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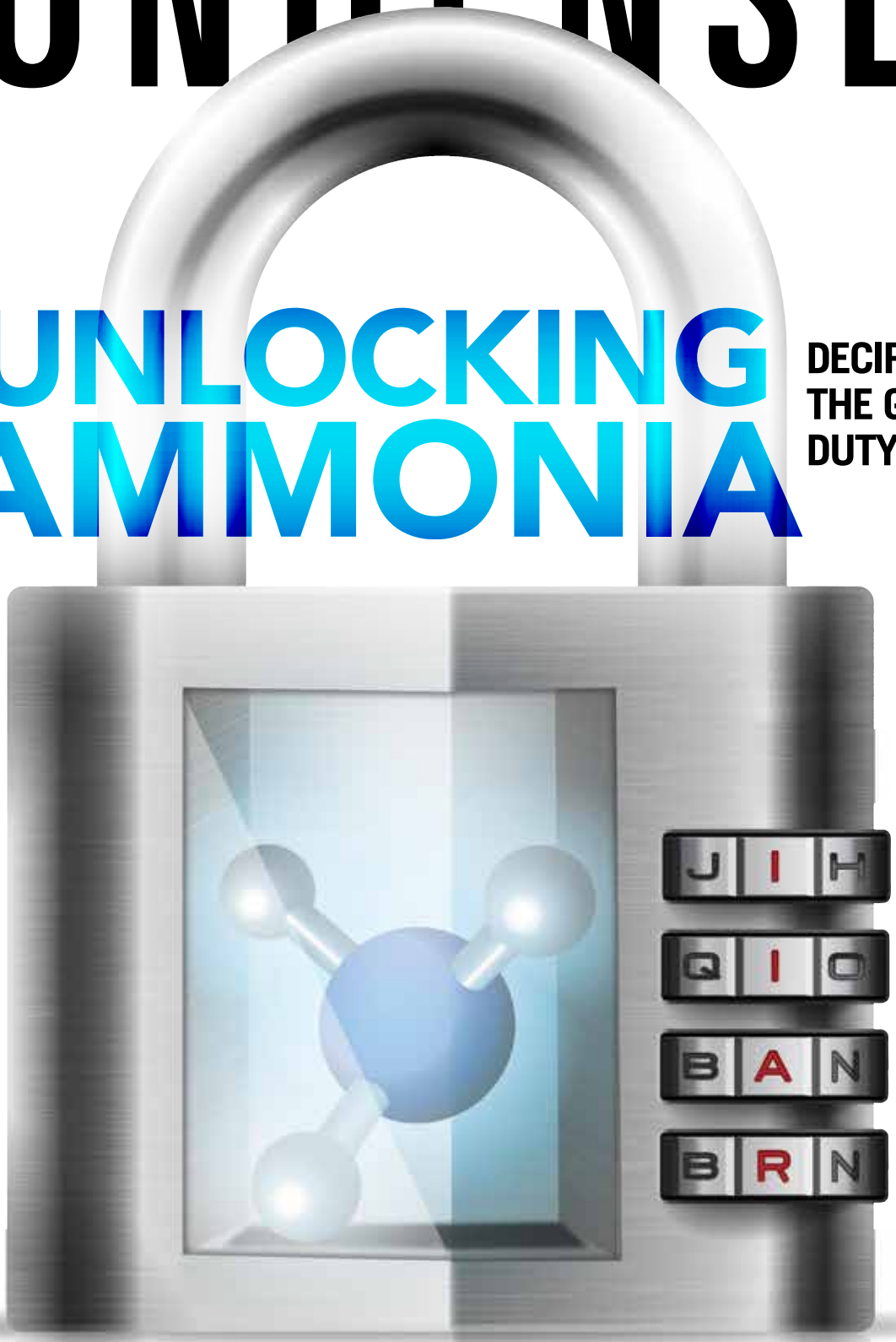

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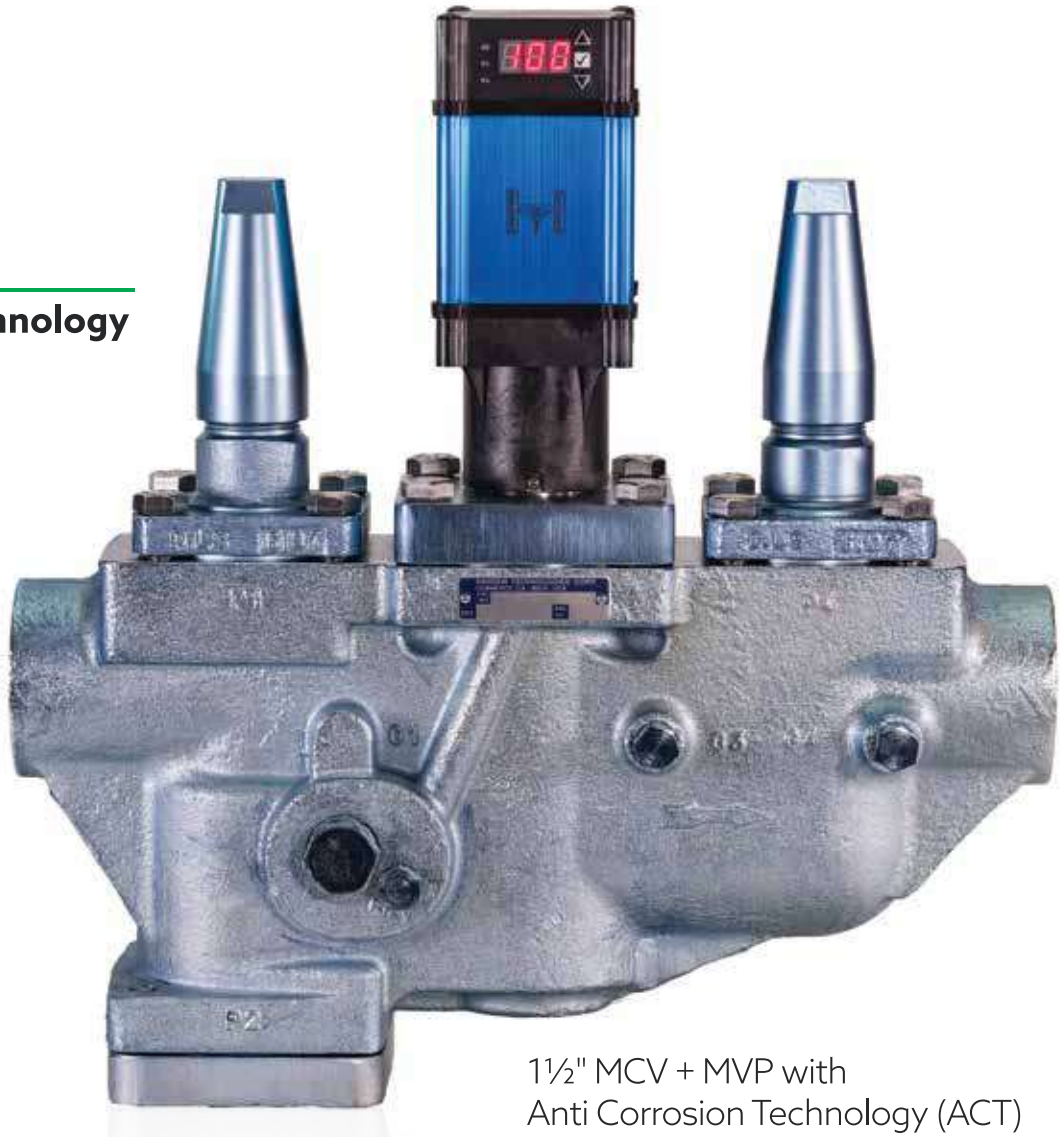

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JUNE 2018

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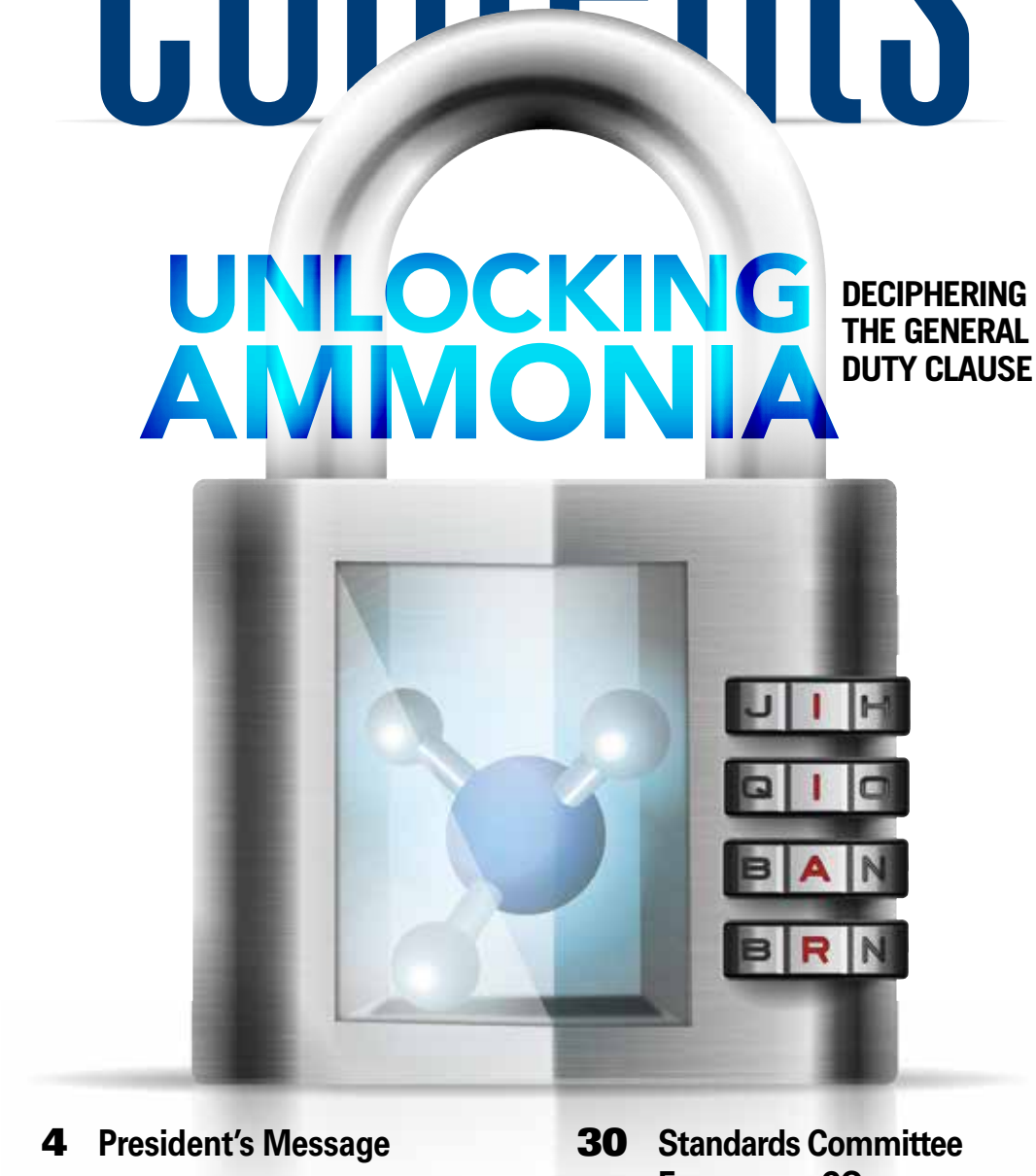

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president's MESSAGE

BY DAVE RULE

This month you'll be hearing from IIAR about one of our most important annual activities, our membership renewal drive. As an IIAR member, we all depend on you to take that essential first step to participate in the activism and advocacy of our industry, by keeping your membership current.

