



Going green — and lean

The groundswell of opinion over the state of the environment continues to dominate the media headlines; and airports and aircraft are getting their fair share of attention in this debate.

Back in January this year, in his State of the Union address, President Bush called for a significant increase in the amount of ethanol that refiners were mixing with petrol: in fact, he was looking to double the current goal of 7.5bn gallons by 2012.

On that basis, 15bn gallons of ethanol would work out to more than 10% of the country's current petrol consumption, a figure that is far in excess of today's capacity that stands around 5.4bn gallons. At least half of this new ethanol would derive from corn.

As we reported in 2006, ethanol was sounding like a promising future fuel, or perhaps more correctly, a fuel additive or mixer. To date, however, there have been no overt signs that this product is being considered for airport use.

Yet the concept won't go away. According to Bill Wicker, who is Communications Director at the Senate Energy and Natural Resources Committee, biofuel and ethanol executives and lobbyists have kept up a continuous level of interest in developments within this sector. Today the Renewable Fuels Association reports that there are 111 ethanol refineries around the US. Further, there are 78 ethanol refinery and expansion projects underway.

But there may be storm clouds on the horizon. Those who take a professional interest in the environment believe that by the end of next year this kind of scale of refining could account for up to 50% of the country's corn harvest, which might in turn lead to corn shortages or perhaps price hikes in terms of basic commodities. Currently, the US contributes around 40% of the world's corn production, so any change in the tariff would be likely to be felt far beyond the homeland. Moreover, any future fuel vs food debate would be a very sensitive topic indeed.

Other avenues

So, should we be concerned? Is ethanol likely to be adopted by the airport community? Are other means of motive power far more important?

This year might possibly be the big year for biomethane, according to some industry specialists. Biomethane, which is chemically the same as natural gas yet can be harvested from almost any kind of organic waste, is emerging as an interesting alternative to fossil-based fuels. Although vehicles do require special fuel tanks to contain it, biomethane has been proving itself in Europe — and the US is now taking an interest in its potential.

Since it derives from waste (which can be animal or vegetable), biomethane production costs are not subject to the vagaries of the world energy market. Remarkably clean and having the ability to consume greenhouse gases in its production phases, biomethane can easily be processed into compressed natural gas (CNG) for natural gas vehicles or the more energy-dense liquefied natural gas (LNG). It is estimated that there are in excess of 5m natural gas vehicles currently in operation around the world.

Biomethane, according to *Fleets & Fuels* (see the January 2007 issue), is actually relatively unknown although there is every reason to believe that this state of affairs will be rectified soon. Its promise doesn't need endorsing in Sweden and Switzerland, though, where it is already used in road transport, nor in Iceland, where it powers all the country's natural gas vehicles.

What can be utilised in the manufacture of biomethane? Basically, urban and agricultural waste is a prime candidate, along with sewage obtained from the water purification process: even woodchips may be used. The remarkable thing about this product is that when cleaned and compressed, once it is used in a vehicle, the by-products are cleaner than the emissions of petrol-engined vehicles. Moreover, research has shown that the yield per hectare for biomethane production is three times better than were ethanol or biodiesel being extracted — and its potential is

enormous, with one industry spokesperson declaring that this fuel has the ability to replace 20% of Europe's petroleum requirement by 2030.

Meanwhile, in Switzerland, the fuel could power 10% of the country's transport requirements; indeed, Bernmobil currently deploys 32 CNG buses and has plans for an additional 13 next year. As it retires its current fleet, it is looking to replace vehicles with models running on biomethane: in all, it could have a fleet of 100 such buses within five years.

Efficiency, though, is the key here. It has been calculated that 70% of the biomass energy input can be recovered as pure biomethane, with some 20% recovered as heat. This means that just 10% of the energy in the feed material is needed to power the process. On that basis alone, biomethane has much to recommend it.

