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Powering change

The green tech behind the commercial vehicles of tomorrow

Introduction

The end of the internal combustion engine is nigh – the electric transport revolution is upon us.

But while electric passenger cars have been the motor industry's headline-makers, the road to zero emissions also calls for decarbonising commercial vehicles.

Progress is being made, with fleets eyeing the potential for lower running costs and regulators cranking up the pressure on manufacturers and businesses alike.

Success not only requires sustained, high-level industry investment in R&D, but for users to embrace innovation like never before.

The zero emissions race has become a tale of two horses – battery-electric and hydrogen. Here we run the rule over these technologies, shine a spotlight on manufacturer developments and consider what the future holds in store.

Read on to discover just how excited we should be about zero emissions tech.

The zero emissions race has become a tale of two horses

E-mobility: from horsepower to kilowatts

With the sale of new petrol and diesel LCVs under 3.5 tonnes set to be banned in the UK from 2030, alongside fossil fuel cars, the market for eLCVs is gaining traction.

The government recently announced a ban on the sale of new diesel or petrol heavy goods vehicles (HGVs) from 2040. Trucks, however, present a unique set of challenges. Whilst electric HGVs are starting to come to market, range limitations remain a significant concern. Heavy battery requirements, combined with the current legal restrictions governing how much weight HGVs can carry, also risk compromising payloads.

As things stand, battery-powered HGVs appear better suited to shorter, urban and regional journeys.

Volvo Trucks, for example, has an impressive line-up of electric HGVs – including two and three axle trucks with gross vehicle weights up to 27 tons – but though these can cover around 45 per cent of all goods transported across Europe, their heavy-duty trucks still max out at 300km (186 miles).

While many believe that hydrogen fuel cells, and biofuels, will ultimately fill the gap for long-haul transport, those clever engineers at Tesla are promising to raise the electric truck benchmark in the not-too-distant future.

Elon Musk told the 2020 European Conference on Batteries that new battery technology will deliver a heavy-duty truck that could cover 1,000 km, or 621 miles, on a single charge.

Image courtesy of Tesla, Inc.

Check out this amazing teaser video of the Tesla Semi prototype

WATCH

The Li-ion science

Li-ion cells, used widely in consumer electronics, currently represent the battery cell tech of choice for EV manufacturers.

For those with a technical mind, these batteries are charged by Lithium ions flowing from an anode tab, through a separator, to a cathode tab, connecting the battery cells' positive and negative terminals.

Behind the locked doors of automotive research laboratories, research engineers have donned their white coats to advance this Li-ion science.

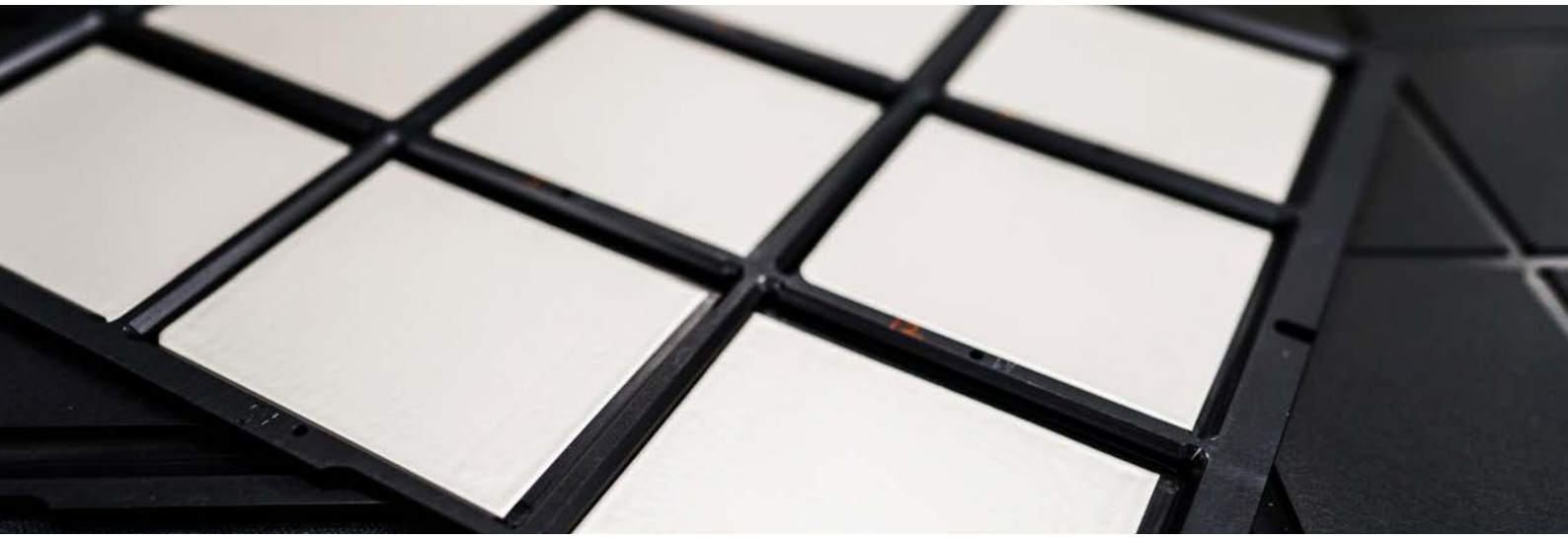
Innovations have made giant strides in recent times, with improvements to cells and chemistries offering increased capacity and longer ranges.

