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CONDENSER

iiar 2025 NATURAL REFRIGERATION CONFERENCE & HEAVY EQUIPMENT EXPO
PHOENIX, ARIZONA

2025 CONFERENCE RECAP







Technical Advances & Thought Leadership

SPRING 2025

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2025 CONFERENCE RECAP

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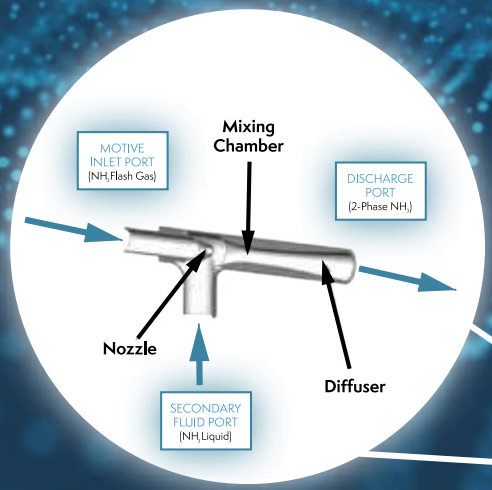

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IIAR Announces New Leadership Structure

The International Institute of All-Natural Refrigeration said it has shifted IIAR's leadership to a new, more sustainable structure, reorganizing internal Vice President roles to fully support IIAR's mission.

"Under this new structure, a core team of four executives will drive every aspect of IIAR," said IIAR president Gary Schrift. "This change supports the IIAR executive committee's and my efforts towards a sustainable organization, one with a core team of four IIAR executives to drive every aspect of IIAR with even representation across all organizational pillars, and with an even distribution of staff reporting to provide a more stable structure for succession planning at all levels of management."

Under the reorganization, Yesenia Rector and Mike Chapman have been promoted to new positions. Yesenia Rector is now the IIAR Vice President, Education, Outreach, and Events, while Mike Chapman is the IIAR's Vice President, Operations. Meanwhile, IIAR's VP and Technical Director Eric Smith's title has been adjusted to Vice President, Technical Director, Publications, Research and Advocacy.

Mike Chapman, IIAR's new Vice President of Operations said the change will help the organization fulfill its primary goals of working with government officials and carrying out the research necessary to help them improve upon the industry's standards.

"This change makes us a more stable organization because now we're not relying on just one or two individuals to lead IIAR's work," said Chapman. "This helps all of us learn each other's jobs better so that we can support each other across our different roles."

Yesenia Rector, IIAR's new Vice President, Education, Outreach and Events, said the change demonstrates IIAR's commitment to building a long-term foundation on which to carry out its mission.

"This reorganization is the practical way we're carrying out our mission, so that IIAR will withstand the test of time and continue to serve our industry in the future," said Rector. "The change will create depth at the leadership level so we can spend more time on strategic issues."

Eric Smith, IIAR's Vice President, Technical Director, Publications, Research and Advocacy said, "The new organizational changes will enable IIAR's individual leaders to focus on specific matters that fall under their purview, while relying on the expertise of their colleagues to manage other aspects of the association's mission."

The new organizational changes were effective April 1st, 2025 and staff are now operating under this new structure, said Schrift, who announced the change earlier this month.

Under this new structure, a core team of four executives will drive every aspect of IIAR.

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2025 CONFERENCE RECAP

ANNUAL MEETING SETS NEW RECORD

More than 1,850 attendees participated in the International Institute of All-Natural Refrigeration's Natural Refrigeration Conference & Heavy Equipment Expo in Phoenix, Arizona. The event provided the latest information on industry issues, technical knowledge and networking and as well as an opportunity to see new equipment for those involved in the natural refrigeration industry.

SHARING KNOWLEDGE AND INDUSTRY INSIGHTS

The meeting featured several opportunities to learn about the industry, including educational sessions, technical paper presentations, panel discussions, and product showcases. "We improved our educational sessions both in content and quantity," said Gary Schrift, president of IIAR.

This year's meeting had almost double the number of sessions as those of past conferences and featured six educational tracks that Schrift said were well received among attendees. Tracks covered system design, system safety, decarbonization, facility management, heat pumps and an introduction to refrigeration/natural refrigerant basics.

Industry experts presented in-depth technical papers and workshop sessions that cover critical industry issues, including safety, efficiency and new technology. Eric Smith, IIAR's vice president and technical director, said Bill Gruelich's technical paper presentation about emergency ventilation rates was intriguing.

Currently, ANSI/IIAR 2 Standard for Design of Safe Closed-Circuit Ammonia Refrigeration Systems (IIAR 2021) requires machinery room emergency mechanical ventilation systems to provide no less than 30 air changes per hour based on the gross machinery room volume. When this emergency ventilation rate is in place, the National Electrical Code (NFPA 2023), adopted by reference IIAR-2, allows for an 'adequate ventilation' exemption for spaces under the electrical hazardous area classification. The IIAR standard also requires de-energization of specified electrical equipment in the room when ammonia is detected at 40,000 ppm, one-fourth of the lower flammable limit (LFL).

"This study presents an overview, with calculations, of a simple integral dispersion model applied to the identification of a potential gas volume resulting from the release of anhydrous ammonia (R-717) deemed so small that significant injury or damage is not expected from ignition, referred to as a volume of negligible extent, Vz," Smith explained.

Gruelich's study also examines issues of ventilation and accidental release theory to elucidate the larger picture of indoor ammonia refrigeration system releases. "This work is intended to support the development of global safety standards and safe, practical design solutions by presenting assessment results for ammonia release jet flammable volume extents and rates, as well as the associated adequate mechanical ventilation rates for several room mixing efficiencies, to limit room background concentrations to one-fourth LFL," Smith said. "These results may assist in re-evaluating current requirements and offer a potential requirement format that comprehensively considers the specifics of ammonia and the size of machinery rooms."

In addition to educational sessions, attendees could see some of the latest equipment available in the industry. IIAR's annual conference now includes a heavy equipment expo each year, and 150 exhibitors showcased equipment during this year's event.

COVERING CRITICAL ISSUES

As with any change in executive administrations, there are many uncertainties that accompany the change, and the conference provided an opportunity to review critical industry issues.

"The most prevalent issues that concern industrial refrigeration are potential changes to the EPA's Risk Management Program (RMP)," Smith said. "Going back about a decade, the EPA, at the direction of the Obama administration, began making changes to the RMP rules as a reaction to the disaster at the West Texas fertilizer facility in 2013."

Many of these rule changes were discarded during the first Trump administration. "When the Biden administration took over, some were reinstated, and now, with a second Trump administration, there is a possibility that we may see yet another swing," Smith said.

A similar oscillation may occur regarding the AIM Act—legislation that gives the Environmental Protection Agency the authority to limit high global warming refrigerants. "At the conference, there was a fair amount of speculation that EPA's initiatives on regulating high GWP refrigerants will hold because synthetic refrigerant manufacturers support the change, even though it will require new investment by synthetic system owners at some point," Smith said.

PROMOTING PARTNERSHIPS

IIAR signed two memorandums of understanding—MoUs—during the meeting. Eurammon and IIAR renewed their MoU, reinforcubg their ongoing collaboration to support the global adoption of natural refrigerants. With the renewed MoU, eurammon and IIAR plan to expand their cooperation through coordinated activities. These will include knowledge sharing, advocacy efforts, and joint initiatives aimed at promoting sustainable refrigeration, air conditioning, and heat pump technologies.

The two organizations have a long-standing partnership and see the MoU as a framework to drive forward the use of environmentally friendly and energy-efficient refrigerants. Eurammon stated that it is looking forward to continuing its close cooperation with IIAR in the years ahead. Schrift added that Eurammon just changed their secretariat—the company that was doing the administrative work for their organization. "With the framework of this new MoU and the help of a new secretariat, we have already begun detailed discussions on some concrete joint initiatives of sharing each group's informational materials, which will assist IIAR in expanding our recognition in Europe," he said.

The other MoU was with Atmosphere. Schrift said it put several initiatives that were already place in writing, including inviting each other to respective conferences with free booths and free registration. "It also sets the stage for future collaboration," Schrift said.

BUILDING A NETWORK

The 2025 conference welcomed students and provided opportunities for university and technical college students to engage with industry leaders and learn more about career paths in natural refrigeration. All NRF Scholarship recipients and student attendees were able to attend the full event, free of charge.

There were several networking events that provided an opportunity for attendees to get to know each other and build their network. Additionally, the IIAR Connection Center was a key place for attendees to come together to discuss and collaborate on critical industry issues.

IIAR Gives 2025 Awards for Presentation Excellence

Each year, IIAR recognizes the best technical paper presentations offered at the annual Natural Refrigeration Conference. This year's event took place March 2-5 in Phoenix, AZ.

The IIAR Award for Presentation Excellence, offered to the top English and non-English language technical papers and previously named the "Andy Ammonia Award," was created to acknowledge the crucial role that education and information-sharing plays within the natural refrigeration industry, and to provide acknowledgement of the expertise that is generously shared by association volunteers. Award recipients receive a free registration for next year's conference, and perhaps most importantly, the acknowledgement from their peers for a job well done.

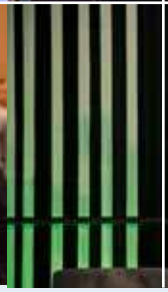
Award selection is based on attendee evaluations, and scores are weighted based on attendance. The 2025 Natural Refrigeration Conference featured 17 outstanding technical papers and presentations, but after extended consideration, the two 2025 winners (English language and non-English language) were:

- **James Booth** of Sustainachem (Hannibal, MO) received the 2025 award for his technical paper presentation that focused on ***"Understanding Water Treatment Performance."***
- **Karel Israel Ortiz Reyes** received the 2025 award for his technical paper presentation that examined ***"Encontrando el balance entre consumo energético y de agua en condensadores y torres de enfriamiento"*** ("Finding the balance between energy and water consumption in condensers and cooling towers").

In a press release, IIAR acknowledged the participation of international natural refrigeration professionals who contribute non-English papers to the program, noting that it wouldn't be an international organization without the dedication of these industry experts.

James Booth

Karel Israel Ortiz Reyes



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AIM Act Faces Uncertainty

Portions of the American Innovation and Manufacturing (AIM) Act are under scrutiny as part of a broader deregulatory agenda, casting uncertainty over the future of U.S. climate policy for refrigerants.

