

Not so niche

The Niche Vehicle Network's annual symposium revealed some projects that have the potential to impact future mainstream commercial vehicles. Brian Tinham reports

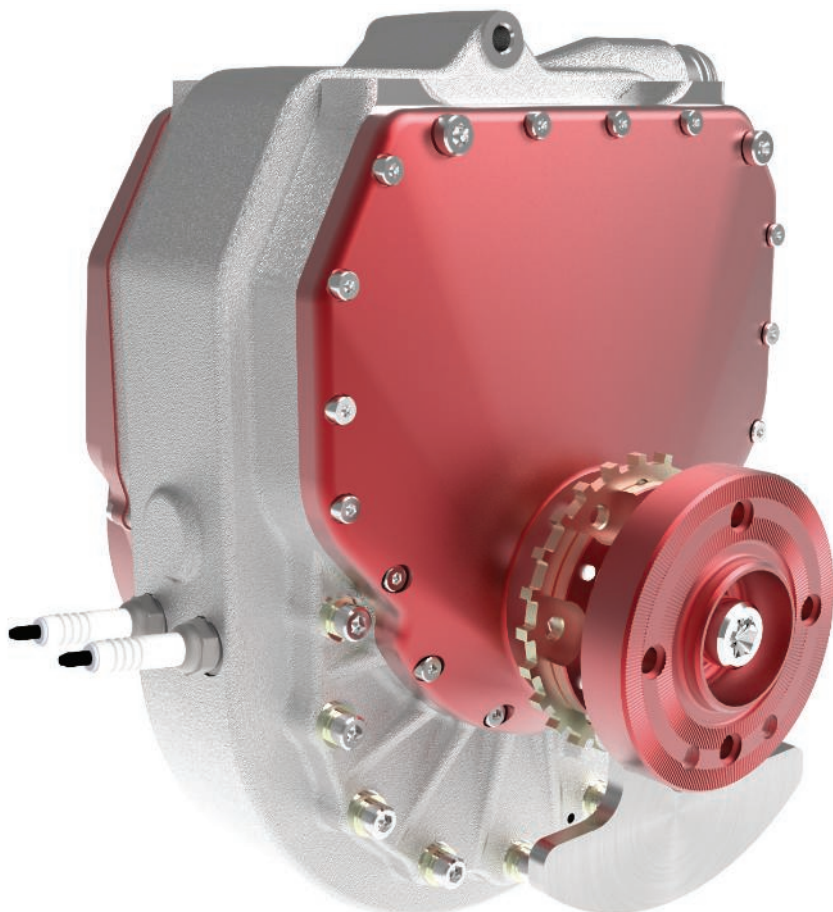
It's not uncommon for R&D aimed at automotive applications to hint at innovative engineering for future commercial vehicles. So it was at the recent Niche Vehicle Network's (NVN) annual symposium, at Gaydon's Heritage Motor Centre, which covered projects funded under NVN's competition-led £1.35m scheme.

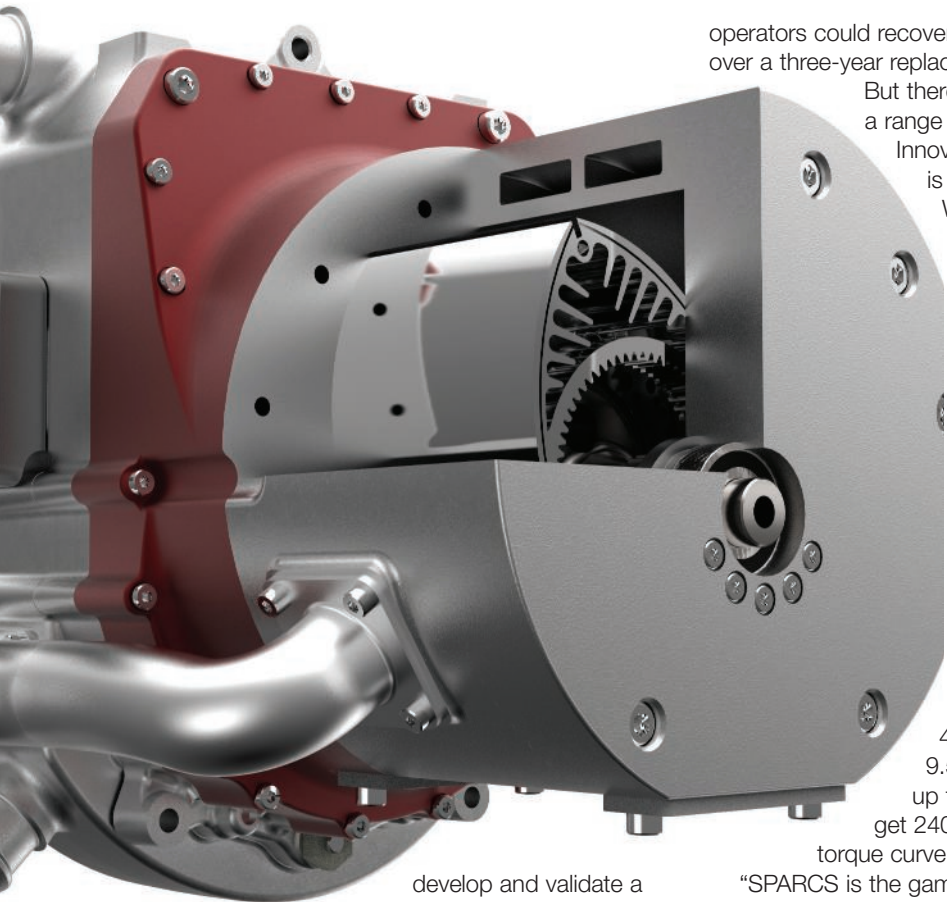
Two stood out: an e-supercharger, ultra-compact range extender for plug-in hybrids and electric vehicles (EVs); and a compound rotary engine expander for EVs. A third – a Euro 6-ready methane slip catalyst for dual-fuel, heavy-duty vehicles – probably only slipped into the 'niche' category by the skin of its teeth. Given projections for take-up of

