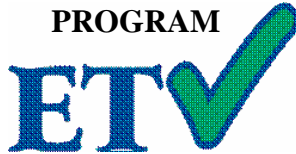


US EPA ARCHIVE DOCUMENT

THE ENVIRONMENTAL TECHNOLOGY VERIFICATION
PROGRAM



U.S. Environmental Protection Agency



Battelle

... Putting Technology To Work

ETV Joint Verification Statement

TECHNOLOGY TYPE: PORTABLE EMISSION ANALYZER

APPLICATION: DETERMINING NITROGEN OXIDES EMISSIONS

TECHNOLOGY NAME: A-Plus Portable Emission Analyzer

COMPANY: ECOM America LTD.

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The U.S. Environmental Protection Agency (EPA) has created the Environmental Technology Verification (ETV) Program to facilitate the deployment of innovative or improved environmental technologies through performance verification and dissemination of information. The goal of the ETV Program is to further environmental protection by substantially accelerating the acceptance and use of improved and cost-effective technologies. ETV seeks to achieve this goal by providing high quality, peer reviewed data on technology performance to those involved in the design, distribution, financing, permitting, purchase, and use of environmental technologies.

ETV works in partnership with recognized standards and testing organizations; stakeholder groups which consist of buyers, vendor organizations, and permittees; and with the full participation of individual technology developers. The program evaluates the performance of innovative technologies by developing test plans that are responsive to the needs of stakeholders, conducting field or laboratory tests (as appropriate), collecting and analyzing data, and preparing peer reviewed reports. All evaluations are conducted in accordance with rigorous quality assurance protocols to ensure that data of known and adequate quality are generated and that the results are defensible.

The Advanced Monitoring Systems (AMS) program, one of 12 technology areas under ETV, is operated by Battelle in cooperation with EPA's National Exposure Research Laboratory. AMS has recently evaluated the performance of portable nitrogen oxides monitors used to determine emissions from combustion sources. This verification statement provides a summary of the test results for the ECOM A-PLUS Portable Emission Analyzer.

VERIFICATION TEST DESCRIPTION

The verification test described in this report was one of a series of tests conducted in early 1999 on commercial portable nitrogen oxides analyzers at Battelle's facilities in Columbus, Ohio. Verification testing of the analyzers involved (1) a series of laboratory tests in which certified NO and NO₂ standards were used to challenge the analyzers over a wide concentration range and (2) tests using realistic combustion sources, in which data from the portable analyzers undergoing testing were compared to simultaneous measurements of NO and NO_x obtained with two chemiluminescent analyzers.

Verification testing lasted three to four days, of which two days were required for laboratory testing and the remainder for source emissions testing. To assess inter-unit variability, two identical analyzers were tested simultaneously in all tests, and results from the two analyzers were kept separate. The analyzers were operated at all times by a representative of ECOM and supervised at all times by Battelle staff.

Verification testing focused on measurement of NO and NO₂, the sum of which is denoted as NO_x. Laboratory testing included a linearity test over the entire nominal ranges of the analyzers for both NO and NO₂; estimation of detection limits and response times; interference testing; assessment of sample pressure and ambient temperature effects on analyzer response; and evaluation of zero and span drift during the various laboratory tests. Tests with combustion sources assessed the accuracy of NO, NO₂, and NO_x measurements, relative to the chemiluminescent NO/NO_x approach that is the basis of EPA Method 7E. Sources used in the testing were a gas-fired rangetop burner, a gas-fired water heater, and a diesel-powered electrical generator operated at both idle and at high RPM. These sources produced NO_x emissions ranging from less than 10 to over 400 ppm. Zero and span drift resulting from exposure to source emissions were assessed, and analyzer stability was monitored during one hour of uninterrupted sampling of diesel emissions.

Quality assurance (QA) oversight of verification testing was provided by both Battelle and U.S. EPA. Battelle QA staff conducted a technical systems audit, a performance evaluation audit, and a data quality audit of 10 percent of the test data. EPA QA staff conducted an independent on-site technical system audit.

TECHNOLOGY DESCRIPTION

The ECOM A-PLUS is a portable, microprocessor controlled, electrochemical sensor-based emission analyzer. The ECOM A-PLUS can be fitted with up to five separate gas sensors to measure oxygen, carbon monoxide, oxides of nitrogen (NO and NO₂), and sulfur dioxide. Only the NO and NO₂ measurement capabilities were verified in the tests reported here. The A-PLUS measures 21" x 10" x 11.8" and weighs 30 pounds. An on-board printer allows hard copy printing of vital stack parameters, while an RS232 interface provides the option to store the data to a computer. The A-PLUS incorporates a sample conditioning system that includes a heated sample line, heated probe head, peltier cooler, and moisture removal assembly. Designed for semi-continuous operation, the ECOM A-PLUS is not recommended for continuous gas emission measurement.

VERIFICATION OF PERFORMANCE

Linearity: The ECOM A-PLUS analyzers provided linear response, but not over their full nominal ranges of 0 to 4,000 ppm for NO and 0 to 500 ppm for NO₂. The actual linear ranges for the ECOM analyzers were about 0 to 3,500 ppm for NO, and about 0 to 450 ppm for NO₂.

Detection Limit: Combustion source tests indicated detection limits comparable to the 1 ppm measurement resolution of the analyzers. Detection limits estimated from the linearity test data were 1.2 ppm for NO₂ and about 4 ppm for NO. These values may have been influenced by the relatively high analyte levels used in the linearity test.