I'd like to use my column this month to invite you to renew your IIAR membership. If you are not yet a member, this is a great time to join. Through the dedication and commitment of members like you our organization has continued to evolve and grow in response to the technology and regulatory changes in our business environment.

When you belong to the IIAR Community, your voice adds impact to our Industry. I'm looking forward to working with you again in the 2018-2019 member year, and I invite you to renew your membership today!

And we have been very active in developing the new products and resources it takes to support such dynamic change. The IIAR has made substantial progress in the development of safety standards, technical publications and education programs during the 2017-2018 member year.

First, I'd like to highlight IIAR's standards development progress. Our membership has been hard at work upgrading the IIAR Suite of Standards in accordance with ANSI certification requirements with continued work on IIAR-2-2014 Addendum A, and the publication of IIAR 1-2017 and IIAR 3-2017. In the new member year we will be working on updates to IIAR 5-2013 and IIAR 7-2013 as well as introducing new standards for inspection, testing and maintenance, CO_2 Safety and Design, and RAGAGEP for existing ammonia facilities. The IIAR standards program is significant as these standards provide guidance to our regulatory agencies by establishing the standard reference for all major fire and safety building codes around the country.

Meanwhile, we're in the public review phase for the new IIAR-6 Maintenance, Inspection and Testing Standard, and we're beginning the ANSI 5-year review cycle for IIAR-2.

As you can see, we have many important products coming online this year, and your membership will be essential as you access each of these resources.

I'm especially excited to announce that the compliance committee just finished a rewrite of the ARM manual and voted to release the ARM-LC, geared toward small and low charge systems. IIAR is also in the process of reviewing and rewriting the PSM/ RMP and the Ammonia Databook, with plans to publish the updated piping handbook very soon.

This year is also a significant year for our education program. IIAR's Academy of Natural Refrigerants just introduced its first PSM/RMP course. The education committee will introduce four to five new courses in 2018 before the end of the year, among them the "specialist program," a long-term certificate program for members to use to build their professional credentials.

When it comes to the regulatory landscape, there's never been a more important time to get involved as an IIAR member. The EPA is now considering writing new rules to manage the refrigerants that have a global warming impact. Not only will IIAR be commenting on the new rules, we'll be working closely with OSHA, EPA and DHS to review existing rules and regulations around ammonia.

Finally, IIAR is also expanding the conference technical program to include a new, second, conference technical paper track. The new tech paper program will address commercial light industrial and food retail applications for CO_2 and ammonia.

I'm also happy to report that IIAR's international education and outreach effort is continuing this year with an expanded translation program, for Spanish and Mandarin, including a new Spanish bi-monthly webinar series for training, and five educational symposiums slated to be delivered in the Americas in 2018.

As always, I encourage everyone to participate in IIAR on our various volunteer committees, and to take advantage of the many new member benefits coming this year. When you belong to the IIAR Community, your voice adds impact to our Industry. I'm looking forward to working with you again in the 2018-2019 member year, and I invite you to renew your membership today!

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chairman's MESSAGE

MIKE LYNCH

As your new Chairman, my first priority this year is to extend a warm welcome to all our new IIAR members. You are joining a community passionate about its work. Your participation and spirit of volunteer leadership is essential in creating the growth and change that will help our natural refrigeration industry meet the new challenges ahead.

There's a lot going on both in our business environment and within our organization. Whether you are a new, or longtime IIAR member, I would like to take this opportunity to talk about how your membership in this organization is making an important contribution to our everyday lives and the lives of others. Our mission together is one of safety and advancing the application of natural refrigerants in our industry.

Embracing the many applications of natural refrigerants means we're making the environment safer for ourselves, our communities, and future generations. Because of their low environmental impact and high efficiency, natural refrigerants are the best answer for refrigeration technology going forward.

Addressing climate change by promoting the use of natural refrigerants in ways that are energy efficient, and to develop safety standards and training programs that insure the safe application of natural refrigerants is paramount to our industry. My tenure on the IIAR Executive Committee has made me increasingly aware of this mission and has allowed me to help foster these initiatives.

Another part of our mission is to extend the reach of natural refrigerants to many kinds of refrigeration applications. That's a goal that our membership and our board is really embracing, as evidenced by our focus on producing safety standards for not only ammonia but now carbon dioxide and soon hydrocarbons. I am committed to pushing forward this industry outreach as your Chairman this year.

The work of our committees is really the cornerstone of our institute and activities, I encourage you to find a committee whose work you can participate in and become passionate about.

We have very active committees and task forces that are currently working on producing a CO_2 safety Standard, and a task group investigating how we can begin to develop best practice documents for hydrocarbon refrigerants. Our industry has a long record of safety to be proud of, and our standards activity is at the core of that accomplishment. We continue to make refrigeration facilities safer through the development of safety guidelines such as PSM, RMP, ARM and the new ARM-LC, as well as the Academy of Natural Refrigerants certificate credentialing program.

All of that work starts with your IIAR membership. So how can you participate in this great mission of ours? Get involved! If you aren't already a member, become one. And if you are already a member but haven't yet found a place to take an active role within the association, please consider getting involved in volunteer leadership on one of our many committees.

The work of our committees is really the cornerstone of our institute and activities, I encourage you to find a committee whose work you can participate in and become passionate about.

As dedicated as our members are to making this organization a success, we also count on our talented and dedicated staff lead by our president Dave Rule. I encourage you to get to know them and connect with them at our conferences and meetings, and whenever you need support as an IIAR member.

The IIAR staff does a lot of "behind the scenes" work, and it is their hard work that allows us to continue to support a dynamic, growing, association. Our organization's strength also lies in the enthusiasm of each one of our members when it comes to sharing knowledge and new ideas. I'd like to take this opportunity to call for your increased participation and leadership in IIAR's committees and development of technical papers. Our publications are second to none, addressing new trends and introducing new technologies, and you, as an IIAR member have the opportunity to contribute to them directly.

That sense of volunteer leadership just keeps growing every year. IIAR's 2018 annual conference was one of our best events yet, exceeding and surpassing expectations, primarily because of the support and hard work of our members, so I'd like to extend special thanks and appreciation to all who contributed their time and financial support to this year's event.

I'm looking forward to working together with you as your chairman this year. As members, your ongoing work and participation make all our activities possible. Thank you for enriching our industry with your support.

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UNLOCKING AMMONIA

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Ammonia refrigeration systems are becoming more compact, portable and simpler to install, widening the potential for adoption of ammonia, carbon dioxide and other natural refrigerants in previously untapped industries.

The evolution of low-charge and package ammonia systems, which means they no longer require a complex installation for some end-user facilities, comes as users are dealing with the phase-out of R-22 and other hydrofluorocarbon refrigerants to comply with Environmental Protection Agency requirements.

"Natural refrigerants don't harm the environment, they help operators meet their regulatory requirements and operators don't have to be concerned in the long run with refrigerant phase-outs from regulatory agencies, such as EPA," said Dave Rule, president of IIAR.

If operators switch to a synthetic refrigerant and then it turns out there is a new environmental concern, then they must switch to another refrigerant product. Some concerns with newer synthetics include increased flammability, potential global warming issues and cost.

Today, companies in the retail food industry, such as operators of microbreweries, small cold-storage facilities and supermarkets, have the option of using small, manufactured package systems that can be operated with very low charges of ammonia in conjunction with CO_2.

"That means they're using a small-charge ammonia package on the roof, so it is isolated from the public. Then they're putting a secondary coolant circuit that is doing the cooling inside the

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building. Typically, that circuit would hold a CO_2 refrigerant or brine," Rule said, adding that ammonia wouldn't be used inside the retail environment. These systems can be very economical to operate.

While some grocery stores have utilized ammonia-CO_2 systems, Rule said many people have concerns over ammonia because they don't understand it. "These systems have been tried and they've been used very effectively, but a lot of supermarkets are going to a straight CO_2 transcritical system," he said. The refrigerant phaseout issues are being addressed but operating costs may prove to be an issue with CO_2 transcritical designs.

CLEARING THE HURDLES

Although some retail facilities have been experimenting with ammonia low-charge systems, the commercial market still has not be proven out. There are numerous hurdles to clear before grocery chains jump in with both feet.

Morgan Smith, project manager for the North American Sustainable Refrigeration Council, which is based in Mill Valley, California, said hurdles that need to be cleared before the retail supermarket industry commits itself include potential high initial costs, availability of trained contractors and service technicians, and appropriate regulatory guidance for ammonia in the commercial sector.

Caleb Nelson, vice president of business development for Azane Inc., agreed that for ammonia to become more widely adopted by retailers, initial capital costs will need to come down. That is not because of high total cost of ownership but because project budgets are often tight and require the lowest bidders to be selected.

Kurt Liebendorfer, vice president of Evapco, based in Taneytown, Maryland, said he has heard that retailers such as grocery stores are less likely to invest in a costly conversion because the locations may move or close. "I'm sure it varies by the particular grocery chain you're speaking to. Some are more sustainable looking forward and others are less so," he said, adding that it becomes less of an issue higher up the food distribution chain.

Although the purchase and installation costs have been higher, that is changing very quickly. "In the past, they've been custom-designed, built-up systems. As manufacturers develop packaged products that can be built in, quality and installing contractors become familiar with the systems, so the cost will come down dramatically," Rule said.

Nelson agreed that volume and economies of scale will help bring down costs but said initial costs will likely never be on par with an HFC system due to inherent differences, which affect quality, lifespan, efficiency and reliability. "You get what you pay for and you should get the best of all those with an ammonia system done right," he said.

"I think the temptation is to try to build ammonia cheaply, but from what I've seen this will actually have a negative effect on total cost of ownership, because by making things cheaper, you're probably making the system less reliable, and more importantly, less efficient," Nelson said.

Randy Fernandez, national sales manager for Kysor Warren, based in Columbus, Georgia, said there is a trend among some grocers who are seeking low quality, short-term capital investments, but he doesn't think that is widespread. "I think most understand the value of sound capital investments that have terrific quality, produce results and offer a solid fit to operational strategies," he said.

