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48 V High-power Battery Pack for Mild-hybrid Electric Powertrains

Mild hybridisation, using a 48 V system architecture, offers fuel consumption benefits approaching those achieved using high-voltage systems at a much lower cost. To maximise the benefits from a 48 V mild-hybrid system, it is desirable to recuperate during deceleration events at as high a power level as possible, whilst at the same time having a relatively compact and low cost system. This paper examines the particular requirements of the battery pack for such a mild-hybrid application and discusses the trade-offs between battery power capabilities and possible fuel consumption benefits.

The technical challenges and solutions to design a 48 V mild-hybrid battery pack are presented with special attention to cell selection and the thermal management of the whole pack. The resulting battery has been designed to achieve a continuous-power capability of more than 10 kW and a peak-power rating of up to 20 kW. The pack has been built and has been subjected to a series of tests at a range of ambient temperatures. The performance of the pack has been validated and the main characteristics, such as the internal resistance and capacity have also been established. The performance targets for the pack have been achieved. Further testing is underway to fully characterize the pack's capabilities and characteristics, after which it will be installed into MAHLE's 48 V eSupercharged demonstrator car.