The Detector

Volume 1, Number 6 June 2004

Newsletter of U.S. EPA's Safe Buildings Monitoring and Detection Technology Verification Program

What is ETV?

The U.S. Environmental Protection Agency (EPA) established the Environmental Technology Verification (ETV) Program in 1995 to verify the performance of innovative technical solutions to problems that threaten human health or the environment.

ETV's mission is to accelerate the use of new environmental technologies in the domestic and international marketplace.

ETV provides third-party, quality-assured performance data so buyers and users of environmental technologies can make informed purchase and application decisions.

ETV works through public/private testing partnerships (called Centers) to evaluate the performance of environmental technologies.

The program

The Safe Buildings Monitoring and Detection Technology Verification Program is part of the U.S. EPA's National Homeland Security Research Center (NHSRC). The program operates under the auspices of ETV to verify technologies that monitor and detect chemical and biological contaminants in buildings and public places.

The Safe Buildings Monitoring and Detection Technology Verification Program develops test plans and protocols, conducts verification tests, and reports the technologies' performance.

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2nd technology tested

Surface Acoustic Wave Technology Being Tested

The second technology—the HAZMATCAD Plus instrument of Microsensor Systems, Inc.—is currently being tested by Battelle under the U.S. EPA's Safe Buildings Monitoring and Detection Technology Verification Program.

This technology, which is commercially available, combines electrochemical sensors that can rapidly determine the presence of toxic industrial chemicals (TICs) in a network of three surface acoustic wave (SAW) sensors that respond to chemical warfare (CW) agents.

A SAW sensor detects chemical vapors absorbed onto chemically selective coatings on the sensor's surface. In the HAZMATCAD Plus, an internal microcomputer measures the profile of changes in surface wave transmission across the three sensor elements to determine the presence, identity, and relative concentration of chemical agents.

The verification test began in May and is expected to be completed in July. The test's objective is to assess the performance of the portable electrochemical/SAW technology, which can be used by first responders to identify TICs and CW agents in a contaminated building. To meet a first responder's needs, the instrument must be fast-responding, accurate

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Two HAZMATCAD Plus instruments submitted for testing by Microsensor Systems, Inc. (at left), are being tested by Battelle's Robyn Kroeger, who is using an electrochemical device to perform an independent check of the concentration of a TIC, in this case, chlorine.

2nd Technology *(from Page 1)*

in identifying TICs and CW agents, and portable (i.e., light in weight and battery-powered).

The performance characteristics being evaluated address the ability to detect and identify target agents and chemicals under both ideal and realistic operating conditions. Performance characteristics include: response time, response threshold, accuracy, recovery time, temperature and humidity effects, interference effects, and battery life.

Examples of potentially interfering compounds being used in testing include ammonia-based cleaner, latex paint fumes, gasoline vehicle exhaust, and air freshener vapors (see box). Operational factors—such as cold/hot start behavior, cost, ease of use, and data output—are also being evaluated.

> The effects of potentially interfering compounds are being assessed because the compounds can potentially produce two types of errors: erroneous reporting of a chemical or chemical agent when none is present (false positive) or reduction in sensitivity or masking of target analytes of interest (false negatives).

Testing is being conducted over ranges of temperature and relative humidity representing conditions that might be encountered in a building during an emergency. Standard test methods are being used to confirm the contaminant concentrations sampled by the HAZMATCAD Plus instruments. Testing of the instrument focused on the detection of chemicals in the vapor phase because that application is likely to be of the greatest use to first responders. The effects of potential interferences in an emergency situation will be assessed both with and without the target TICs and CW agents.

Two test phases are being conducted: the first with TICs, in a non-surety laboratory; and the second with CW agents, in a certified surety facility. The TICs selected for testing are cyanogen chloride, hydrogen cyanide, phosgene, chlorine, and arsine. These gases are relatively common and available materials that could be used by terrorists to attack a building. Two CW agents—sarin (GB) and sulfur mustard (HD)—will be used in the CW agent testing. Identical test systems are being used to assess the response of the HAZMATCAD Plus instrument to challenge mixtures of the selected TICs and CW agents.

Benefits of ETV Verification

- Increased public awareness of technologies that can detect contamination in buildings or other structures
- Reduced anxiety about building contamination
- Access to credible performance data from technologies that monitor for and detect chemical and biological contaminants
- Acceptance by regulators and permitters of new technologies or new uses for existing technologies
- More rapid deployment of technologies to meet governmental goals
- Increased varieties of additional building detection technologies
- Awareness that technologies undergo objective, third-party testing
- Knowledge that trained experts develop and deploy technologies
- Successful building detection technologies restore confidence for workforce, visitors, investors, stockholders, and lenders.

In the foreground is a glass vessel used to supply interferent vapors—for example, paint fumes for testing.