A compelling story coupled with solid proof that demonstrates the value of the investment in natural refrigerants will help spur adoption, Fernandez said. "Every customer is going to be seeking a different set of benefits and we need to shape the messaging accordingly as low-charge systems really yield a great number of benefits," he said. Information on the benefits, training and installation, ease of adoption, return on investment and energy savings will all factor into users' decision-making process, he added.

Rule said the payback on lower energy costs should be very good, benefiting businesses such as the grocery industry, where operating costs are a significant concern.

"All of our life-cycle costing models show that efficiency — not the rated efficiency but the efficiency the system is likely to actually maintain for the life of the system — is the most important metric for payback and favorable total cost of ownership. So, if you focus too much on first costs, you're also giving away some of the benefits you're paying extra for. It's a bit of a Catch 22," Nelson said.

What's more, maintenance costs of natural refrigerants shouldn't be much higher, if they are at all, than HFC systems because they are more robust and easier to operate. Nelson said operators should consider other factors, such as the typical HFC refrigerant replacement expense cost of downtime or loss of revenue.

Nelson said our products can show a payback advantage over HFC systems in the four-to-seven-year range. "I think there are end users that are focused on life-cycle costs and are ready to invest in good long-term business decisions. Of course, utility incentives for efficient technology will help, and there's even some incentives available now for natural refrigerants due to the focus on greenhouse gas reductions in certain parts of the country," he said.

Nelson said ammonia could give retailers a standard design that is repeatable and efficient in any climate because ammonia isn't penalized like CO_2 is in warmer climates. "Furthermore, the same ammonia system cooling the high side of a CO_2 system, for example, can also provide air-conditioning and building heat to offer a 100 percent natural refrigeration solution for the entire building," he said.

That would mean the central cooling/heating part of the system would be set up for long-term efficient operation and would be immune to the ever-changing politics and regulation that affect synthetic refrigerants, Nelson explained. He added that retailers, even the ones with very exotic natural systems for refrigeration, have struggled to figure out a natural refrigerant solution for their HVAC systems. "A central ammonia chiller providing refrigeration could easily do both."

CO_2 systems are more efficient in cold climates, and in some regions, operators must run on a transcritical system during certain times of the year. "If you're operating a supermarket in northern Vermont where you don't get the high temperatures in the summertime, then the CO_2 system is reasonably efficient. As you go further south, they become more difficult to operate and maintain," Rule said, adding that ammonia with CO_2 can operate much more efficiently and save operators money on energy costs. "By lowering the energy demand, it is a secondary benefit to the environment because the additional electrical burden you put on the grid is normally a negative impact on the environment."

Fernandez said Kysor Warren's installation at a 40,000-square-foot Piggly Wiggly store in Georgia had an overall energy savings of 22 percent, using a 53-pound charge of ammonia.

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Efficiency can vary based on how many bells and whistles the CO_2 system is fitted with to regain the efficiency losses of supercritical operation in hot ambient-temperature situations. "However, a CO_2 booster transcritical system with parallel compression in a moderate climate should at least be able to be on par with a R407a/CO_2 cascade system. And I know of at least two retail case studies of ammonia system operating 20-25 percent better than a R407a/CO_2 system," Nelson said.

MEETING REGULATORY REQUIREMENTS

Ammonia is a highly regulated refrigerant by both the Occupational Safety and Health Administration and the Environmental Protection Agency. Systems that use 10,000 pounds of ammonia or more are ruled by the PSM/RMP program, which has strict guidelines and reporting systems. Systems below 10,000 pounds, which is still well above the amount that would be used in the commercial and retail industry, must adhere to OSHA's General Duty Clause, Rule said.

Several years ago, IIAR developed the Ammonia Resource Management (ARM) manual to give guidance for complying with the General Duty Clause. "Now we have the commercial industry — light industrial, small cold-storage facilities and the retail food industry — that has an opportunity to use ammonia systems in their facilities, but they don't have a business model where they have engineers and technicians on-site," Rule said.

That creates a dilemma, he said. "The regulators are questioning proper guidance and monitoring for these systems. The owners and the rest of the commercial industry are doing the same thing."

To provide guidance, IIAR has developed the ARM-Low-Charge guidelines, also called ARM-LC, which is slated to be published in the next few months. It will help those in the food and retail distribution space create a refrigeration management program to ensure they meet the General Duty Clause and operate their systems safely. "If your refrigeration management program is effectively set up, your regulatory burden to manage it shouldn't be higher than it was on HFC systems," Rule said.

IIAR is also developing the ARM-LC Reference Manual, which provides specific details on what the design engineer, equipment manufacturer and installing contractor should look for and be aware of. "It simplifies what operators need to be doing to properly document and set up their refrigeration management program so they're compliant."

"Some consider this to be very onerous and difficult when it really isn't," Rule said. "It is more a system of documenting your program and how you select your equipment and contractor and set up the management system."

The program is very similar to current requirements for operating a store with today's HFC refrigerants. "Although they're not dealing with toxic refrigerants, there are still safety procedures, leak-reporting requirements and emergency management systems, so the concept of having a refrigeration management system should already be in place. This just gives you another way to look at it," Rule said.

Nelson said it may be only the biggest retailers that develop formal management systems and execute them in a consistent manner. "Actually, many large retailers are already familiar with General Duty Clause compliance, or even PSM/RMP compliance where they have ammonia distribution centers already. The smaller users that choose ammonia will deal with it on a case-by-case basis."

Tony Lundell, director of standards and safety for IIAR, said as a best practice, each refrigeration system should have its own Recognized and Generally Accepted Good Engineering Practices file, even if they aren't required to, because they're under 10,000 pounds. He said operators should have a file for each refrigeration system they have on-site detailing how the system was designed and installed and how it is continuously maintained for safe operations. "If an inspector from EPA or OSHA looks at the system, they can only audit against those files," he said.

If a system is under 10,000 pounds, an operator can't be audited under PSM, but an inspector can ask to see information under the General Duty Clause. It is very generalized and they'll start asking for system information.

"The ARM-LC document was developed to provide proper guidance for the owner and their service contractor to address these issues," Lundell said.

Nelson said some HFC requirements, such as those in California, are more burdensome than those for natural refrigerants. "Many don't realize that HFCs have been regulated there ever since 2006 with rules similar to the EPA's regulation of R-22 through Section 608 of the Clean Air Act, which, by the way, has resulted in many large fines issued to end users over the years, some well over $500,000," he said.

The federal EPA has recently made these regulations applicable for HFCs also, and has made the use of several HFC refrigerants illegal for use in certain applications through the federal Clean Air Act's Significant New Alternatives Policy program. "While this is all still tied up in legal battles on the federal level, California has gone ahead and adopted them locally," Nelson said. "So, with California being the largest U.S. economy, I would expect to see a continued trend toward more federal regulation for HFCs in the U.S., if not in the current administration, likely in the next."

EXPANDING THE REACH

In addition to the potential growth in the grocery industry, Liebendorfer said he also sees tremendous opportunities one tier up from the supermarkets, in the distribution centers and warehouses that serve the retail-food segment of the industry. The many smaller distribution centers, food-service providers and fulfillment centers have historically utilized Freon and present an immediate opportunity for ammonia, particularly because they're so focused on energy savings. "There is an uptick in smaller cold storage facilities and this is where ammonia and ammonia CO_2 will be experiencing rapid growth in the next few months," Liebendorfer said.

No matter what segment of the industry is adopting natural refrigerants, ammonia systems can offer significant benefits, including no global warming potential, a future-proof refrigerant and excellent thermodynamic qualities, Fernandez said. "When combined with a CO_2 system there is even improvement (reduction) in pull-down time at the case level," he added.

Awareness and education will continue to drive the future for natural refrigerants. "It is time to band together as stakeholders to drive the change we are seeking. It will be a win-win for all in the long run," Fernandez said.

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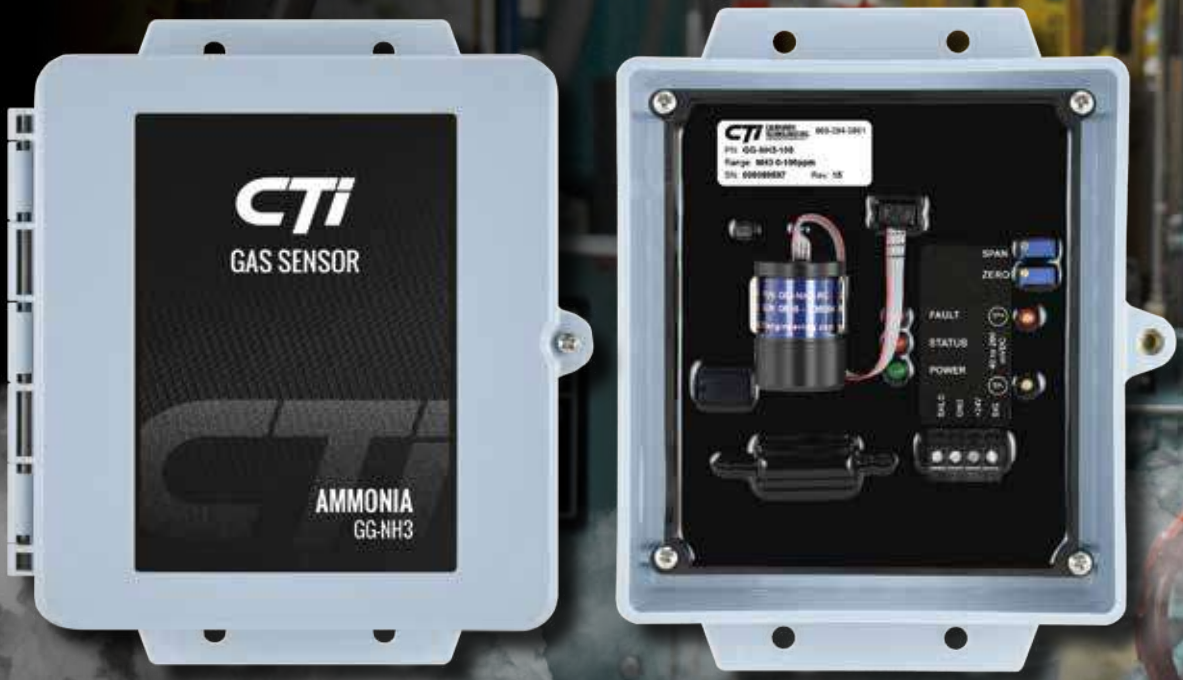

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With New Technology, Buying Decisions Hinge on Efficiency

The focus on efficiency and technology has become more important in every arena, and a growing number of companies are prioritizing the potential for long-term efficiency gains, reduced labor costs and streamlined maintenance - over initial cost - when designing their facilities.

