



The Future of Biofuels: Corn, Rapeseed and Chopsticks

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FCL Biofuels is one of the largest biofuels companies in the UK and one of the first to launch an own-brand fuel for the forecourts in the shape of PrioBio™. It is a fact that the fossil fuels, which currently fulfil over 80 per cent of our energy needs, will one day run out. It is also a fact that 'one day' is coming ever nearer.

With the developing areas of the world embracing their industrial revolutions, and the developed world requiring energy for almost everything that we do, it's a case of 'when' not 'if' sustainable fuel solutions will come into play.

The potential of electric and hydrogen cars is fast-becoming a reality, albeit one fraught with set-backs. But what will the next 50 years bring for the petroleum industry in the transition from cars powered by fossil fuel to reliable next-generation vehicles?

Biomass fuels

We are faced with the certainty of fossil fuels running out.

The answer should be simple – a return to the biomass fuels that sustained us for so many centuries ie the burning of wood to cook food. The reality, however, is that technology has moved on.

Biofuels have been talked about for years. The combustion engine was originally designed to run on ethanol, as was the Ford Model T, while the diesel engine was originally developed to be powered by peanut oil.

However, as the cheaper mineral oil became more widely available, cars ceased to use biofuels.

The global agenda

The tide has turned and biofuels are now high on the global agenda. The European Union has set the target that all fuel sold should contain at least ten per cent renewable fuel by 2020. In the United States, Congress has mandated a 4 billion gallon total for national biofuel consumption in 2006, with an increase to 7.5 billion gallons by 2012.

In the UK, we will see the RTFO (Road Transport Fuel Obligation) come into force from April 2008. This will formally put in place EU targets, with a legal requirement on suppliers to ensure that five per cent of all UK fuel comes from a renewable source by 2010. It will also set up a system of certificates and opt-outs to ensure companies comply.

Biofuels on the market

Saab launched their first BioPower car in 2005 but fewer than 25 Morrisons stores across the UK currently stock the E85 bioethanol required to power these vehicles.



New Saab 9-3 Saloon BioPower
MY 2006

Fig 1. Saab 9-3 BioPower Saloon, ©GM Corp

One source names fewer than 70 outlets across the UK selling biodiesel of a higher than five per cent blend and many of those are 'members-only clubs' where you have to make an appointment to fill up.

However, by the end of 2008, both bioethanol and biodiesel will have a stronger showing on European forecourts. A growing number of companies are set to have refineries online with many of the big oil majors putting large research and development budgets behind sustainable fuels.



Fig 2. PrioBio™ is set to become a leading retail brand in the next decade.

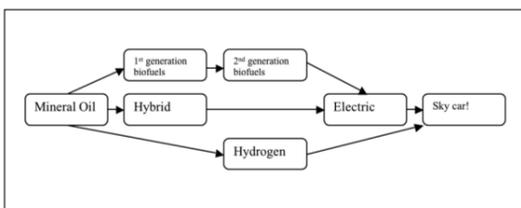


Fig 3. Mapping out the future

Currently, we sit firmly at the start of the process. First generation biofuels are just coming onto the market and hybrid electric cars are available but at a higher price than petrol or diesel counterparts.

First generation biofuels

First generation biofuels are those made up of traditional feedstocks such as sugar cane, sun oil and rapeseed.

Stan Freeman of The Republican suggested in June 2007 that the rush to fill America's cars with bio-ethanol as a way to reduce the country's dependence on foreign oil was leading to soaring costs for milk, tequila, filet mignon and popcorn among other edibles. According to the International Monetary Fund (IMF), world food prices rose by ten per cent in 2006 because of side effects of the growth of crops for biofuels.

There are very few people in the renewable energy and petro industries who would argue that first generation biofuels are the ultimate answer. But they are a significant move away from the rapidly-depleting stocks of fossil fuels and a vital stepping stone for both scientist and consumer.



