The Detector

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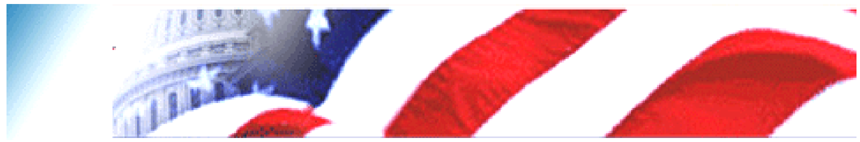

Newsletter of U.S. EPA's Safe Buildings Monitoring and Detection Technology Verification Program

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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HAZMATCAD Plus Is Second Technology To Be Verified

The technology submitted by Microsensor Systems, Inc.—the HAZMATCAD Plus hybrid electrochemical (EC)/surface acoustic wave (SAW) detector—has completed verification testing with toxic industrial compounds (TICs) and chemical warfare agents (CWAs). The objective of the test was to characterize the performance of the detector on selected TICs and CW agents, under conditions representing use of the detector by first/emergency responders.

The HAZMATCAD Plus uses a network of three SAW sensors that can detect blister and nerve agents, and EC sensors for detecting choking agents and hydride and halogen gases.

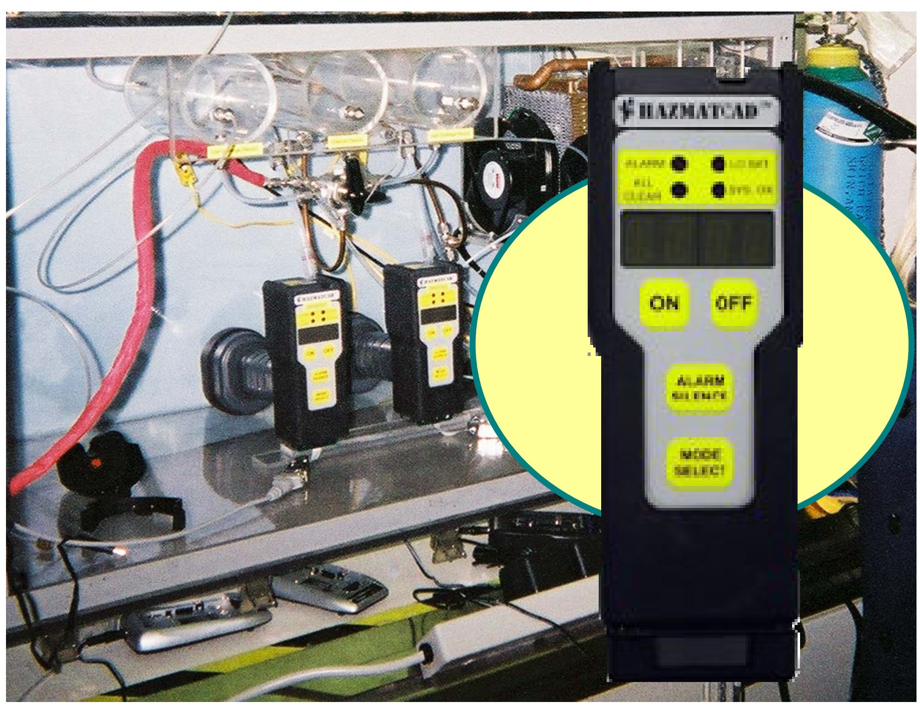
Hydrogen cyanide (AC), phosgene (CG), arsine (SA), and chlorine (Cl_2) were the TICs used for the test because they are relatively common and may be accessible to terrorists. Sarin (GB) and sulfur mustard (HD) were the CWAs used.

The performance characteristics tested included response time, response threshold, accuracy, recovery time, temperature and interference effects, and battery life. Also evaluated were operational factors such as cold/hot start behavior, cost, ease of use, and data display capabilities.

