SAFETY MANAGEMENT THRU RMP/PSM REGULATIONS ON AMMONIA REFRIGERATION INSTALLATIONS

In recent years, OSHA has stepped up adherence to this standard via rigorous inspections enforced by its National Emphasis Program (NEP) on Process Safety Management regulated industries which include the eco-friendly ammonia refrigeration facilities. This means that owners and operators of large ammonia systems in excess of 10,000 pounds (10 Tons) now have the added responsibility and expenses of continuous record keeping in preparation for NEP inspections. Additionally OSHA requires that employers keep records on employee training so that when employers conduct mandatory audits of the program, any inconsistencies can be detected and corrected. In this manner the facility under inspection ensures the protection of workers from work-related injuries, illness and deaths.

To partially reduce the regulatory burden, the following safety services are also recommended for implementation:

- Modern cold storage applications call for bigger systems to support increasing low temperature requirements. Many are opting to prevent bumping up against the 10,000 lbs ammonia threshold and are evaluating cascade system by combining R717 with CO2 (R744) in system architectures by removing the ammonia circuit of the system from occupied spaces and containing it in the refrigeration plant room.
- Recommended practices for proper ventilation of plant rooms to manage ammonia leaks, is of crucial importance in the design & safety standards set forth in the IIAR-2-2017 standards.
- Instead of traditional stick-built ammonia systems, a low charge ammonia package (modular) skid-mounted units be incorporated. These provide energy efficiency and are internally piped, insulated & factory wired thus reducing in-house labor and eliminating construction of big machinery rooms.
- Installation of ammonia detection system (to activate emergency exhaust fans for continuous ventilation) with properly installed, maintained and strategically located sensors which are the essential element in preserving the safety of employees and products in any cold store facility.
- Installing remote monitoring systems, a valuable safety tool, as it would cover from detection of leaks and high liquid levels to a change in system pressure and can be analyzed 24/7/365 by an expert in-house technician.
- The use of analytics technology (sensors and software) to identify trends and patterns is another practice that can be implemented.

Therefore, facilities that wish to operate safely and comply with internationally recognized codes and standards should rely on what is called RAGAGEP or (Recognized and Generally Accepted Good Engineering Practices) applicable to ammonia refrigeration systems.

These lists, though not representative or inclusive for each country and state, are a
good basis for understanding what programs a facility should have to operate safely and yet comply with outside agencies or local chapters with jurisdictions over their facility.

The following are list of OSHA/EPA programs that need to be implemented regardless of the amount of ammonia in the facility:

- Blood borne Pathogens (29 CFR 1910.1030)
- Compressed Gases (29 CFR 1910.101)
- Confined Space (29 CFR 1910.146)
- Electrical Safety (29 CFR 1910.333)
- Ergonomics (29 CFR 1900.900-945)
- Fall Protection (29 CFR 1910.22)
- Powered Industrial Trucks (29 CFR 1910.178)
- HAZWOPER (29 CFR 1910.120)
- Hearing Conservation Program (29 CFR 1910.95)
- Housekeeping Program (29 CFR 1910.38)
- Laboratory Standard (29 CFR 1910.1450)
- Lockout/Tagout (29 CFR 1910.147)
- Medical Surveillance Program (29 CFR 1910.95, 1910.120)
- Personal Protective Equipment (29 CFR 1910.132, 1910.133)
- Record Keeping (29 CFR 1910.1904)
- Spill Prevention, Control and Countermeasures (40 CFR Part 112)
- Storm Water Pollution Prevention Plan (40 CFR Part 122.26)
- Superfund Amendments Reauthorization Act (SARA) (40 CFR Part 355.30) Used Oil Management Program
- Welding and Cutting Safety Program (29 CFR 1910.251 -255)
- Workplace Security Plan

**IF THE FACILITY HAS LESS THAN 10,000 lbs – (LIGHTER CHARGE OF AMMONIA )**

When a facility has less than 10,000 pounds of ammonia charge in its refrigerating system, both OSHA’s PSM and EPA’s RMP use their respective General Duty Clause (GDC) and RAGAGEP gets involved to inspect and generate citations.

These clauses describe responsibilities owners and operators have to be diligent in preventing chemical releases. This includes both an employer's recognition of hazards and most importantly the industry's recognition of hazards! The prominent
ammonia refrigeration consensus standards are issued by IIAR and ANSI/ASHRAE-15 Standards.

