

UPM talks to *Biofuels International* about the process of trialling a new biofuel in fleet tests

Good results

Preparations for a new wood-based renewable diesel to enter the market have been underway since 2012. Production is finally due to begin this summer at a plant in Lappeenranta, Finland, following the successful completion of some extensive fuel tests and trials.

This fuel – known as BioVerno – has been developed by UPM, a producer of advanced biofuels based in Finland. Previous motor tests, carried out at the VTT Technical Research Centre of Finland, have already demonstrated the renewable diesel functions in diesel engines and works just as well as regular diesel, the only difference being it reduces greenhouse gas emissions by up to 80%, unlike its fossil-based counterpart. However, long-term fleet tests on the fuel had never been carried out.

Fleet tests

For the fleet testing, a fuel blend comprising 20% BioVerno and 80% fossil diesel was prepared, while regular fossil diesel was used as a reference fuel. VV-Auto Group provided four new Volkswagen Golf 1.6 TDI cars. The aim was to drive each car 20,000km in variable conditions, totalling 80,000km.

Prior to this fleet test a 3,000km 'running-in' period took place, whereby the standard European exhaust and fuel consumption tests were carried out on both the renewable and reference fuels in a laboratory to establish a baseline for the field test.

The cars were then divided into pairs, one fuelled with UPM's BioVerno and the other with the reference fuel. The cars were now ready for test driving.

The drivers



Fleet test results show UPM BioVerno renewable diesel works just like regular diesel

A total of 20 experienced drivers familiar with and working on vehicle, motor and fuel testing at the VTT Research Centre participated in the fleet tests. The objective was to circulate the vehicles between the drivers, all of which had different car-handling styles and techniques.

All variable conditions were recorded: outside temperature, distance, route, and the start and end points. Fuel consumption was calculated by the car's onboard computer. In addition, each car had a GPS tracking device which recorded all journeys. Fuelling of the cars was possible only at VTT in Espoo, where a special tank had been dedicated for the fleet testing. Most of the driving was therefore carried out in southern Finland. However, as the fuel tanks only allowed for a 1,000km drive, an extra fuel canister was also used to enable longer distances.

Test drives were carried out between May and December 2013 when the 20,000km target was reached. This test drive

length was chosen based on the fact that, in Finland, the average yearly distance driven with cars is 17,300km.

Weather

When analysing the data, it was concluded that the weather differed dramatically, reaching 30°C in the summer months before dropping to around -10°C in November and December. However, due to last year's mild winter, truly arctic weather conditions were not experienced.

Altogether the four cars were driven 81,324km. On average, 360 trips were taken with each car, 17% of which were less than 5km. Similarly, 17% of the trips were longer than 100km. Around 60% of the journeys were under 50km, with the average of all trips reaching approximately 53km.

Fuel consumption

Test results of fuel consumption were surprisingly constant. The difference in consumption between UPM's

BioVerno blend and the reference diesel was only 0.03 litres per 100km. In one pair of cars, both had the same calculated consumption.

In practice, this minor difference in fuel consumption is insignificant because the difference between the fuels was less than between the car pairs. Considering the minor differences in the physical and chemical properties between the fuels, this result was expected.

Emissions

After completing the fleet tests all cars were tested again for exhaust emissions and fuel consumption. The cars were now also measured at the sub-zero temperature of -7°C, according to European standards. Additionally, the fuels were switched between pairs; those cars that were driven with the reference fuel were tested with the UPM BioVerno blend and vice versa.

Nitrogen oxide (NOx) emissions and particles are the most typical exhaust pollution



Inside UPM's Lappeenranta facility, where the production of BioVerno renewable diesel is due to start this year

from diesel cars. The test cars complied with Euro 5b type approval and therefore their emissions were very low, especially for particles due to particle filters typical for new diesel cars. These filters

meant that measured particle emissions were at the same level as the measurement method inaccuracy, i.e. an extremely low level. Therefore, detecting the differences in particle emissions between the

fuels was almost impossible.

On the other hand, NOx emissions were measurable but differences were also marginal. If the average emission of the reference fuel, measured from four cars, is marked as 100%,

the corresponding average of the UPM BioVerno blend measured from four cars was approximately four percentage points smaller (96.3%).

The test drivers were driving four cars 20,000km each, in real and typical Finnish weather conditions. In addition, several laboratory tests were done.

It can also be concluded that the test fuel made up of 20% of the new, wood-based renewable diesel worked very well in test cars. There was minimal difference in fuel consumption and exhaust emissions compared to the reference diesel, while the engines of the test cars also worked well in all conditions throughout the fleet testing.

This fleet test has therefore shown that UPM BioVerno works just as well as regular diesel in passenger cars. ●

For more information:

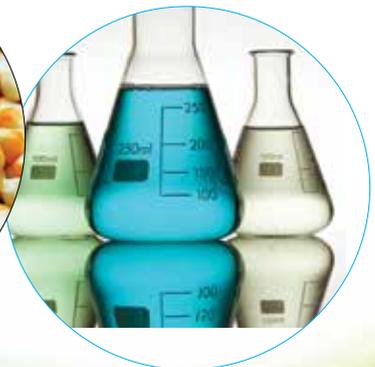
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