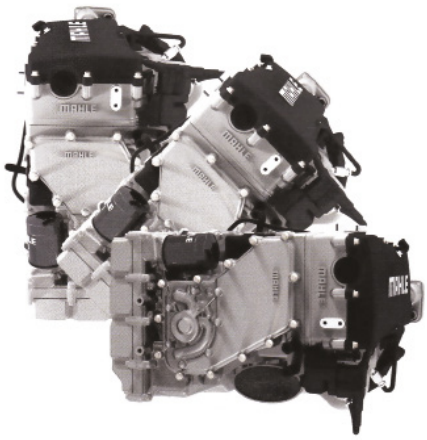
MAHLE Powertrain

Range Extender Demonstrator Vehicle



Flexible installation & orientation

Lightweight range extender engine

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.

- Powers vehicle until battery is depleted
- Developed to address EV range anxiety

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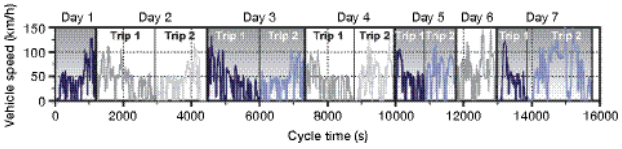
Benefits

- No mechanical link between the engine & wheels differentiates our concept from established hybrid cars
- Compact, lightweight engine with integrated generator
  - › Charges the battery as necessary which extends range of the vehicle
  - › Greater flexibility of use is available for longer journeys with it being refuelled with gasoline the traditional way
  - › Combined battery + engine range up to 500km before recharging / refuelling is required
- Bespoke battery management system for energy efficiency
- MAHLE Flexible ECU (MFE) implemented for both engine & vehicle control



Vehicle drive cycle

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

Range extender engine in demonstrator vehicle

Summary

The range extender demonstrator vehicle is fitted with a compact, lightweight range extender engine and is developed to address EV range anxiety. This hybrid allows for efficient energy usage and the potential for long distance driving, with the range extender engine running as required to sustain the battery charge, further extending the vehicle range.

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