The Environmental Protection Agency (EPA) has announced it will reconsider the Technology Transitions Rule, while Congress is reviewing the Refrigerant Management Rule—two key components of the AIM Act framework. "There's a lot at stake for a number of folks, including the OEMs. Some of the delays and rollbacks really serve to actually hurt the U.S. manufacturers because they're already prepared for this transition," said Tristam Coffin, co-founder and president, sustainability, policy, and technical services, êffecterra. "Delaying it any further actually opens the door for manufacturers outside of the U.S. to come in and potentially undercut what they've already tooled up."

Avipsa Mahapatra, climate campaign director for the Environmental Investigation Agency, said ultra-low GWP refrigerants, which include ammonia and CO_2, are already providing cooling in a wide range of applications.

"This is established technology being used globally. Asking for more time is, to me, not a need, but an excuse, and rolling back rules that were already vetted and long in consideration with multiple stakeholders does not create certainty," Mahapatra said. "Rolling back any regulations creates a regulatory vacuum that freezes investment and lets our global competitors spread ahead."

According to CUSER, the cold storage sector is facing significant barriers in complying with the 150 GWP limit.

TECHNOLOGY TRANSITIONS RULE UNDER PRESSURE

The Technology Transitions Rule targets the phase-down of high global warming potential (GWP) hydrofluorocarbons (HFCs) used in refrigeration and HVAC systems. Under current provisions, refrigerants with a GWP above 150 are banned in many refrigeration applications, while air conditioning and heat pump systems face a 700-GWP threshold. Compliance deadlines range from 2025 to 2028.

However, many R-513A users and suppliers are pushing back. The Coalition for the Use of Safe and Efficient Refrigerants (CUSER), representing users and suppliers of R-513A, has formally petitioned the EPA to revise the rule. CUSER seeks to raise the GWP limit for cold storage systems from 150 to 700, citing high costs, limited alternatives, and safety-related building code challenges.

The petition, filed under subsection (i) of the AIM Act and 40 C.F.R. § 84.62, argues that the EPA underestimated the practical difficulties in transitioning the cold storage sector. It specifically challenges 40 C.F.R. § 84.54(c)(9), which bans refrigerants with a GWP over 150 in new cold storage refrigeration systems beginning January 1, 2026. CUSER is also requesting exemptions for specific refrigerants, such as R-513A, to prevent disruptions in the cold storage supply chain.

According to CUSER, the cold storage sector is facing significant barriers in complying with the 150 GWP limit. These include the continued unavailability of viable low-GWP alternatives, high conversion costs, and complicated compliance with building codes when using flammable or high-pressure refrigerants. The Coalition argues that these challenges are more severe than the EPA anticipated when it issued the Technology Transition Rule in October 2023.

CUSER has also requested that the EPA allow the continued use of specific refrigerants with GWP values up to 700, such as R-513A, in lieu of a general increase to the limit. The group urges the EPA to expedite consideration of its petition to avoid major disruptions to the cold storage supply chain.

Coffin said he doesn't see the need for any changes, given that safer, lower-GWP options, including, namely, carbon dioxide systems, are commercially available and technically viable. "I could see the reasoning if the industry were widely adopting a moderate GWP refrigerant like R-513A, but the majority of commercial and industry refrigeration applications are adopting CO2

as the go-forward solution of choice," he said. "There's really no basis in reality here."

While working for Whole Foods, Coffin worked on one of the first transcritical CO_2 stores stateside in 2013. "It's 2025 and the industry is largely moving in that direction," he explained.

IIAR is currently drafting its own letter to the EPA opposing the CUSER petition.

CONGRESSIONAL SCRUTINY OF THE REFRIGERANT MANAGEMENT RULE

Alongside the Technology Transitions Rule, Congress has initiated a Congressional Review Act process to examine the AIM Act's Subsection (h), known as the Refrigerant Management Rule or Emissions Reduction and Reclamation Rule. While no legislative action has yet occurred, the review may prompt further EPA evaluation.

"The Technology Transition Rule sets policies for different uses of HFCs and associated global warming potential limitations. The Refrigerant Management Rule is more around what you need to do related to leak detection and monitoring," said Lowell Randell, director of government relations for IIAR. "There hasn't been any movement on that Congressional Review Act, but that may lead EPA to take a closer look at that piece of the AIM Act as well."

Coffin said subsections (h) and (i) are meant to help balance the demand of refrigerants and regardless of the regulatory requirements are generally smart business practices. "The rules in themselves are meant to ensure that there isn't a pinch on the supply of the refrigerants and to also address the potential for price volatility of the refrigerants. So, to remove those is almost like cutting off your nose to spite your face," he said.

STAYING THE COURSE

While the reviews could bring potential changes, the AIM Act will remain in place. "The main goal of the AIM Act is to phase down the production and consumption of HFCs in the United States," said Danielle Wright, executive director of the North American Sustainable Refrigeration Council (NASRC). "The primary mechanism to accomplish this is a gradual reduction in the manufacture and use of HFCs, aiming for an 85% reduction from the baseline by 2036. This has not fundamentally changed."

Coffin is urging end users to stay the course and not form their plans based on temporary political shifts. "Don't allow the noise to disrupt where you're headed. Make sure you're doing the proper due diligence and working with the proper experts to point you in the right direction," he said. "If people are going to change their strategy based on the political environment every two to four years, it's a failed approach because the pendulum is likely to continue to swing."

Before purchasing equipment, Mahapatra recommends that end users think long-term. "Ask: Will this still be legal and affordable five years from now? What about 10 years from now? This equipment usually has a life of at least 15 to 25 years. You do not want to invest in stranded technology, and betting on yesterday's refrigerant is a gamble."

Mahapatra added that the trend is clear. "Globally, companies should see the writing on the wall that HFCs are not refrigerants that are going to continue in the future," she said. "We might have a little bit of delay—plus two years here or plus three years there—but at the end of the day, this is a dead-end technology."

Smart companies globally are looking for the best technology that is the lowest GWP that is safe and that can be adopted in the market today. "American companies can either set the pace or spend the next decade catching up," Mahapatra said. "We need this framework of rules that were already established to keep the momentum and to give innovators clear runway, and rollbacks are only sending mixed signals and creating more uncertainty."

GOVERNMENT RELATIONS

BY LOWELL RANDEL, IIAR GOVERNMENT RELATIONS DIRECTOR

A Look Inside the "Big, Beautiful Bill"

President Trump has made it a top priority to pass a tax package that would make many provisions of the Tax Cuts and Jobs Act (TCJA) permanent, as well as providing additional tax relief through policies such as no tax on tips. Republicans in Congress are planning to use the Budget Reconciliation process to move the "Big, Beautiful Bill" with the goal of completion before August recess. The benefit of using the reconciliation process is that approval only requires a simple majority in the House and Senate, avoiding the 60-vote filibuster threshold in the Senate. On May 22nd, the House narrowly passed its version of the legislation by a vote of 215-214. The bill will now be considered in the Senate. While Senate passage of the House package is far from certain, it is useful to understand the provisions passed by the House as the process moves forward. Below is a summary of key provisions compiled by selected House committees included in the "Big, Beautiful Bill".

WAYS & MEANS COMMITTEE

The House Ways and Means Committee has jurisdiction over tax policy and is at the center of the reconciliation package.

- Increases the debt limit by $4 trillion.
- Permanently extends the marginal tax rates included in the TCJA. Without action, the rates would revert to pre-2017 levels.
- Permanently extends the enhanced standard deduction, which is annually adjusted for inflation and allows taxpayers to reduce their federal taxable income if they don't itemize their deductions.
- Increases the State and Local Tax (SALT) deduction cap to $40,000 in 2025 with annual increases through 2033, after which it would be permanent.
- Permanently extends and increases the estate and gift tax to $15 million, from $10 million, starting in the 2026 tax year. The exemption would be indexed to inflation.
- Permanently extends and increases the pass-through business deduction to 23% (up from 20%) beginning in tax year 2026.
- Creates a deduction for qualified tips for tax years 2025 through 2028.
- Establishes a deduction for overtime compensation for tax years 2025 through 2028.
- Allows businesses to immediately deduct the cost of their domestic research expenses in the year paid or incurred for tax years 2025 through 2029.
- Restores the 100% bonus depreciation for certain property placed in service in 2025 through 2029.

ENERGY & COMMERCE COMMITTEE

- Requires states to impose "community engagement" rules as a condition of receiving Medicaid benefits starting on Dec. 31, 2026. Recipients between the ages of 19-64 would have to work, perform community service or participate in a work program for at least 80 hours per month (unless they qualify for an exemption).
- Rescinds multiple climate related programs operated by the Department of Energy and the EPA.

AGRICULTURE COMMITTEE

- Achieves significant savings through reforms to nutrition programs. States would be responsible for funding 5% of the costs of SNAP benefits. Prevents USDA from updating the cost of the Thrifty Food Plan, which forms the basis of SNAP benefits calculations, outside of annual cost-of-living adjustments. Modifies the ages for work requirements to include recipients 18-64.
- Extends and modifies commodity support programs and increases coverage levels under the crop insurance program.
- Extends conservation program funding.
- Provides $285 million for USDA trade promotions programs including the Market Access Program, Foreign Market

The benefit of using the reconciliation process is that approval only requires a simple majority in the House and Senate, avoiding the 60-vote filibuster threshold in the Senate.

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 (continued from page 13)

Development Program and Emerging Markets Program.

- Increases funding for animal disease prevention and response programs.

HOMELAND SECURITY COMMITTEE

- Provides $46.5 billion for CBP to construct physical barriers along the US border, as well as related infrastructure including access roads, cameras, and lighting.
- Provides $5 billion to acquire or construct CBP checkpoints and other facilities near US borders.
- Provides $4.1 billion to hire additional CBP personnel.

JUDICIARY COMMITTEE

- Provides $45 billion for ICE detention capacity, including single adult detention and family residential centers.
- Provides $14.4 billion to ICE for transportation and removal activities, and to ensure the departure of noncitizens ordered removed.
- Provides $8 billion for ICE to hire 10,000 additional immigration enforcement officers and support staff.

Transportation & Infrastructure Committee

- Provides $12.5 billion for the Federal Aviation Administration to improve air traffic control (ATC) technology.
- Imposes a new annual $250 fee on electric vehicles and a $100 fee for hybrid vehicles.