Tesla, for instance, has designed a tabless battery which is being utilised in its truck prototypes. This promises to provide five times more energy and six times more power.

Many research departments are also focussing on extending battery life by improving energy density though the use of alternative materials for cathodes, notably nickel.

Developments in this area, along with the use of cheaper metallurgical-grade silicon in battery anodes, should help to reduce costs. This will prove critical as the industry strives to deliver upfront price parity with equivalent fossil fuel vehicles.

Image courtesy of QuantumScape



Solid state wizardry: the next big thing?

Some have dubbed the solid-state battery as the ‘holy grail’ of electric motoring – and it could provide a significant fillip to commercial vehicle electrification.

As the name suggests, solid-state involves replacing solvent liquid electrolyte, used at the centre of lithium-ion batteries, with solid material. This has the potential to lower cost, increase energy density and range, while offering much faster charging - all vital ingredients for commercial vehicle operators.

Volkswagen-backed Californian start-up QuantumScape is currently regarded as one of the leading pioneers of solid-state technology.

According to reports, the company’s lithium-metal solid-state battery can enable up to 80 per cent longer range and will charge to 80 per cent capacity in just 15 minutes. Furthermore, the battery is said to cost less than most of today’s conventional batteries.

Image courtesy of QuantumScape

Why has it been so challenging to develop solid-state batteries? QuantumScape explains

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Other automotive OEMs, such as Toyota, General Motors, Ford, Hyundai and BMW, have also been making waves in this arena with significant investments in solid-state battery technology.

A highway to hydrogen

Elon Musk may have described the use of hydrogen for EVs as “just crazy”, but the UK government begs to differ. It sees hydrogen having a big role on transport’s road to zero.

“The whole transport sector will need to embrace new, innovative technology such as green hydrogen,” claimed Transport Minister Rachel Maclean earlier this year, as the government stumped up £54 million for three projects to develop hydrogen powertrain technology for commercial vehicles and buses.

The market for hydrogen fuel cell electric vehicles is still in its infancy when compared with plug-in electric vehicles, but this has not stopped truck makers – from Daimler and Volvo to Iveco and Hyundai – from exploring the technology’s potential.

Hydrogen-powered trucks, fuelled with either liquid or gaseous hydrogen, use fuel cells to convert the hydrogen, and oxygen from the air, to heat, water and electricity. The heat and water are eliminated though the exhaust pipe, while the electricity drives the vehicles’ motors, either directly or via a battery that stores the energy.