Bio on the boil

Just before we went to press, BP, along with ABF and Dupont, announced they were investing heavily in a bioethanol plant, to be constructed in the UK. The plant is due to be commissioned in 2009 and should have an annual capacity of 420m litres. Once bioethanol production gets underway, it is the intention of those involved in the joint venture to look at converting this substance to biobutanol. The idea of a partnership designed to develop the next generation of biofuels was actually announced last year.



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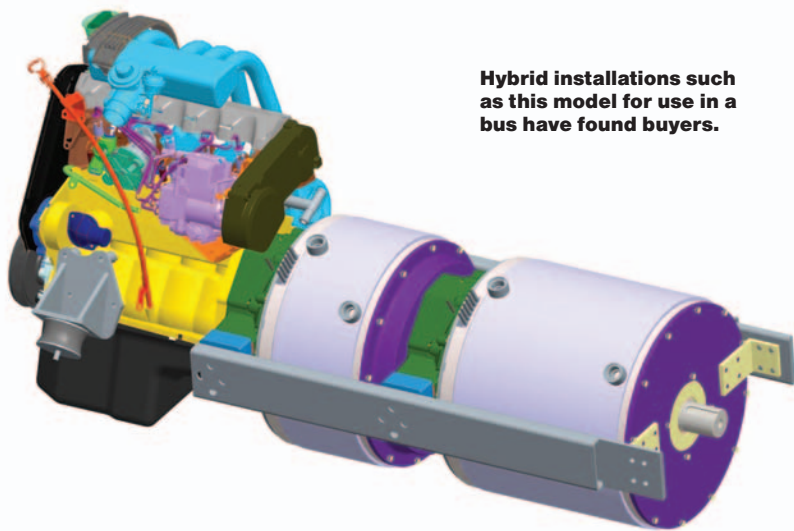
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Hybrid installations such as this model for use in a bus have found buyers.

Hybrids: yesterday, today – and tomorrow

Hybrids attracted an unprecedented level of interest a few years back and their technology continues to attract both designer and purchaser. Last year, Japanese manufacturer Nissan rolled out a hybrid light-duty commercial vehicle in Japan, a diesel-electric version of its Atlas 20 light commercial vehicle.

The car manufacturer initially hoped to sell 30 of the vehicles equipped with an Isuzu Motors hybrid system (as used in the Isuzu Elf), which relies on a lithium-ion battery pack in the power arrangement. Its maker claims it offers a fuel economy improvement of 20-25% over the conventional vehicle.

Several of the better known GSE manufacturers can supply a hybrid tug or other vehicle. One of these companies is Germany-based VOLK. Whilst hybrid tow tractors have been operating at airports for some years now, tractors that can align efficiency with reduced downtime are not that common. VOLK believes that it has the answer to this imbalance.

Although a conventional hybrid tow tractor may be frequently in the workshop for maintenance work on its diesel engine, the VOLK hybrid tractor is not so restricted. The reason for this is to be found in the innovative VOLK POWER PACK system. This is essentially a quick-change module that incorporates diesel engine, generator, starter battery and starter: this module can be easily exchanged, typically in under five minutes.

Because of this set-up, drivers can simply drop off the module in the workshop for maintenance and be fully operational again in just a few minutes — either with a replacement VOLK POWER PACK unit or without a unit at all. This is possible because the vehicle can still be utilised as a fully functional electric tractor despite the absence of the power pack.

Dr Matthias Baur commented on the current trends in alternative power for *Ground Handling International*.

“The level of popularity of the hybrid concept has increased quite a lot over the past few years. In the last four years alone VOLK sold more than 100 hybrid tow tractors. This might not sound a lot but it is quite a big number in our industry segment. We feel that the increasing popularity of hybrid passenger cars due to the current debate on climate change has led to an increased awareness of our products.

“However, the main reason for buying a hybrid tow tractor is usually not an environmental concern, as is the case with passenger cars. Tow tractors with a hybrid drive are mainly used whenever operating conditions require transportation over comparatively long distances outside as well as entry into closed buildings. This is typically the case at airports, where baggage tractors have to travel over great distances on the apron and also enter baggage handling areas inside the terminal buildings.

