Ammonia Detection, OSHA PSM, & IIAR 2-2014

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I would have to say in the past 5-years or so, it seems ammonia detection has been made a priority, for industrial refrigeration systems using ammonia. Why is this? It could be due to a whole host of different things going on in our industry including, but not limited to: Insurance companies, OSHA Process Safety Management (PSM), EPA Risk Management Plan (RMP), safety days, IIAR & RETA conventions, the new IIAR 2-2014 Standard, corporate policy, and/or Recognized And Generally Accepted Good Engineering Practices (RAGAGEP). I believe the key reason is the awareness has been elevated to higher levels than in the past. Education through seminars, operator classes, on-the-job experience, etc. has been paramount in this evolution. So, let's look at how ammonia detection and alarms specifically relate to OSHA's PSM.

OSHA's PSM is made up of fourteen specific elements. Some of these elements are listed below (not in any particular order) and are followed by a description of how they apply to ammonia detection and alarms:

1. Mechanical Integrity (MI): This is probably one of the key areas where it all starts out and expands from there. Initially, under OSHA PSM 1910.119(j) for Mechanical Integrity, it begins with the Application and defining what constitutes 'process equipment'. This leads to Controls which is further defined as 'monitoring devices and sensors, alarms, interlocks'. So, ammonia detectors along with the applicable alarms would fall under this definition. From there, it further expands into the written procedures to maintain the integrity of the process equipment, training, inspection and testing along with the frequency, and, of course, the documentation. Alas, it ends with correcting any deficiencies in the equipment when it is operating out of the acceptable limits.

2. Standard Operating Procedure (SOP): Since the MI element has referred to '*written procedures*', an argument could be made that it should fall under the guidance of the SOP element. As a reference, the exact statement from 1910.110(j)(2) states: "*The employer shall establish and implement written procedures to maintain the on-going integrity of the process equipment.*" The next steps would be to identify how this applies to the ammonia detection system and alarms. Working with the manufacturer of the detection equipment and/or the installation contractor, these steps can be easily written up. Of course, some of the obvious things would be understanding the basic operation of the detector/sensor, know the ammonia concentration alarm values, know how to react to these alarm values , know the frequency of the testing or calibration, and who performs these functions.

3. Employee Training: Referring back to the MI element, training is essential for maintaining the integrity of the process equipment. The Operator/Maintenance personnel training should cover ammonia detection within the safety systems and their functions. Also, referring back to the SOP element, the training not only requires performing to the written procedures but a documented testing procedure needs to be completed to insure the personnel understood the training.

4. Process Safety Information (PSI): Safety devices, such as ammonia detectors/sensors, central panels, and audio-visual alarms, should be entered into a PSI "Tracking Log". The Tracking Log should include, but not be limited to: location of all devices, equipment manufacturer, a listing of alarm setpoints, what activates at the various concentration values when the alarm setpoints are reached, a testing log showing how the devices react, a calibration log, who does the testing and/or calibration, and the frequency it is performed.

5. Process Hazard Analysis (PHA): This PSM element is a very powerful tool since it can be applied to many "what if" scenarios within an ammonia refrigeration system including controls such as ammonia detection systems and alarms. Fortunately, due to the new IIAR 2-2014 Standard, many of these "what if's" can be addressed by referencing the related Chapter and/or section within this standard. As an example, "what if" there is a power loss to the ammonia detection system. Referring to Chapter 17 of the IIAR standard, section 17.2 Power for Detectors and Alarm, we would find in the last sentence of the paragraph that it states: "*In the event of a loss of power to the ammonia detection and alarm system, a power failure trouble signal shall be sent to a monitored location.*" We would find in Chapter 2, "Definitions" that a monitored location is defined as: "*A means of continuous oversight, such as notification of staff, a third-party alarm service, or a responsible party.*" So, as you can see, many different scenarios can be addressed, within an ammonia detection and alarm system, to keep it operating at an optimal level.

Now that we have seen how ammonia detection and alarms are an integral part of the OSHA PSM, let's look at a few areas that need some more emphasis. Several of the more common questions that have come up over the years for ammonia detection and alarms would include, but not be limited to:

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1. What code does our facility need to follow?
2. How many detectors do we need?
3. Where should they be located?
4. How often should they be tested?
5. How often should they be calibrated?
6. Who should perform the testing and/or calibration?
7. We had an ammonia leak and the detector did not go off. Why?

Currently, the IIAR 2-2014 Standard has been, or is being, adopted for most applications when it comes to code related compliances. This is a good thing, it is why we have been driving it as an industry. Basically, it is at a point of being all inclusive, all accepted. Questions 2-4 have been fairly well addressed in the IIAR standard but still leave some gray areas which are better addressed through the manufacturers of ammonia detection components, systems, and/or our industry RAGAGEP. As an example of a gray area in a machine room, the IIAR standard says a minimum of one detector is required. However, if it is a very large room, more than one detector may be needed due to the amount of the equipment in the room, how the ventilation air is circulated through the room, etc. Remember, some insurance companies may want redundancy of detectors, no matter how large the room. So, two detectors may need to be installed to satisfy their requirement. Otherwise, they may not insure your facility.

An example of a gray area for detector location would be in large coolers, freezers, and/or dock areas where there is heavy forklift traffic. There has been at least one recommendation floating around our industry for locating detectors at least 5-feet off of the floor. It's not a bad idea since the detectors would be easily accessible and they would be in the breathing zone of plant personnel. However, all too often, this does not work out real well because of product being stacked in front of detectors, forklifts running into and damaging detectors, etc. The IIAR standard basically says: "Locate detectors where ammonia vapors could accumulate but still be easily accessible for testing." Eventually, we may come to a consensus as an industry, and have a better recommendation for detector location.

For the most part, testing or calibration of detectors has always been kind of a gray area because most personnel do not understand the difference between the two. A good way to remember either one is that testing is done to check for detector/sensor reaction without making any adjustments. On the other hand, calibration is using a known calibrated test gas to check for a reaction and for making adjustments to bring the detector/sensor into compliance. Remember, whether testing or calibrating detectors, documentation is crucial to making sure your facility is in compliance especially when an inspector is reviewing the records.