"There is no magic bullet. It takes a lot of magic bullets," said Pete Lepschat, director of engineering for Henningsen Cold Storage Co., which is based in Hillsboro, Oregon. "Whether that is a capital investment, a process change or even a paperwork change, there is a never-ending list of possible improvements that we just keep rotating back through."

Lepschat said improving efficiency has been a priority for the Henningsen family since the company was founded in 1923. "It is a cultural thing for us. Since I've been here, it has been a major driver," he said, adding that through technology and equipment, Henningsen Cold Storage has a corporate-wide specific energy usage rate that is well under half of the industry average. "Our newest plant consumes only around 25 percent of the industry average. When our second biggest cost is 25 percent of the industry average, that is a competitive edge for us."

Bing Cheng, manager of utilities engineering at Campbell Soup Co., based in Camden, New Jersey, said decisions based on the long-term efficiency of systems have become standard practice for designing and choosing Campbell's new systems. "Our organization realizes these benefits not only affect our operating costs, but also improve our safety environment in the engine room and reduce our risk in human errors," he said.

SIZING SYSTEMS CORRECTLY

For Henningsen Cold Storage, the low-hanging fruit was gone a long time ago, and the company has had to become creative. "We're doing things that are harder for a typical company to justify," Lepschat said. "We see the benefit so we invest more. The savings compound like interest. It pays off over time."

Henningsen Cold Storage has built several plants over the past few years, and Lepschat said the company has made a commitment to reduce ammonia charges in their systems. The company's last plant utilized a central pumped-liquid overfeed ammonia system with an evaporative condenser on the roof. "The charge is very low at 3,000 pounds for a 143,000-square-foot freezer facility with refrigerated docks. That is also our most energy efficient plant," Lepschat said.

As part of his quest to reduce the ammonia charge, Lepschat recently started investigating carbon dioxide. "I had looked at ultra-low charge packaged NH_3, CO_2 trans-critical and CO_2/NH_3 cascade," he said, adding that as part of his research he looked at construction, operating and energy costs. "With conventional ammonia, you have to have someone there every day watching the system. That is a fairly big cost. With CO_2, it is pretty much a hands-off system." "The Trans-critical CO_2 system shaved several weeks off the construction schedule and saved thousands in construction costs."

The company ended up installing a transcritical CO_2 system, which Lepschat said "seems to check all of the boxes."

Evaluating the system requirements is also a priority for Campbell Soup Co., and the company is careful to size its refrigeration systems to match its cooling loads as closely as possible when rolling out new refrigeration system designs. "Closely matching ammonia compressor capacities to our cooling requirements ensures that we are operating at efficient, full-load conditions," Cheng said.

What's more, proper material selection and installation of insulation on piping, vessels and valves have provided long-term efficiencies in reducing heat loss for Campbell's. In addition, Campbell's tracks its electrical and water usage, which allows the company to quantify its efficiency gains specifically related to the ammonia refrigeration system.

SELECTING NEW EQUIPMENT

Campbell's has started to standardize the water treatment system for its condensers, utilizing a system that does not require any traditional water treatment chemicals. "This has reduced our blowdown rates, eliminated the need for chemical treatment equipment and eliminated our chemical material costs," Cheng said.

Henningsen designs its systems with more heat exchanger surface area. "Larger evaporators and condensers allow us to reduce our pressure differential. Those systems are more efficient," Lepschat said.

Henningsen has also embraced creative use of waste heat in the systems. "Traditionally, we'd send all of our heat outside and get rid of it into space. We've taken to doing things like warming under floors with it in some of the newer facilities," Lepschat said. "Rather than it being a waste product, now I almost don't have enough of it."

The waste heat can also be used to control humidity in parts of the warehouse or heat workshops. "We'd have to pay to heat with gas or electricity and now we're using waste heat," Lepschat said. "It is a reasonable investment and provides a reasonable return."

To reduce maintenance needs on its existing systems, Henningsen has turned to sealless ammonia pumps. "You don't have to periodically replace the seal, and a common leak point is eliminated. We are also using welded instead of flanged controls and valves for the same reason," Lepschat said.

Some operators have invested in corrosion-resistant pipe and valve treatments that last the life of the valve train system, which can save time. Traditionally, a facility could shut down for a week

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to sand and repaint all valves every year or so, but end users can now bypass that whole process and eliminate unnecessary maintenance related to managing corrosion, thus freeing up staff from time spent sanding and painting.

For Henningsen, other changes, such as investing in LED lighting to reduce the heat load inside of the freezer box and adding high-speed doors to freezer openings to minimize infiltration, have provided additional efficiency gains. "It is a death by 1,000 cuts kind of scenario. Many small savings measures add up and compound over time," Lepschat said.

TURNING TO AUTOMATION

Campbell's systems are fully automated, which ensures equipment is operating at optimum efficiencies. "We also operate our compressors at the lowest suction pressure, while maintaining our plant cooling load requirements," Cheng said.

Campbell's provides variable frequency drives on its condenser fan motors, which can help stabilize head pressures. "Condensers experience variable load conditions and having them on variable frequency drives eliminates the on/off conditions, which is inefficient," Cheng said.

For the past 20 years, everything refrigeration related has been computer controlled at Henningsen, and the company has used variable frequency drives for the past 20 years. "We wouldn't do a plant without VFD fans on condensers and evaporators and variable speed compressors. Those give us a huge bang for the buck," Lepschat said.

Because most of Campbell's systems are controlled automatically, operators can focus on monitoring and maintenance related tasks. "This also reduces the risk of human error and provides for a safer working environment in the ammonia engine room," Cheng said.

Lepschat said training staff is a top priority. "You can take the best designed or the most capable, efficient system and put in an operator that doesn't know what he is doing, and is all for naught," he said, adding that he focuses on teaching critical thinking to employees. "If they know the theory behind what is happening and don't take things for granted they are much better at finding ways for things to be improved."

DRAWING ON DATA

Gathering and tracking data on refrigeration systems, maintenance and repair can help operators take a risk-based approach to repairs and replacements, which can improve safety and ultimately reduce expenses.

Lepschat said data is king and Henningsen Cold Storage logs large quantities of information. "It goes into the database. We have information in there from the day we installed the system right up to now. You can trend things over time, like pressures and temperatures," he said. "All of our engineers are looking around in there for trends heading the wrong direction or things that pop up that aren't right."

Peter Thomas, president of Resource Compliance Inc., based in Dinuba, California, said gathering and tracking data is essential to predicting when equipment may fail in the future, which can improve operating efficiency by eliminating unnecessary downtime. "Collecting data quarterly for compressor vibration analysis can be thankless to an owner who is trying to cut costs, but could be the difference of tens of thousands in repairs later on," he said.

Campbell's monitors, tracks and trends operating data associated with our refrigeration systems through its programmable logic controllers/human machine interfaces. "This provides insight into our operating efficiencies and helps us in troubleshooting," Cheng said.

In addition, Campbell's operators perform daily checks of its refrigeration systems, which help identify any anomalies or maintenance issues. "We also perform five-year mechanical integrity audits to check any deterioration in our piping, vessels and insulation systems," Cheng said.

Lepschat said the goal is to use data and information to get to predictive maintenance rather than reactive or preventative maintenance. "The idea is to do inspections of that device, piece or part and use tracking and trending along with history to predict what needs to be done and to do it at the optimum time which is just before it fails. We do a lot of that now," he said.

Henningsen has also taken many of its inspections to the next level, which provides a clearer picture of equipment condition. Rather than doing a semi-annual vibration analysis, the company does semi-annual shock-pulse monitoring, which Lepschat said is, "10 levels above basic vibration analysis. We actually invested in our own SPM equipment and sent all of our operators to factory training, enabling them to take readings as often as they want."

Henningsen also invests in more advanced oil analysis. "You can do the basic one and it gives you information on water and wear metals, or you can spend a few more dollars for one that also gives you viscosity, total acid number, and a lot of other useful info." Lepschat said, adding that the company has invested in oil filtration systems which have virtually eliminated compressor oil changes. "I have plants built in 1996 with the original oil in the screw compressors, which still tests fine every six months. I've eliminated the cost of oil, the labor to change it and the danger associated with opening the system to get the oil in and out". "The compressors still look like new inside when we have them torn down for internal inspections

While vibration analysis and electrical tests have become common practice for larger companies, it can be difficult to educate the owners of smaller companies on the value, plus it can be a challenge for them to find qualified personnel to interpret the results of the data that is collected, Thomas said.

"Smaller companies need to partner with competent contractors and consultants that they can trust guide them through the process," Thomas said. "It is unlikely that a small business will have qualified staff to obtain or even interpret the results, so it is important to have business partners that can help.

Consultants can help companies get more value out of their five-year inspections, Thomas said. "Different consultants may have strengths in different areas — vibration analysis, piping inspection, ultrasonic thickness testing, RAGAGEP, etc.," he said. "Make sure that the inspector's qualifications are suitable to what the business needs are."

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- IIAR 9: Recognized and Generally Accepted Good Engineering Practices (RAGAGEP) for Closed-Circuit Ammonia Refrigeration Systems
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Industrial Refrigerant Apprenticeship Program Nears Completion

A consortium of agencies including RETA, IIAR, ARF, the Global Cold Chain Alliance, FASTPORT and Lanier Technical College has been working diligently to build the Industrial Refrigerant Apprenticeship Program and to get it up and running with the U.S. Department of Labor. It is with great pleasure that we announce that the process is nearly complete.

In the December issue of the Condenser, Lois Stirewalt O'Connor, executive director of the Ammonia Refrigeration Foundation remarked that there are over 40,000 refrigeration jobs nationwide waiting to be filled, and a nationally recognized apprenticeship program would help fill that gap. The program will have many benefits, particularly in terms of bolstering a shrinking workforce and also assisting companies that rely on industrial refrigeration to remain viable.

Jim Barron, executive director of RETA, the organization selected to be the administrator of the program, said the program is nearly ready to be put into action. RETA drafted the program's policies and procedures and outlined the requirements of the program. These policies and procedures were reviewed by members of the agency consortium, and RETA is now considering the consortium's notes and suggestions.

While Barron cannot share the names of companies in which interest has been piqued, he said there are several large players who are interested in participating. "There are already companies lining up for this program," Barron says, "so we need to get this out and start getting apprentices going."

Barron said the importance of this program cannot be understated. It is coming together at a critical and historical moment in the industry. A large segment of the refrigeration workforce is nearing retirement age, and there are no skilled workers to replace them. "The baby boomers are retiring out," Barron says. "When you have companies saying, 'We're going to lose 40 percent of our refrigeration staff in the next three years to retirement,' you have to look at that, and you have to get serious."

This shortage of refrigeration technicians is not a new topic of concern. According to Barron, it has been discussed for at least a decade, and he contends that if the problem is not addressed immediately, the industry could be facing an existential crisis. "It's come to the point now that we must do something to keep our food safe," he added.

