Analysis of US and EU Drive Styles to Improve Understanding of Market Usage and the Effects on OBD Monitor IUMPR

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ABSTRACT

The US is generally considered as the most critical market for emissions and On Board Diagnostics (OBD). Effective calibration of OBD monitors to meet legal and robustness requirements, whilst simultaneously achieving the In Use Monitor Performance Ratio (IUMPR) targets, requires an understanding of real world driving behaviour. Failure to achieve the legal minimum fleet average IUMPR could result in a product recall in the US. The planned implementation of IUMPR into Europe for EUV+ makes the understanding of customer drive patterns in the US and EU even more critical.

This paper outlines the development of a drive style analysis toolset that defines key metrics, which enable US and EU fleet vehicle drive data to be categorized and compared. The toolset objectively quantifies driving behaviour into drive type and drive style. Drive type is simply the recognition of US and EU road infrastructure. Drive style is determined by observing the interaction of two variables; pedal input (demand) and vehicle speed (response) through an aggressivity algorithm designed to detect subtleties in vehicle performance. The result is three aggressivity categories; gentle, normal and aggressive. The development of this toolset also includes detailed metrics to compare drive data using cumulative fraction plots. Key metrics include idle frequency, idle duration, vehicle speed and vehicle acceleration. These definitions were formulated using a range of production passenger vehicles with power-to-weight ratios varying from 100 to 230hp/tonne (approximately 0.07 to 0.17kW/kg).

Using the drive style analysis toolset, fleet data from 40+ vehicles running in the US and 10+ vehicles running in the EU has been categorized. Vehicle usage patterns in the US and EU have been compared against each other and to relevant legislative drive cycles. Fleet vehicle IUMPR data is analyzed against the drive style data and key results and trends are identified and presented.