Cenex LCV

Through-the-Road Parallel Hybrid with In-wheel Motors

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ABSTRACT

Present automobile development is keenly focused on measures to reduce the CO_2 output of vehicles. Plug-in hybrid electric vehicles (PHEVs) enable grid electricity, which is clean in tail-pipe emissions terms, to be utilized whilst the on-board electrical storage has sufficient charge. MAHLE Powertrain and Protean have jointly developed a plug-in hybrid demonstrator vehicle based on a C-segment passenger car. The vehicle features Protean's compact direct drive in-wheel motors with integrated inverters on the rear axle and retains the standard gasoline engine, and manual transmission, on the front axle.

To support this one-off prototype, a flexible vehicle control unit has been developed, which is easily re-configurable and adaptable to any hybrid vehicle architecture. The unit operates using software developed by MAHLE Powertrain to achieve a fully configurable vehicle control unit (VCU), intended to provide a rapid and cost effective platform for the development of demonstrator and niche volume vehicle fleets. The control software can also intelligently manage the use of the battery energy through the combined use of GPS and road topographical data. Knowledge of the route prior to a journey enables the software to calculate the SOC throughout the journey and pre-determine the optimum operating strategy for the vehicle to enable best fuel efficiency.

This paper describes some of the challenges, and solutions, associated with the vehicle conversion, including key vehicle integration topics, such as the CAN interface, vehicle control strategy, and the cooling system. Test results from the vehicle will be used to illustrate many of the points discussed.