

MAHLE Range Extender Engine Family

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ABSTRACT

MAHLE has developed a dedicated range extender (REx) engine to investigate the challenges and potential benefits of this technology when applied to future drive concepts. During the concept development of the system, different configurations of the REx engine were designed and simulated. The optimum variant for a compact class vehicle was established as a two-cylinder four-stroke petrol engine with 0.9 liter displacement producing 30 kW at 4000 min⁻¹ and with a fully integrated electric generator. The REx module was subsequently installed successfully in a series hybrid demonstrator vehicle with limited installation space and excellent NVH behavior.

To further extend the various application options of the developed REx system, MAHLE has investigated methods to increase the performance with minimal modifications. One of the key attributes of the developed REx module is the very compact size. To minimise the extent of the required changes while maintaining its compact design, the work concentrated primarily on increasing the specific performance of the existing engine. This was achieved by the combination of two approaches - first by raising the engine speed to 5500 min⁻¹ at the rated output point, and second by pressure charging the engine. These two measures will enable the development of two additional higher output variants with 40 and 50 kW based on the same engine hardware. The higher performance versions will cater for the increased power requirements of heavier vehicles such as SUVs and light commercial vehicles.

The article describes the resulting family of REx engines and presents the initial test results. Furthermore, the market potential for these types of engines, taking into account the various global markets, is identified and analysed.