True STORY

Wireless Gas-Detection Monitoring Goes Beyond Responder Safety and Data Collection

Major Tank Leak at an Australian Port Leverages Extensive Role of Wireless Gas-Detection Monitoring During Extended HAZMAT Situations

The strong smell of hot bitumen, a tar-like substance heated for use in road and roofing construction, emanated throughout the small, industrialized Australian City of Portland on a Saturday afternoon just as many residents were getting ready to fire up their "barbies" for evening supper. The malodorous hot-tar smell soon overtook sections of town and forced residents and businesses of this bayside community to barricade themselves indoors, shuttering doors and windows, and turning off air conditioners on the late summer day in 2012.

Liquid coal-tar pitch, leaking from a nearby storage container at the city port, was the source of the odor. It's considered a carcinogenic substance that includes a volatile organic compound (VOC), xylene, which is a flammable and toxic liquid or vapor. The pitch can cause irritation to lungs, eyes and throat, reported one Country Fire Authority (CFA) spokesperson. The chemicals within the pitch volatilize or evaporate into the air. Once airborne, the toxic vapors are capable of long-range dispersion.

The CFA issued warnings communitywide confirming there had been a hazmat spill involving a storage tank at the port, and that residents should shelter-in-place and seek medical attention for

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symptoms such as headaches or shortness of breath. The Port of Portland, which is a transportation hub for a range of products including grain and wood chips, was shut down and its traffic diverted. City officials also had begun evacuation plans, reported CFA Senior Station Officer Rick Owen.

"While you could smell the stuff throughout the area, it probably wasn't in concentrations where it was dangerous outside the initial [hot-zone] exclusion area," said Owen, whose Dandenong Fire Brigade hazmat team and equipment was flown 250 miles to Portland to deal with the incident. "Once we deployed our wide-area monitors, we were able to set up our exclusion zones based on equipment readings, and offer the community some peace of mind."

While the smell persisted throughout the duration of the incident, gas-detection sensors monitored the immediate area and the community to ensure exposure levels remained below thresholds for adverse health effects for the general population, said Owen, a 22-year veteran of the fire service in Victoria.

The Port of Portland is located on Portland Bay on the southwest side of the State of Victoria, Australia, where tanker deliveries of liquid coal-tar pitch are routine. On a monthly basis, the tank ship docks, secures its transfer rigging and deposits hundreds of tons of the molasses-like liquid – heated to 400 degrees (200C) to keep it in a liquefied form – into one of two large storage tanks at the port (each about a 3,000-ton capacity). The pitch is used at the nearby aluminum smelter, the third largest such facility in Australia, as a binding agent in its smelting process.

But on this day, soon after the tanker had transferred its load and headed back to sea, the superheated liquid began to leak from a seam of the 20-year-old storage tank, said Owen. The leaked pitch was cooled using a water mist and then, once solidified, painstakingly removed from the area using tractors and dump trucks. While a concrete bund helped contain the leaking material from spreading further or contaminating the bay, contaminated water used to cool the material was pumped out of the bund area so it wouldn't overflow. Additionally, crews filled more than

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4,000 sandbags, which were placed around the leaking pitch to reduce environmental damage. "Once we got our equipment in place, we could get people back into their homes, which made logistics a lot easier," said Owen, who is the equivalent of a fire-service captain in U.S. terms. "What we didn't realize at the time was the incident would last a full seven days."

VAPOR MONITORING CRITICAL

Coal tar-pitch volatiles are widely considered dangerous and toxic, especially in day-to-day working environments. The temporary emergency exposure limit (TEEL) for coal-tar pitch fumes is 0.2 mg/m3 over a one-hour period. At this level, health effects or symptoms in the general population are not expected, however, the smell may linger without causing ill-health effects. Still, the U.S. National Institute for Occupational Safety and Health (NIOSH) recognizes high-level exposures as Immediately Dangerous to Health or Life (IDHL) and considers coal-tar products to be potential occupational carcinogens; the NIOSH REL (10-hour TWA) for coal-tar products is 0.1 mg/m3 (cyclohexane-extractable fraction). The U.S. Occupational Safety and Health Administration (OSHA) PEL (8-hour TWA) for coal-tar pitch volatiles is 0.2 mg/m3 (benzene-soluble fraction).

