(1-06) Real-Time On-Board Measurement of Mass Emissions of NOx, THC and Particulate Matters from Diesel Vehicles

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ABSTRACT

Recently, an on-board measurement system that is capable of measuring real-time mass emission of nitrogen oxides (NOx), fuel consumption, road load, and engine output simultaneously has been developed. The system consists of a data recorder and a variety of sensors including an air-to-fuel ratio sensor and a NOx sensor. The system can be placed on the passenger seat and operated without external power. Test results of NOx mass emission and fuel consumption obtained by on-road measurements of diesel vehicles have been already reported. In the present investigation, a total hydrocarbon (THC) analyzer using flame ionization detector (FID) and a smoke-meter using opacity method are added to the on-board measurement system, because THC and particulate matters (PM) are paid much attention as well as NOx.

The on-board measurement system was installed in a diesel vehicle and measurements were taken on a chassis dynamometer and on public road. As a result, it can be shown that the on-board measurement system can measure mass emission of THC as well as NOx or other items. Mass emission of PM is also possible to be obtained from smoke-meter output, by applying a calibration line that is pre-determined by comparing with conventional filtering method. Evaluation of the results, using a chassis dynamometer and CVS-tunnel system as a reference, reveals fair correlation: from -3 % to 8 % for THC mass emission, and from -10 % to 12 % for PM mass emission. At the on-road test, it has been observed that the patterns of THC and PM mass emission during on-road runs show good agreement with those of NOx mass emission and fuel consumption. And the effects of the EGR function for NOx and PM mass emission have been clearly observed by the on-board measurement system.

Figure 1. Configuration of the on-board measurement system