Fig 4. Transport group Arriva has invested in renewable fuel options across its passenger fleets. As well as sending their bus drivers on courses to improve their fuel economy, Arriva-Portugal has recently decided to fuel its 240 Portuguese bus fleet with biodiesel from FCL's partner company, Prio SA. Image ©Arriva PLC.

Second generation biofuels

Second generation biofuels include crops which grow on marginal land, such as switchgrass, as well as waste products like sewage and algae.

The Japanese government announced in August 2007 that, with each of Japan's 127 million people using on average 200 sets of disposable chopsticks per year, approximately 90,000 tonnes of wood could potentially be converted into biofuel.

Second generation technologies such as biomass-to-liquid (B-T-L) and cellulosic ethanol are still in the experimental stage although gas-to-liquid (G-T-L) is being used by at least one major oil company. They are arguably cheaper than conventional biofuels in terms of energy balance and carbon saving, but their production will require a huge initial investment.

Unfortunately, the costs and set-backs involved in first-generation biofuels are likely to make it harder to attract investment for the second-generation fuels now in development.

Measuring quality

Stanhope-Seta design and manufacture laboratory instruments for quality control and analysis of fuel, including biofuels.

Regarding biodiesel analysis, product specialist Andy Woodward says: "The fuel quality of biodiesel depends on several factors including the quality of feedstock, the fatty acid composition of the parent oil or animal fat, the production process and other materials used in this process.

"For example, fuels with excessive free glycerin show problems with glycerin settling out in storage tanks. This creates a highly viscous mixture which can lead to clogged fuel systems, injector fouling and valve deposits.

"It is important to test the fuel to ensure the quality of the biodiesel at the time of delivery, monitor the consistency of the biodiesel from batch to batch production and check the biodiesel quality for any deterioration during storage.

"The current specification to check biodiesel quality is EN14214 which was developed to ensure that fuel

does not cause any adverse effects to the vehicle engine management system. EN14214 contains up to 25 different tests which biodiesel has to meet before it can be sold."



Fig 5. Stanhope-Seta Setaflash Flash Point Tester

Stanhope-Seta's guide to analysing fuel

- Producers can set up their own quality control laboratories. This requires significant capital investment of up to £250,000.
- Samples can be sent to a third party laboratory at a cost of approximately £750 per batch. This option can take three or four cycles and additional testing may be required if the product is off specification.
- Producers could purchase equipment to perform the critical test parameters themselves, for example, density, flash point, water, viscosity, and acid content. These tests provide an indication of fuel quality and suitability of use.

However, regardless of how the producer chooses to test their fuel, all biodiesel has to meet the full requirements of EN14214 for sales purposes to the end user.



Fig 6. The European producer of PrioBio™ - Prio S.A.'s refinery in Portugal

Biofuels standards

FCL's own blended fuel, PrioBio™, will be commercially available from spring 2008. To ensure quality assurance, more and more companies will need to follow FCL Biofuels' model in controlling the entire supply chain – from planting the crops, through to refining, marketing and distribution.

A lack of quality control over the storage process can lead to impurities finding their way into fuel tanks as one supermarket forecourt trader discovered to its cost. Consumer confidence was shaken and the retailer had to compensate drivers for damage done to their cars.

There are currently three specification standards for diesel and biodiesel fuels – EN590, DIN 51606 and EN14214. EN590 is the standard all diesel must meet to be sold in the EU. It allows for a five per cent biofuel blend.

DIN 51606, a German standard, is the most stringent standard existing and most commercially-produced biodiesel exceeds this standard. EN14214 is based on DIN51606 and is the standard for biodiesel recently finalised by the European Standards organisation CEN.

Many car manufacturers do not warrant their cars to run on biofuels but the UK Department for Transport makes clear that 'currently, most products on the

market are a blend of 95 per cent mineral fuel to five per cent biofuel.'

Biofuel is already in our tanks, meeting British standard EN590. However, this standard does not yet account for the quality discrepancies between different biofuels and feedstocks.