For the hazmat experts dealing with the leak in Portland, wireless gas-detection monitors were essential tools in helping to manage the incident. A command-control center was established about a mile from the incident in a port-operations office. Fourteen wireless AreaRAE multi-sensor detection monitors were deployed around the storage tanks, the port and in community locations.

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For Senior Station Officer Owen, the AreaRAE instrument is a portable wireless system he has used in the past to monitor large gas-leak incidents, major coalmine burns, and fuel compounds during big air shows. Equipped with a photoionization detector (PID) and a lower explosive limit

(LEL) sensor, the monitors in Portland quickly began broadcasting gas-measurement data in real-time back to a Windows-based computer running RAE Systems' monitoring software. From the command center, Owen received sensor status information in real time that was used to establish and adjust safety zones, and store data for recordkeeping. He used plume-modeling software, which combines real-time weather data with multiple sensor information, to predict where the vapor-cloud was heading.

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The monitors also were essential for keeping crews near the spill safe. Each day, there were 60 breathing-apparatus operators, six hazmat specialists from multiple jurisdictions, four paramedics and a support staff of more than 50 people at the staging area, the incident operations point, and at the command-control center. The overall effort kept the pitch spill down to about 600 tons, reported CFA. The area detection monitors were checked every six hours with the units being maintained by swapping out batteries and filters.

Real-time monitoring also helped keep a host of stakeholders apprised of the situation, including the owner of the leaking tank, the local governing council, various government agencies (such as the Dept. of Sustainability and Environment, the Environmental Protection Authority, WorkSafe (similar to OSHA), and the Dept. of Transportation), other fire services and the Port of Portland officials. Based on detection-monitoring readings and predictive plume models, CFA officials made port managers happy when they permitted parts of the port to reopen within two days. Community meetings and briefings were held regularly, and a community newsletter was established to keep the township updated.

"We used the AreaRAE instruments to spread out through the city to monitor the levels of off-gassing to make sure people in the town were safe," said Owen. "One of the key roles of the monitoring instruments was to reassure people in the community that concentration levels were at safe levels as vapors dispersed away from the incident. We were getting readings within the 100-foot range, but nothing farther out."

In addition to using the AreaRAE instruments, air quality was monitored in the city of more than 12,000 residents using flame-ionization detectors, and sensitive detectors with parts-per-billion (ppb) capabilities. Thermal imaging cameras were used to check the heat of the leaked material and numerous PH test kits were deployed to ensure water quality was maintained. The water was tested each hour, reported Owen. More than 105,000 gallons of contaminated water was removed, reported the CFA.

A LOAD OF CHALLENGES

Of the two storage containers at the port for holding the liquid pitch, the undamaged tank was full—so product could not be transferred from the damaged container. That meant the ship that delivered the pitch would have to return to the port and the superheated substance would have to be transferred back to it. It took three days for the ship to return.

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But transferring the liquid back onto a ship was a big challenge. The tanker was designed to move product off, not onto the ship. While they waited for the tanker to return, engineers who designed the storage container were on site and working on a reverse-transfer solution. They were eventually able to adapt pump and pipe equipment so that the product could be returned into the ship's hold. In the end, 2,400 tons were pumped back on the tanker within an eight-hour period.

"During this process, our detection monitors were again put into action monitoring the ship and the port for any leaks or fugitive emissions as the product was pumped back into the ship's hold," Owen said.

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It was just one of many challenges during the incident. Other issues cropped up that were complicated by the hazmat team being away from their home base, including having to reset computers as memory buffers filled and having to replace a couple of failed sensors in the field. But the benefits of the specialized wireless equipment did not go underappreciated.

Said Owen: "Throughout the project, our wireless monitors gave us the edge we needed to control the situation from beginning to end. On top of keeping responders at the incident safe and making sure we did not spread contaminates, the monitors were invaluable for helping us keep the greater community informed during this extended-duration incident. The monitors were there for the confidence of the community."

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