Agroethanol AB	Sweden	50,000,000	www.agroetanol.se	Wheat
SEKAB (formerly Svensk Etanolkemi)	Sweden	100,000,000	www.sekab.se	Wood waste and wine alcohol
EUBIA & ABENGOA, 2006				

The table above shows the large players in bioethanol production in Europe. Abengoa is by far the largest producer, followed by Sauter and Südzucker. SEKAB has an important place in the industry as they specialise in lingocellulosic bioethanol technologies and production. They use wood residues from the paper pulp industry as well as surplus wine alcohol as bioethanol feed stocks. This wine usage has been encouraged by the European Commission in response to the present surplus in the wine industry in Europe. It is expected to last for another 6-7 years. SEKAB also invests in bioethanol plants, especially now in Hungary where they are investing 380 million € in 4 new bioethanol plants to produce 600 million litres by 2008 from mainly maize and some wheat along. In addition 460,000 tonnes of animal feed will be produced as a co-product.

Bioethanol Co-products

DDG (Dried Distillers Grain) is an important co-product from cereal bioethanol production. It is created from drying the mash after all useful ethanol has been extracted. It is used as feed for cattle. Also DDGS is a soluble version made by adding water which is more easily consumed by cattle. DDGS can usually be kept for 2 to 3 days or 1 week by adding preservatives. The dry, DDG can be stored indefinitely.

"DDGS is a high quality feedstuff ration for dairy cattle, beef cattle, swine, poultry, and aquaculture. The feed is a partial economical replacement for corn, soybean meal, and dicalcium phosphate in livestock and poultry feeds." (www.ethanol.org)



Straw is another important co-product from cereals and has been used for centuries for various uses. Straw is the waste part of the plant that does not contain the grain and it makes up around 50% of the plants weight. Historical uses include use for rope, paper, packaging, thatching and bedding. It has mostly been used for animal feed although recent uses include biofuels in the lignocellulosic path to bioethanol. It can also be used as a substrate for biogas production through anaerobic digestion. Straw has mainly been somewhat of a burden for farmers as they had to dispose of it some way but its application for bioethanol or biogas means they can sell this waste as a marketable by-product.



Bagasse is the primary by-product from sugar cane production. Bagasse is commonly combusted in boilers or cogeneration systems in the sugar industry for the production of heat in the mill for sugar refining processes and for the production of electricity for either direct use by the plant or to sell to the national grid which can increase their overall profit. About 35% of the weight of sugar cane becomes bagasse. Brazil, India, China and Thailand are the largest producers and utilisers of bagasse.

Bagasse is a straw like material left from cane sugar. It can also be used for making agro-pellets which can be exported as a feedstock for home pellet boilers or co-firing.

Lignin products from lignocellulosic bioethanol production are highly varied. Due to the nature of the organic compound they have **unique strength to weight and elastic or adhesive properties**.

Lignin is the most important organic compound for strength between cell walls in plants. Between 1/4 and 1/3rd of all dry tree mass is made of lignin. It fills cells along with cellulose and some other compounds and forms covalent bonds between different polysaccharides thereby giving mechanical strength to the whole plant. Lignin can be used for a variety of uses and in varying sectors.

Companies specialised in Lignin based products:

- Borregaard LignoTech USA Inc. www.lignotech.com/
- Rayonier Performance Fibers www.rayonier.com/
- Tembec www.tembec.ca/
- Temple Inland www.myinland.com/

See www.lignin.org for more information

Examples of Lignin Products and Uses

Category of Use	Explanation/example of Application
Food & Perfumes	Flavourings or scent for perfume, e.g. Vanilla (Borregaard)
Binder/glue	Fertiliser, plywood, dust suppressants, ceramics
Dispersant	Reduces binding with other substances, e.g. Oil Drilling muds, paints, dyes, pigments
Emulsifier	Mixes 2 immiscible liquids together, usually for a limited length of time, e.g. the mixing of oil and water
Sequestrant	Lignosulfonates can be used for cleaning compounds and for water treatments for boilers, cooling systems, micro-nutrient systems

The company Borregaard (Norwegian/USA) has a range of products based on vanillin an organic compound more commonly known as vanilla in the foods and perfumes sector. Producing vanilla naturally like this is proving more cost effective than the synthetic route, i.e. through the petrochemical industry. The natural production of rubber from the plant is a good example as many of its applications cannot be synthesised petro-chemically. Lignin is largely produced as a by-product of the paper industry, separated during the pulping process. Through the production of bioethanol, this opens up a new line of production.