As the action turns to the Senate, it is important to note that the Senate's budget resolution was different than the resolution passed by the House. For example, the Senate version allows for larger tax cuts and a $5 trillion debt limit increase. In addition, committees were giving different spending and savings instructions. The House Agriculture Committee was directed to save $230 billion from programs within its jurisdiction while the Senate Agriculture Committee was directed to save only $1 billion. Questions may also be raised about some of the House provisions and whether they meet the requirements of the Byrd Rule, which requires that all provisions directly impact spending or revenue. Anything deemed to violate the Byrd Rule would require 60 votes in the Senate to remain in the bill.

Some Senate Republicans have indicated their intention to modify the bill. Several of the more controversial and challenging provisions include the House reforms to Medicaid and nutrition programs, the debt limit, SALT deduction levels and the magnitude of savings/spending. Congressional Republicans will have to strike a delicate balance across these various issues to satisfy moderate party members who are concerned about reforms to safety net programs and more conservative members who are demanded greater savings as a part of the bill. This balancing act will be challenging as party leaders attempt to reach agreement during the summer. Failure to pass the tax provisions before the end of 2025 would result in the largest tax increase in the nation's history, so the incentive to successfully pass the legislation will be very high.

Several of the more controversial and challenging provisions include the House reforms to Medicaid and nutrition programs, the debt limit, SALT deduction levels and the magnitude of savings/spending.

NRF Fun Day Raises $40,000 for Scholarships and Research

The Natural Refrigeration Foundation's Fun Day during the annual conference featured golf and Bingo, raising around $40,000 to support the foundation's scholarships and research.

"The golf event was a success with 100 golfers—68 individual golfers and eight President's Brackets teams of four people—at the Arizona Grand Resort. This was one of the most beautiful golf courses we've used for the NRF golf tournament," said Yesenia Rector, meetings and international program director for IIAR.

Those who don't golf were invited to take part in Bingo to support NRF. "Everyone seemed to have a great time supporting the foundation's work."

The foundation also introduced the NRF Lounge this year. "It was open in the afternoon during the education program sessions, and closed by the education program sessions," Rector said. "In the lounge, we had espresso coffee, cookies, networking areas, working areas, and some giant games."

The lounge was designed to enhance visibility of the foundation beyond the golf event and Bingo and highlight the important work it does. "The NRF research projects are key to the development of the IIAR standards, guidelines and advocacy work," Rector said.

The foundation also provides valuable scholarships that can attract new talent. The scholarships provided bring new talent to our natural refrigeration industry, which ensures the sustainability of this industry. IIAR members are key in ensuring these efforts continue, and participating in these activities during the annual conference is an excellent opportunity to do so."

The foundation has also formed the Natural Refrigeration Career Center. "This is a hub where students and new professionals can explore internship opportunities and entry level job opportunities," Rector added. "This hub and the conference provide fantastic opportunities for these attendees to explore our industry."

Financial Tech Tip

Income Tax Considerations When Selling Your Home

If you're getting ready to list your home this spring, you likely have a long checklist of things to do. One thing that is sometimes overlooked is whether or not the gain on the sale of your home will be subject to federal income taxes. The following information provides a brief review of the rules for excluding the gain on the sale of your home for income tax purposes.

First, it is important to know if you have a gain or a loss. A loss on the sale of your home is not deductible. A gain is taxable. However, you may be able to exclude part or all of your gain from your taxable income. Your gain or loss is determined by subtracting what you paid for your home from your sale proceeds. If that results in a gain, you may be able to reduce the taxable amount of the gain further by the expenses paid to sell or improve your home. A few examples of selling expenses include title insurance, recording fees, or survey fees. A few examples of home improvement expenses include costs for landscaping, a new roof, or a new HVAC system.

Next, if you have a gain, you will need to determine if you meet the requirements for excluding that gain. In order to receive the maximum exclusion amount, you must meet both the ownership and use tests. This exclusion may be used once every two years.

MAXIMUM EXCLUSION AMOUNT	OWNERSHIP TEST	USE TEST
• $250,000 for single filers • $500,000 for joint filers	You must own the home for at least two of the five years prior to the sale. Only one spouse must meet this test, if filing jointly.	You must use the home as your primary residence for at least two of the five years prior to the sale. Each spouse must meet this test individually.

There are many special rules and circumstances that may change the amount of gain exclusion for which you are eligible. Here are some situations you will want to explore with a qualified tax advisor. You may also consult IRS Publication 523 at irs.gov for more detailed information on each of these topics.

- Marriage, divorce, or death of a spouse
- Selling the home within the two-year test period due to a work-related move, a health-related move, or other unforeseeable events
- Prior or future participation in a 1031 like-kind exchange
- Converting a rental property or second home to a personal residence or vice versa
- Business use of your home

Finally, if your gain exceeds the exclusion amount, you will need to include the excess in your taxable income. This type of gain will be treated as a capital gain. If you own the home for more than one year, the maximum tax rate on this gain is 20%. If you own it for one year or less, the maximum rate is 37%. For a high-income individual (income over $200,000 single/$250,000 joint), an additional 3.8% net investment income tax may apply as well. These additional taxes may also result in the need to make a quarterly tax payment.

IMPORTANT DISCLOSURES

The IIAR and NRF reserve investment funds are currently managed by Stifel Financial Services under the investment policy established by their respective board of directors. Members of IIAR may use the services of Stifel for personal and business investments and take advantage of the reduced rate structure offered with IIAR membership. For additional wealth planning assistance, contact your Stifel representative: Jeff Howard or Jim Lenaghan at (251) 340-5044.

Stifel does not provide legal or tax advice. You should consult with your legal and tax advisors regarding your particular situation.

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The Value of Pre-emergency Preparedness

BY KEM RUSSELL

Are you prepared? I think most of us think we are prepared, at least to deal with whatever we expect to happen. The trouble is that often what we come up against is not something we expected, therefore we are not prepared for that. For ammonia refrigeration whether a system has 400 lbs. or 40,000 lbs (or more) we should do pre-emergency planning and training. Having people, training, equipment, etc. in place and properly functioning before the emergency can greatly reduce the impact of an incident.

The majority of people do not consider their preparation for an emergency, and only seriously think about what they should do after the emergency occurs. I say that with great confidence having been a volunteer for Search & Rescue for over 20 years. For example: how many people that are lost have a map? Answer: Almost none. Here's another, how many people with a GPS device know how to work that device and/or know what the coordinates mean? Answer: not very many.

Doing tabletop or field exercises is practicing and learning appropriate actions before a real emergency occurs. This is pre-emergency preparedness. These exercises can help a facility find what works or doesn't work in their emergency plan (action or response), and can also find small, yet crucial details that need additional clarification or options in your emergency plan. The purpose of these exercises is to both improve your emergency plan and the function of your emergency team so the outcome is better.

Let me assume that you have never done these types of exercises. It helps if it is pre-determined who is going to function in what position(s) in the exercise, and it can be valuable to have persons involved who have specific experience and knowledge relevant to the type of emergency being prepared for. Also, decide who is going to be in charge (Incident Commander). You need a team to deal with emergencies. Trying to be the "Lone Ranger" in an emergency will very likely lead to undesirable outcomes.

TABLETOP DRILLS

Tabletop drills are a discussion-based session where team members meet in an informal, classroom-type setting to discuss their roles during an emergency and their responses to a particular emergency situation. It can be helpful to have outside persons involved in a tabletop, such as someone from the local Fire Department or Hazmat Team, a representative from a refrigeration contracting company, the president of the Local Emergency Planning Committee, etc. Having people from outside the organization involved in an exercise should improve overall coordination for when an actual emergency occurs.

For the tabletop drill, someone pre-determines a realistic emergency scenario at the facility. For example, a refrigerant line gets hit, or a relief valve releases, or maintenance is being done, and a release occurs. The scenario should not give real, specific/detailed information about exactly what or how something happened. Asking and understanding the situation and figuring out what to do is part of the learning process that the team needs to go through as they work to understand the emergency and to determine the best actions. There should be a facilitator to guide the team through their discussion of the scenario.

In addition to allowing the team to practice their response in real-time, the value in tabletop exercises is that they can help identify weaknesses and gaps in an organization's response before a real emergency happens. Confusion about responsibilities, poor decisions, lack of understanding of what could occur, inadequate training or equipment, identifying new vulnerabilities, and finding weak points in the processes don't indicate failure; rather, these are precisely what tabletop exercises are designed to weed out.

Once the scenario is presented the team starts determining what should be done to deal with the emergency using their present emergency plan. The team should have clear objectives in mind. They may be as simple as, Life Safety (onsite and offsite); Facility/Product protection; Environmental. The facilitator should help the team with suggested considerations, not solutions. If the team discussion is going well, the facilitator may just listen and take notes for the discussion after the exercise.

After the exercise, it's essential for the team to explain what their actions were and discuss any shortcomings in the

Doing tabletop or field exercises is practicing and learning appropriate actions before a real emergency occurs.

response. It should be documented what worked as well as what didn't, so vulnerabilities are identified and recommendations for improvement are determined. These recommendations can improve the emergency plan, help the next exercise run more smoothly, and ensure more effective actions of the team when an actual emergency happens.

FIELD EXERCISES

Field exercises can be simple or complex, but these exercises are the real “boots on the ground” type of practices. These exercises mimic reality as close as possible in both the use of personnel and equipment.

A simple exercise might be an evacuation or shelter-in-place. This exercise might only involve facility personnel.

A more complex exercise could involve facility personnel, Fire Department responders, and equipment. If your Fire Department has a Hazmat Team that will respond to ammonia releases, involve them and see how facility personnel and the outside responders work together to address a pre-determined scenario. For example; I have been involved in several exercises where the machine room was “smoked” (using a smoke generating machine), the Fire Dept. and Hazmat Teams were pre-alerted to the exercise (only responding to the site when notified by their dispatch), an ambulance service was pre-alerted to the exercise and responded as the exercise unfolded, and the facility personnel practiced their evacuation and shelter-in-place plan. Such exercises also involved calls to the National Response Center (NRC), the State, and the local LEPC. All were first informed that "This is a drill, not a real emergency".

The somewhat complex exercises don’t take much time to coordinate, but you do have to find a time and date that works best for all involved (Facility and Fire Department).

A very complex exercise would involve multiple groups outside of the facility. Such emergency exercises are typically “mass casualty incidents" or "MCI's". In these exercises, there are multiple victims so that the multiple groups of responders can be actively involved, testing and practicing their own responses. These events take time to organize and develop, usually many months. Such exercises might involve the Fire Department, Law Enforcement (State Patrol, Sheriff, Police), Ambulance Service (land and air), Hospital(s), State Hazardous Response Team, State Emergency Management, Media, Local Emergency Planning Committee, Public Works, Department of Transportation, etc. All of these groups are very professional, knowledgeable, and experienced in what they do.