Barron said the apprenticeship program will help entice young people, particularly those who are searching for a career with job security and competitive wages. "Not everyone is meant for a four-year college degree. With that being said, what do we have out there for the rest of these folks who are maybe mechanically inclined? Those are the kinds of people we're looking for," Barron states.

Dave Harrison, executive director of National Apprenticeship at FASTPORT, said that veterans are a perfect fit for this program, and has been actively working to get them involved. "A focus of this Industrial Refrigerant Apprenticeship Program is veterans and transitioning services members," he said. "One of the benefits to this, if you're a trainee and you have GI Bill benefits, you're eligible to draw a monthly housing allowance based on the zip code where you will be training. The average is approximately $1,500 a month to start." This is paid directly to the apprentice from the Department of Veterans Affairs and is in addition to the training wage drawn from the company with whom they are training. "Transitioning military personnel," Harrison stated, are a perfect fit.

Not only is the program lucrative for the apprentice, but also Harrison said he feels that generally speaking, veterans have the right mindset and work ethic for this industry. "If you engage transitioning military, they have higher retention rates, trainability and the ability to overcome obstacles. They're better employees," he said. "By and large, they will be better than their civilian counterparts."

Harrison also stressed the prioritization of accessibility in the design of the program. "What we've done very successfully is design a process for this registered apprenticeship program… this process allows multiple companies to engage quickly and seamlessly. We've built a national standard for the consortium. This is an industry-wide apprenticeship program."

To achieve maximum buy-in at the organizational level, the program had to be designed in such a way that employers could opt-in to predefined training elements. "This allows each employer to adopt a training process which has been approved, or they can substitute their own as long as it's relatively close," Harrison said. "Each company can tailor the training process to its own individual needs as long as the company is getting the proper certifications." He explained that this allows for flexibility from an employer's standpoint and also ensures that the program can be altered so that it will fit each company's particular needs.

By standardizing this apprenticeship process and making it as accessible as possible to companies, Harrison said that it will eventually create a pipeline of qualified technicians ready to fill the gaps left by exiting workforce members. "If you give people a process, a guideline, a map," he said, "then they will become a valued turn-key member of the industry."

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ARF AMMONIA REFRIGERATION FOUNDATION news

LOIS STIREWALT O'CONNOR
EXECUTIVE DIRECTOR, AMMONIA
REFRIGERATION FOUNDATION

High School Program Attracts Kids to Refrigeration

In an effort to attract more young people to the industrial refrigeration industry using natural refrigerants, a high school in Azle, Texas, is taking a novel approach. By offering a fully dedicated ammonia refrigeration class, the school gives students unprecedented hands-on training, meaningful work experience and even industry credentials long before their peers are even considering what their careers might be.

Marcos Braz, president of MRBraz & Associates and former Foundation Chair, who was instrumental in getting the program off the ground, says Azle High School is forward-thinking in the sense that it's working to prepare students not only to be successful in a traditional four-year college but also for careers in skilled trades. He worked with Azle's new Tech School, which is looking to fill educational gaps, to develop an industrial refrigeration course to help the industry gain exposure and to help young people develop the skills necessary to enter the labor market.

One of the first hurdles to overcome, Braz said, was to define industrial refrigeration for both students and faculty. The common misconception is that the industry deals with air conditioners and HVAC systems that use synthetic refrigerants, he said, when in reality it's directed greatly to the food storage and process rather than comfort cooling. Explaining its important role in the day to day of modern society was necessary. But once everyone was on the same page, the school's interest was piqued, and they wanted to know more.

"We worked together to develop a building plan that utilized about 30 feet by 40 feet for equipment layout and training and we made the intention of the class clear," Braz said. "A presentation was made to the board to show the potential of employment for the kids after they leave high school."

The Azle High School refrigeration facility was constructed with financial support from Azle High School and equipment donations from local refrigeration companies and end users. It was up and running by August 2017.

Braz developed the curriculum to cover the most basic concepts to more advanced refrigeration theory, using materials from the International Institute of Ammonia Refrigeration and Refrigeration Engineers & Technicians Association, he said. After students, who were sophomores, juniors and seniors, went through a two-semester-long course, they were given RETA's certification test. Of the eight students who took the test, six became certified.

Braz said he hopes that the success of this class will prompt other schools to consider similar programs. There is a tremendous need in the industry for new talent, and if gaps aren't quickly filled, many businesses may face a crises. "We need to generate hundreds of new technicians to make natural refrigeration viable. We need skilled individuals entering the industry to keep natural refrigeration alive."

"To change an oil filter on an ammonia compressor, you typically end up hiring a technician with 15 years of experience," Braz said. "[In today's workforce] this is difficult to find."

The success of the Azle refrigeration class has created excitement in the industry, Braz said. Course graduates were given the opportunity to attend the IIAR conference in Colorado Springs, Colo., where they were received well and became more intimately familiar with the industry and were also introduced to its key players. "It was a great visit for these kids," Braz said. "I think it was a life-changing experience."

CIMCO Highlights NHL Green Initiative

In late February, the Ammonia Refrigeration Foundation helped coordinate a meet-and-greet event to promote the natural refrigeration industry and joint member involvement in the upcoming National Hockey League (NHL) Stadium Series.

During the event, participants were given a first-hand look at how ice is created and maintained at NHL events. CIMCO Refrigeration, IIAR/GCCA is leading the process as the preferred supplier of refrigeration equipment to for the NHL, having installed 80 percent of the ice in the league's facilities.

CIMCO's ice creation and maintenance practices fall in line with the NHL's Green initiative, which emphasizes the need to make outdoor hockey games a reality – even in warmer climate cities, such as Annapolis – and to do so in a sustainable, environmentally-friendly manner. For the rink at the Naval Academy, CIMCO is using ammonia, a natural refrigerant, with glycol pumped through a 53-foot, 300-ton capacity mobile refrigeration unit to create the up to 2 inches of ice needed to sustain the outdoor rink.

The group was hosted by Lois Stirewalt O'Connor, the Foundation's executive director and Lowell Randall, Government Relations of IIAR and GCCA. In attendance were representatives from the Occupational Safety and Health Administration, the Environmental Protection Agency, the Department of Homeland Security, the U.S. Chamber of Commerce – Hiring our Heroes program, the Department of Defense, the Soldier for Life program, SkillBridge, and the ASHRAE Student members from the University of Maryland. Additionally, twelve students ranging from Sophomores to PHD candidates were in attendance.

The NHL Stadium Series showcases just one of the exciting ways ammonia technicians and operators can use their skills in the workplace. "We had a wonderful opportunity to help share a practical - and fun - application of ammonia in terms folks can understand," O'Connor said. "Government officials, students and transitioning military all had a chance to better understand this safe and natural refrigerant. "

IIAR Puts Resume Engine to Work

For many service members transitioning to civilian life, creating a resume that bridges the gap between their military service and a professional occupation is a daunting challenge. That's why the U.S. Chamber of Commerce Foundation's Hiring Our Heroes Program developed the Resume Engine -- a digital tool help transitioning service members draft resumes that will translate their military skills and experience into language applicable to the civilian job market.

The Ammonia Refrigeration Foundation is using this tool to help employers in the refrigeration industry to fill empty positions with transitioning military personnel. Many of these individuals possess the skills needed for a successful career in natural refrigeration, but they simply don't have access to it.

"The Foundation's support and partnership with Hiring Our Heroes provides immediate access for our member companies to identify, recruit, and hire qualified talent for the refrigeration industry," Foundation Executive Director Lois Stirewalt O'Connor said.

The foundation provides members with the ability to post job openings in the Resume Engine's database that provides qualified veterans access to over 60,000 job titles. The Foundation views the Resume Engine as a mutually beneficial tool; not only does it help veterans prepare for a life in the civilian workforce, but it also provides members with access to a uniquely qualified and talented labor pool consisting of the best and brightest America has to offer.

"The natural refrigeration industry has over 40,000 jobs available," O'Connor said. "Recruiting, training and hiring transitioning military, veterans or family members is not only 'the right thing to do' but also it makes sense. These are qualified personnel with similar skill sets and values that match our industry needs."

Hiring Our Heroes

On Thursday, April 11, more 300 military personnel transitioning out of the military, and their spouses, participated in the U.S. Chamber of Commerce "Hiring Our Heroes Transition Summit" at Dover Air Force Base in Dover, Del. The event was co-sponsored by the Ammonia Refrigeration Foundation.

The day-long session was designed to help veterans transition from military to civilian life. At the event, the veterans participated in workshops to develop their interviewing skills, had access to career counselors, and were given effective tactics for online job searching.

The Foundation sponsored the event as part of its ongoing outreach efforts not only to educate the general public about the importance of ammonia and other natural refrigerants, but also to encourage veterans and others to consider this industry as a viable and rewarding career.

The Foundation spearheaded one of four industry panels that participated in the event. Walter Teeter, Chair of the Foundation Board: Jim Price from the Refrigeration Engineers &Technicians Association; and Laura MCCann from Burris Logistics participated. Also attending were Werner Paulus of RDS

and Melissa Cassal of General Refrigeration. All brought job listings and reported positive interactions with the attendees. The Foundation team collected about a dozen resumes and are working to follow up with job seekers.

The Foundation was able to obtain a seat at this important table and move our industry forward due, in part, to the financial contributions of corporate members. Access like this can be time-consuming and challenging for contractors and small businesses that don't have a dedicated military outreach team like most larger manufacturing companies enjoy, so your ongoing financial support will enable the Foundation to continue to participate in these and other training, recruiting and hiring opportunities.

To find out how you can help #MakeAmmoniaGreatAgain by participating in future hiring summits, please contact the Foundation Executive Director, Lois S. O'Connor

Documenting RAGAGEP

BY PETER JORDAN, MBD RISK MANAGEMENT SERVICES, INC.

The Occupational Safety and Health Administration's Process Safety Management (PSM) standard (29 CFR 1910.119) was issued as a final rule in 1992. The Environmental Protection Agency's Risk Management Program (RM Program) regulation (40 CFR 68.79) was issued as a final rule in 1994.

Since both these regulations are relatively "mature", one would think that most of the procedures and practices needed to comply with their requirements are well known and relatively straightforward. But to this day, there are certain requirements which facilities routinely struggle to comply with. One of these is the requirement that employers must document that equipment complies with recognized and generally accepted good engineering practices (RAGAGEP.)

There are often two issues which facilities struggle with when attempting to document that their ammonia refrigeration equipment complies with RAGAGEP. First, what "good engineering practices" are they expected to comply with? Should they comply with the good engineering practices which were in place when equipment in the system was initially installed? Or should they comply with current practices under the assumption that they are no longer "grandfathered?"