Bioethanol Use -

Chemicals

A number of chemicals are produced in the ethanol industry and potentially even more in the 2nd generation bioethanol industry, serving a wide range of uses in the pharmaceuticals, cosmetics, beverages and medical sectors as well as for industrial uses. The market potential for bioethanol is therefore not just limited to transport fuel or energy production but has potential to supply the existing chemicals industry.

SEKAB co-produce the following chemicals along with Fuel Ethanol:

1. Acetaldehyde (raw material for other chemicals e.g. binding agent for paints and dyes)
2. Acetic acid (raw material for plastics, bleaching agent, preservation)
Ethylacetate (paints, dyes, plastics, and rubber)
3. Ethanol 95% (foods, pharmaceuticals, fuel ethanol, detergents)
4. Thermol (cold medium for refrigeration units and heat pumps) (SEKAB, 2007)

KWST also provide a range of chemicals mixed into marketable compounds such as:

1. Ethyl Alcohol (ethanol) (spirits industry, cosmetics, print colours and varnish)
2. Isopropyl alcohol (IPA), Ethyl acetate (EAC), WABCO-antifreeze (disinfectant, cleaning agent for electronic devices, solvents)
3. Vinasse, Potassium Sulphate (feeding stuffs, fertilizer) (KWST, 2007)

Transport Fuel:

Bioethanol has mostly been used as a biofuel for transport, especially in Brazil. Indeed it was in Brazil where the first bioethanol fuelled cars emerged on a large-scale. Although generally unknown to the average consumer, a large volume of bioethanol is already used in Europe as it is blended with petrol at 5%. It is used as a substitute for lead as an oxygenating additive and has a high octane rating, which improves performance. Although the eventual target is the private consumer, few are aware of bioethanol's potential to, at least, partly replace petrol as a transport fuel in Europe.

Stakeholders in the Bioethanol Fuel Market:

- bioethanol producers
- fuel suppliers
- car manufacturers
- the government - support is also extremely important as was the case in Brazil in the late 1970s and in the USA today bioethanol has been endorsed by the President and helped by subsidies and tax breaks
- transport users



