AVOIDING OR CORRECTING IN-USE TEST VARIABILITY FOR IMPROVED DETECTION OF FUEL-EFFICIENCY AND EMISSIONS DIFFERENCES

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Mesilla Valley Transportation is a well-known innovator/early-adopter of fuel efficiency technologies and cost-effective fleet management practices. Their testing subsidiary, Mesilla Valley Transportation Solutions (MVTS) utilizes an innovative method they developed for accurately and quickly assessing the real-world fuel consumption impacts of new technologies in their industry. The method derives much from motorsports engineering (e.g., NASCAR and Formula 1), combining on-vehicle sensors and motorsports techniques with a “first principles” energy-balance algorithm to assess fuel consumption impacts in real-time. Even though its accuracy and statistical validity exceed those of the “industry standard” SAE protocols, the real-time conclusions are obtained more quickly and cost-effectively than for the integrated, gravimetric approach of SAE protocols.

Through their experience in empirically detecting small fuel-efficiency differences from fuel saving technologies in long-haul trucking (e.g., aerodynamic changes, lowered rolling resistance, etc.) MVTS has developed techniques that avoid or correct for the influences of changing ambient, roadway and vehicle conditions on the measured fuel consumption and exhaust emissions. By avoiding or correcting for these influences, test-to-test (replicate) variability is greatly reduced and much smaller changes in fuel efficiency and emissions can be detected than are otherwise possible.

This presentation will describe how in-use test variabilities are avoided through test design and how unavoidable influences are corrected for through the use of control vehicles, energy balance calculations and other data analysis techniques. Several examples from recent testing will also be presented as practical demonstrations of the techniques.