If you have ever heard of the saying, “herding cats”, you will have an idea of the effort needed to put a very complex emergency exercise together. The challenge with such large events is how beneficial this field exercise will be for facilities personnel. To determine that, you must be involved and participate in the entire development process for the event. If you are not, you could be relegated to a lesser involvement than you planned. Still, this will be a learning experience.

Field exercises can be simple or complex, but these exercises are the real “boots on the ground” type of practices.

The lesson learned is, you should do exercises, tabletop and field, and you should coordinate with your local groups. Doing the exercises on a regular basis, at least annually, will have your team much more prepared for when an emergency happens, and it will happen.

Coordinating with your local groups who would be involved in emergencies will prepare you to better understand what your various local groups can do, who they are, and how you might be able to work with them. If you practice and coordinate, do pre-emergency planning and training, the result will be knowing you are much better prepared to do the best you can.

Industry Stakeholders Continue Work on Critical Task Guideliness

The Critical Task Guidance for Ammonia Refrigeration System Emergency Planning is a key resource designed to support employers, government regulators, and public safety responders in preparing for and mitigating ammonia-related incidents.

The guidance, which was released in 2021, promotes a proactive approach to safety in facilities where ammonia refrigeration systems are in use and is currently being revised in response to feedback from users, regulatory agencies, and committee review.

"Like the first editions of many publications, many opportunities to improve and clarify the document were identified by both the compliance committee and OSHA reviewers," said Eric Smith, vice president and technical director for IIAR. "This next edition enhances the first by clarifying the intent, providing reorganization of the material, including additional information on tasks and training, and providing additional references and resources."

BACKGROUND AND DEVELOPMENT

The first edition was developed by members of the International Institute of Ammonia Refrigeration (IIAR), Refrigerating Engineers and Technicians Association (RETA), Global Cold Chain Alliance (GCCA), and Ammonia Safety and Training Institute (ASTI). It incorporated input from multiple regulatory bodies and aimed to provide foundational safety practices.

"There are two main goals for this document. The first is to encourage facilities and employees to wear ammonia purifying respirators and personal ammonia detectors when performing high-risk tasks, such as initially opening a system," Smith said. "The second main goal is to encourage facilities to react to small releases and stop them when it is safe to do so rather than relying solely on public emergency response teams."

Many releases can be stopped quickly if personnel are prepared for the unexpected, and this document can help facilities prepare for such circumstances.

"The critical task guidance includes more clarity about how a trained technician or operator can engage emergency system control while working in environments that do not exceed Immediately Dangerous to Life and Health (IDLH) concentrations (300 ppm)," said Gary Smith, chief executive officer of the Ammonia Safety Training Institute " "Performing these tasks would not place a facility into a HAZWOPER emergency response plan category."

THREE CORE AREAS OF GUIDANCE

The guideline focuses on three broad areas essential for effective emergency planning:

Reaction Planning and PPE Use: Facilities should have a well-defined reaction plan for unexpected ammonia releases and ensure workers are equipped with the appropriate personal protective equipment (PPE). This helps reduce or eliminate exposure risks during tasks with high ammonia hazard potential.

Medical and Rescue Preparedness: Emergency Action Plans (EAPs) and Emergency Response Plans (ERPs) must address the specific needs and procedures related to medical and rescue efforts, enhancing response outcomes in the event of an incident.

Training for All Stakeholders:

Comprehensive training is vital, not only for employees but also for visitors, contractors, and others who may need to respond during an incident. Proper training helps reduce liability and ensures a faster, more effective response.

CRITICAL TASKS IDENTIFIED

The document also outlines three critical tasks for managing ammonia system emergencies: preparation, escape, and system emergency control, and rescue.

"The guideline can be used to help ensure that existing or new emergency action plans include appropriate personal protective equipment selection, training, emergency planning, and communication associated with these critical tasks," Eric Smith said.

For organizations with well-established safety programs, adopting this guidance shouldn't create a significant cost burden. "Those with minimal action plans and procedures may incur some expense and effort in training and upgrading personal protective equipment, but it would be a fraction of the cost of an unanticipated shutdown, even if such a shutdown is just a few hours," Eric Smith added.

VOLUNTARY, YET VALUABLE

It's important to note that this guidance is not an ANSI Standard and was not developed under ANSI/IIAR rules for standards development. "As such, its use is voluntary, and its content should not be considered normative requirements," Smith explained. "However, IIAR intends to have this guideline reviewed by all IIAR committee members, which will ensure its broad acceptance both by the membership and the industry in general."

The second edition is nearing completion and is expected to be ready for distribution by the third quarter of the year, pending final reviews.

Key Focus Areas for Enhancing Emergency Action Plans for Ammonia Releases

The goal of an emergency action plan is to prevent exposure, protect property, and safely manage potential ammonia releases through preparation and systematic response. To improve emergency action plans for ammonia releases, focus on these key areas:

Operational Readiness

- Train all employees and visitors on ammonia awareness
- Establish clear evacuation and shelter-in-place procedures
- Create communication protocols for reporting releases
- Develop a 30-minute emergency response playbook
- Train ammonia refrigeration operators and technicians to "First Responder - Operations Level"

Equipment and Protection

- Use air-purifying respirators (APRs) and personal monitors
- Stage APRs in areas with potential access issues
- Have escape hoods available

Response Procedures

- Define what constitutes a "controllable release"
- Train employees to safely slow or stop small releases
- Use emergency exhaust fans and ventilation to reduce concentration
- Establish clear roles for incident commanders and technicians

Coordination

- Coordinate with local emergency responders
- Develop clear leak investigation procedures
- Create plans for remote release mitigation
- Establish two-way communication during emergencies

Training

- Provide awareness training for all site personnel
- Train specific personnel on emergency control techniques
- Conduct regular drills and scenario planning

For organizations with well-established safety programs, adopting this guidance shouldn't create a significant cost burden.

Emergency Preparedness Means Building Relationships

Emergency preparedness is often taught as a concept supported by three critical legs of a stool: government, public safety responders, and industry. Each leg plays a vital role, and the stability of the whole structure depends on the coordination of all three, making it important for those in the industry to foster strong relationships.

"To be coordinated and have an effective emergency response of any level, you've got to hold some meetings," said Mike Chapman, director of business operations for IIAR. Chapman also spent 17 years in the industry with Tyson Foods and served in public safety as a firefighter and hazmat specialist.

Gary Smith, CEO of the Ammonia Training Institute, said it can be challenging to build synergy between internal operations, emergency responders, and regulatory authorities. The goal is to "get past the fears and anxieties of what the regulations may say by being better operationally with your local emergency responders, your local authority having jurisdiction, and your own command team that you're building."

If facilities and first responders work together and communicate in a way they can all understand, they have an advantage. "If you've trained your team operationally to a first responder level, which means that you can have the capabilities in to address first-responder related challenges, and if you do that together with a fire service on what they can do to support on that initial first 30 minutes, you're ahead of the ball game right off the bat," Smith said.

ESTABLISHING RELATIONSHIPS IN ADVANCE

Building relationships starts with making contact with the fire department, hazmat team, or emergency manager, and it needs to be done in advance. "Establishing your first contact is really the hardest part. You've got to pick up the phone. In order to do that, you have to talk to people that maybe you haven't spoken with before," Chapman said. "You want to make sure you get to the right person that can adequately communicate your intent and your wishes to the proper authorities that can make decisions and say, 'Yes, we can allocate these resources to come and coordinate with you.'"

Like with any relationship, the first step is usually a meeting, but that is only the starting point. "Relationships require effort, so it means you have to build upon it," Chapman said.

Chapman recommends scheduling a walkthrough and explaining systems, safety measures, and the emergency plan. Operators can walk responders through key systems, such as ventilation controls, e-stops, evacuation routes, and refrigeration room access. They need to understand the physical layout of the facility and any unique hazards. Helping responders understand refrigeration in relatable terms can make a difference in how quickly and effectively they can respond.

It is also important to identify key internal stakeholders, including refrigeration technicians, facility management, maintenance personnel, and even administrative staff, particularly those responsible for evacuation rosters or emergency notifications.

A high-profile ammonia release can quickly attract media attention. Local leadership, including town councils and mayors, may become involved, especially if there is potential for public exposure. “If it's a small-town community, I can guarantee you that the town council, the mayor, those kinds of folks, are going to be there if it's something that's big and in the news,” he explained. “So, you want to probably pull those folks in so that everybody's on the same page.”

DETERMINE THE APPROACH

A key decision every facility must make is whether to adopt an emergency action plan (EAP) or a full emergency response program (ERP). An EAP focuses on evacuation and calling in external help, while an ERP involves maintaining and training an in-house response team. Each has pros and cons. An ERP allows faster control of incidents and improved employee protection but requires more resources, training, and regulatory compliance. An EAP, while less resource-intensive, may delay response actions and leave more of the burden to public responders.

"There are certainly advantages with employee safety and being able to protect employees if you've got a full emergency response team. You can mitigate or minimize your incidents much more quickly with onsite public safety, because you're able to probably keep the ammonia on site or very close to the site, so it's not going to affect your public or people around you," Chapman said.

For many ammonia refrigeration operations, especially those with small or moderately staffed sites, maintaining a fully staffed hazmat team 24/7 is unrealistic, but even with an EAP, teams needs enough awareness-level training to initiate an emergency stop, identify a leak and communicate effectively.

Deciding between a response and an action plan should be strategic. ERP gives operators the advantage of quick response and improved incident control, but demands serious investment in training, staffing, and compliance. EAP is more cost-effective but puts more reliance on external agencies whose response times may be limited.

EFFECTIVE PLANNING AND COMMUNICATION

While there are different levels of planning needed, a “30-minute plan” can improve operational readiness. Smith saw one situation when an ammonia compressor failed and a slick, dangerous environment quickly developed, but all key stakeholders had been trained.

"I'll never forget, as I rolled into that call, I got a rundown of what had happened, so I upped the alarm and got more resources coming in," Smith said. "Long story short, when we got there, we put the fans in, we got the power shut down and ventilation going…Thirty minutes later, we took what was potentially a catastrophe, and because starting together earlier meant we were working with understanding, cooperation, and collaboration, and it worked."