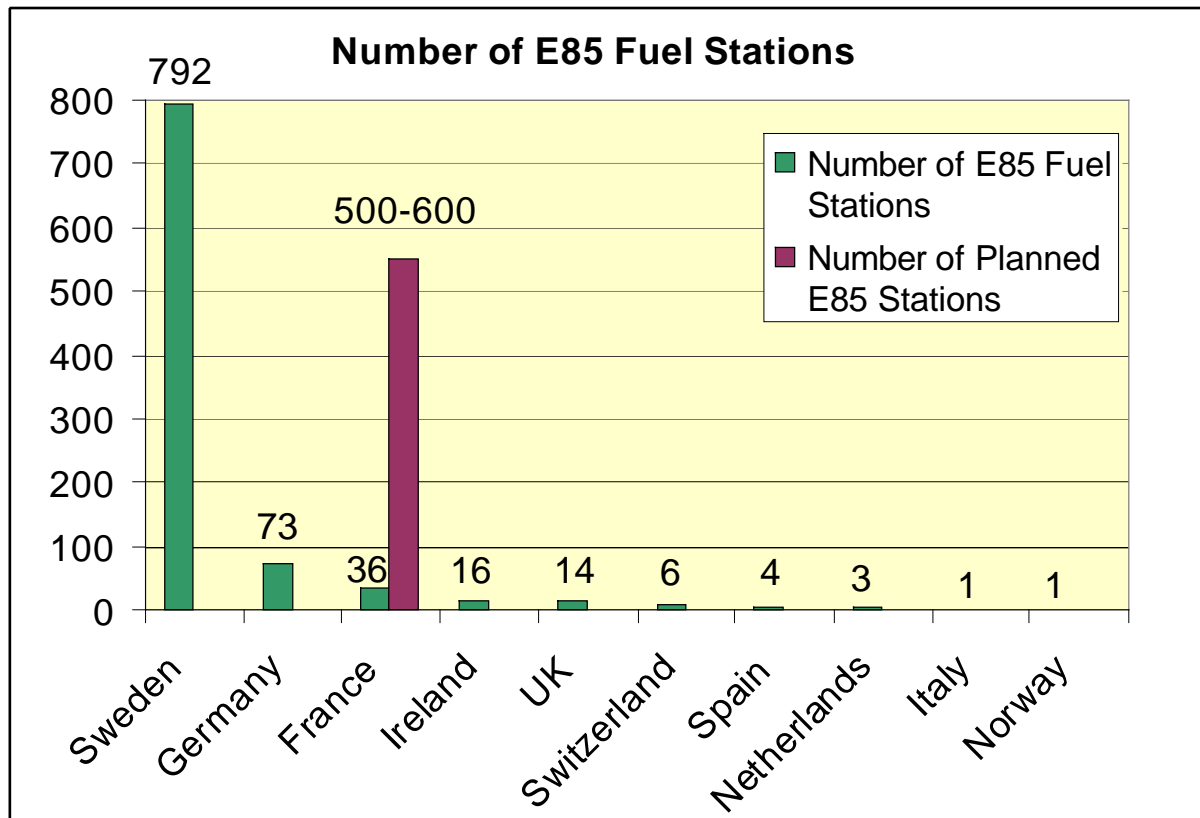
In addition supermarkets who provide petrol stations to customers are seeing the opportunity to provide petrol/ethanol blends from 5-85% (E5 –E85). Even though most experts agree that up to a 10% mix will not damage modern car engines, the manufacturer warranty for standard cars is set at 5%. Above this level to maintain the warranty, the car engines need to be modified or one has to buy a fuel flexible vehicle (FFV).

Fuel ethanol in Europe:

Sweden is the strongest in the bioethanol transport market with over 792 E85 (BAFF, March 2007) fuel stations and 15,000 Ford Focus FFVs have been sold there since its debut on the market in 2001. By May 2006, 15% of all newly sold cars were either bioethanol or biogas fuelled vehicles. E85 is being sold at prices substantially less than petrol, between 75 and 85 € cents per litre compared to 1.11 € and 1.19 € for petrol. An important consideration when marketing the price of bioethanol is the fact that ethanol contains around 30% less energy per litre than petrol which means you have to fill up more frequently. Therefore the sale price will have an important impact on take-up of bioethanol as a transport fuel.

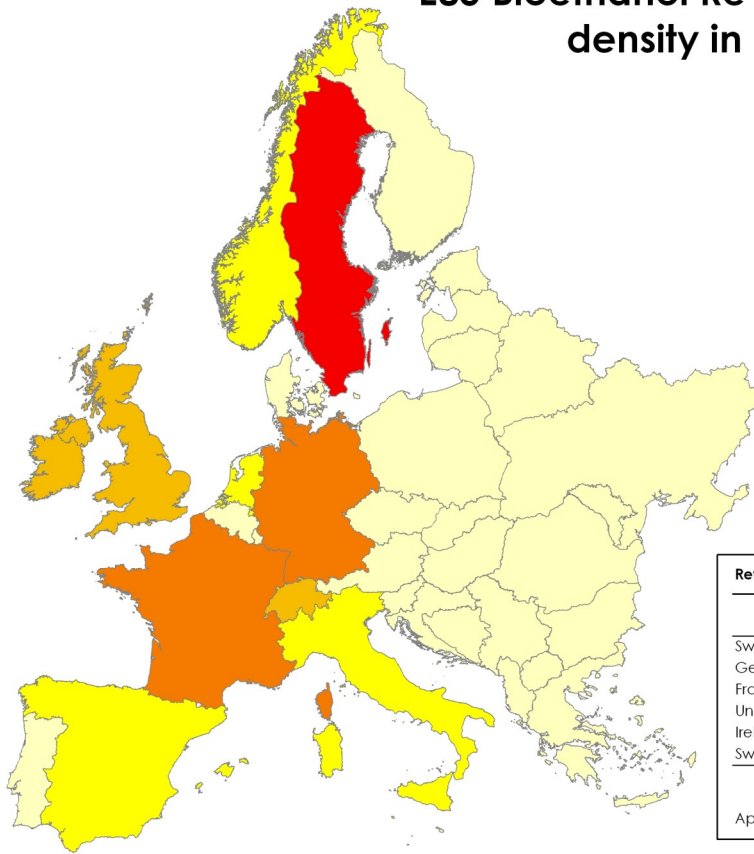
Fuel	Energy Content (kJ per litre)
Petrol	32 389
Diesel	35 952
Ethanol	21 283
E85	22 950

