H FOR HGVs

Under its Road to Zero strategy, the British government wants at least half of new vehicles to be ultra low emission by 2030. Is hydrogen or fuel cell power the answer?

Hydrogen, chemical symbol H, or fuel cell power has long been seen as a potential solution in achieving zero-carbon transport, despite scientific entrepreneur and Tesla boss Elon Musk dismissing the idea as 'fool cell' technology. Could it be the answer to the problem of HGV diesel emissions?

A study of the research seems to lead to the conclusion that, while this is a probability in other parts of the world, it might not be so likely in the UK and much of Europe.

It might work in the USA, for example. Giant US brewery company Anheuser-Busch announced in May that it had put in an order with Nikola Motor Company for up to 800 fuel cell long-haul HGVs.

The company stated: "The zero-emission trucks – which will be able to travel between 500 and 1200 miles and be refilled within 20 minutes, reducing idle time – are expected to be integrated into Anheuser-Busch's dedicated fleet beginning in 2020. Through this agreement, Anheuser-Busch aims to convert its entire long-haul dedicated fleet to renewable powered trucks by 2025."

Why hydrogen?

Fuel cell electric powertrains are essentially chemical batteries. At the hydrogen extraction site, water is split into hydrogen and oxygen through a process called electrolysis, where electricity is used to split the water. The hydrogen becomes a store of energy. It is pumped into the vehicle's tank and then exposed to oxygen in the fuel cell. The hydrogen and oxygen combine to form water (the only 'emission' from the vehicle using hydrogen power), releasing energy as the atoms combine.

The resulting energy, electricity, drives the truck's motor in much the same way as a battery would.

Graham Cooley, chief executive of UK-based hydrogen extraction and fuelling company ITM Power plc, explains the advantages of hydrogen.

"There are three fundamental factors. The first is that with the vehicle you can fuel them very quickly. You could put 500 miles-worth of fuel into the tanks in a very similar time to that for diesel. Second is range – vehicles can travel hundreds of miles between topping up the tanks."

Just like diesel

In this respect, hydrogen is very like diesel for the driver – you put the gas in the tank and drive wherever you need to go. If the infrastructure is in place then it is possible to do a very long run with similar stopping routines to those for a diesel vehicle.

Cooley makes his concluding point: "If you have batteries on a long-distance vehicle, these batteries are very heavy, which impacts on the payload you can carry."

Cooley's last argument is reinforced by a piece of academic research published in a 2017 American Chemical Society journal that compared battery electric systems on long-haul trucks with hydrogen power. The paper concluded that, using existing lithium-ion battery technology: "For [a range of] 600 and 900 miles, we observe a mean [battery] pack weight of about 16,000kg and 24,500kg."

So, for a 40-tonne HGV, the weight of the battery would take up to 24.5 tonnes of weight, which, added to the weight of the chassis and trailer – 8.0 tonnes – would allow for a maximum payload of just 7.5 tonnes.

ITM Power has been established to extract, store and provide the fuel for fuel cell electric vehicles (FCEVs).

Cooley explains: "We make an electrolyser that responds very quickly. That means you can use it for 'grid balancing', or storing excess energy

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