

Heavy-Duty Engine Testing to Establish Transient and Steady-State Emission Levels

Program Capabilities:

SwRI operates 17 transient-capable heavy-duty engine test cells fitted with full-flow constant volume systems (CVS) to examine diesel, gasoline or alternatively fueled engines for emissions and performance. Each of these cells is equipped with instrumentation to measure hydrocarbons (HC), carbon monoxide (CO), oxides of nitrogen (NO_x), and particulate matter (PM) emissions over both steady-state and transient engine operation. In addition, SwRI has sampling and analytical abilities to quantify numerous specific chemical compounds and to characterize particles of concern and associated with exhaust from internal combustion engines. Of the more than 200 engine dynamometer stands at SwRI, these transient test cells represent SwRI's unique ability to not only characterize these emissions, but to examine and develop strategies to reduce emissions through the application of new technology. SwRI serves the needs of engine and vehicle manufactures, refiners, chemical and catalyst companies, as well as regulatory and research groups to generate meaningful and reliable data to assess and develop the various technologies needed to maintain the world wide transportation infrastructure while striving to reduce pollution, improve fuel efficiency, and control cost.



Using US EPA, European, and other regulatory and developmental test procedures, engines from 3 to 750 kW engines are tested over transient on-highway and nonroad transient cycles as well as steady-state and ramp modal cycles to quantify emissions most often to prove compliance with increasingly stringent emission regulations. Because transient test procedures are used for regulatory purposes, the same procedure is used generate data in a prescribed manner to study the effects of fuel properties on emissions, to identify the most effective catalyst, to establish the most cost effective engine calibration or to tract the effects of changing or redesign of various engine components. Periodic emission testing is often carried out as the engine and related technologies

accumulate durability operation to establish deterioration factors, ensuring that the design being released is robust for the useful life of the engine. For production engines, periodic testing of a sample of that production can provide assurance that the engines being produced meet expectations, reducing the need for costly recalls or field fixes.

In addition to the regulated emissions of HC, CO, NO_x, and PM, individual hydrocarbon species and detailed particulate matter composition, number and size can be determined using equipment and procedures already in place to measure these and other unregulated emissions including dioxins, furans, aldehydes, metals, semi-volatile compounds, and other toxic compounds that may be found in exhaust emissions. Standard data acquisition includes second-by-second data for the engine torque and speed, regulated exhaust emissions listed above, and 20 other channels for thermocouples, pressure transducers, or other analog signals. Additional data acquisition is available and can be set-up quickly to meet test specifications. This includes high-speed thermocouple multiplexers as well as cylinder pressure.

SwRI is confident that we can meet your testing needs and you are invited to review our website at www.swri.org for an overview of the Institute and the Engine, Emissions and Vehicle Research Division, described at <http://www.swri.org/4org/d03/d03home.htm>.

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