Testing included common

(See HAZMATCAD on Page 2)

Two HAZMATCAD Plus hand-held instruments are shown in the test chamber, where they were tested for detection of toxic industrial chemicals and chemical warfare agents. Inset is an enlarged photo of the instrument.



HAZMATCAD Plus Response Thresholds for TICs and CWAs Used in Testing	TIC/CWA	Response Threshold
	Hydrogen cyanide (AC)	0.6 - 1.25 ppm (0.6 – 1.25 mg/m^3)
	Phosgene (CG)	0.2 - 0.4 ppm (0.8 – 1.6 mg/m^3)
	Arsine (SA)	0.3 - 0.6 ppm (1.0 – 2.0 mg/m^3)
	Chlorine (Cl_2)	0.5 - 1 ppm (1.4 – 2.9 mg/m^3)
	Sarin (GB)	0.1 - 0.2 ppm (0.6 – 1.1 mg/m^3)
	Sulfur mustard (HD)	0.1 - 0.6 ppm (0.7 – 4.0 mg/m^3)
	ppm - parts per million	mg/m^3 - milligrams per cubic meter

HAZMATCAD *(from Page 1)*

materials that could interfere with the technology's ability to detect TICs or CWAs, including latex paint fumes, air freshener and ammonia cleaner vapors, exhaust hydrocarbons, and diethyl amino ethanol (DEAE), which is used in a building's boiler water to prevent corrosion. The test procedure generally consisted of establishing a challenge, measuring the detector's response, allowing the system to recover (i.e., return to the base-line)—then repeating the cycle five times. The test emphasized the detection of chemicals in the vapor phase because that application is likely to be of the most relevance to first responders.

The EC sensors responded within a few seconds and the SAW sensors in about 40 seconds. Alarm responses were consistent with the manufacturer's specifi-cations. The recovery times were generally 0-2 minutes for CG, SA, Cl_2, HD, and GB and greater than one minute for AC. The response test was repeated at different temperatures and relative humidity. The largest effect was for Cl_2–the high humidity and temperature caused a decrease in response.

The table above shows the TIC and CWA used in testing and the HAZMATCAD Plus response thresholds determined.

The false positive tests showed no response for latex paint, air freshener, ammonia cleaner, DEAE, or exhaust hydrocarbons. However, interferent tests showed increases in Cl_2 and GB responses from ammonia cleaner and a masked GB alarm from air freshener. Cold start behavior was tested at three storage tempera-tures (normal, cold, and hot), and there was no change in response or response time.

Battery life was also tested and found to be 9 to 10 hours, with no change in response, response time, or recovery time until the batteries were fully depleted.

The verification statement and report for the HAZMATCAD Plus will soon be available on the U.S. EPA's Environmental Technology Verification (ETV) Program's Web site at (http://www.epa.gov/etv). The verification statement and report for the Bruker Daltonics RAID-M IMS have also been posted on that site. It was the first technology tested under the U.S. EPA's Safe Buildings Monitoring and De-tection Technology Verification Program. In the left-hand column of the opening page of the web site, click on the *Verified Technologies* button, then on the Safe Buildings Monitoring and Detection Technology Verification Program, and scroll down to the reports.

Testing is currently underway on a technology submitted by Environics USA, the M90 ion mobility spectrometer (IMS).

Stakeholders Suggest Future Technology Tests

During an August teleconference, stakeholders revisited the technologies suggested earlier for testing—SAW detectors (see main article), flame spectroscopy detectors, photoionization detectors (PIDs), and portable infrared technologies. They recommended several other tech-nologies that may be considered for testing:

- Bio devices or test kits (used by the U.S. Department of Defense [DOD]), especially those that can detect anthrax spores.
- Lateral flow assays.
- End analytical components for bio-detection.
- In general, test important devices/systems that consumers are buying. Stakeholders recommended that Battelle select for testing the devices being purchased regularly, test what is being used most frequently in the field, and base the test on how it is currently being used.