OSHA and EPA regulators have also struggled with this difficulty. I am aware of PSM and RM Program audits conducted by regulators where they attempted to apply the latest IIAR standards, such as ANSI/IIAR 2-2014, to existing ammonia refrigeration systems which were installed prior to 2014. Worse, I have been involved in audits where the regulators tried to apply good engineering practices applicable to other industries – such as American Petroleum Institute (API) standards -- to ammonia refrigeration systems. Needless to say, those audits have not gone well.

In 2014, IIAR and OSHA representatives met to discuss issues related to RAGAGEP. One of the key items on the agenda was how existing facilities would be affected by updated codes and standards. During the meeting, it was agreed that existing facilities wouldn't be expected to immediately implement the new codes and standards.

The OSHA representatives did indicate, however, that they would expect an evaluation to determine which new codes and standards should be implemented, especially when there are new safety hazards or controls that have been identified by the industry. The OSHA representatives also indicated they would look favorably if a new standard was developed which defined the minimum requirements that all facilities should comply with.

In 2015, the IIAR Standards Committee established a subcommittee led by Eric Johnston to develop a standard which provides the minimum RAGAGEP applicable to existing closed-circuit ammonia refrigeration systems. This standard, which is designated by BSR/IIAR 9-201X (IIAR 9), is

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currently being finalized as part of the ANSI public review process. Once finalized, it is anticipated that the proposed standard will help companies ascertain whether their existing systems should be updated to reflect new requirements from updated codes and standards, thus helping determine what equipment should or should not be "grandfathered" for these systems.

Twice in 2018, I have been asked by clients to conduct an evaluation of existing ammonia refrigeration systems to determine if these systems comply with industry codes and standards. One of these clients is located in South America and the other client is located in the United States. My proposal to each facility included the following scope of work:

An evaluation of the ammonia refrigeration system will be conducted to determine if the equipment is designed, constructed, and operated in accordance with IIAR standards. The purpose of this evaluation will be to document any gaps between the operation of the ammonia refrigeration system and the IIAR standards. The primary document which would be used during this evaluation is BSR/IIAR 9-201x, IIAR's draft Standard for Recognized and Generally Accepted Good Engineering Practices (RAGAGEP) for Existing Closed-Circuit Ammonia Refrigeration Systems.

We chose to use the draft version of IIAR 9 for the evaluation conducted in South America because (1) the equipment was installed in stages and we did not wish to use multiple versions of ANSI/IIAR 2 to conduct the evaluation and (2) we were not able to identify any local building, fire, mechanical or electrical codes which would take precedence over IIAR 9.

We chose to use the draft version of IIAR 9 for the evaluation conducted in the United States based on discussions with the local regulatory authority. Fortunately, the local regulatory authority was familiar with IIAR 9 and stated that they would be comfortable with the results if we used IIAR 9.

In both cases, we acknowledged that we were taking a risk because IIAR 9 only exists in draft form; changes will be made before IIAR 9 is finalized. For the facility in South America, I will most likely make a return visit during which we will review the progress made in addressing the gaps identified during the evaluation and address differences between the draft version of IIAR 9 and the finalized version. For the facility in the United States, the evaluation would have to be updated at a later date once IIAR 9 is finalized, most likely when the next Process Hazard Analysis study is conducted at the facility.

The method used to conduct the evaluation was relatively straightforward. First, I prepared a Microsoft Word® table with four columns: (1) BSR/IIAR 9-201X Requirements, (2) Existing System, (3) Gaps Identified, and (4) Method Used to Address Gaps.

8.3.12.2, Part 1: A clearly identified control switch for emergency ventilation with a tamper-resistant cover shall be located outside the machinery room and adjacent to the designated principal machinery room door.

There is no "On/Auto" control switch for the emergency ventilation system located at the main entrance to the main machinery room.

An "On/Auto" control switch needs to be installed at the main entrance to the machinery room.

Install a clearly identified "On/Auto" control switch for the emergency ventilation system with a tamper-resistant cover outside the main (west) entrance to the main machinery room. The control switch must not have an "Off" position.

The next step of the evaluation was to obtain documents related to the facility's ammonia refrigeration system. I requested the following documents for each facility. Where documentation was unavailable, we either prepared the documentation on-site or made a recommendation during the evaluation to develop the documentation at a later date.

- Block flow diagram(s);
- Piping and instrumentation diagrams (P&IDs);
- Inventory calculations used to estimate the amount of ammonia in the refrigeration system;
- A list of pressure relief valves, along with sizing calculations related to pressure relief valves and pressure relief headers;
- A description of the ventilation system in the machinery room, along with sizing calculations for the ventilation equipment;
- Load calculations for the ammonia refrigeration equipment;
- Written operating procedures describing the steps used to start and

shut down the ammonia refrigeration equipment;

- A description of the ammonia detectors, including the location of the detectors, the set point for the detectors, and the actions taken if the ammonia concentration exceeds the setpoints;
- A description of any emergency stop button (E-stop), including the location of these buttons and the actions taken if a stop button is pressed;
- Manufacturer's data sheets and installation manuals for ammonia refrigeration equipment.

The on-site portion of the evaluation involved additional document reviews, equipment inspections and discussions with facility personnel. Approximately two days were spent at each facility conducting the evaluation. In each case, additional time was spent at the facility on other activities. In each case, I prepared an evaluation report which contained the completed evaluation table and a list of recommendations.

The type of recommendations identified during the evaluation were similar to those which would have been identified during a Process Hazard Analysis study. For example, there were recommendations to:

- Upgrade the ammonia detection systems;
- Install and/or modify emergency shutdown systems;
- Upgrade the machinery room ventilation systems;
- Upgrade the pressure relief systems;
- Install additional eyewash/safety showers;
- Upgrade the labeling and signage.

A significant amount of time and effort will be required to finalized IIAR 9. And there may be some within the ammonia refrigeration industry who may not fully appreciate IIAR 9. But my clients and I are happy with the evaluations we conducted using the draft version of IIAR 9. The advantage of conducting the evaluation is that each facility now has a document which can be used to demonstrate compliance with RAGAGEP. If/when these facilities are audited by a regulatory authority, these documents may prove to be invaluable.

Standards Committee Focuses on CO_2

One of the main focuses this year for the Standards Committee has been the development of a CO_2 standard. As this refrigerant is growing in popularity, it's becoming clear the industry needs guidance on its development, deployment and safety measures.

John Collins, the CO_2 safety standard taskforce leader and Industrial Sales Manager for manufacturer, Zero Zone, said the new standard will be comprehensive in scope. "It will cover the life of a C02 refrigeration system from its inception and design stage through construction, installation, start-up and subsequent operation." What's missing from the industry right now, he said, is a standard which effectively covers all those aspects. While IIAR has released a CO_2 handbook as a reference and a resource, it doesn't carry the weight of a complete standard.

This standard represents the culmination of a prioritization effort the IIAR has been discussing for years, Collins said. The organization has been moving away from strictly dealing with ammonia and widening its focus to other natural refrigerants. "This is a progression of a decision that was made by this organization more than 10 years ago, we've been moving towards this project since then," he said.

In the industry, what we're seeing is a shift away from some of the more traditional synthetic refrigerants, and C02 is starting to fill those gaps, said Collins. He explains this increased focus on C02 has been driven by increased regulations on these refrigerants. There were a number of changes to laws and rules which applied to hydrofluorocarbons, making their use more complicated. CO_2 seems to be filling a need, and due to these regulatory changes as well as progress in refrigeration technologies, its use has become more popular over the past decade.

"A good part of what's driving this is a lot of development in the retail and commercial sector," Collins said. "We are seeing CO_2 technology that has been developed for retail and commercial sectors of the industry now being applied in the industrial sector." For example, transcritical refrigeration technology is making the application and use of CO_2 a lot broader."

Because of this increase in popularity, there's a need in the industry to have a clear set of rules in developing these systems. With the rate of growth, there's a lag in terms of what is available for guidance, Collins said. The IIAR is stepping up to address this need.

> **"A good part of what's driving this is a lot of development in the retail and commercial sector."**
>
> **–John Collins, CO_2 safety standard development taskforce leader**

It's important that IIAR, as an accredited standard-issuing body, take the lead on this issue, Collins said. "This standard, once published, will be used by the industry as a whole and referenced by code authorities to actually create the laws and rules by which we build and operate these systems."

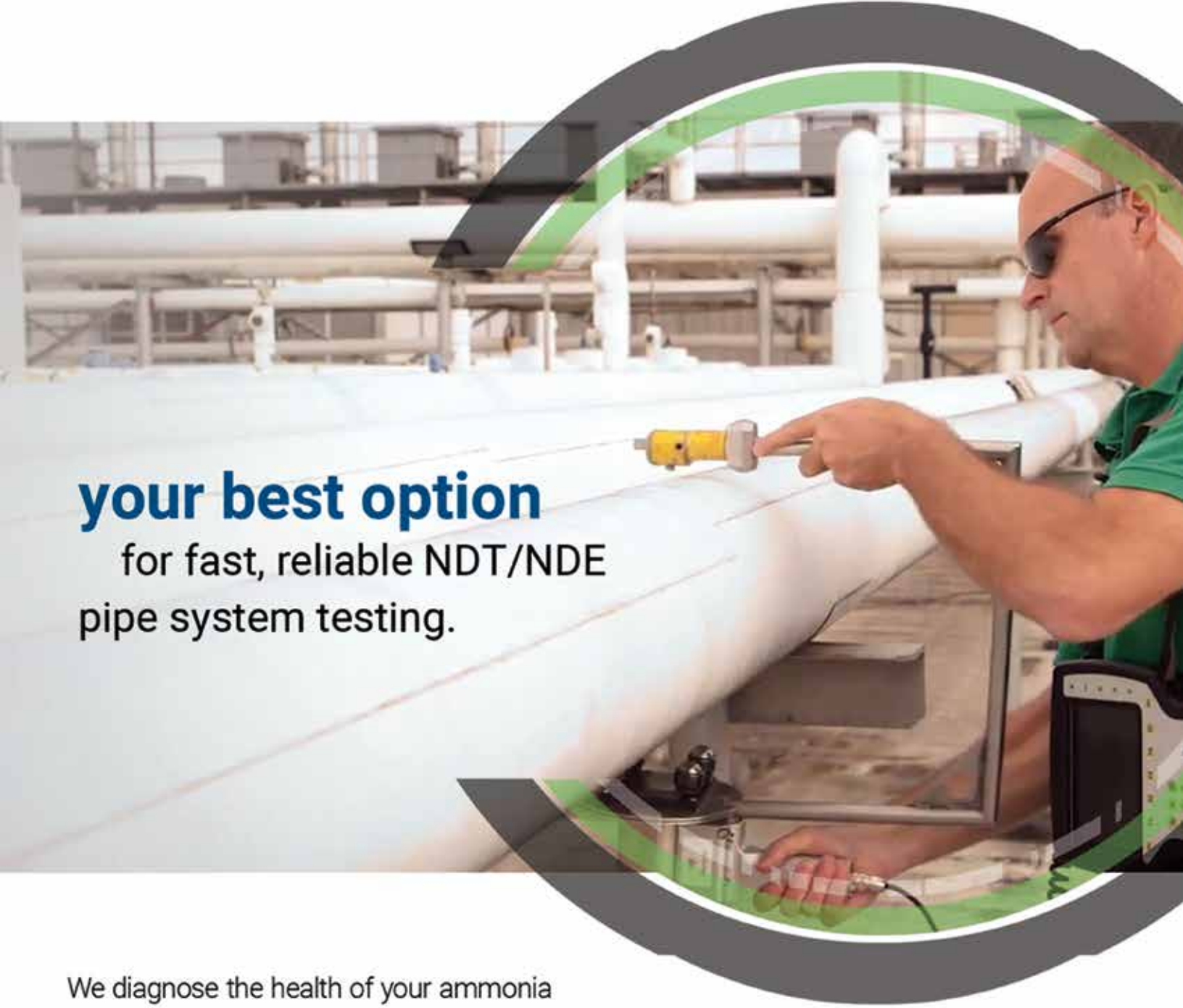
Over the past year, the IIAR CO_2 task group has been meeting on a regular basis, and over the last 8 months, these efforts have been accelerated to facilitate the development of the standards document. "We're having weekly phone calls with the task group," Collins said. "A core group of members is doing the heavy lifting of pulling together materials to develop the document."

