



DAYTON, OHIO REGIONAL HAZ-MAT RESPONSE TEAM NEWSLETTER

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Gary Rettig, Coordinator

Cell phone with voicemail 937-901-5112, rettigg@earthlink.net

Please see the Training Section of This Newsletter for updates

Metering in the Unknown Environment

You arrive on the scene of an “odor investigation” with no other information provided. The RP states they have a smell but can’t identify what it is or where it is coming from. The initial engine crew enters the structure with a four-gas meter to attempt to find the issue and while inside they get 0 on LEL, 0 on CO, 0 on H₂S but their O₂ sensor goes down to 19.9%. The meter doesn’t alarm but is there an issue? Yes, there is a big issue. When we have a 1% drop on our O₂ that is the equivalent to 10,000ppm. When looking at the NIOSH Pocket Guide you will only find 4 of the 677 chemicals found in the guide that are at or above 10,000ppm. There are thousands of chemicals out there that are deadly at low IDLH, some as low as 2 to 3ppm.

Additionally, of concern is the displacement of oxygen this 1% drop represents. When we see a drop like that, what is causing the drop? It could be a simple asphyxiant like Nitrogen, Argon, Ammonia, or more commonly Carbon Dioxide used in the carbonation of beverages and found in restaurants and convenience stores in all of our jurisdictions. We cannot ignore subtle changes in our instrument readings as these can be deadly.

As hazmat operations and technician level responders we must be students of our instrumentation. When the recruit firefighter comes on board and asks how the meter works and what are the alarm levels for each sensor, we should be able to recite these easily.

Oxygen (O₂) Sensor

For example, our O₂ alarm is set at 19.5%. OSHA considers 19.5% to be IDLH for O₂. Below that number we need to ventilate to improve the atmosphere or where SCBA. The high alarm for O₂ is 23.5%, representing a hyper-oxygenated atmosphere. High O₂ creates a potential for a fire to burn much more intense than it would at 21% and that atmosphere is not something our fire gear is designed to withstand. The most appropriate actions, in these scenarios, is to ventilate the space, deny entry unless life safety is involved, and identify/shutoff the source of the oxygen.

Lower Explosive Limit (LEL) Sensor

Next sensor to discuss is Lower Explosive Limit or LEL. This sensor is set to alarm at 10% of the LEL of the calibration gas used. Some detectors use Methane and some can use Pentane for calibration. The detector is looking for combustible gases or vapors. The instrument doesn’t understand whether you are metering for propane, natural gas, gasoline or some other product, just whether it is combustible or not. Discussion on Correlation Factors is beyond the scope of this newsletter. Just understand that the calibration gas used is getting you close to the percent of the LEL of the chemical not necessarily exactly. The environment we are investigating can change rapidly so watch your meter and document or provide to Command any changes noted and where the changes were found.

Carbon Monoxide (CO) Sensor

After LEL it seems that the Carbon Monoxide or our CO sensor is the one we talk about most because of frequency. We are dispatched to CO investigations on a regular basis because of CO detectors in homes. For our sensor the alarm is set to 35ppm. This 35ppm represents what is called a Threshold Limit Value/Time Weighted Average. Agencies like OSHA establish this number through research and post these numbers representing the maximum time a person can be exposed to the chemical over an 8hr day/40hr work week with no adverse effects. Now if you respond to a house with a person that never leaves the house and has *Uber Eats* delivered to them then that person is being exposed to CO 24 hours a day, 7 days a week and doesn't have an opportunity to blow off the CO in their bloodstream in a clean air environment. When faced with less than alarm limit levels of CO we must be good investigators to try to find the source of the CO in the house. Carbon Monoxide is the byproduct of incomplete combustion of carbon-based fuels. Faulty or malfunctioning furnaces, hot water heaters, vehicle exhaust, kerosene heaters, power washers, fireplaces, and generators just to name a few.

Additionally, if you are in an all-electric house with no fuels that create CO, and you are getting a reading, then maybe you have a lead acid battery overcharging that is giving off Hydrogen. Batteries in power chairs, battery operated kids' cars, golf carts, or sump pump battery back up systems can off gas hydrogen when overcharging. This hydrogen will cause the CO sensor to respond due to the physical and chemical properties of Hydrogen. Be good investigators

Hydrogen Sulfide (H₂S) Sensor

Last sensor to cover is Hydrogen Sulfide or H₂S. Sometimes called sewer gas, H₂S is the byproduct of the decomposition of materials like vegetation, animal and human waste. It is also found in landfills and in the petrochemical

industry. Additionally, we find H₂S as the byproduct of the chemicals typically used in Chemical Suicides. Our H₂S sensor alarms at 10ppm due to its toxicity. H₂S has the ability, at low concentrations, to deaden our sense of smell. The use of our nose as an indicator of its presence is a bad plan because even if you do smell it, it will fade and you will think that you are out of the product when in fact you are not and it is slowly harming you.

The best way to keep yourself safe on any investigation is to wear your Structural Firefighting Gear, SCBA (breathing air) and trust your instruments when they start to provide you with information. Alarms are designed to alert you but if you are paying close attention to your meter, you will catch things before they become dangerous.

Training

Training for this month is **April 13, 14, & 15** – 0900 - 1200 hours – Metering and Calibration Stations. If you have a multi-gas meter you should be at this training.

We will be at Dayton Fire Department Station 11, 145 Warren St. Dayton, OH 45402.

April 13, 14, & 15 – 0900 - 1200 hours
Station 11
Calibration Station and Meter Maintenance

May 18, 19, & 20 – 0800 - 1600 hours
Location - TBD
MCLEPC Exercise Month

June 15, 16, & 17 – 0900 - 1200 hours
DFD TC @ Task Force Bldg
Decon Review

July 13, 14, & 15 – 0900 - 1200 hours
DFD TC @ Task Force Bldg
Anhydrous Ammonia with David Binder

August 17, 18, & 19 – 0900 - 1200 hours
Location - TBD
GCLEPC Exercise Month

September 14, 15, & 16 - 0900-1600 hours
DFD TC @ Task Force Bldg
Railroad with Jon Simpson

October 5, 6, & 7 – 0900 - 1200 hours
DFD TC @ Task Force Bldg
Top Ten Scenarios

November 16, 17, & 18—0900-1200 hours
Location - TBD
Walk-Through of Facility

December - No Training