Knowledge Trumps Everything in HazMat Decon

Tighter Integration Between Firefighting and HazMat Increases Knowledge and Reduces Toxic Exposure

RAE Systems, Inc.
Decon and Fire/HazMat Response

Today, decon is getting more attention as commanders consider the HazMat implications of routine structural fires. Many teams are making sure that soot-covered turnouts are getting hosed down at the scene instead of being worn as smudged badges of honor as they go from one incident to another.

As studies and evidence mount, there is a growing perception in fire service that residential fires are flaming, smoky HazMat incidents, and that HazMat safety protocols should to be applied to structure fires when smoke is present. This includes:

- Performing more on-scene decontamination to ensure contaminates do not get transferred from one location to another;
- Firefighter ensemble clothing and equipment are maintained regularly; and
- HazMat detection tools are deployed to help keep first responders and their custom gear contaminate-free.

This eBook discusses key emergency responder airborne toxic threats, decon and HazMat techniques to reduce these threats, and the latest gas-detection solutions capable of increasing responder, HazMat, EMS and public safety.

Toxic Smoke from Building Materials

The plating shop where chemicals were used to turn unfinished metals into a smooth and finished product was engulfed by flames as a Boulder County, Colo., fire truck arrived on-scene. Responders immediately took a defensive position. They extinguished the fire from outside positions to keep it contained and protect firefighters from billowing smoke potentially loaded with unknown chemicals.

The HazMat team arrived and determined the presence of hydrochloric acid, a highly corrosive solution that could cause dermal burns and damage firefighter gear. A standard decontamination zone was set up after test-strip swipe of bunker gear revealed an acidic PH factor of 3, indicating that, despite their best efforts to stay back from the fire and its corrosive smoke, responders had been exposed.

“Decon can set the tone for the rest of the scene,” said Lt. Mike Becker, an 18-year fire service veteran who coordinates HazMat response for the Longmont Fire Department (LFD) in Colorado. “If you don’t have things properly in place, you can drag contaminates all over God’s green earth. It’s critical to recognize upfront all the key issues and indicators; it’s important to have decon in place early on.”

At the plating shop scene, three decontamination pools were set up. The firefighters, who had no idea they were exposed before the HazMat team arrived, were washed thoroughly in the first pool (gross decon) and then received a technical wash in the second pool and a final rinse or “definitive” rinse in the third pool. Using a PH test strip on each pool, the HazMat team monitored the contamination levels as they decreased at each pool level, showing the decontamination effort was effective. This is something Becker refers to as “definitive decon.” [See Related Sidebar Story]
Still, the incident resulted in having to decontaminate 15 firefighters and discard an estimated $50,000 in turnout and other gear destroyed by the corrosive atmosphere at the plating fire, reported Becker, leading him to conclude: “Recognition is huge.”

Lt. Becker is a proponent of having HazMat units team with structure firefighters on a majority of calls, acknowledging the importance of recognizing and detecting the presence of hazardous and toxic materials at any incident, including structure fires. He reasons that in many larger departments, HazMat resources can be underutilized, while firefighters battle residential fires that today have more in common with HazMat events than old-fashioned house fires.

The use of alternative building materials – such as plastics, laminates, synthetics and foams – in the construction of modern-day homes and furniture creates new toxic hazards for firefighters combating structure fires. When these materials burn, they off-gas hazardous and toxic chemicals, including carbon monoxides (CO), hydrogen sulfides (H₂S) and hydrogen cyanides (HCN). The smoke from these materials puts first responders who are not wearing a self-contained breathing apparatus (SCBA) at risk for long-term health illness from chronic conditions or cumulative exposures or immediate death. The public also is at risk, making smoke inhalation the leading cause of death during structure fires.