The General Duty Clause (GDC) compliance basically involves the following:

- Identification and assessment of process hazards.
- Maintaining a safe process system
- Minimizing consequences of any ammonia release
- MOST IMPORTANT! - adhering to industry codes and standards.
  
  (NOTE: This is commonly referred to as "Recognized and Generally Accepted Good Engineering Practice" - RAGAGEP.)

While compiling & updating, the following information are essential to GDC compliance:

- Process Safety Information (PSI) including current P&ID's
  
  (NOTE: A crucial standard are considered are in IIAR Bulletin #110 - Section 4: Records)
- Process Hazard Analysis (PHA) with a discussion of potential release scenarios and their impacts.
- Operating Procedures
- Training
- Pre-Start up Procedures
- Mechanical Integrity and Preventive Maintenance
- Hot Work Permit
- Incident Investigation
- Emergency actions, planning, and response

NOTE: Under OSHA and EPAs General Duty Clauses, if one has multiple facilities and the majority of the facilities are under RMP, then RMP can be applied to the ones whose ammonia charge are under the 10,000 pounds.

**Once the facility goes over 10,000 lbs – PSM goes into effect**

The following two programs need to be developed and implemented when the amount of ammonia charge in any facility is greater than 10,000 pounds:

**OSHA - Process Safety Management (in compliance with 29 CFR 910.119)**

- OSHA's PSM program has 14 elements that must be addressed by Employers:
  - Employee Participation
  - Process Safety Information (PSI)
  - Process Hazard Analysis (PHA)
  - Operating Procedures
  - Training
  - Contractor Management
  - Pre-Startup Safety Review
  - Mechanical Integrity (B109's)
Hot Work Permit
Management of Change
Incident Investigation
Emergency Planning and Response
Compliance Audits
Trade Secrets

EPA - Risk Management Program (in compliance with 40 CFR Part 68)

- EPA's RMP supports the Management System & defines following major components:
  - **Hazard Assessment** - This assessment has specific requirements. It includes such items as a "worst-case release scenario", dispersion modeling, potentially affected population and environmental impact, etc.
  - **Prevention Program** - This component is essentially identical to OSHA's PSM elements. *(Note exception: Trade Secrets are not included, and Emergency Response is handled as a separate component.)*
  - **Emergency Preparedness & Response Program** - Although EPA's program follows OSHA's requirements for HAZWOPER (1910.120(q) and/or Emergency Action Plans (1910.38)-it also requires this component to be integrated with the community response plan.

NOTE: CFR denote Code of Federal Regulations; for instance OSHA1910 are used to designate the health safety regulations in the Federal CFR.

For further guidance OSHA and EPA use following standards to qualify citations:

- ANSI/IIAR-2 "Equipment, Design and Installation of Ammonia Mechanical Refrigeration Systems"
- IIAR Bulletin 110 "Start-Up, Inspection and Maintenance of Ammonia Mechanical Refrigeration Systems"
- IIAR Bulletin 114 "Identification of Ammonia Refrigeration Piping and System Components"

Implementing above integrated safety solutions provides following advantages:

- Protect Employees, Investments and the Environment
- Increase Productivity & Quality
- Reduce Likelihood & Severity of Adverse Consequences
- Comply with Good Industry Practices
- Achieve Community Social Goals
✓ Enhance Overall Business Performance

As stated TRAINING becomes an essential practice for recognition, avoidance, and prevention where a number of methods are recommended and must be available on-site & on-demand. In view of the prevailing Covid-19 virus these include virtual classroom, online and self-taught social media based training which has the benefit of access anywhere in the world and can include variety of following areas:

✓ Ammonia Safety
✓ Auditing
✓ Effective Operating Procedures
✓ Incident Investigation/RCA
✓ Process Hazards Analysis
✓ Management of Change/PSSR
✓ Mechanical Integrity
✓ Safe Work Practices
✓ OSHA General Safety & Compliance

Finally in order to arrange for training procedures in any country, it is advisable that a “train-the-trainer” approach is followed where employers arrange for training of their senior staff to coordinate with authorized inspection companies in the USA. In addition it is important that the trainers continue to keep their certifications up to date by taking relevant training courses on a periodic or yearly basis.

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