A teaming agreement made in advance can define roles and responsibilities during an incident, outlining the expectations for both the facility and responding agencies. While some municipalities may hesitate to sign such agreements due to liability concerns, it is not a binding legal contract. Instead, it serves as a communication tool and a compliance safeguard that demonstrates coordinated planning, Champman explained.

Agreements should specify training levels for all parties, PPE capabilities, available equipment, and the expected actions during various incident scenarios. It should never be assumed that the arrival of a fire truck implies hazmat capability—roles and resources should be clearly defined in advance.

Chapman said that when responders arrive, their success depends on a facility's ability to communicate quickly and clearly. One proven method is the CAN Report:

- **Conditions:**
What's happening.

Example: We have a low-side ammonia leak in the compressor room.

- **Actions:**
What's been done.

Example: We hit the e-stop, evacuated the area, accounted for all personnel.

- **Needs:**
What is required.

Example: We need leak confirmation and atmospheric monitoring in the adjacent corridor.

Delivering this kind of information allows responders to tailor their PPE, assess risk, and act faster. Smith added that it is important to establish who is in charge. If nobody sets the first step in motion, things can escalate, with a release leaving the facility, getting out, and becoming a bigger threat to the community.

TRAINING WITH REALISM

Training is a critical part of any safety plan. Smith recommends facility supervisors who are assigned by their employer to lead an emergency response event should take the FEMA/NIMS free on-line training for ICS 100, 200 and 800. "The training results in a FEMA certificate of completion and is enjoyable and easy to understand," he explained. "Certified ICS training will help the facility commander to liaison much more effectively with the public safety responders."

Smith added that employers should consider having their lead operators comply with the six (6) simple and straightforward requirements located in OSHA 1910.120 (q)(6)(ii) First Responder Operations Level requirements. "The employer may accept all forms of operator training and experience to show their capabilities for being considered a 'First Responder Operations Level employee,'" he said.

Another best practice is to ensure training is realistic. Paper drills alone are insufficient. Facilities should simulate leaks, test response timing and walk first responders through system layouts. Chapman said the goal should be to uncover opportunities for improvement and reinforce successful practices not to assign blame.

Consistent training builds confidence. A team that is well-acquainted with emergency procedures will respond more effectively under stress. Past incidents and industry case studies can provide valuable lessons. Scenarios should also be tailored to facility-specific hazards. For example, a system prone to valve freeze-ups should include freeze-related leak drills in training exercises.

RISK AWARENESS IN ACTION

Before initiating any task, workers should pause for five seconds to ask, "What could go wrong?" This brief moment of reflection can prevent incidents. Whether opening a valve at work or lifting a vehicle at home, assessing the risks and mitigating hazards beforehand can save lives. "If you take that five seconds to say what could go wrong, then you can take a little bit longer to engineer out those risks," Chapman said.

Additionally, understanding the incident command structure enables facility teams to integrate effectively into broader emergency responses. Free FEMA training on the National Incident Management System (NIMS)—specifically ICS-100, 200, 700, and 800—provides essential background for those involved in emergency planning. Familiarity with unified command roles ensures smoother collaboration with external agencies.

When all parties—from facility operators to emergency responders- understand their roles and expectations, incident responses become more coordinated, efficient, and safe. That coordination can limit operational downtime, reduce financial risk, and keep employees and the community safe.

Refrigeration Industry Eyes Deregulation

The Trump administration is renewing its focus on deregulation, with potential rollbacks that could significantly affect the natural refrigerant and broader chemical safety industries.

"The Trump administration is making deregulation a priority, and the goals are to reduce the number of regulations and reduce the cost of regulations. It's part of a broader effort across government, and some changes will have a direct impact on IIAR members," said Lowell Randell, director of government relations for IIAR. "We don't have many details on anything yet. It is all prospective and potential, but we can get clues from what what happened in the first Trump administration."

RISK MANAGEMENT PROGRAM UNDER REVIEW

Environmental Protection Agency Administrator Lee Zeldin announced that the agency is going to reconsider more than 30 rules, including the Risk Management Program (RMP). "There's no more detail than that on exactly what they're going to propose for reconsideration," Randell said.

Originally introduced in 1996, the RMP was significantly expanded during the Obama administration. These measures were rolled back during Trump's first term, only to be reinstated and strengthened under President Biden in 2021. The Biden-era rules aimed to reduce the risk of industrial accidents at nearly 12,000 high-risk facilities, such as oil refineries, chemical plants, and water treatment sites. They also called for increased transparency with local communities and emergency responders, independent audits for facilities with a history of accidents, and a review of the most dangerous chemicals used, encouraging safer alternatives where feasible.

The enhanced rules required stronger protections against spills, explosions, and climate-related disasters like floods and hurricanes. They also mandated greater transparency with local communities, independent safety audits, and a shift toward safer chemical alternatives. The EPA plans to rewrite the regulation.

EPA filed a motion in federal court indicating it intends to rewrite the regulation. Challengers argued that the new requirements imposed significant costs and compliance burdens without delivering proportional safety benefits.

"We know that the Trump administration has identified climate-change related provisions and DEI or environmental justice provisions across government as being counter to its position," Randell said. "So, inasmuch as there are some pieces of the RMP rule that Biden put forward that get kind of into those territories, I would anticipate that they will take a close look at things like the natural hazards provisions, the facility siting, and related provisions."

There may also be more review of programmatic policies, such as safer technology analysis, as well as operational provisions, like hot work permits. Randell said there isn't a timeline for the review. "When you announce that you're going to be reconsidering 30 different rules, some of them were going to go quicker than others, and we don't know where RMP is going to fall in that timeline," he explained. "We may see things happen in the next several months, or depending on where they prioritize their quickest actions, it might come a little bit later in the Trump administration."

CLEAN WATER ACT RULE MAY BE REVISED

Another regulatory requirement that may change is the Clean Water Act Worst Case Discharge Planning Rule. "This applies to facilities that are within a particular radius of a protected waterway," Randell explained.

The rule applies to facilities that have more than 100,000 pounds of ammonia and are located within 0.5 miles of a navigable water or a conveyance, such as a ditch or storm drain, that can reach navigable water. Currently, the compliance date is June 1, 2027.

"It is being looked at by EPA and may become one of those areas where they take some type of action, whether it is revising the rule or extending compliance dates," Randell said.

UNCERTAINTY AROUND THE AIM ACT

Key provisions of the American Innovation and Manufacturing (AIM) Act are also being reconsidered. The EPA recently signaled its intent to review the Technology Transitions rule, specifically increasing the global warming potential (GWP) threshold for new cold storage refrigerants from 150 to 700.

EPA and Congress are currently reviewing key parts of the American Innovation and Manufacturing Act. The U.S. Environmental Protection Agency has announced plans to reconsider the Technology Transitions rule, including changing the new cold storage refrigerant GWP from 150 GWP to 700 GWP. Read more about uncertainty surrounding the AIM Act on page 11.

Tristam Coffin, co-founder and president, sustainability, policy and technical services, êffecterra, said the industry, including OEMs and others, has largely been in favor of the technology transition. "There is a holistic perception that regulation is bad for business, and that's not always true. In this instance, industry has largely been behind the Technology Transition rule," he said.

Certain timelines in the rule were already delayed once from the proposed rule to the final rule, and those in the industry have been preparing to meet the deadlines. Having to retool now or make further adjustments doesn't necessarily benefit the OEMs. "If there's going to be regulation, folks want consistency," Coffin said.

Deregulation at the federal level could push states to adopt their own restrictions, explained Danielle Wright, executive director of the North American Sustainable Refrigeration Council (NASRC). Some states, including California and New York, already enforce strict GWP standards. "The reality is that the majority of end-users would prefer to have consistent and predictable regulations, rather than deal with a patchwork of state regulations," she explained. "Uncertainty is not good for business."

Companies operating within the U.S. and internationally are already dealing with differences in regulations. "Now you enter local and state regulation, and it becomes even more challenging for them," Coffin said.

Even if limits are changed and larger quantities of synthetics are allowed, many of the new synthetic refrigerants present other environmental challenges, such as being classified as PFAS, which may also face new regulatory requirements. "In my mind, all of the potential pros and cons of these solutions need to really be laid out," Coffin said. "A lifecycle analysis approach needs to be taken to determine the best overall solutions."

Currently, the California Air Resources Board is working with several partners to develop a life cycle analysis of synthetic and natural refrigerants. "I think that will be really telling," Coffin said. "We're also working on an embodied carbon methodology for commercial refrigeration equipment, for example, which I think is another important factor in choosing the winners through the lifecycle lens."

TECHNICAL PAPER #6

Implications of HAZWOPER Regulations

on Ammonia Refrigeration Contractors

JEFF PACE CSP, DIRECTOR SAFETY & HEALTH
INDUSTRIAL REFRIGERATION PROS

ABSTRACT

This technical paper addresses potential business risks associated with the Hazardous Waste Operations and Emergency Response (HAZWOPER) standard for ammonia refrigeration contractors when used for repairing leaks in ammonia refrigeration systems. The definitions of an incidental leak and leaks requiring an emergency response within the HAZWOPER code are ambiguous, subjective, and narrowly defined. Furthermore, defining only two leak classifications is overly simplistic and ignores many early leak mitigation options.

The HAZWOPER standard encompasses five distinct groups of employers and their employees, with the fifth group being directly relevant to ammonia refrigeration contractors—specifically, emergency response operations for releases of, or substantial threats of releases of, hazardous substances (1910.120(q)). When a customer reports an ammonia leak, it triggers a situation characterized as "a release of a hazardous substance," necessitating a response from "outside the immediate release area," a defined category encompassing every ammonia refrigeration contractor.

These conditions align with those classified as emergency response situations. The crucial determination lies in discerning whether the incident qualifies as an incidental release or if it necessitates an emergency response. Compliance with the provisions of 1910.120(q) has become a focal point of scrutiny and interpretation by the Occupational Safety and Health Administration, adding complexity to the regulatory landscape faced by ammonia refrigeration contractors in their service provision.

Background

Picture the following scenario: a valued customer reaches out to your company with a critical problem. Their ammonia refrigeration system, a key component of their operation, is malfunctioning. Production may grind to a halt, and the clock is ticking. The stakes are high because any prolonged downtime may result in substantial financial losses and product spoilage.