Hydrogen offers a high energy density and arguably greater range than lithium-ion batteries, making it an attractive option for long-haul trucks. What’s more, the fuelling of hydrogen vehicles is a quick and easy process, more akin to fuelling a diesel truck.

As things stand however, hydrogen fuel cells are expensive to manufacture and a huge investment in hydrogen production and infrastructure would be needed to make it a viable option.

An industry alliance backed by Daimler Truck, Iveco, OMV, Shell and the Volvo Group – H2Accelerate (H2A) – has been launched with the aim of helping hydrogen trucks achieve a breakthrough across Europe. The partners estimate that mass market roll-out will take about a decade.

Martin Daum, Daimler Truck AG Board Chairman, believes that with political support the hydrogen fuel cell will “become indispensable for CO2-neutral long-haul road transport in the future”. The company has high hopes for its GenH2 Truck prototype, which it hopes will be sold commercially in 2027.

> **“The hydrogen fuel cell will become indispensable for CO2-neutral long-haul road transport in the future”**

Image courtesy of Hyundai

Elsewhere, Hyundai has already started shipping its XCIENT Fuel Cell, the world's first mass-produced fuel cell electric heavy-duty truck. Check out its emission free tech:

WATCH

Volvo, meanwhile, aims to have fuel cell vehicles in production by the end of the decade. Powertrain Strategic Development Director Lena Jansson explains Volvo's hydrogen vision:

WATCH

But can hydrogen play catch-up with the momentum of battery-powered BEVs, or has it already lost too much ground? Time will tell.

Tech and tyre support for the electric transition

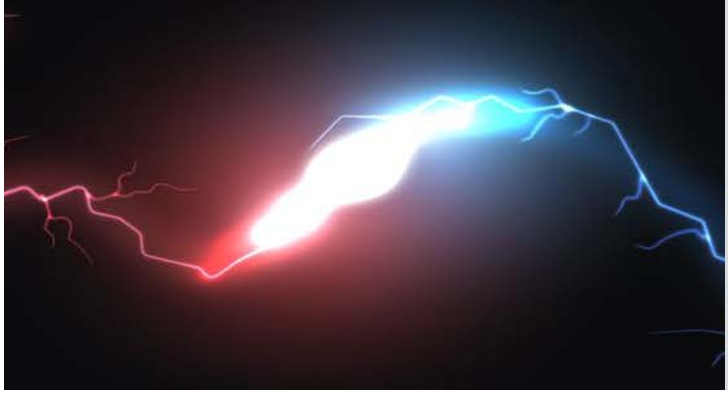
Businesses looking to electrify their fleets need critical data insights to help them make the right decisions at the right times – both for EV procurement and for their ongoing management.

Telematics solutions have an increasingly important role to play here in helping shape fleet strategies. Current innovations include planning reports to identify the fossil fuel vehicles that could be replaced with EV alternatives, based on 'real world' mileages that take account of factors ranging from road types to standstill times.

Workflow planning can be optimised with real time battery levels and remaining driving ranges available for every fleet vehicle. Access to EV health data is enabling pre-emptive maintenance, while on the road, mapped charging infrastructure means charging points can be pinpointed via drivers' business sat navs.

Telematics developments continue apace with recent EV software advancements including charger connection reports to help ensure charging occurs when tariffs are most favourable, and just before vehicles are needed for operation.

Such essential data intelligence will help pave the way to an electric commercial fleet future that is both environmentally and financially sustainable.



Tyres are also being engineered with ever greater precision in a bid to minimise rolling resistance and maximise range.

Bridgestone's Nano Pro-Tech TM compound, for instance, deployed in the Ecopia H002 and Duravis All Season van tyre, alongside design details such as low deformation pattern and slim beads and buttresses, has been proven to reduce energy loss and therefore maximise range.

Technology that couples lighter, large diameter tyres with narrow tread designs to minimise both aerodynamic and rolling resistance to even lower levels – such as Bridgestone's ologic – may become commonplace on future commercial EVs.

Discover more about EV tyre development here

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Such advancements will help pave the way to an electric commercial fleet future that is both environmentally and financially sustainable.

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