

Truck down to electric avenue



Battery-electric trucks are gaining traction, but the energy consumption is taking a hit in urban areas. For the £10m BETT (Battery Electric Truck) trial, Cenex has been working with DAF to lead the study aspects of research into the performance of 20 DAF LF battery-electric trucks. They are being used across different public sector operations, including the NHS Supply Chain (see below right) and Blackpool Council. The other operators include Eastern Shires Purchasing Organisation, NHS Leeds Teaching Hospital, NHS Northern Care Alliance, Rochdale Borough Council, Thameside Metropolitan Borough Council, University Hospitals Birmingham and the York Purchasing Organisation.

Tom Allerton, senior technical specialist at Cenex, says 13 of the 20 trucks are collecting data based on 45,000km of driving over the last few months in a project that has used more than 35MWh of electricity over more than 3,000 individual journeys.

The vehicles' range is just shy of 300km (186mi), which according to Allerton, is slightly more than the vehicle specification.

Another highlight of the study relates to the variation of energy consumption caused by different drive cycles. In practice, this means that motorway travel entails moderate amounts of energy

While UK truck drivers are responding positively to battery-electric vehicles, findings unveiled at Cenex 2022 expose a variation in energy consumption between motorway, urban and rural drive cycles, reports Ben Spencer

consumption, compared to urban drive cycles where the "energy consumption takes quite a hit" due to the vehicles having to stop and start at slow speeds.

To better understand the situation, the research extended to regenerative braking, which Allerton describes as a "big opportunity to recover energy" for urban and rural drive cycles.

"Despite the lower regeneration, driving on the motorway has a reasonable energy efficiency, and despite a high regeneration for urban, it tends to be a lot worse overall," Allerton continues. "So we conclude that the steady speeds on the motorway give you a reasonable consumption. Also, rural tends to be a bit of a sweet spot, as it is steady speeds without too much acceleration and deceleration, which gives a good energy consumption."

Allerton reveals that the next stage of the study will look at how driver behaviour affects energy consumption. "We will look at whether driving training can have a measurable impact on energy consumption, and therefore, the cost of running these vehicles," Allerton concludes.

Elsewhere in the session, Rob Lawton, principal engineer, alternative

powertrain at Leyland DAF, offers a glimpse into the challenges surrounding charging infrastructure and local grid networks. "Please, if you're thinking of getting into electric trucks, don't underestimate the amount of time you need to make sure you've got the right power network."

HYDROGEN: EXTENDING THE RANGE

Other speakers point toward the promise of hydrogen. In particular, Dr Harsh Pershad, head of hydrogen at Tevva Electric Trucks, claims that traditional truck manufacturers face challenges in switching their production and joining what he calls the 'energy revolution'.

"While working with truck operators on battery systems, there have been





some interesting challenges that have taken us towards the hydrogen opportunity like site constraints, charging constraints and long ranges on routes that involve arduous terrain," Pershad says.

He continues: "We want people at each depot to transition to hydrogen vehicles over time, so we need to think about future-proofing their infrastructure. Therefore, rather than trying to manage in the beginning to put in permanent infrastructure where the economic case is still weak, we can work with them to upgrade in line with their demands."

Delving further into the topic, ULEMCo managing director Amanda Lyne underscores the importance of hydrogen for range extension. She says: "All hydrogen fuel cell vehicles are electric vehicles anyway; you can have a fuel cell doing lots of the power and using the battery to match the top speeds," she says. "But ultimately, we feel that we can make the most of some of the battery miles as long as we can keep up with recharging them using the range extension."

The work involved in adding range extension covers the hydrogen fuel cell, hydrogen components, control system and electrical system. "This is why we're

focused on creating a module or a toolkit that enables vehicle suppliers to extend their range in hydrogen. That allows the electric vehicle to be optimised and bring the cost down."

Lyne emphasises that ULEMCo is thinking about a concept in which a powertrain that is similar to a hydrogen engine provides range extension to a battery that is connected to an switched reluctance (SR) motor.

She adds: "If we can understand the benefits of the hydrogen combustion engine, the cost of the hydrogen combustion engine, and get that right, then there's no reason why you can't have an engine working equivalent to diesel efficiencies."

TECHNOLOGY IN PRACTICE

In the Cenex exhibition space, Electra Commercial Vehicles demonstrated the benefits of hydrogen via its 19-tonne zero-emission refrigerated fuel cell electric vehicle (FCEV, pictured above).

Benjamin Smith, managing director at Electra, says: "The truck can travel up to 406 miles. This work is about how do we do it and how far we can go. From this, we can now spec the trucks we are going to build next year."

When asked whether hydrogen provides different benefits from battery electric, Smith refers to the company's telemetry and vehicle operations.

"Battery-electric vehicles work in city centres and a lot of vehicles come back with 50-60%; some of which are not being charged for four to five days. For this fridge vehicle, battery-electric could only be an option with rapid charging which is why this megawatt charger

is coming out with a 150kW DC fast charge, but it's that out of city centres where hydrogen comes in," says Smith.

Additionally, Electra is working with hydrogen infrastructure company Element 2. "We're delivering the truck and the trailer to refuel it, so the question of how do we refuel it has already been answered."

HYDRO-ENGINE

New launches aside, the BorgWarner H₂ Demonstrator, developed with French firms Automobiles Dangel and Caillau, incorporates a 30bar direct injection line fed from an onboard high-pressure hydrogen tank into a two-cylinder four-litre van engine (inset picture, left).

David Smith, plant manager - Gillingham, says the vehicle has a full hydrogen combustion engine with almost zero carbon dioxide output.

"You see water and steam at the tailpipe, so we can use much of the same drivetrain components that you would on a normal combustion engine. So rather than ripping up the whole concept, you're just replacing certain key parts." According to Smith, this appeals to customers because the cost of transformation is less and the process is quicker than doing a full conversion to a battery-electric vehicle or fuel cell electric vehicle.

However, he says that the size of a hydrogen installation designed for light vehicles is not suitable to meet the capacity and the range requirements of heavy-duty vehicles. Still, he adds that the fuel density with this vehicle is getting better as the hydrogen pressure capability grows, allowing the vehicle to obtain range with minimal changeover.

As battery-electric technology continues to win over truck professionals, the allure of hydrogen is proving hard to ignore. Combining both technologies with enough infrastructure support could eventually steer drivers away from diesel. **TE**

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David Smith