The framework is structured to mirror the arrangement of existing IIAR materials. There's a design section, there's an installation section, there's a commissioning and inspection section, and others similar to that which would be found in other standards. That being said, there's an awful lot of new material which is specific to C02, being that it's such a different refrigerant than ammonia and its application is driven by those differences. We have a lot of work to do to incorporate CO_2-specific content and to make it a stand-alone C02 standard."

A rough draft of the first eight chapters, which deal with design, has been drafted. The remaining chapters are in progress. Collins said content has been driven by a small group at first to lay the groundwork, but that focus will broaden to get input from across the industry to help finalize the particulars of each section. "We are committed to engaging experts from the commercial side of our industry in this effort. The North American Sustainable Refrigeration Council (NASRC) is an industry group, with a focus on the retail sector, who shares many common goals with IIAR. Many IIAR members are also NASRC members; and we are working with the organization to develop the standard with the necessary considerations for broad application."

In the fall meeting of the Standards Committee, Collins said he hopes the remaining sections will be mostly completed, and by the January meeting, he said it's his expectation that the initial draft will be complete. At that point, the board will be invited to approve a public review sometime in the spring of next year.

"When you're developing a new standard of this scope it's not a small task." I think one of the things IIAR is good at is getting these projects done in a timely manner," Collins said. "I think the fact that IIAR has a history of putting together standards in a focused way is one of the reasons why we're in a position to be successful.



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International Committee Expands Outreach

Over the past year and a half, IIAR's International Committee has established working chapters in several Latin American countries and has its sights set on more countries across the region and the world.

Argentina, Chile, Peru, Ecuador, Colombia, Central America, Costa Rica and Mexico now all have active IIAR chapters, and the group is taking action to establish chapters in Uruguay, Paraguay, and Brazil, as well as in Spain. "We've already been working in these countries, said Adolfo Balsquez, the International Committee's Chair. "We know people and have been having conferences with them."

In addition to outreach efforts, the International Committee helped facilitate meetings in several countries. The meeting in Costa Rica was particularly interesting because governmental officials were on hand to discuss the creation of national standards using IIAR materials as a framework. "We spoke with the Minister of ecology," Balsquez said. "She's very straight-forward and wants to get things done. I'm happy we've found these types of people because we've been taking giant steps to establish these standards." Additionally, the International committee has been working with the Costa Rican government to register and certify all of the country's refrigeration technicians and engineers.

"The good news is that we're close to accomplishing this. Once we have these programs settled in Costa Rica, it will be easier to approach other countries to do the same. We're going to engage the chapters we've established to start working with government agencies to look into adoption of IIAR standards." Balsquez said he expects these standards to be fully adopted in Costa Rica within the next few months.

In Chile, the committee is engaging with the country's biggest university to establish a master's degree in refrigeration. To Balsquez's knowledge, this would be the first such program in higher education. If this goal is not accomplished, though, he said the university system would still be offering certification programs for those interested in joining the industry.

"This is knowledge of refrigeration; this isn't exclusive to the United States. You can do the same work right here in Paraguay, Ecuador, Chile and Argentina. It's going to be safer, it's going to be better for the end user, and it's going to be better for the education system."

–Adolfo Balsquez, International Committee Chair

News of this action spread to Argentina, Balsquez said. "They don't want to be left behind, either," he quipped. Next month the Argentinian chapter will hold a meeting in Mendoza, in the middle of the Mendoza wine producing region, and a major refrigerant consumer.

Additionally, Colombia recently held its meeting in Bogota, where hundreds attended.

Federico Alacon, Administrator for Latin America, said the IIAR Argentinian chapter also hosted a Safety Day in Rafaela, a fruit-growing region with many natural refrigerant end-users, attended by more than 250 people, including first responders and other government officials.

During the first part of the Safety Day, Rick Williams from the Ammonia Safety and Training Institute taught a 30-minute emergency response plan. In the afternoon, Carolina de la Fuente from the Ministry of Health presented the final version of the regulations on safety conditions in ammonia refrigeration systems which is based on IIAR standards and other information.

Implementation and compliance with these codes is a way off, but in the meantime, Alacon said he sees opportunity for the International Committee to help end users, technicians and engineers to fall into compliance by offering information and education programs.

Overall, there is an international momentum growing, and this momentum is very exciting, Balsquez said. By tapping into the international market, IIAR is positioning itself as a global leader in this industry. "[The] Spanish-speaking world – we are 650 million people. We can definitely get another three or four thousand engineers [in this region] to really engage with the IIAR," he said. "This is good for two reasons – these professionals will be better in their work, and they will be safer."

One stumbling block to this process is that oftentimes organizations such as IIAR are viewed as being effective only in their home country. Balsquez said the International Committee is committed to dispelling this misconception. "This is knowledge of refrigeration; this isn't exclusive to the United States. You can apply the IIAR standards publications and educational materials right here in Paraguay, Ecuador, Chile and Argentina. It's going to be safer, it's going to be better for the end user, and it's going to be better for the education system."

Balsquez said that as knowledge and international adoption of IIAR standards spread, the industry will no longer be siloed and segmented, and this isn't limited just to Latin America. The international committee is also making inroads in India, China, Europe and Australia, and already the committee has seen international membership grow, with many new members over the past year and a half. "This is going to help everybody. These members will be working on committees, and adding to the conversation," Balsquez said. "These committees will be stronger, the information will be more diverse, we can accomplish more."

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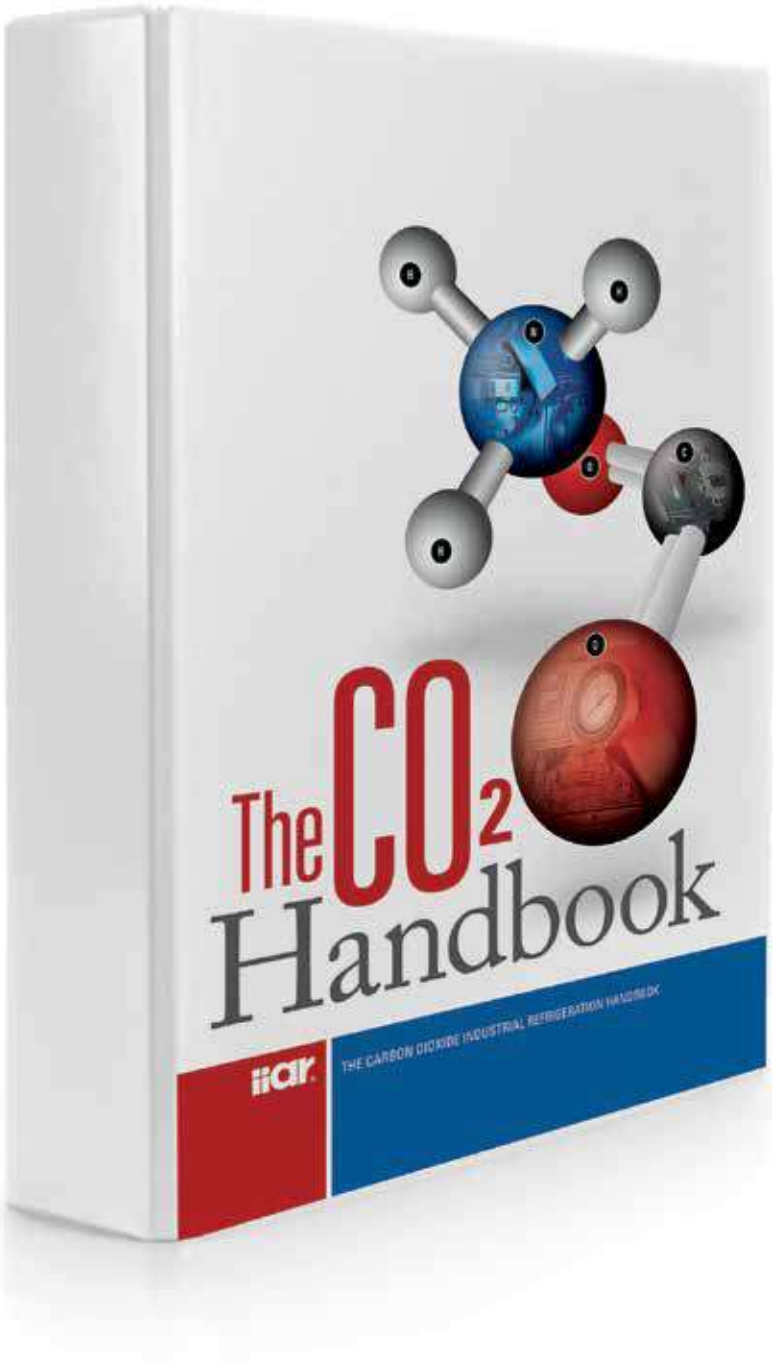

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Marketing Committee's Report Quantifies Member Data

This year the IIAR Marketing Committee released its first State of the Industry report. The objective of the report was to compile various data sets and information about the industry and present it to IIAR members in an easily digestible way to share valuable information.

"Our goal this year was to initiate the report for the membership of IIAR," said Stephanie Smith, the marketing sub-committee chair. "We focused on inspections and violations with the EPA [Environmental Protection Agency] and OSHA [the Occupational Safety and Health Administration] because there is a lot of data and they've been given initiatives to get that data out… I think its valuable to see what's going on with these agencies and what they're finding."

Smith said the visualization of this data helps end users to determine where they might need to look at their programs in terms of safety and determine where potential hazards might be.

