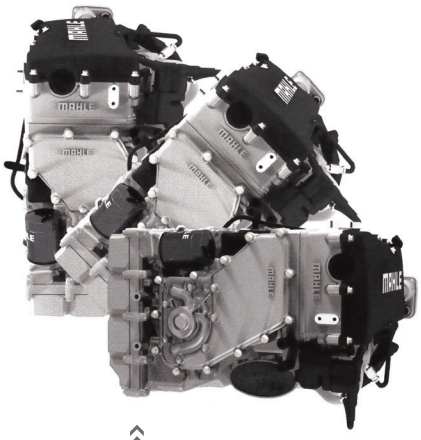
MAHLE
Powertrain

MAHLE Range Extender Demonstrator Vehicle

- Compact, lightweight range extender engine
- Powers vehicle when battery is depleted
- Developed to address EV range anxiety



Flexible installation and orientation

As oil prices continue to rise and society becomes increasingly aware of the environment, the global automotive industry is now sharply focused on electric vehicles.

However, the issue of 'range anxiety' has become a major concern for consumers and this negative factor, coupled with persistently high battery costs, has severely limited the market penetration of these new generation, zero emission vehicles. MAHLE Powertrain's solution to this dilemma is a compact Range Extender engine which can power the vehicle when the battery is depleted. A demonstrator vehicle has been built to showcase this technology and to assist in the further evelopment and optimisation of the engine, associated hardware and control systems.

MAHLE Powertrain set ambitious performance targets for the demonstrator vehicle including a minimum 'electric only' range of 70 km. The maximum speed will be 145 km/h with the ability for continuous (charge sustaining) driving at 120 km/h. The vehicle will also be capable of maintaining 90 km/h on a 6 % gradient.

To reach all these targets, the engine was designed to produce 30 kW and the generator was specified to match this output. A battery pack rated at 14 kWh was required and a traction motor with 100 kW peak output was selected.

The other necessary electric drive hardware also included a 2-speed gear box, two motor control units with associated cooling systems and a battery management system. The MAHLE Flexible ECU (MFE) was implemented for both the engine and vehicle controllers.

Your contact:
Tel. +44 (0)1604 738 000
powertrain@mahle.com

MAHLE Powertrain Ltd.
Costin House, St. James Mill Road
Northampton, NN5 5TZ United Kingdom

www.mahle-powertrain.com

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The packaging of all the hardware in a compact vehicle represented a significant challenge. MAHLE Powertrain utilised its experience and skills in demonstrator vehicle build to solve this challenge, especially with regard to the intake, exhaust and cooling system packaging. With the battery situated beneath the rear luggage compartment, it was possible to install all the other components within the engine bay and thus retain all of the original passenger and luggage space.

What differentiates our concept from established hybrid cars is that there is no mechanical link between the engine and the wheels. Our compact, lightweight engine (with its integrated generator) simply charges the battery as necessary and so extends the range of the vehicle. For optimum economy, the battery should always be charged externally, whenever possible, via a standard plug in supply. However, with the car being refuelled with gasoline in the traditional way, greater flexibility of use is available for longer journeys, with a combined battery + engine range of up to 500 km, before recharging / refuelling is required.

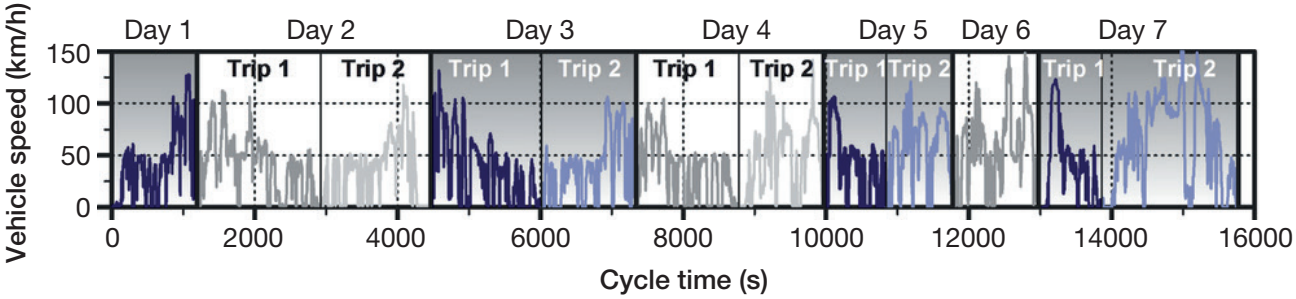
In keeping with the low emissions philosophy of electric vehicles, the engine has been calibrated for compliance with Euro 6 regulations and the vehicle is capable of achieving 45 g CO_2/km on the legislated NEDC test.

Through building this range extender demonstrator vehicle, MAHLE Powertrain has used its expertise and knowledge to create a viable alternative to current production EVs. This car provides the optimum combination of extended range and flexibility of use with zero tailpipe emissions capability and class-leading fuel economy. The car is an enabler for electrification.

Technical specifications	
Engine layout:	900 cc, 2 cylinder
Bore/stroke:	83.0 / 83.0 mm
Installation angle:	Vertical or horizontal
Engine control:	MAHLE Flexible ECU
Maximum power:	30 kW [4000 min-1]

Vehicle specifications	
CO_2 output NEDC:	< 45 g/km
Emissions target:	Euro 6
Pure Electric Range:	70 km
Combined Range:	500 km
Maximum Speed:	145 km/h
Kerb Weight:	1350 kg

>> Week 1 cycle



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