Several organizations representing firefighters agree that the components of fire smoke are dangerous, toxic and in some cases, carcinogenic. The groups include HazMatIQ (http://www.HazMatiq.com), the Industrial Emergency Council (http://www.iectraining.org) and the Fire Smoke Coalition (http://www.firesmoke.org). Experts from these organizations report education is the single best way to sensitize the industry to the real-world dangers of fire smoke and to help instigate changes in department polices throughout fire-service organizations in the U.S.

“We are trying to get firefighters to realize that many of the chemicals they would never consider breathing in a HazMat release are the same chemicals found in smoke at structural fires,” confirmed Santa Clara County (Calif.) Firefighter, Paramedic and HazMat Specialist Katie Roberts. “Firefighters need to change their perception and acknowledge that a structure fire truly is a dangerous HazMat situation.”

One of the barriers to having HazMat technicians involved in typical structure calls is firehouse tradition. Many in the fire service are beginning to challenge the tough-guy “get-it-done-at-any-cost” attitude that is stitched into the cultural fabric of many first-response organizations. Adherence to the old
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ways can often supplant common-sense changes. In addition, many departments today have a strict demarcation between the job of HazMat technician and operational firefighter, often borne out of long-standing traditions.

“In some ways, our culture makes us our own worst enemy,” said one department chief who is looking to have fire smoke scrutinized and appreciated for its impact on acute and chronic health effects on firefighters and the publics they protect.

For Becker, combining resources that have traditionally been separate in many departments can bring HazMat experience and knowledge, along with advanced detection-equipment capabilities, to most fire incidents.

“We arrive on-scene with a containment mindset trained to recognize and identify dangerous, toxic or combustible materials, and reduce the contaminants to ALARA levels, or As Low As Reasonably Achievable,” Becker said. “That’s always our goal.”

Experts agree there are a host of dangerous and toxic components to smoke, but two elements are getting called out for their toxicity – carbon monoxide (CO) and hydrogen cyanide (HCN) – dubbed by the Fire Smoke Coalition as “the toxic twins.” While the dangers of CO have been long understood, it is now recognized that HCN is as bad or worse of a “silent killer” as CO.

While Becker acknowledges that commanders need to manage departmental resources in ways that are cost efficient and retain resources to respond to the next call, he believes more can be done, and should be done, to limit firefighter exposures through tighter integration of HazMat and firefighting crews.

“But because of our occupation, firefighters are getting exposed to a range of hazards over the course of a 20- or 30-year career, and we now know that fire smoke is a big contributor,” Becker said. “Soot, in and of itself, is a known carcinogen, so why are we not decontaminating at every fire scene where smoke is present?”

**Guidelines for Contaminate Reduction**

NFPA 1851 provides guidelines for the care, maintenance and repair of firefighting clothing ensembles and gear, including Personal Protective Equipment (PPE) and bunker gear. It was developed to reduce health hazards by ensuring embedded gases, particulates and possible carcinogenic material are removed from the “protective ensembles” worn by firefighters.

Because oils and contaminates can be flammable, toxic or cancer causing, and can be carried from one incident site to the next, NFPA 1851 provides standards to increase safety and protect the health of anyone who comes in contact with firefighting gear, including a mandate that requires bunker gear be professionally cleaned a minimum of twice a year. As a result, many departments have instituted policies that prohibit storing bunker gear in day rooms, sleeping quarters or in homes. Despite these rules, the inadvertent transfer of contaminates from a HazMat or fire scene remains a big concern.
But with increased emphasis on the dangers of fire smoke exposure – once considered just a routine part of the job – sensitivity to bunker and turnout gear contamination is more prevalent in many organizations, said Paul Tarter, Fire Chief for the Bexar-Bulverde Volunteer Fire Department in Texas.

“If we respond to a fire that includes known hazardous materials, say a pool company with chlorine, we would decon at the scene and take the gear out of service as a precaution so it can be cleaned and the contaminates removed,” Tarter said. “It’s when the chemicals are not known that poses the greatest risk to firefighters, and can lead to having to decommission gear that gets contaminated beyond repair.”