Elsewhere in Europe, there are at present (March 2007) 73 bioethanol petrol stations in Germany serving E50, E85 or E100. Morrisons Supermarket chain in the UK supply E85, available from 14 forecourts in the South of England (see photo above) marketed at 2 pence below petrol. However, their bioethanol is supplied from Futura Petroleums, which all comes from Brazilian fuel stocks. Despite the distances involved, it is still competitive to import bioethanol from across the Atlantic instead of producing it locally.



The graph above shows the leading countries in bioethanol fuel stations in Europe. Sweden is by far and away the largest proponent for bioethanol as a transport fuel. Germany is progressing faster than most and the rest sell E85 at only a handful of service stations often to support private vehicles such as police or governmental fleets around the more densely populated areas. In 2007 we can expect to see a substantial increase in some of these countries, especially in France where the government has mandated the introduction of 500-600 E85 service stations.

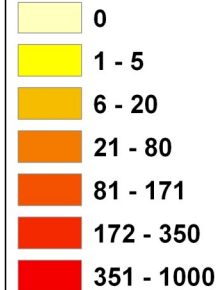
E85 Bioethanol Re-Fueling Station density in Europe



Legend

Europe

E85 Refuelling Stations



Refuelling Stations per 10000 head of Population

	E85 fuel stations	E85 per 10000 Persons	Petrol Stations per 10000 Persons
Sweden	792	0,8721	4,33
Germany	73	0,0088	1,85
France	36	0,0059	2,22
United Kingdom	14	0,0023	1,62
Ireland	13	0,0383	3,83
Switzerland	6	0,0080	4,66

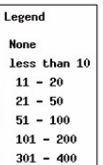
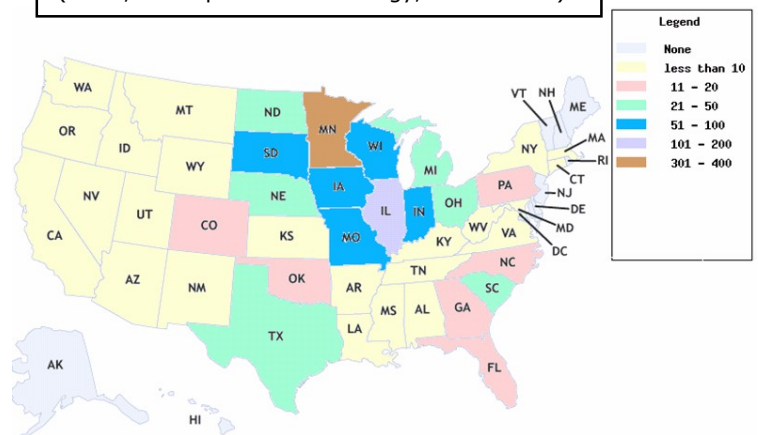
April, 2007 (EUBIA)

The map and figures above gives you a brief overview of the bioethanol fuel market and the density of E85 stations in comparison with petrol stations. The number of service stations per 10,000 persons gives a useful comparison. While the total number of petrol stations has declined dramatically over the last 20 years, being half or even one third of what they once were, the bioethanol stations are still very low in comparison as they are just starting to appear in Western Europe with the exception of Sweden. There, the first E85 filling station appeared in 1995 but steady expansion started only in 2002 (Saab, 2006).

