United States
Environmental Protection
Agency

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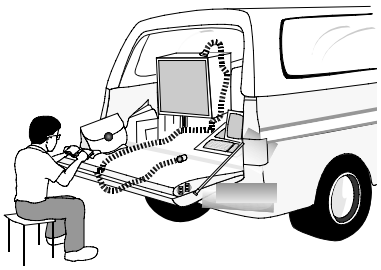
OFFICE OF RESEARCH AND DEVELOPMENT

TECHNOLOGY SUPPORT PROJECT

Mobile Mass Spectrometry



Environmental Technology Verification

The U.S. Environmental Protection Agency, through its Environmental Technology Verification (ETV) Program, works on accelerating the acceptance and use of improved methods for environmental analysis. Recently, scientists at the EPA National Exposure Research Laboratory, Environmental Sciences Division (ESD) in Las Vegas, conducted two studies to evaluate the performance of field-portable gas chromatograph/mass spectrometer (GC/MS) equipment.

Working with instrument developers and an independent testing organization (in this case, Sandia National Laboratory, Albuquerque), ESD scientists designed an evaluation study wherein the two candidate technologies were evaluated against an approved reference method. The accuracy, precision, and comparability of each instrument was assessed based on results obtained for performance evaluation (PE), spiked, and environmental samples.

GC/MS in the Field

GC/MS is an EPA recommended method for the analysis of volatile and semivolatile organic compounds. This proven analytical technique identifies and quantifies organic compounds on the basis of molecular weight, characteristic fragmentation patterns, and retention time of the chromatographic column. Until relatively recently, it was not feasible to bring a GC/MS instrument to a hazardous waste site because of its size and weight, the need for strict control of temperature and humidity, and the effect of vibration during transport. With the growing demand for field-portable instrumentation in environmental analysis, rugged, smaller units, like the two in this study, have been developed. Field-transportable GC/MS is a versatile technique that can be used to provide rapid screening data or laboratory quality confirmatory analyses. In most systems, the instrument configuration can be quickly changed to accommodate different inlets for media such as soil, soil gas, and water.

The Study

Two sites were selected for evaluating the instruments for measurement of several compounds: the U.S. Department of Energy Savannah River Site in South Carolina (for trichloroethene and tetrachloroethene), and Wurtsmith Air Force Base in Michigan (for benzene, toluene, xylenes, and chlorinated organic solvents). In addition to the different contaminants present, these sites also provided different climatic and geological conditions to test the ruggedness and versatility of the instruments.

The two portable GC/MS instruments evaluated in this verification study were: the Viking SpectraTrak™ 672 and the Bruker-Franzen EM640™. The reports cited at the end of this fact sheet provide details of the studies and their results.

Verification

Six features were considered for each of the instruments: throughput (samples/increment of time), completeness (% of target compounds detected), precision (relative percent difference for series of duplicates from each medium), accuracy (proximity to the known concentration), comparability (against contract laboratory results), and deployment (field ruggedness, setup time, and other ease-of-use factors).

Specific results for each of the instruments is available in the reports cited below.

References

W. Einfeld, S. F. Bender, M. R. Keenan, S. M. Thornberg, and M. M. Hightower, EPA/600/R-97/148, U.S. Environmental Protection Agency, Washington, D.C., 1997. (Viking Instruments Corporation SpectraTrak™ 672)

W. Einfeld, S. F. Bender, M. R. Keenan, S. M. Thornberg, and M. M. Hightower, EPA/600/R-97/149, U.S. Environmental Protection Agency, Washington, DC, 1997. (Bruker-Franzen Analytical Systems, Inc., EM640™)

For Further Information

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