The transition stage

Within the next 50 years, it is likely we will have come to the end of the mass supply of fossil fuels. Technology should have reached the stage that hydrogen and electric fuel cells are a daily reality and we may even have moved beyond.

Biofuels stack up environmentally and commercially. They are a sustainable stepping stone which will fill the gap between fossil fuels running out and next-generation technologies kicking in.



Fig 7. Saab Aero X BioPower ©GM Corp

Biofuel is a reality, not a pipe dream

The question is not whether we should look to biofuels for the future but rather how we should move forward from the biofuels progress already made. Reality is already beginning to bite with escalating fuel prices.

As the economic situation shifts, biofuels will enable producers to provide economical solutions in the shape of renewable fuels. It will alter the petro industry landscape – the rules are going to change. By 2050, the petro industry will have moved on to embrace new technologies. It will be a very different market.

High-Throughput Sample Introduction Systems For Environmental Analysis

PerkinElmer Life and Analytical Sciences (USA) recently announced an agreement with Elemental Scientific Inc. (ESI) to offer integrated sample introduction systems designed to improve throughput when making measurements under EPA Methods 200.7 and 200.8 analysis, which focus on the determination of metal concentration in drinking water, in addition to other environmental applications.

ESI's Sample Changer (SC)-FAST system fully integrates with PerkinElmer's inorganic spectrometers and is offered with PerkinElmer's ELAN® Inductively-Coupled Plasma Mass Spectrometer (ICP-MS) and Optima™ Inductively Coupled Plasma (ICP) instrumentation.

"With PerkinElmer instruments and the ESI FAST system, laboratories can improve the sample throughput of their ICP-MS and ICP dramatically, for some samples up to 50 percent and enhance return on investment," said Ian Shuttler, Vice President Inorganic Analysis Business, PerkinElmer Life and Analytical Sciences.

The system reduces non-productive time segments of the analysis, including uptake, stabilization and rinse times.

"PerkinElmer's ELAN and Optima instrumentation are a perfect fit with ESI's SC-FAST system," said Dan Wiederin, President of ESI. "The software PerkinElmer uses to control sample introduction is a flexible and user-friendly interface to ESI sample introduction systems. The combination of the SC-FAST with ELAN and Optima offers laboratories dramatic benefits in throughput and data quality."

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New Complete Guide to Chromatography Columns and Consumables

Thermo Fisher Scientific Inc., (USA) announces the availability of its new 2008-2009 Chromatography Columns and Consumables catalogue. The catalogue is a complete product and technical reference guide that consolidates the extensive collection of Thermo Scientific chromatography columns and consumables into one comprehensive resource. New this year, the catalogue includes a section containing user-replaceable parts for the most popular Thermo Scientific chromatography and mass spectrometry systems.

The catalogue offers application and column selection sections, providing chromatographers with the tools they need to select the appropriate product to meet their requirements. As well as an extensive range of HPLC products, the catalog also features individual sections devoted to GC columns and consumables, SPE products and chromatography accessories.

This comprehensive resource presents the breadth of quality Thermo Scientific HPLC columns, including new Hypersil GOLD™ Phenyl HPLC column extensions to the flagship Hypersil GOLD™ family. It also highlights the expanded line of Thermo Scientific TRACETM GC columns offering reliable, reproducible columns for GC and GC/MS applications. The Thermo Scientific line of HyperSep™ SPE products is also included, offering numerous options for sorbents and formats, including the new HyperSep Retain™ polymeric SPE products, 96-well plates and novel tips. The highly reproducible and efficient phases of Thermo Scientific SPE products provide consistently high recoveries, free from contaminants and impurities.

The new Thermo Scientific Chromatography Columns and Consumables catalogue is built on over 30 years of chromatography experience. Together with the Separated by Experience Chromatography e-newsletter and web-based Chromatography Resource Center the catalog offers the most comprehensive and reliable guide to chromatography consumables on the market.



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