Transport Fuel in the USA:

Depending on the state policy and natural resources, E85 is being used to a varying degree across most states. Some states where E85 service stations are fewer in number serves E85 only to governmental and private fleets such as in parts of California, whereas there is a very impressive publicly available E85 infrastructure around the American corn belt (Iowa, Illinois, Nebraska, Minnesota, Indiana, Wisconsin, South Dakota, Michigan, Missouri, Kansas, Ohio and Kentucky) which is shown by the blue, grey and brown colours in the following map.

E85 Filling Stations in the USA (EERE, US Department of Energy, March 2007)



Manufacturers of bioethanol fuelling vehicles:

Ford are the only mass producer of Flexi-fuel vehicles in Europe, led by the Focus and C-Max models. Saab and Volvo started offering an alternative from 2005 and 2006, respectively, with their Flex-fuel bioethanol cars. Both Swedish companies in fact offer a biogas fuelled model as well. Scania has also a series of E85 fuelled buses and trucks.

The USA has already a large number of car manufacturers selling fuel-flexible vehicles: Ford, Chrysler, General Motors, Isuzu, Mazda, Mercedes, Mercury and Nissan. And in Brazil the companies Fiat, Ford, General Motors, PSA, Renault, Volkswagen serve the national E85 vehicle needs.



Ford Focus, Ford Motor Company

The Ford Focus FFV (see left) has been marketed around the same price as the basic petrol model. The commercial potential of the car has received a boost by the Avon and Somerset (UK) Police who bought 15 of the fuel flexible Focus' in March 2006. Further interest has been shown by other regional police forces throughout the United Kingdom. The advantage is that they are still able to refuel from petrol at any percentage, thus not limiting their range to where the bioethanol pump infrastructure does not reach. Ford reports there is a 70% reduction in CO₂ emissions compared the petrol version.

The Focus FFV, and C-MAX although released in 2001 in Sweden, only became available in the UK in September 2005 and it is still yet to be released to the dealerships in the UK on a large scale. However it has enjoyed substantial success in the Swedish car market since its introduction. Swedish car maker, Volvo, has two models that run on bioethanol, those being the S40 (see opposite) and V50. Neither of them are, as yet, widely available in countries outside Sweden.



S40 FFV Volvo, Volvo

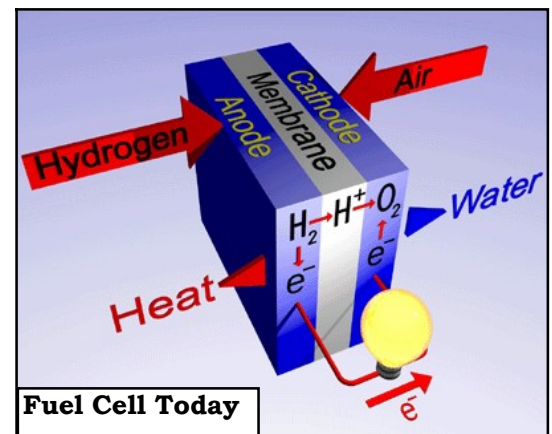
Saab has a 9-5 biofuel saloon and estate model that can run on E85. There are a small number of these biopower models available at selected dealerships in the South and East of England where there is a small E85 fuel pump infrastructure via the Morrisons supermarket chain. Saab has in 2006 produced a bio-hybrid electric engine that will work on E100, first shown at the Stockholm motor show and based on the Saab 9-3 model. By the end of 2007, Renault, Peugeot and Citroen will have their own fuel-flexible vehicle ready for the market in line with the government's mandated E85 infrastructure plans for 2007.



Saab 9-5 Biopower, www.ethanol360.com

Fuel Cells:

Fuel cells are another potential area for ethanol use to produce heat and power. Fuel cells function by combining the fuel hydrogen with oxygen from the air to produce electrical energy, with water vapour and heat as by-products. Fuel Cells have a typical electrical efficiency of between 30 and 60 % and an overall efficiency, if using the heat by-product, of 70-90 %. The units run with very low noise emissions and pollutant gas emissions are also reduced considerably. It's disadvantages are its relatively high cost and their short life span (regular replacement of components). They are, however, regarded as very reliable for the duration of their lifespan and are often used for emergency power. Some uses of fuel cell CHP systems include providing heat and power for hospitals, university campus', remote telecommunication stations as well as for transport, stationary power generation and residential buildings. The recent growth in small residential (0.5 to 10 kWe) fuel cell CHP is based on natural gas fuelled units.



