

Best management practices for testing chemical properties during first response

By Cliff Holland

Best management practices for first response, testing chemical properties, sizing-up unknown conditions and addressing time-critical issues are a sequence of behaviours and protocols. These common sense approaches have been developed and field-tested for over 25 years and demonstrate how basic tools, combined with improvising off-the-shelf supplies, as well as clear language chemistry, can provide response capability at major emergencies.

The creative use of test papers can identify the properties of unknown chemicals and also be used to provide continual monitoring of the atmosphere for corrosive vapours. General alarm gas detectors can help locate pockets of flammable liquids and sources of contamination, as well as impacting gasses and changes in atmospheric conditions.

Best management practices (BMP) should be used as a key approach for identifying hazards, providing capabilities and improvising quick tests that will help keep personnel safe at small roadside spills, train derailments or criminal/terrorist events.

Responders with field experience have first-hand knowledge in the management of a spill situation, spill control, remediation and regulatory compliance. Their skills go beyond reading placards, labels, guide-booklets and material safety data sheets for information. They gain control of a spill by using the response objectives of *slow*, *divert* and *contain*.

Experienced personnel are intimately familiar with pump limitations, improvising control, as well as staging personnel, supplies and equipment. Experienced chemists and waste management technicians can size up unknown chemicals by specific gravity, viscosity, crystallization, containers and pressurization, and can also use test papers to classify chemical properties for safe response. Testing unknown chemicals has been used to identify perchloric acid, and to uncover potential impacts and scales of impact.

With first-hand knowledge, personnel are in a better position to make informed



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decisions, including knowing when to do something and when not to go any further. Doing nothing *can* be a response option! Living with the consequences of a bad decision is *not* an option.

Since 9/11, we have witnessed terrorist activities which revealed the harmful realities and potential of chemical, biological, radiological, nuclear, and explosive (CBRNE) activities. CBRNE has created a renewed focus on the need to understand and respect physical and chemical properties. Consequently, we are coming full circle to the pre-1985 working conditions and procedures where understanding the compatibility of substances was learned and practised on the job. This was a time where working at waste manage-

ment was a full-time job of identifying, verifying and assessing physical and chemical properties for safe handling, transportation, and processing.

As an example, in 1981, a forty-five gallon drum, two thirds full of household chemicals, exploded as a result of a mere two ounces of an incompatible substance being poured into it. The force from the explosion caused office furniture, on the opposite side of the cement block walls, to move out nine inches from the wall. This event happened because workers became complacent about the properties of household chemicals, worked until fatigue set in, and did not follow “The Golden Rules for Site Safety”.

The golden rules of the waste man-

agement industry can be traced back to 1946 and were understood by each person who worked in hazardous conditions on a daily basis. In 1979, a full-sized rail-car at the Mississauga, Ontario, train derailment travelled over 2,000 feet through the air and landed in a field. The tanker could have travelled up to ten miles under optimum conditions. Thomas Waste Removal, a small, highly capable industrial waste hauler at the derailment, used the unwritten golden rules. They used their accumulated knowledge and experience, combined with the advice from the rail and chemical companies, to handle the transfer of the chlorine as well as the three-year clean-up.

The Mississauga train derailment became a catalyst in the creation for the Transportation of Dangerous Goods Regulations, as we know them today, in both Canada and the United States. In Canada, CANUTEC's 24-hour reporting centre, support service, and its Emergency Response guidebook (ERG 2008) provide key information for site safety as well as questions to ask to verify what is on site. The responders have benefited from the legislation as it has helped them identify dangers and, in turn, has allowed them to prepare before entering accident sites. The labels and placarding provide today's responders with a symbol that can be used to indicate what is inside a tank or container.

Emergency Response Assistance Plans (ERAP) provide audited plans and procedures for company response teams and contractors to implement an effective response to any accident in transporting dangerous goods.

Golden Rules for Response Safety and Best Management Practices

The three golden rules for response safety are: never assume; suit-up for toxicity; and work clean.

1) Never Assume (BMP)

Response is a combination of first-hand knowledge, experience and training. We cannot assume anything because on spill and work sites, spontaneous reactions and unknown conditions have fatally injured workers and responders. Do not assume that guide booklets, material safety data sheets, personal opinions, labels and placards are correct. This information should only be classified as indicator information until

proven differently. Remember the drum of household chemicals that exploded when competent people were working on the job. Never assume anything is one of the first rules of life!

Personnel who work with chemicals on a daily basis know that understanding and respecting the physical and chemical properties of a substance are vital for workplace and personal safety. Chemicals have varying degrees of concentration, temperature, reactivity, and compatibility, and should never be second-guessed. The day you second-guess a chemical may be your last, so every piece of pertinent information must be identified, checked and, if necessary, re-checked before anyone prepares for entry.

It may not be safe to enter the hot zone or designated work area to patch, repair, open, transfer or move damaged and undamaged goods until all the physical and chemical properties have been determined. Secondary properties, incompatible conditions and potential scales of impact will also have to be considered before entry is authorized.

At train derailments, industrial explosions, and laboratory spills, chemicals and products may become unstable, shock sensitive, water reactive, as well as air reactive. Damaged containers may be of poor integrity and require special handling and processing on site. Spontaneous reactions may be caused by incompatibility, heat, fire, mechanical damage, dampness or drying of the product. Until these risks and hazards have been identified and the scales of impact are determined, no one should enter the area to slow, divert or contain a spill.

2) Suit-up for Toxicity (BMP)

Assessing and matching suits for ideal working conditions may not be enough. Suits that are not designed to be used in robust conditions such as train derailments or collapsed buildings may rip or tear and thereby compromise an individual's safety. Varying conditions and unidentified chemical properties may create greater problems for choosing the right suit, along with appropriate back-up personnel, supplies and equipment.

Protect the body from mechanical dangers as well as the entry routes of the body by keeping out unwanted properties such as particulates, gasses,

vapours, radiation, carcinogens, mutagens, teratogens, and other airborne toxins. Reduce or eliminate the number of situations that will need to be continually tested and monitored by suiting up for such things as asbestos and non-warfare biohazards. Once controllable hazards are kept out of the human body, site safety efforts can now focus time and energy on the physical dangers that will harm the body, such as flammable vapours, radiation levels, reactive and explosive circumstances, as well as mechanical hazards and work site conditions. By suiting up appropriately to provide your own safe environment, nuisance contaminants can be covered off during decontamination.

3) Work Clean (BMP)

Working clean, means not tracking contamination that could cause widespread impact to people, property or the environment. Workers and responders have experienced trace amounts of incompatible substances combining to cause such spontaneous reactions as heat, fire, off-gassing and explosions. Working clean also means being mindful of disturbing chemicals that have been buried underground for long periods of time. They may have formed new and highly unstable, toxic or lethal substances. Never assume anything, suit up appropriately, and work clean.

Escalating situations have resulted in personnel rushing in to handle the urgency of the moment with unpredictable consequences. Practising and testing response skills and emergency response plans in real time helps responders to develop valuable techniques, procedures, and habits.

Best management practices for testing and verifying, and the evaluation of products will be continued in a future issue of *Environmental Science & Engineering Magazine*.

Cliff Holland is with Spill Management Inc. He will be presenting a hands-on approach for keeping safe on spill sites and discussing what to do when spills happen at CANECT 2008 in Toronto April 21-22. (See page 87 for more information). Cliff can be contacted at e-mail: spillman@on.aibn.com