“In operating conditions like these, electric tow tractors often prove to be inadequate due to their limited battery capacity; but it is not possible to replace them by diesel or LPG tow tractors due to their emissions when entering closed buildings. Hybrid tractors — on the other hand — can be driven on electric inside the closed baggage handling areas and switched to diesel as soon as they get out on the apron. Thus, the diesel engine recharges the battery while the tractor is being operated outside on the apron. As a consequence, it is not necessary any more to have a battery charging station to recharge the battery and the tractor can be operated 24/7, and need only be interrupted by short visits to the filling station.

“The battery question itself is quite an interesting one. It is important to understand that the requirements concerning battery technology in our industry are quite different from those of the automotive industry. In the latter it is very important to have a extremely high energy density in the battery because the additional weight of a large-sized battery would increase the energy consumption of an electric or hybrid passenger car and thus decrease its environmental friendliness and its driving range. Also, in a conventional car there is normally not enough space for a big battery, since people want a large boot and enough space to accommodate at least four passengers.

“In our tow tractors, however, the additional weight of a battery is not a disadvantage at all. A



VOLK: thinking about the future.

tow tractor needs a body weight of approximately 3.5-5.5 tons (depending on operating conditions) in order to be able to tow and safely brake heavy loads of up to 30 tons and more. Even if we used a battery with a higher energy density, we would still require the weight — so we would have to build this into the vehicle frame. Additionally, space is not such a big issue in tow tractors as it is in conventional electric or hybrid passenger cars.

“For this reason, conventional lead/acid batteries are currently the best choice in our industry. They are much cheaper than the more fancy battery technologies from the automobile industry (such as lithium or nickel metal hydride) and they are also more robust and are not so sensitive with respect to damage or neglected maintenance. The potential disadvantages that they would have in a passenger car can be overlooked on the ramp.

“The above also explains another fact, which is quite surprising to most people. While hybrid concepts are currently being acclaimed as the future technology *par excellence*, the public is largely unaware that hybrid drives have been in operation in tow tractors for a long time already. For example, VOLK delivered the first tow tractor with a hybrid drive 20 years ago, in 1987.

“When compared to global car manufacturers with their multi-billion R&D budgets, it is quite easy to explain where this lead has come from: whereas

battery technology represents the biggest obstacle to a breakthrough for hybrid technology in passenger cars, for reasons of traction, very heavy batteries in tow tractors are not a disadvantage at all.”

Matthias also underlines the importance of the airport infrastructure in this technology.

“If you have to cover very large distances on the apron (in other words, if you have a spread-out airport or if there is a long distance from the parking position of the aircraft to a central baggage handling area), the battery capacity of an electric tow tractor might not be sufficient for the job.

“In this case, a diesel tractor might be more interesting. But with a diesel tractor, you cannot go inside closed buildings because of its emissions. Therefore, diesel tractors are mostly used in cargo handling (where you normally do not need to go inside), whereas hybrid tractors are often used in baggage handling, since they allow both interior and exterior operations and have a virtually unlimited driving range.

“It is also important to know that you will need a large battery charging station in order to recharge a medium-sized fleet of 100 or more electric tractors during the night. Since space on airports is quite valuable, this is another reason for favouring hybrid tow tractors. Their batteries are continually recharged by the diesel engine while driving outside.”

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According to Matthias, the biggest interest in the hybrid concept lies within Europe but he continues to receive an increasing number of enquiries from Asian countries. "European airports where we have a lot of hybrid tow tractors in operation are Amsterdam/Schiphol, London/Heathrow, Dusseldorf, Cologne and Munich," he relates.

In the longer term, he firmly believes that dependence on diesel power will reduce. At the same time, he thinks that fuel cell-powered tractors will become more important. "But there is still a long way to go before this technology becomes as reliable as it needs to be in the GSE environment, with all its strenuous demands."