PEMFC energy exchange diagram

A number of fuel cells can use bioethanol as well as fossil fuels, sometimes with, sometimes without the need for a reformer (to convert it to hydrogen). Acumentrics (USA) and Ceramic Fuel Cells (Australia) manufacture such fuel cells.



Acumentrics



Sulzer Hexis

The ideal situation is where one uses pure hydrogen as the fuel. This creates energy and water vapour as products – as is demonstrated in the PEMFC diagram. However many fuel cell units are designed to take fossil fuels like natural gas, propane, methanol or butane. Here CO₂ is additionally produced with water vapour. The obvious advantage is the fuel flexibility and equally obviously, the disadvantage is the emitted CO₂.

Acumentrics manufacture a fuel cell suitable for residential and other small-scale use with 5 and 10 kWe capacities. They can be set to 120 or 240 volts depending on needs. The start up time is from 10 to 30 minutes. The fuelling options are impressive as it can take propane, natural gas, ethanol, methanol, methane and hydrogen. Sulzer Hexis are responsible for the majority of SOFC installations in the world. They are working on a CHP system, 1 kWe, 2.5 kWth with an additional burner to provide for the heat requirements of the home.

Types of Fuel Cell:

- **Molten Carbonate Fuel Cells** (MCFC)
- **Solid Oxide Fuel Cells** (SOFC)
- **Polymer Electrolyte Fuel Cell** (PEFC) aka **Proton Exchange Membrane Fuel Cell** (PEMFC)
- **Phosphoric Acid Fuel Cells** (PAFC)
- **Alkaline Fuel Cells** (AFC)

Bioethanol Engineering Companies

The complexity of a bioethanol plant is considerable and it therefore requires dedicated planning and expertise to build one, so the majority of bioethanol plants are built upon specification by a contracted engineering company (specialising in bioethanol), rather than by purchasing individual component units **(Details of individual component manufacturers can be found in a number of publications such as the Sugar Industry Buyers Guide, Spring 2006)**. Firms that provide the complete design to construction service are listed below.

Company	Country	Website	Email Address	Telephone Number	Fax Number
Vogelbusch GMBH	AT	www.vogelbusch.com	office@vienna.vogelbusch.com , office@hongkong.vogelbusch.com office@houston.vogelbusch.com	+ 43 1 54 661-0 + 852 2314 3030 + 1 713 461 7374 (USA)	+ 43 1 545 29 79 + 852 2314 0369 (HK) + 1 713 461 7374 (USA)
Lurgi	DE	www.lurgi.com/	kommunikation@lurgi.com	+49 (69) 58 08-0	+49 (69) 58 08-38 88
GEA Wiegand	DE	www.gea-wiegand.com	info@gea-wiegand.de	+ 49 7243/705-0	+ 49 7243/705-330
TECNIA	PT	www.tecna.net	info@tecna.net	+351 261 912 470/1 +966 1 218 1460 (Saudi Arabia)	+351 261 912 472 +966 1 218 1461
Chematur Engineering	SE	www.chematur.se/	info@chematur.se	+46 586 641 00	+46 586 791 700
Bayer Technology Services	DE	www.bayertechnology.com/	info@bayertechnology.com benelux@bayertechnology.com btsasia@bayertechnology.com	+49 214 30-50100 (Germany) +49 214 / 30-1 +32 3 540 79 92 (BENELUX) +86 21 67120280 (CHINA) + 1 877-229-37 87 (USA)	+32 3 540 37 78 (BENELUX) +86 21 67120393 (CHINA)
Delta-T Corp.	USA	www.deltatcorp.com/	sales@deltatcorp.com	+1 (757) 220-2955	+1 (757) 229-1705
Praj Industries	India	www.praj.net/	info@praj.net	+91-20-22951511	+91-20-22951718
MW Zander	UK/DE	www.mw-zander.co.uk/	uk-info@mw-zander.com	+44 1249 455150	+44 1249 657995
Parker, Messana & Associates, Inc.	US	www.pma-engr.com/		+01 253 926 0884	+01 253 926 0886
BBI International	US	www.bbibiobiofuels.com	info@bbibiobiofuels.com	+01 719 539 0300	+01 719 539 0301

