

Biofuels Update

by Peter L Barlow BSc (Hons), C Chem, FRSC, FEI



Peter L Barlow

First some statistics

How is the biofuel market fairing in the UK against the reduced rate of introduction of biofuels prompted by the Gallagher Review? Here are some statistics published by the Department for Transport at the end of April.

4.1 billion litres of biofuel have been supplied under the Renewable Transport Fuels Obligation (RTFO) in the first 33 months of its existence; while in the first nine months of the 2010/11 obligation period:

- 1,205 million litres of biofuel have been supplied, which is approximately 3.3% of total road transport fuel. The annual target is 3.5%.
- More biodiesel (61%) has been supplied than bioethanol (39%). A small volume of biogas (methane) has also been declared to the administrator.
- Amazingly, the largest single feedstock for biofuel was used cooking oil (314m litres, 26% of total biofuel supplied). The most widely reported source of biodiesel was soy from Argentina (179m litres, 24% of biodiesel supplied). The most widely reported source of bioethanol was sugar cane from Brazil (117m litres, 25% of bioethanol supplied).
- The majority of feedstock has been imported but 20% of the biofuel was reported as coming from the UK.
- Greenhouse gas savings of 55% were achieved against a target of 50%.
- 49% of biofuels were produced according to the criteria of a recognised environmental standard, against a target of 80%. For fuels coming from UK feedstocks this figure was 76%.

What is happening on the ground?

Until the widespread emergence of biofuels for motor transport, the petroleum sector didn't appreciate just how fortunate its former existence had been. From an early reliance on the old adage that oil and water don't mix it has been presented with the stark realisation that with biofuel components they do. This has involved a rapid learning curve and change in priorities for suppliers, transporters, retailers, and, yes, the consumers also.

The fuel distribution system in the UK was built on the assumption that, no matter what, water would enter the system but could be separated without harming the fuels. Now, with the miscibility of alcohol and water in petrol and the emulsifiability of water in biodiesel, the rules have changed and eternal vigilance is the order of the day.

Another old saying that: *"If a thing can go*

wrong it will and if it can't go wrong, it still will", is not far from truth as far as biofuels are concerned. Motor fuel supply used to be uncomplicated because petroleum fuels are relatively inert. This is not the case with biofuels and biofuel blends because they contain oxygen and are more reactive there is more to go wrong, and if it can go wrong it will...!

In April 2007 I wrote a half page article on biodiesel for the Sunday Telegraph Motoring Section. In it was the statement:

'Being more oxidatively and thermally unstable fatty acid methyl ester- containing blends tend to age more rapidly. This might not be a problem for a busy main road service station, but what about a hospital's stand-by generators which might not get through a whole tank of fuel in two years.'

So what happened? Were the powers that be forewarned and forearmed? Not a bit of it. Hospitals and emergency services ran into filter blockage problems through sludge formation and microbiological infestations, and back-up generating capacity failed. A hush-hush Government committee was formed to decide what to do about it. In secret because, presumably, those responsible were too embarrassed to admit that while foisting biofuels on an unprepared country, **they had not thought through the problems biofuels would cause to public services.**

Thankfully, in the retail sector the early bugbear of blocked and perforated filters on dispensers is now less common as more systems are cleaned out. Retailers' complaints that the rusty deposits or quantities of water were introduced from the distribution system were met with outraged protests from the suppliers that *"It wasn't us, Gov."* *"We are innocent!"* And they were right, but only some of the time! The appearance of yellowy brown or black sheets of bio-film in biodiesel storage will now follow the introduction of water as sure as night follows day unless there is an effective biocide dosing regime for biodiesel blends and/or rigorous attention to keeping tanks dry. It may not appeal to many forecourt operators but taking small samples from a dispenser before and after a delivery into clean glass bottles and leaving them on a suitably safe window ledge for an hour or so will soon detect a delivered problem. But this is a chemist speaking. Maybe, for retailers, this is too risky.

Second generation biofuels

If we need proof of the specific downsides of biodiesel we need only look at the efforts being made to correct these in the production

of second generation fuels. In March this year, Neste Oil formally opened the world's largest renewable diesel plant in Singapore. The plant has a capacity of 800,000 metric tonnes per annum. (Compare this with the DERV sales in the UK in 2010 of 20.6 million tonnes.) The new facility takes existing biodiesel feedstocks like palm oil or rapeseed oil and uses high pressure hydrogenation to remove both the oxygen and unsaturated components which cause most of biodiesel's problems. That is to say, Neste are converting the natural product into a stable material more akin to traditional diesel but with a higher cetane number.

As far as bioethanol production is concerned, the much sought after prize is the economic biomass-to-liquid technology which will produce alcohol from the cellulose in wood or straw, or a gasification feedstock which can be converted into a range of fuels. But if we remember the original plot, the defeat of global warming, sorry, climate change, the objective was a low carbon economy. But these second generation processes tend to be more energy intensive, and once the life-cycle analysis is worked through properly it is unlikely that they are going to either sustainable or climate friendly. Nevertheless, these future technologies may very well provide better alternatives to present day biofuel blends and so increase the global availability of the motor fuels to which the world is addicted. Despite asking the question numerous times no one in either the Department for Transport or the Renewable Fuels Agency has been able to quantify for me, in carbon emissions terms, the cost of all the blocked filters, damaged engines, production of biocides, cost of research programmes, and the growth of a much larger sector in the UK dealing with tank cleaning, fuel polishing and treatment to overcome the problems biofuels have created. Possibly they do not wish to know the answer. After all, the huge and still expanding market for fuels in China, India and the other Asian economies is increasing demand and forcing up the price of petroleum. This is making alternative processes more economically viable and, just maybe, the real reason that we have biofuel blends today is more for energy security than to fend off climate change.

Continued on Page 12