

A Friction Comparison between Chain and Belt-Drive Systems

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ABSTRACT

Concerns over greenhouse gas emissions are driving governments and the automotive industry to seek out ways of reducing vehicle CO₂ emissions. Engine friction reduction is one means of reducing CO₂ emissions, through fuel consumption improvements. Of the different systems within the engine, the camshaft timing drive can contribute around 5 to 10% of the overall engine friction. It is therefore a system that can benefit from careful optimisation.

MAHLE has undertaken a motored friction-testing program on a 2.2 litre turbocharged diesel engine with the following different types of camshaft timing drive:

- Chain drive with hydraulic tensioner. This is the standard configuration for this engine.
- Chain drive with friction tensioner
- Wet belt drive
- Dry belt drive

Testing was conducted to allow the differences in friction between the different drive configurations to be calculated, by comparing each camshaft drive against the standard chain drive system. Using the frictional differences as a basis, the changes in fuel consumption from the standard configuration were predicted for a drive cycle. Changes in CO₂ emissions were then calculated. Experimental uncertainty levels were assessed during the analysis of the results.

This paper considers the approach to the testing, the testing process and the test results.