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Development of Transmission and Packaging for Parallel Hybrid Light Commercial Vehicle

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Abstract : The hybrid electric vehicle is widely accepted as a promising short to mid-term technical solution due to noticeably improved efficiency and low emissions at competitive costs. Retro fitment of hybrid components into a conventional vehicle for achieving better performance is the best solution so far. But retro fitment includes major modifications into a conventional vehicle with a high cost. This paper focuses on the development of a P3x hybrid prototype with rear wheel drive parallel hybrid electric Light Commercial Vehicle (LCV) with minimum and low-cost modifications. This diesel Hybrid LCV is different from another hybrid with regard to the powertrain. The additional powertrain consists of continuous contact helical gear pair followed by chain and sprocket as a coupler for traction motor. Vehicle powertrain which is designed for the intended high-speed application. This work focuses on targeting of design, development, and packaging of this unique parallel diesel-electric vehicle which is based on multimode hybrid advantages. To demonstrate the practical applicability of this transmission with P3x hybrid configuration, one concept prototype vehicle has been build integrating the transmission. The hybrid system makes it easy to retrofit existing vehicle because the changes required into the vehicle chassis are a minimum. The additional system is designed for mainly five modes of operations which are engine only mode, electric-only mode, hybrid power mode, engine charging battery mode and regenerative braking mode. Its driving performance, fuel economy and emissions are measured and results are analyzed over a given drive cycle. Finally, the output results which are achieved by the first vehicle prototype during experimental testing is carried out on a chassis dynamometer using MIDC driving cycle. The results showed that the prototype hybrid vehicle is about 27% faster than the equivalent conventional vehicle. The fuel economy is increased by 20-25% approximately compared to the conventional powertrain.

Keywords : P3x configuration, LCV, hybrid electric vehicle, ROMAX, transmission
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