In your commitment to providing exceptional service, you dispatch an experienced service technician to the scene. They are tasked with one mission: to get the refrigeration system back on track and ensure your customer's operations run smoothly once again. It is a familiar situation in the contracting business – a challenge to meet, a customer to satisfy, and a reputation to uphold.

However, as your service technician rushes to save the day, your company may inadvertently be stepping into a complex regulatory minefield, completely unaware of the implications. Depending on the circumstances, this service call may be classified as an emergency response under the Hazardous Waste Operations and Emergency Response (HAZWOPER) regulations.

In my role as Safety Director for an industrial ammonia refrigeration company with a nationwide presence, I discovered that only a few of our customers mandated HAZWOPER awareness training for our service technicians. Initially, I held the view that such a requirement was unwarranted, as our operations did not involve hazardous waste site cleanup or activities associated with hazardous waste treatment, storage, and disposal facilities.

Nonetheless, to meet customers' requirements, I embarked on a comprehensive review of the HAZWOPER standard. Subsequently, I undertook a 24-hour Emergency Response Team Training and attained certification as a Hazardous Materials Technician, signifying that in the event of an ammonia leak emergency, I have the

competence to execute an employer's emergency response plan, operate within the Incident Command System, and undertake advanced control, containment, and confinement measures, employing the available facility resources and personal protective equipment (PPE). It is essential to note that terms such as "emergency response," "Hazardous Materials Technician," and "Incident Command System" are defined following specific criteria and requisites outlined within the HAZWOPER standards.

In this dynamic landscape, multiple stakeholders play crucial roles. Federal and state regulatory bodies, such as the Occupational Safety and Health Administration (OSHA) and the Environmental Protection Agency (EPA), customers employing workers in product processing, manufacturing, and cold storage warehousing, contractors engaged in designing, constructing, installing, and servicing ammonia refrigeration systems, and industry associations, like RETA and IIAR, all contribute to shaping the regulatory environment.

What unifies these diverse stakeholders should be a collective dedication to ensuring safe and healthy working conditions for employees and the broader community. Acknowledging the interconnectedness of these interests fosters a collaborative approach to navigating the complexities of compliance, ultimately promoting a safer environment for all.

Purpose and Scope

This paper focuses on the HAZWOPER standards and their direct relevance to both ammonia refrigeration contractors and their customers during service calls. Assessing the impact of HAZWOPER regulations on ammonia refrigeration contractors is essential for recognizing potential business risks. Contractors are strongly encouraged to adopt a proactive stance, thoroughly understanding and integrating these regulations into their operational fabric. This requires the identification and

implementation of procedures and controls that not only mitigate risks but also safeguard their companies and employees and address the specific needs of their customers.

Effective communication and potential education of customers regarding these regulations and their application to their facilities are integral components of this proactive approach.

This approach seeks to prevent an ammonia leak incident that leads to a service call that can later be classified and cited as a leak that required an emergency response.

The Difference in Responses Between an Incidental Leak and One Requiring an Emergency Response

An incidental ammonia leak is a small leak that can be absorbed, neutralized, or otherwise controlled at the time of release by employees in the immediate release area, or by maintenance personnel. Incidental leaks of hazardous substances that are limited in quantity and pose no emergency or significant threat to the safety and health of employees in the immediate area are not under the scope of the HAZWOPER standard.

However, an ammonia leak that is classified by OSHA as requiring an emergency response is completely different. An emergency response requires the customer to have and follow an emergency response plan (ERP). The ERP should cover the roles, lines of authority, training, and communication, which should be consistent with the National Incident Management System (NIMS). Furthermore, the Response Team Organization laid out in their ERP includes the Incident Commander, who has ultimate authority and responsibility during an emergency response operation. The Safety/Operations Officer, Primary Responders (minimum of two), Backup Responders, Decontamination Officer, Staging Officer, Equipment Personnel,

Information Logger, Site Security, First Aid, Agency Liaison, and Press Liaison should all be included.

A quick overview of the actions outlined in the ERP is provided below.

Check the wind direction and determine safe places of refuge. Evacuate and account for all people (e.g., employees, contractors, and visitors).

Isolate and control the flow. Stop the flow as close to the leak as possible without risking exposure. Secure the plant and spill areas.

Determine the extent of the hazard, establish the Command Post and Decontamination Area, and set hot, warm, and cold zones.

Assign roles and review the pre-entry checklists. The Response Team pre-entry vitals should be taken and confirmed to be in acceptable ranges (i.e., temperature of less than 100.4 F, blood pressure below systolic of 160 and diastolic of 100, maximum allowable heart rate based on the chart, and acceptable body water loss).

Conduct the Entry Briefing. Then, execute the plan, followed by decontamination and cleanup.

The response operations are performed employing the "buddy system," and Backup Responders are geared up and ready to go in case emergency assistance is required for the Primary Responders. The Safety Officer monitors conditions and alters, suspends, or terminates these activities if they see that conditions at the response area have changed or gas/vapor levels exceed ¼ of the LEL (for ammonia: 3.75% or 37,500 ppm).

The Primary Responders should wear Self-Contained Breathing Apparatuses (SCBAs) and "Level A" suits.

Overall, there is a significant difference between an incidental leak response and an emergency response. One can be easily and quickly handled by a maintenance employee, and the other requires a full team (all trained by role in compliance with HAZWOPER requirements) operating in a NIMS.

Brief History and Overview of HAZWOPER (Hazardous Waste Operations and Emergency Response) Regulations

The annals of industrial history are marked by numerous unforeseen releases of highly hazardous chemicals, with incidents spanning various sectors, including ammonia refrigeration, which continue to unfold. Often considered a watershed moment, the catastrophic chemical release in Bhopal, India in 1984 was deemed the "world's worst industrial disaster," spurring the enactment of the Clean Air Act Amendments. These amendments gave rise to Process Safety Management (PSM) regulations, designed to mitigate the risk of accidental chemical release to employees.

The newly instituted PSM regulations apply to companies using chemicals listed on the "List of Highly Hazardous Chemicals, Toxics, and Reactives" at or above specified threshold quantities. Notably, anhydrous ammonia's federal threshold quantity (TQ) is 10,000 pounds, with states setting local variations (1910.119 App A - List of Highly Hazardous Chemicals, Toxics, and Reactives).

In the mid-1980s, Congress enacted the Superfund Amendment and Reauthorization Act (SARA Title III), also known as the Emergency Planning and Community Right-To-Know Act (EPCRA). This legislation aimed to empower communities by providing information about hazardous chemicals in industrial facilities. It delineated the roles of the Local Emergency Planning Commission, State Emergency Response Commission, OSHA, and the EPA in addressing hazardous chemical releases.

Derived from OSHA regulation CFR 1910.120, which was finalized on March 6, 1990, HAZWOPER is a comprehensive standard that defines procedures to safeguard workers handling hazardous substances. The standard comprises five application topics, and the fifth is directly applicable to ammonia refrigeration contractors, namely the emergency response operations for the release or substantial threats of the release of hazardous substances (1910.120(q)).

Under SARA Title III/EPCRA, Section 302, **HAZWOPER standards are invoked if a customer's facility exceeds the Threshold Planning Quantity (TPQ) for ammonia, federally set at 500 pounds, and the release is not considered incidental**. OSHA's ongoing National Emphasis Program for chemical facilities, initiated in 2017, ensures compliance with the PSM standard.

Understanding HAZWOPER Regulations

Key Component of HAZWOPER for Ammonia Refrigeration Contractors - Incidental Release Versus a Release Requiring an Emergency Response

When faced with a customer reporting an ammonia leak, the uncertainty surrounding whether it qualifies as an incidental release or necessitates an emergency response becomes a critical consideration. As detailed in OSHA Instruction Directive Number CPL 02-02-073 Appendix A, under the planning provisions of 1910.120(q), releases of hazardous substances in the workplace are systematically classified into three groups: clearly incidental regardless of the circumstances, may be incidental depending on the circumstances, and emergency response regardless of the circumstances.

1. **Releases that are clearly incidental regardless of the circumstances.**

The scope of the HAZWOPER standard does not cover the foreseeable release of a hazardous substance that is limited in quantity and poses no emergency or significant threat to the safety and health of employees in the immediate vicinity. This type of release is referred to as an "incidental release" in 29 CFR 1910.120(a)(3), under the definition of "emergency response."

An incidental release is a release of a hazardous substance that does not pose a significant safety or health hazard to employees in the immediate vicinity or to the employees cleaning it up, nor does it have the potential to become an emergency within a short time frame. Incidental releases are limited in quantity, exposure potential, or toxicity and present minor safety or health hazards to employees in the immediate work area or those assigned to clean them up.

If the hazardous substances that are in the work area are always stored in small quantities, such as in a laboratory that handles amounts in pint sizes or less, and the hazardous substances do not pose a significant safety and health threat at that volume, then the risks of having a release that escalates into an emergency are minimal. In this setting, only incidental releases are expected, and employees are trained to protect themselves in handling incidental releases as per the training requirements of the Hazard Communication Standard (HCS), 29 CFR 1910.1200.

OSHA Instruction Directive Number: CPL 02-02-073 Appendix A

2. **Releases that may be incidental or may require an emergency response depending on the circumstances.**

The properties of hazardous substances, such as toxicity, volatility, flammability, explosiveness, and corrosiveness, as well as the circumstances of the release itself, such as quantity, confined space considerations, and ventilation, have an impact

on what employees can handle safely and what procedures should be followed. Additionally, other factors may mitigate the hazards associated with a release and its remediation, such as the training or experience of the employees in the immediate work area, the response and available PPE, and the pre-established standard operating procedures for responding to releases of hazardous substances. Some engineering control measures are necessary to mitigate the release, which employees can activate to assist them in controlling and stopping the release.

These combined considerations (properties of the hazardous substance, the circumstances of the release, and the mitigating factors in the work area) define the distinction between incidental releases and releases that require an emergency response. The distinction is site-specific, and its impact is a function of the ERP.

For example, a spill of the solvent toluene in a facility that manufactures toluene may not require an emergency response because of the advanced knowledge of the personnel in the immediate vicinity and the equipment available to absorb and clean up the spill. However, the same spill inside a furniture refinishing shop with personnel who have only had basic training on toluene may require an emergency response by more highly trained personnel. In this case, the furniture refinishing shop's ERP may call for evacuation for all but the most minor spills, whereas an evacuation and emergency response may only be necessary for much larger spills at the chemical manufacturing facility.

