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Analysis of the Optimum Drive-line Configuration for a Compact-class Passenger Car for Differing Usage Patterns

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ABSTRACT

The world car fleet is around 750 million units, and growing. Travel survey data and fuel consumption information both indicate that the distances travelled by each vehicle have increased over recent years. Because of these factors, and despite the great strides made in increasing the efficiency of vehicles, the energy consumed by the automotive sector is still rising, thus leading to increasing pressure to further improve vehicle energy efficiency.

This paper uses a correlated drive-cycle simulation to examine the interaction between drive-line configuration and vehicle usage pattern on the CO2 emissions of a compact class passenger car. Various drive-line configurations, including series and parallel electric hybrids, will be analysed using a mixture of legislative drive-cycles, including the NEDC and WLTP, and “real-world” logged usage data. The results will be analysed to show which vehicle architecture yields the lowest tail-pipe CO2, well to wheel CO2, total life-cycle CO2 and lowest overall operating cost to the consumer. The dependence of the results on future energy prices, electricity generation carbon intensity, and vehicle component costs will also be examined.