**Using HazMat SOP to Reduce Toxic Exposure**

Combining the skill sets of HazMat professionals with the structural fire operations team brings more advanced tools to each fire engagement to help identify risks and verify the effectiveness of decontamination efforts, said Becker. In Colorado, each LFD vehicle carries a standard four-gas detection instrument, ideal for detecting CO, H₂S, and flammability. If an incident goes beyond the capabilities of its operations people, who are specifically trained to use four-gas monitors, the HazMat team will be called out with its arsenal of more advanced and sensitive detection tools.

That arsenal includes portable wireless multi-gas instruments with photoionization capabilities often used for perimeter monitoring during HazMat incidents, handheld instruments with sensors capable of detecting volatile organic compounds (VOCs) with a detection range to 10,000 parts-per-billion, and handheld detectors for chemical warfare agents (CWA) and selected toxic industrial chemicals (TICs).

“In the end, it’s about keeping our people and the public as safe as possible by making sure we have a handle on the incident at hand, whether it’s a HazMat event or a structure fire,” said Becker. “The expertise, the pre-planning and the tools presented by a HazMat team can best be utilized by engaging these teams early to recognize HazMat situations upfront and help reduce the spread of contaminates right down until the last truck rolls away from the scene.”
Learn More: Additional Useful Information and Ideas

1. For more information and to see how to monitor toxic industrial chemicals, flammable gases, VOCs, radiological, man-down, meteorological and physiological information from outside the hot zone via the ProRAE Guardian Wireless Safety System, click HERE.
   (http://www.youtube.com/watch?v=KUXiCAZzg8o&list=PLD78244588F3C9DE&feature=c4-overview-vl)

2. See how HazMat uses wireless gas detection and command center software HERE
   (https://www.youtube.com/watch?v=YJEz_Tvgqys)

3. Check out this video on the hazards of the Toxic Twins (HCN and CO) in fire smoke, click HERE.
   (http://www.youtube.com/watch?v=5D5sO73_rOE&feature=c4-overview&list=UU_ouqOKA6n5MAcEWI0ogMrQ)

4. Watch a video on the new MultiRAE, the world’s first wireless portable multi-threat monitors that give safety professionals unprecedented visibility into chemical threats HERE
   (http://www.youtube.com/watch?v=DY8p_uCy6lo)

5. For more information on the QRAE 3 and to schedule a demonstration, click HERE.
   (http://www.raesystems.com/products/qrae-3)

About RAE Systems, Inc.

RAE Systems is a global sensor and wireless-system innovator that designs and manufactures a full line of fixed, portable, handheld and personal chemical- and radiation-detection instruments. The company’s life- and health-saving detectors are used in 120 countries by many of the world’s leading industrial corporations, first responders and government agencies. RAE Systems offers a variety of rapidly deployable and custom-configurable sensor solutions for incident response and Oil & Gas site monitoring. RAE Systems delivers cohesive, wirelessly connected threat-detection solutions that create a layered defense against gas and VOC threats and other gas and combustible risks. RAE Systems’ solutions for Oil & Gas monitoring and protection are:

- **Versatile:** RAE Systems’ easily deployable fixed and portable monitors placed in sensitive areas transmit sensor information in real-time to a central location for quick interpretation, analysis and action.
- **Wireless:** Wireless atmospheric monitoring that utilizes cost-effective equipment that is easy to install and operate can assist plant managers and operations commanders and first responders with real-time information on potential hazards.
- **Proven:** With more than 23 years of experience, RAE Systems’ innovative solutions have a verified track record.

The company offers a wide range of rugged, yet easy-to-use monitors that enable continuous, real-time safety- and security-threat detection in nearly every environment, along with wirelessly connected solutions that lead the industry in performance and reliability. RAE Systems’ intrinsically safe and globally certified monitors help elevate safety for workers, responders and the public at large; reduce project downtime; and maintain regulation compliance.