(OSHA Instruction Directive Number: CPL 02-02-073

Figure 1 introduces a flow chart that can be used to categorize a release as incidental or requiring an emergency response.

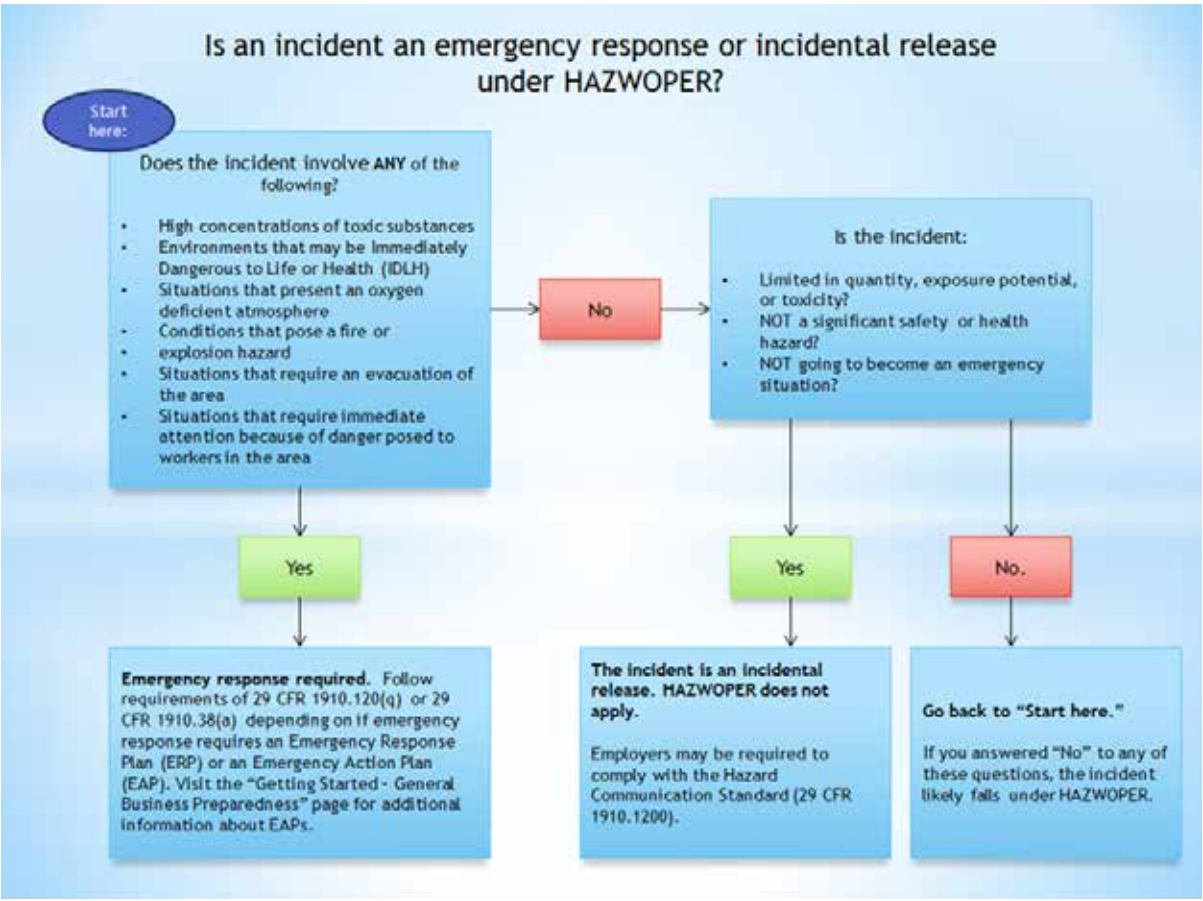

Figure 1. A flow chart used to determine whether a release is an emergency response or incidental release under HAZWOPER regulations. Source: https://www.osha.gov/emergency-preparedness/hazardous-waste-operations/background

3. Releases that require an emergency response regardless of the circumstances.

There are releases of hazardous substances that pose a sufficient threat to health and safety, and by their very nature, require an emergency response regardless of the circumstances or the mitigating factors. An employer must determine the potential for an emergency in a reasonably predictable worst-case scenario, referred to as "anticipated emergencies" in 29 CFR 1910.120(q)(1)), and plan response procedures accordingly.

If a spill of a hazardous substance occurs and an employer instructs all their employees to evacuate the danger area, then the employer may not be required to train those employees under 1910.120. However, training is needed to determine whether a spill is incidental or requires an emergency response. Additionally, any employees who are expected to become actively involved in an emergency response due to the release of a hazardous substance are covered by 1910.120 and must be trained accordingly. (Note: OSHA has limited authority for over-the-road vehicle operation. In the instance of spills occurring while the material is on the vehicle or otherwise "in transportation," OSHA's HAZWOPER standard may not cover the operator in all circumstances. If the operator of the vehicle in transportation becomes actively involved in an emergency response, then they become an emergency responder and are covered by 1910.120(q), as are all emergency response personnel who respond to the incident.)

Generally, the release of anhydrous ammonia, for example, from a refrigeration unit would necessitate an emergency response under HAZWOPER. Employers must determine whether there is a potential for the release of ammonia in their facility that could result in an emergency situation. Anhydrous ammonia can produce severe health effects depending on the degree of exposure. The bottom line is that if the leak involves anything other than that defined as an "incidental leak," then the leak which requires an emergency response, as the law is currently written.

(OSHA Instruction Directive Number: CPL 02-02-073 Appendix A)

"OSHA recently stated, activities such as turning valves, tightening leaking gaskets, etc. have the potential to result in catastrophic releases depending on the condition of the equipment. OSHA believes it is possible, and indeed any given release of ammonia could necessitate an emergency response. Extremely small vapor releases where the exposure in the breathing zone of the employee is less than 50 ppm and there is no risk of a catastrophic release, may be incidental."

(PSM and Operators Perspective by Jeremy Williams p. 45)

The potential risks for ammonia refrigeration contractors can be summarized as follows. First, releases that may be incidental or may require an emergency response depending on the circumstances are defined for "employees in the immediate work area." Any response to a customer's ammonia leak beyond what is considered "clearly incidental" opens the contactor to potentially serious citations. Reiterating the bottom line: if the leak is anything other than the defined "incidental leak," it requires an emergency response, **as the law is currently written**.

What is an Emergency Response?

According to 1910.120(a)(3), an emergency response is an organized response to an incident that is or may pose an emergency. Considering that every industry experiences different types of emergencies, OSHA does not attempt to create a formula in which all emergencies apply. Appendix A of this instruction provides further guidance.

(OSHA Instruction Directive Number: CPL 02-02-073)

An emergency response includes, but is not limited to, the following situations:

1. The response comes from outside the immediate release area.
2. The release requires the evacuation of employees in the area.
3. The release poses or has the potential to pose an immediate danger to life or health (IDLH).
4. The release poses a serious threat of fire or explosion (exceeds or has the potential to exceed the lower explosive limit or lower flammable limit).
5. The release requires immediate attention because of imminent danger.
6. The release may cause high levels of exposure to toxic substances.

7. There is uncertainty about whether the employees in the work area can handle the severity of the hazard with the available equipment, and the exposure limit may easily be exceeded.

8. The situation is unclear, or data are lacking on important factors.

(OSHA Instruction Directive Number: CPL 02-02-073 Appendix A)

The Customer's Role in Recognizing an Event Requiring an Emergency Response

1. Responsibilities

A company (owner) that uses anhydrous ammonia in its process has many responsibilities in the case of an ammonia leak. The company is either under the federal PSM/RMP programs or under State TQ regulations and is covered under the General Duty Clause, which outlines written programs to provide for employee safety. Furthermore, they rely on the general industry to establish Recognized and Generally Accepted Good Engineering Practices, which are produced in the refrigeration industry in publications such as IIAR, ASME, ASHRAE, IBC, NEC, and NFPA, establishing minimum safety criteria. Regardless of whether the customer is under PSM/RMP standards or the General Duty Clause, if the customer has ammonia above the TPQ of 500 pounds and experiences a leak requiring an emergency response, they are under the HAZWOPER standards.

Additionally, SARA Title/EPCRA, Section 304 establishes spill-reporting requirements. If there is a leak or release exceeding the minimum reportable quantity, it must immediately be reported to the National Response Center, Chemical Safety Board, state, and local emergency coordinators, as well as those entities required by the company policies. The federal reportable quantity is 100 pounds released within 24 hours.

These are only part of a customer's role; however, within the scope of this paper, we focus on the customer (whose ammonia inventories are above TPQ) options during a release of ammonia.

Customers exceeding the TPQ must opt for either an emergency action plan (EAP) or an ERP. OSHA emphasizes the critical nature of planning for emergencies through the development of these plans, as outlined in 29 CFR 1910.38.

"The most important aspect of HAZWOPER paragraph (q) is planning for emergencies through the development of an emergency response plan (ERP) or an emergency action plan (EAP) under 29 CFR 1910.38."

(OSHA Instruction Directive Number: CPL 02-02-073 A. Scope and Application – 1910.120(a)(1) and (a)(2))

Emergency Action Plan (EAP) – In short, this can be thought of in terms of "if there is a release, we do not do HAZMAT response. Rather, we simply evacuate and get everyone out of harm's way." Of course, there must be a means to handle small or incidental releases. There also must be a plan that addresses what is considered an incidental spill, including the determination of who is trained and authorized to respond to that spill, as well as what type of leak would require an emergency response.

Emergency Response Plan (ERP) – Evacuate all non-HAZMAT personnel. Then respond to the spill to stop or control the release. This option is for customers who have chosen to invest in the necessary planning, equipment, and training to have an on-site team familiar with the necessary site precautions and key shut-off valves on the refrigeration system.

(1910.120 (q)(2)(iii) Emergency Recognition and Prevention)

According to the Inspection Guidelines, the ERP must define the types of releases that may require an emergency response and should define what types of releases would not be an emergency, or in other words, what may be handled as an incidental release.

The ERP should include an inventory of the hazardous substances found on-site, how they are stored, and the consequences of an uncontrolled release. Scenarios or circumstances that trigger activation of the ERP should be described for the various hazardous substances stored on-site that have the potential to cause an emergency. Reasonably predictable worst-case scenarios must be identified in the planning phase.

(OSHA Instruction Directive Number: CPL 02-02-073 Inspection Guidelines)

In *An Introduction to Ammonia Refrigeration*, Jeremy Williams offers an example of a well-developed facility leak procedure.