Politics

The Biofuels Progress Report (Brussels, [9.1.2007] COM(2006) 845 final) from the Commission has stated that it doesn't expect the biofuels target of 5.75 % to be met in 2010. The average member state achieved 52% of its target in 2005 where only 2 member states met their target of 2% biofuels in the national mix. Although biofuels are not the most cost effective fuel, they are the only practical means for reducing the EU's dependence on oil. It should be said that the production of biofuels does not automatically equate in CO₂ savings as it depends on the land management employed. If the energy crop has replaced natural rain forest the effects would be negative not only on CO₂ sequestration but also on native biodiversity and habitat areas. The energy crops need to be thoughtfully planted on appropriate land. Responsible bioethanol production can provide diversification of energy supply and energy security while also creating employment in the many process jobs involved in the industry.

Further actions to reduce emissions in the EU were reinforced by the European Commission's call for vehicle manufacturers to reduce car CO₂ emissions to 120g/km by 2012 from 2004 levels of 163g/km². The role of bioethanol for transport fuels could also make an important impact on CO₂ reduction from transport. The technology side is seen as a critical area for reducing transport CO₂ as it is acknowledged that mobility, in the EU, will certainly not decrease but increase with time.

Concluding Remarks:

The opportunity to reduce dependence on fossil fuels, while reducing CO₂ is of strategic importance today. Since there is increased consensus among experts on the reality of human induced global warming and the repercussions which are associated with it, the potential to use carbon neutral fuels like bioethanol can help us stop (or slow down) this negative impact on the environment. As long as the plantation of the bioethanol feed stocks are done in a sustainable way without compromising native species habitats and endangering the local biodiversity, there is no reason why bioethanol cannot be one of the energy solutions for today.

The potential for bioethanol to create jobs is immense in farming, biorefineries, the chemical industry, the fuel supply sector as well as fuel-flexible vehicle engineering. The economic climate is ripe for investing in bioethanol production in Europe mostly for fuel ethanol but also for the chemical use and stationary power generation. The bioethanol by-products provide a useful side revenue through feedstocks for animal feed, power generation and as a feedstock for 2nd generation bioethanol.

² European Commission Press Release IP/07/155, 07/02/2007,
<http://europa.eu/rapid/pressReleasesAction.do?reference=IP/07/155>

RESTMAC

“Creating Markets for Renewable Energy Technologies EU - RES Technology Marketing Campaign”

PROJECT OVERVIEW

The project aims at developing and implementing a concise, well-targeted and thematic approach to ensure the uptake of selected RES technologies in the market. In other words the consortium works towards establishing a technology marketing campaign for the different RE technologies involved. So far the market uptake of R&D results does not happen in the best possible way. Lack of information and use of synergies between stakeholders (industries, governments, consumers) is still seen as the critical barrier to large-scale RE technology use in the market place. RESTMAC aims to reverse this trend by:

- A sectoral approach with the objective of promotion and valorization of selected technologies with relevant and strong socio-economic potential;
- A geographical approach with the identification of key market areas where those technologies first selected could be largely deployed;

More specifically the project will look at renewable electricity technologies, renewable heating and cooling technologies and thirdly, the production and distribution of liquid biofuels. A key objective of the project is also to target new member states in the EU and European Islands, along with Asian states and the Mediterranean area where there is significant potential for RES which is as yet un-harnessed. For more information visit the website:

www.erec-renewables.org/projects/proj_RESTMAC_homepage.htm

The renewable energy sectors to be marketed include:

- PV (photovoltaic)
- SHP (Small Hydro Power)
- Biomass
- Geothermal
- Solar Thermal
- Wind Power

The biomass part of the project focuses on some selected areas that have great potential for the European biomass market and energy sector. EUBIA is responsible for brochures number 4 and 5 while AEBIOM is responsible for the other three:

1. Pellets for Small-scale Domestic Heating Systems
2. New Dedicated Energy Crops for Solid Biofuels
3. Procurement of Forest Residues
4. Co-generation at Small-scale
5. Bioethanol Production and Use