

Transport transformation

Amanda Lyne, MD of **ULEMCo**, shares her views on the opportunity for hydrogen in sustainable mobility

For the transport sector to develop in line with the Government's ambitious new climate targets, new thinking and approaches to decarbonising transport and off-highway vehicles are needed.

While cars increasingly transition to EVs, other sectors, such as haulage, construction and agriculture, are harder to move to batteries. The range and power needs of HGVs, combined in many cases with the challenge of providing a suitable

charging infrastructure, means a hydrogen-based solution is more practical. With arduous duty cycles, which can include 24/7 running or thousands of stop-start miles, HGVs need an energy source with long range and very fast refuelling, as well as a very durable powertrain.

As Boris Johnson said during his Global Investment Summit speech, hydrogen provides the "grunt" these vehicles need. In addition, the UK's existing motor manufacturing sector, which supports tens of thousands of jobs, is well placed to rise to the challenge.



There are at least two options for a hydrogen solution, both of which we are actively working on at ULEMCo. One is hydrogen fuel cells (H2FC): these work with electric drive systems, and use a fuel cell to convert hydrogen to electricity. The other option is hydrogen internal combustion engines (H2ICE), achieved by adapting a petrol/diesel engine to allow it to be fuelled by hydrogen. The maturity of the technologies is important here, and the relative economic case too. Currently, a H2ICE solution is closer to realisation at scale, given the extensive industry wide know-how and experience in engine technology and manufacturing capability.

Over the last couple of years, ULEMCo has successfully converted several types of existing vehicle designs to run on hydrogen / diesel dual fuel. Examples are the three road sweepers now working for Aberdeen City Council, and the water bowsers for Yorkshire Water - converted from standard trucks to use hydrogen dual fuel and expected to deliver a 33% reduction in tailpipe carbon emissions. The carbon saving benefit is enhanced by the use of so called "green hydrogen" made from renewable energy, such as the e-hydrogen fuelling station in Sheffield that is powered directly from renewable wind. Utility applications like those that ULEMCo has targeted benefit that they operate on a back to base basis, and so are not impeded by the present lack of a nationwide refuelling infrastructure, rather localised solutions are possible.

We've demonstrated that fleets of vehicles like these can become hydrogen enabled, with dual fuel technology, without delay, as with the recent delivery of 20 gritter / multi-purpose vehicles for Glasgow City Council, which although half were fitted with hydrogen from new, half were already in the fleet. This location based, fleetwide conversion capability, builds demand for hydrogen, and creates the business case for investors to build the infrastructure. By using existing assets and vehicle platforms, hydrogen fuel can become a viable, cost-effective option.

On the fuel cell side, we're working with Oxfordshire County Council and its Fire and Rescue Service, to design the fuel cell electric powertrain configuration for zero emission fire appliances. This is the kind of specialist vehicle application that is extremely hard to envision can decarbonise without hydrogen - given the requirement for fast refuelling and the high levels of on-board energy storage required to provide the four hours independent water pumping capacity to cover emergency operation. The challenge behind fuel cell technology deployment currently is that not only does the fuel cell itself need to be proven in real world use for heavy duty vehicle fleet operations, so does the EV powertrains, supply chain and support structures behind them. It seems some years off before such vehicle solutions will be sufficiently proven for widescale take up.

The Zero Emission Hydrogen Combustion Advocacy Group (zeHca) is formed of organisations including ours offering solutions to the decarbonization of transport through the use of hydrogen fuel. Its focus is to achieve urgent action to accelerate the transformation away from the use of high



7.5 tonne bower converted to use hydrogen dual fuel.

carbon fossil fuels. zeHca believes that a range of solutions is needed, including zero-emission hydrogen combustion.

As representatives of UK academia and industry, zeHca recently contributed to research with the UK's Advanced Propulsion Centre and the University of Brighton. The findings showed that engines that run directly on hydrogen could present the best solution in many heavy-duty applications such as HGVs and construction machinery.

Steps are being taken in the UK to accelerate the development of this technology. However, we need greater policy and resource support from the Government if we are going to lead in this future technology. The zeHca research has also revealed that China and the EU are accelerating investment in hydrogen engine technology, including a string of very recent announcements from Toyota, MAN Trucks etc. This signals a clear and quite immediate danger that the opportunity for the UK will be lost if we don't visibly widen the support for this approach.

To meet our climate targets, boost UK manufacturing and further the Government's levelling-up agenda, we believe urgent attention is needed on how the UK can best capitalise on this hydrogen-based technology.

We are very proud that at COP26, ULEMCo, with its partners, is showcasing the Zero Emission Rapid Response Operations ambulance (ZERRO) project, a hydrogen fuel cell vehicle prototype of which is planned for delivery to the London Ambulance Service NHS Trust soon.

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Opposite page: ULEMCo enables fleet and commercial vehicle owners access to zero emission hydrogen fuel, as part of their strategies to reduce transport related carbon emissions.