.....

Each facility must consider all possible situations and specifically address who and how they will address leaks of ammonia:

- Leaks in the machinery room
- Leaks on the roof
- Leaks in production rooms
- How to detect releases
- How to do odor investigations
- How to report leaks

Leak in Areas Outside of the Machinery Room – Example

1. Inform another qualified employee of the PSM team of a potential leak in the production room and have them notify the assigned production management staff person.
2. Put on an ammonia leak backpack and respirator.
3. Wear a functioning ammonia sensor at the neckline.
4. As soon as ammonia has been detected, radio to the PSM team for support and evacuate employees from the room.
5. If the room has ventilation, turn it on manually.
6. Initiate the room has e-stops for the evaporators.
7. Investigate the source of the leak, minimizing exposure to less than 50 ppm.
8. If you see a leak (dripping or light fog) radio to the machinery room to drop all suction pressure set-points to 1 inHg and set compressors to AUTO mode. Initiate liquid feed e-stop outside of the production room.
9. Leaks that cannot be isolated or controlled at concentrations less than 50 ppm require an emergency response.

Leak in the Machinery Room – Example

1. Inform another qualified employee of the PSM team of a leak in the machinery room and have them notify the PSM manager and refrigeration manager.
2. Turn on the ventilation system manually.
3. If a leak is blowing and the room is completely foggy, stop immediately, evacuate the facility, and hit the e-stop outside the machinery room doors.

4. Do not proceed until another qualified PSM team member is always in visual contact with you.
5. Put on an ammonia leak backpack and respirator and wear a functioning ammonia sensor on the neckline.
6. If the exposure is not greater than 300 ppm, search for and address the leak. Use ventilation and water mist to minimize exposure, when applicable.
7. If you can see the leak (dripping or light fog) change all suction set-points on the compressors to 1 inHg and set compressors to AUTO mode.
8. If the leak is on the high side/discharge 9uninsulated pipe or vessel), determine if proper valving can be changed to the low side.
9. Begin isolating piping that is connected to the source of the leak that is not located at the leak and work your way closer to the source without reaching an exposure greater than 300 ppm.

The potential risks for ammonia refrigeration contractors can be summarized using the following example. The customer calls with an ammonia leak and is not sure whether it is incidental or not. They smell ammonia or see a small vapor leak, but they have not defined "… the types of releases that may require an emergency response and should define what types of releases would not be an emergency, or in other words, what may be handled as an incidental release."

For example, if the customer has an evaporator with a leak in a production room, then their low ammonia alarm goes off at 25 ppm and they would immediately evacuate their production employees and call an ammonia refrigeration contractor to dispatch a service technician, as per their EAP. This is a situation that occurs more frequently among smaller companies that have operators who do rounds and monitor their refrigeration systems parameters but cannot troubleshoot or make repairs.

Notably, the response came from outside the immediate release area, the release required evacuation of employees in that area, the release **may** cause high levels of exposure to toxic substances (ammonia), but the situation is unclear, or data are lacking on important factors. Thus, four of the eight listed conditions are met for an emergency response, in this basic scenario.

Recall that OSHA's definition of incidental release is based on the perspective of "employees in the immediate work area."

The greatest risks to ammonia refrigeration contractors involve EAP customers who are not under PSM/RMP because they are under the TQ ammonia levels or customers who are under PSM/RMP but have not implemented a process safety program. These same customers generally do not have service techs. Most have people who do rounds, inspecting the ammonia refrigeration system and recording the data their company requires, as well as operators who maintain the system conditions at normal operating levels using the various control systems. Without a robust process safety program in place, in addition to the required training and definitions of what they see as incidental, they may not understand the potential hazards. Therefore, they must call the ammonia refrigeration contractors, the experts on their system, to repair their systems.

Although ammonia refrigeration contractors provide maintenance and service support for customers, they are not emergency responders wearing Type A suits, using SCBAs, and arriving with a full Incident Command System, equipment, and all other requirements for employees who aggressively respond to a release (i.e., approaching the point of release to plug, patch, or otherwise stop the release). To respond in that manner, the service techs must be trained to the HAZMAT technician level and be part of an Incident Command System with designated roles.

Conclusion

There is a disparity between the existing number of operators and the escalating demand for adept professionals well-versed in ammonia refrigeration systems. Operating with leaner teams, some plants struggle with labor shortages, either owing to recruitment challenges or reliance on advanced electronic control systems and automatic ventilation, fostering an overconfidence that all bases are adequately covered. However, upper management of some facilities may lack a comprehensive understanding of ammonia refrigeration, including the multifaceted responsibilities associated with system ownership.

As ammonia refrigeration contractors, we bridge this gap, often understanding our clients' systems, surpassing the knowledge of the system owners themselves. Our proficiency enables us to efficiently diagnose and rectify issues. Furthermore, a critical issue arises with the prevailing HAZWOPER standards. The stringent language delineating the scope of actions permissible for a "contractor responding from outside" impedes our ability to proactively address leaks and contain them within the infrastructure. Our workforce is trained, possesses an understanding of the ammonia refrigeration systems, and is equipped with the requisite PPE, including respirators capable of meeting IDLH conditions. Nevertheless, OSHA deems anhydrous ammonia releases from refrigeration units as necessitating an emergency response under HAZWOPER, putting constraints on the entities poised to offer invaluable assistance in mitigating early-stage leaks, beyond the current "incidental leak" classification. Timely intervention in these instances not only augments the safety of personnel and the public but also translates into substantial economic savings for our customers.

In anticipation of potential revisions to the HAZWOPER code, and to provide a more nuanced delineation of response scenarios, contractors and their clients must assimilate the existing regulations in their unaltered state. Ammonia refrigeration contractors, and by extension their customers, must aim to understand these laws as they are written.

The key requirements for ammonia refrigeration contractors (and our customers) in the current regulatory environment can be outlined as follows:

- Understand the current standards.
- Understand each of the customers and their current EAPs or ERPs. Do they have a facility-specific leak procedure addressing "who" and "how" they will address ammonia leaks? What types of releases can be considered incidental, and which would require an emergency response? Does the customer have a plan to address these leaks?
- Develop a written plan that defines and outlines the leak monitoring, evaluation, and documentation process (both prior to and while responding to leaks) and identify what types of releases would not be an emergency (i.e., incidental release) and what conditions may arise if employees back off.
- Develop training methods and procedures to help employees understand and follow this program.

References

Williams, Jeremy. 2022. "Introduction to Ammonia Refrigeration-Next Steps." *Incidental Release vs. Emergency Response*, (1):44-45.

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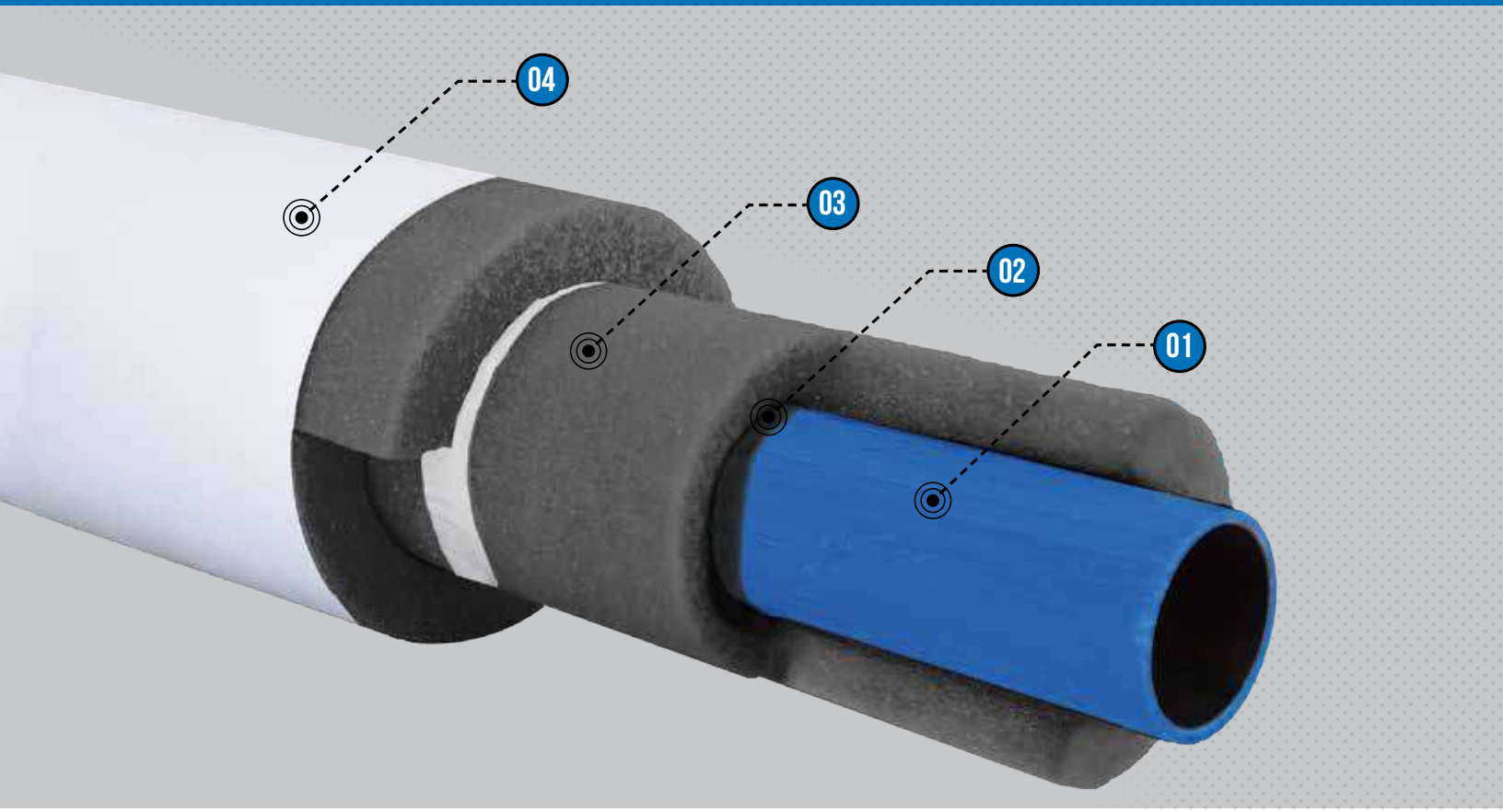

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