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Testing For Emissions Era Engines



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Fractional Sampler For Transient Testing Of Diesel Engines



The Emissions Division of Sierra Instruments' has introduced a partial flow sampling system, the model BG-3 with transient dilution airflow control, designed to provide accurate, repeatable PM measurements for transient testing of diesel engines. The system utilizes dilution tunnel design advances and a unique flow apportionment and control system to execute proportional sampling.

Sierra Instruments' Emissions Division, Monterey, Calif., has introduced the model BG-3 with transient dilution airflow control (TDAC), a partial flow sampling system (PFSS) designed to provide accurate, repeatable PM measurements for transient testing of diesel engines.

The TDAC system utilizes dilution tunnel design advances and a unique flow apportionment and control system to execute proportional sampling. The flow delay at the particulate sample probe is considerably less than the 500 ms delay specification elaborated in ISO16183. Further, the model BG-3 utilizes a real-time measurement of exhaust flow to ensure correlation with full-flow constant volume sampling.

One of the major challenges for a PFSS is to maintain constant proportional flow from an exhaust stream with a highly variable mass flow rate. Recent tests at a major diesel engine manufac-

turer as well as at Southwest Research Institute have demonstrated the system's ability to maintain transient cycle PM correlation to within ± 5 percent of full dilution tunnel (CVS) results.

In the model BG-3, conditioned dilution air is measured and controlled by the system dilution air mass flow controller located in the TDAC module. A flow control valve system in a feedback loop with a fast-response (<15 ms) mass flow meter provides feedback loop control of the proportional flow control valve.

The dilution air mass flow controller and its ancillary instrumentation are maintained in a thermally stable environment in close proximity to the dilution tunnel. TDAC input is provided by a zero to 5 V linear output from the engine intake mass flow sensor. The engine intake air measurement system voltage output is introduced through a discrete amplification circuit, allowing the operator to optimize the amount of

sample flow regardless of engine size.

The fully automated model BG-3 is also designed to reduce costs of full flow dilution test cell requirements. The easily transported unit accurately tests any size engine regardless of rpm, power output, or stack size, Sierra said. Sampling time is approximately three to five minutes for a 2 mg net sample mass.

The system is also designed for both steady-state and transient applications, with certifications awarded under EEC 91/42, ECE R49, U.S. EPA /40 CFR 89, and TALuft. Sierra said short sample time reduces fuel costs and improves efficiency and that networking capability facilitates data sharing. In addition to certification work, the model BG-3 is being used for combustion and emissions research, engine development, and baseline engine measurement by manufacturers and government agencies around the world. ★