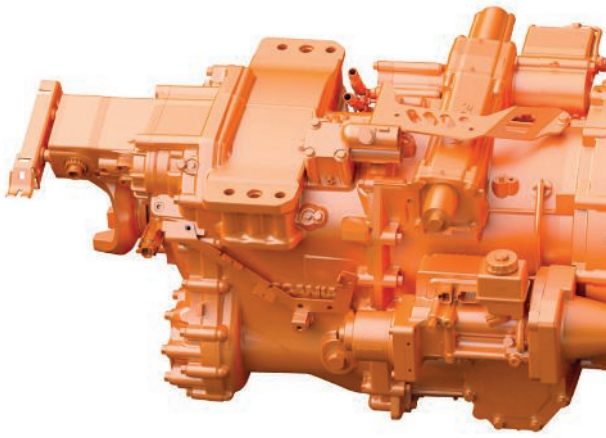

BORN TO BE **MILD**

Partial vehicle electrification through technologies such as regenerative braking, starter/generators and even stop-start systems in so-called 'mild-hybrid' systems can provide significant fuel savings, finds Steve Banner

Modifying established diesel powertrains using mild-hybrid technology to make them work with greater efficiency can be more cost effective for OEMs than developing full-electric models. "It means you don't have to carve up the vehicle's entire architecture," says Mike Savage, chief engineer at automotive engineering consultancy Drive System Design (DSD).

Admittedly, it will not result in emissions being eliminated completely, and mild-hybrid vehicles are unlikely to qualify for concessions should they be sent into urban areas where emission restrictions are in place. Going the mild-hybrid route should, however, lead to lower fuel usage and a fall in CO_2 production. "A 48V mild hybrid can reduce CO_2 output by up to 15% compared with a standard diesel engine," points out Joel Durr, Delphi Technologies' powertrain electrification expert.

So what sort of mild-hybrid modifications are possible?

Fit a 12kW motor-generator that recovers kinetic energy as a truck decelerates, then use it to boost engine torque as it accelerates. That can cut fuel consumption by up to 8%, according to Federal-Mogul Powertrain. Its compact size and fully integrated electronics, combined with increasingly standardised control protocols, mean that a vehicle manufacturer should be able to slot it into an existing driveline design without too many difficulties, the component supplier contends.

An example of a production vehicle with similar technology, the proprietary Micro Hybrid 2, is Wrightbus's StreetLite single-decker (left). Euro Bus Expo at the NEC in November showed off one bus from an 88-unit order for Transport for Ireland, also fitted with 205bhp Daimler OM934 engine.

Burn fuel in an engine, and 20% to 30% of the energy it uses disappears in the exhaust gases. Install an exhaust-driven generator, and energy can be returned through an electric motor which supports the driveline, or through electric supercharging, Federal-Mogul Powertrain says. As well as cutting emissions, adopting this approach can yield a fuel economy improvement of up to 5%, it adds. It can also lead to engine downsizing, Federal-Mogul contends.

These initiatives form part of the company's latest electrification strategy for medium- and heavy-duty commercial vehicles, which was launched last September at Germany's IAA Hanover Commercial Vehicle Show. They can be configured for 12V, 24V or 48V electrics.

In other news, Valeo has come up with a 48V iBSG – integrated belt starter generator – which replaces the alternator. It can recover the vehicle's kinetic energy during braking and deceleration, store it in a battery, then deliver either 4kW or 8kW of continuous power – depending on the version chosen – to boost the engine or to power key components. The package includes a DC/DC converter. Simulations conducted by Valeo indicate that iBSG can deliver fuel savings of 3% to 5% when fitted to medium-duty trucks

– rigids engaged in short-haul local work for example – rising to 5% to 10% when installed in light commercials.

Mid-2019 will witness the arrival of Ford's new Transit MHEV (mild hybrid electric vehicle) equipped with a belt-driven starter/generator. The 48V unit can deliver average fuel savings of 3%, rising to 8% in city traffic, says the manufacturer. It makes the point that this sort of package can enhance any stop-start system. In Transit's case, it operates when the vehicle is stationary but in gear, and when decelerating at speeds below 7.5mph.

While mild-hybrid technology is primarily there to assist the engine, the power produced may be sufficient to enable the vehicle to manoeuvre at low speeds without the need to start it up, says DSD's Savage.

Moving up the weight scale, transmission manufacturer Voith is adopting a mild-hybrid policy with its new DIWA Nxt fully automatic gearbox for buses, which was also showcased at IAA. Production of DIWA Nxt should start in early 2021. An optional 48V central recuperation unit can be integrated into the flywheel housing between the engine and the transmission, and requires almost no extra installation space, contends Voith.

Offering continuous power of 25kW and peak power of 35kW, it recuperates energy whenever the bus decelerates, and provides it to the vehicle's electrical system through the battery and a DC/DC converter as well as for traction.

At the Euro Bus show at the NEC, Scania showed a hybrid 4x2 chassis for city and suburban operations (above). The K320EB powertrain (main image) provides torque from both 9-litre 316bhp engine and electric motor in parallel. A special driver support function provides instant feedback about braking, as this is a key source of power for the motor. The system is claimed to be capable of delivering 20-25% fuel savings.

STOP-START

Widely installed in light commercials, stop-start on its own can be viewed as a form of mild hybridisation. Although featured on the Scania K320EB, it is still not employed to any great extent in trucks and buses (see *www.is.gd/vuyuyi*).

That does not mean it is unavailable. Voith offers stop-start with its DIWA.6 fully automatic box which, it says, is helping bus operators achieve fuel savings of between 10% and 12%. ZF's six-speed EcoLife auto box is available with stop-start, too, while Allison has it as an option on its new nine-speed auto box, combined with an extra Li-ion battery package. It already offers neutral at stop on bus automatic boxes. This reduces the load on the engine by putting the transmission into neutral while the vehicle is stationary, thereby cutting fuel usage and emissions. A version is available which allows low-speed coasting. Both variants feature a locked output at stop to help prevent roll-back.

The challenge stop-start faces, so far as large vehicles are concerned, is that it can involve stopping and re-starting a big-displacement engine every two minutes in congested urban traffic, with all the stresses on components such as the starter motor and the electrical system that implies; not to mention the impact on the engine's oil pressure.

Cummins is offering stop-start on its B4.5 and B6.7 engines, however, with modifications that include an upgraded starter motor. The package is in service on some 1,500 buses in the UK; stop-start can deliver 8% fuel savings in slow-moving city traffic, says the engine builder. Engine noise levels are reduced, too – a vital concern in urban areas, especially late at night. TE