diesel/natural gas trucks, it seems out of place. Nevertheless, project leader Clean Air Power, which is working with emission controls firm Eminox and catalytic materials developer CDTi, is bullish about its achievements so far, following tests using the World Harmonised Transient Cycle.

Looking at the e-supercharger project – led by electric boost systems specialist Aeristech with Mahle Powertrain (formerly of Cosworth fame) – the goal is to

Below: Aeristech's e-supercharger ultra-compact range extender for plug-in hybrids





Left: Advanced Innovative Engineering's CREEV technology for Wankel engines – designed for hybrids or to run auxiliaries

operators could recover that very quickly, certainly over a three-year replacement cycle.”

But there are other ways of building a range extender. Advanced Innovative Engineering’s approach is a development of the Wankel rotary engine, using SPARCS (self-pressurised, air rotor cooling system) technology and an integrated expander to create what it describes as a compound rotary engine for electric vehicles (CREEV).

Engineering director Nathan Bailey explains that rotaries have several advantages over piston engines – in particular, their efficiency when run at high power. “Our initial engine is only 225cc displacement but it develops 40bhp and only weighs 9.5kg,” he explains. Scale that up to 1,300cc, 55kg, and you get 240bhp and with a nice, straight torque curve.

“SPARCS is the game changer,” declares Bailey, “because it makes the engine thermally much more efficient and means it lasts longer.” And he explains that the system uses self-pressurising (80psia) blow-by air and gases from combustion that have escaped into the rotor chambers’ interior via the side seals. A shaft-driven internal fan recirculates the air-gas mix, which extracts heat very effectively from the engine’s rotor before dumping it via an intercooler within the rotor housing.

Incidentally, since SPARCS is sealed, oil loss is eliminated. Oil supplied to the engine core is recirculated until escaping past the apex seals and providing lubrication there before being burnt in the combustion process. As a result, consumption is much lower than on standard oil-cooled and certainly air-cooled rotary engines.

As for the expander, Bailey explains that it’s based on a single-lobe rotor design that, used in series with the host engine, effectively extends its expansion stroke. This compounding approach, he says, reduces exhaust noise and temperature, while recovering energy and cutting fuel consumption.

“This is not going to make a primary power source,” concedes Bailey. “It will be a range extender package for hybrids, or a high power-density, low-cost engine for running vehicle auxiliaries. But it could also work with batteries in a hybrid to boost acceleration – for example, in small vans.” ^{TE}

develop and validate a range extender capable of much greater power density. And, according to Aeristech commercial director Julien Servant, although the focus is on passenger vehicles, there is also “a strong interest” in light commercial vehicles.

Servant says the idea grew out of a limitation on Mahle’s two-cylinder ICE (internal combustion engine) range extender, which delivers 30kW. That’s fine for a small EV, he explains, but moving up the kerb weights would necessitate more like 50kW. Hence the attraction of an integrated, highly responsive electric supercharger – enabling a family of compact range extenders without major modifications to the base unit.

City van potential

“We did a proof of concept, taking an existing electric supercharger and implementing it on the range extender engine. That increased power to 56kW at the crank at 5,500rpm. Also, at 4,000rpm engine speed, the supercharger consumed only 2.2kW for 15kW performance improvement.”

Once development is complete, Servant expects interest from the city van market, citing the likes of DHL and Royal Mail, currently looking for technologies capable of cutting fuel consumption and emissions. “Range extenders reduce battery requirements – so also weight and cost. Also, although the purchase price might be higher,