The report provided graphs to break down the types of violations reported to both OSHA and EPA and dollar amounts of penalties leveled against violators. "I think it's important to see where OSHA is finding violations in other facilities so you can address these issues at your own facility and make sure you're up to par," Smith said.

The report also gives a brief insight into regulatory and standards updates as well as an update on the Chemical Facility Anti-Terrorism Standards Program (CFATS). Since Oct. 2015, IIAR has been working with the Department of Homeland Security regarding the department's Chemicals of Interest list. While Smith said there has not yet been major movement on this topic, its inclusion in the report is meant to keep members aware and abreast of potential changes they might be facing in the future.

Looking forward to the 2019 report, Smith said the focus will be on where the industry is headed and focusing more on low-charge systems and alternative refrigerants. It will also widen the focus internationally to better understand the industry on a global scale.

To help draft the next report, the committee released a survey to gauge what members might like to see. "Ultimately, we need help from industry members – we want to know what they'd like to see discussed," Smith said. She encourages all members to visit the IIAR website to participate in the survey, which asks:

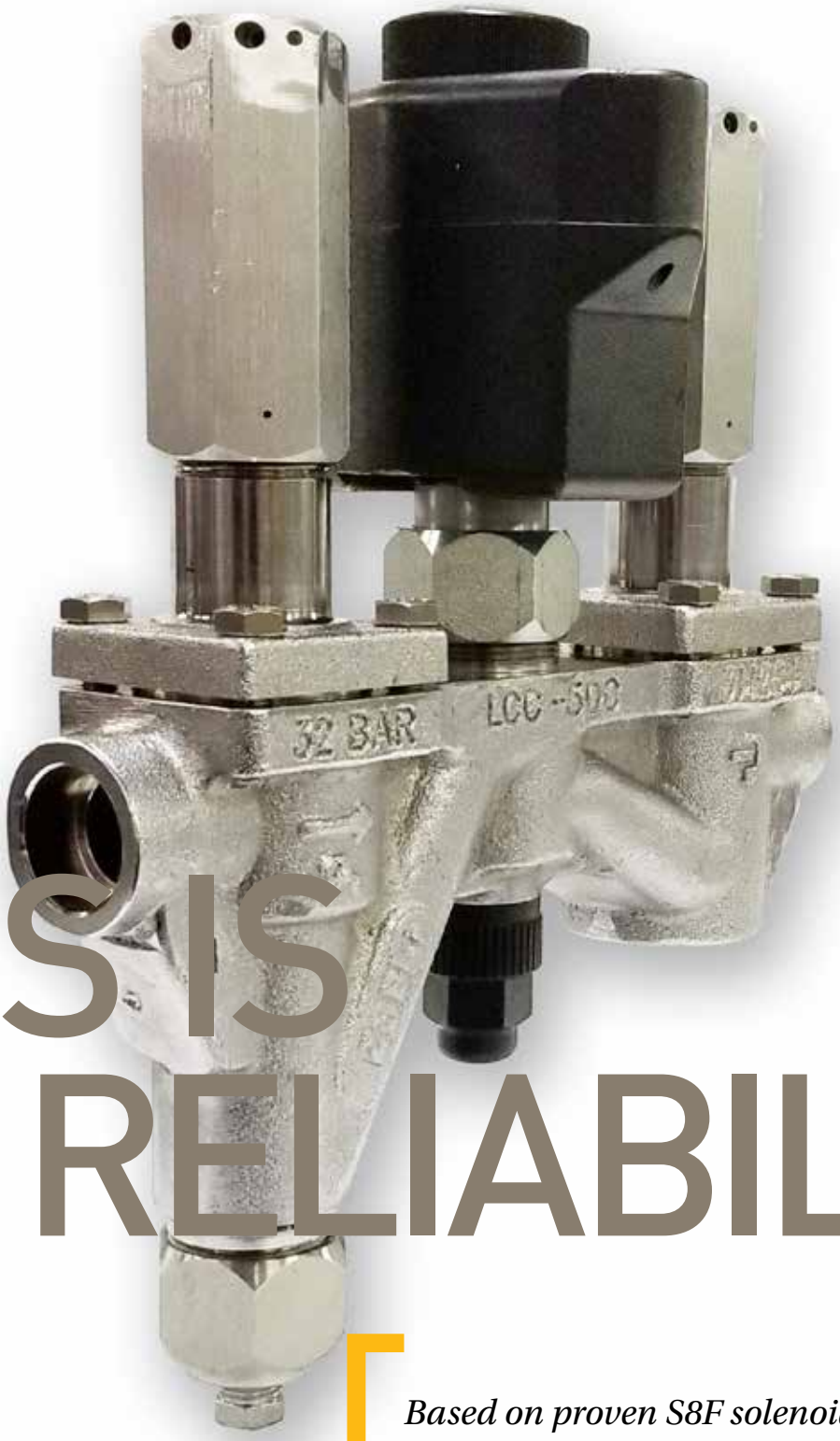
- For those who have classified reportable incidents to the National Reporting Center as "other" or "unknown," was there more information later to classify it differently? If so, what was the new classification?
- What new technologies (cascade systems, low-charge systems, etc.) are end-users actually using and how do they compare to "traditional" ammonia refrigeration systems?
- If the membership could make one change/suggestion to the regulatory community, what would you change/suggest?
- What is the biggest challenge faced for end-users in the industrial refrigeration industry?
- What information would you like to see in future reports?

Those who wish to respond can do so on the IIAR site by searching for the 2018 State of the Industry Report.

"Generally speaking, the intent of the report is to try to quantify data that's of interest to the membership of IIAR," said Werner Paulus, the marketing committee chair. "We're trying to take a handful of specific topics on an annual basis and then report on those topics with input from the members."

"We focused on inspections and violations with the EPA [Environmental Protection Agency] and OSHA [the Occupational Safety and Health Administration] because there is a lot of data and they've been given initiatives to get that data out… I think its valuable to see what's going on with these agencies and what they're finding."

–Stephanie Smith, the marketing sub-committee chair.



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How much is in the system?

BY KEM RUSSELL

Anyone who has an ammonia system should know how much ammonia is in the system. There are at least a couple of important reasons.

One reason is compliance with federal safety and risk-management regulations. If the system is over the threshold quantity of 10,000 pounds, then it is subject to both the OSHA Process Safety Management (PSM) program and the EPA Risk Management Program (RMP). Additionally, some states may have more stringent program levels.

The second reason is, if the quantity is 500 lbs. or more, then it must be reported annually as part of Tier II. Tier II reporting is not difficult to do, but if not properly done state and local agencies and responders will not know that you have ammonia or other hazardous chemicals on-site. As with the PSM and the RMP programs, there are potentially serious penalties for not complying with these requirements. The majority of ammonia systems have over 500 lbs., but with the introduction of low-charge systems, some have less than 500 lbs. Even systems operating under that threshold must comply with federal General Duty Clause requirements. The important thing is to know how much is in the system.

There are at least three ways to determine how much is in a system.

If the system is new and this is the initial charging of the system, sizing it should be relatively simple. An accurate amount of ammonia can be obtained from the ammonia supplier or installing contractor. At least you know how much was put in on day one, which may not be the case after the system has been in use.

If the system has been in operation for some time, calculating the amount of ammonia can be done either by pumping down the system, or by calculating the volume of all the vessels, pipes and valves in the system.

Pumping down can be fairly accurate, but difficult. A good system pump-down could take several attempts, and likely several days. It is somewhat of a challenge pumping out the ammonia from insulated vessels and piping due to the decreased heat input that would vaporize the liquid ammonia.

How well the pump-down goes also depends on how low the system can be pulled down. A system should be pulled into a vacuum, then left to sit for some time. Likely the pressure will increase, indicating there is still ammonia in the system that needs to be pumped back. Ideally, a system is pumped down enough so that the pressure in the system does not rise, but instead remains in a vacuum.

Many systems cannot do a total pump-down because the system cannot be shut down long enough for this to happen, and/or there is not sufficient storage volume in the high-pressure receiver or other potential storage pressure vessels to hold the entire charge. With many large systems, this is the case, so volume must be calculated.

IIAR has provided tables and charts in the "Process Safety Information" section of the PSM/RMP guidelines. The tables and charts can be very helpful in coming up with a calculated estimate of the total ammonia charge. However, it will require some investigative work.

The method of calculating the total ammonia charge is challenging. You need to know the size and length of every ammonia pipe in the system, the operating temperature of the ammonia in those pipes and what phase the ammonia is in. The pipe may have liquid, vapor, or two-phase flow. The more accurate the information on all these fac-

As with the PSM and the RMP programs, there are potentially serious penalties for not complying with these requirements. The majority of ammonia systems have over 500 lbs., but with the introduction of low-charge systems, some have less than 500 lbs. The important thing is to know how much is in the system.

tors, the better the result. Fortunately, most refrigeration equipment manufacturers provide the estimated ammonia charge for their equipment.

The tricky part of calculating the total charge is that the estimate must be based on a "snapshot in time" that best fits the systems "typical" operation. It's tricky because a "typical system operation estimation" could miss by a lot on several occasions.

For example, for several years the charge in a system I encountered had been calculated and re-calculated. It was clear from all of these calculations that the system had over 10,000 lbs. of ammonia. As the calculation was refined, the total charge amount increased to nearly 20,000 lbs. The charge amount was reported on the facility's Tier II, on the submitted RMP, and documented in their PSI section of the PSM/RM Program.

I happened to be at their plant auditing their PSM/RMP, and mentioned to the chief engineer, "It sure would be nice if you could totally pump down the system".

Fortunately, the facility was going to shut down completely for some weeks, so the chief said he would do a good pump down with the shut down. The system had two good-size high-pressure receivers, so it seemed possible that the system could be totally pumped down.

I checked in with the chief a couple of weeks later and he told me he had done multiple pump downs of the system. He was going to do a couple of more just to be sure, but he figured he wouldn't be getting much if anything back.

The system's two high-pressure receivers were interconnected with isolation valves. The chief engineer said that one of the receivers had been totally emptied and isolated some time ago, so the total system charge fit into the other receiver.

He explained the depth of the vessel, the vessel size (OD and length), and the pressure in the vessel. Using that information, I calculated the amount of ammonia.

"That can't be right," I said to myself. I calculated it again. Same answer. The amount was significantly less than 10,000 lbs. How could that be?

The lesson learned: you must base the charge calculation on a point in time when you can accurately estimate how much ammonia is in all the piping, vessels and equipment. In this case, the previous calculations had assumed, incorrectly, that everything in the system would be operating simultaneously. The chief said all the equipment is not operated at the same time, only those pieces required for the production being done.

This particular facility has a complete PSM/RMP, which they will continue. However, now the discussion is: might something change in the future requiring more ammonia, or should the facility be deregistered with EPA? The Tier II report will also have to be updated.

If the only reasonable approach is to calculate the amount of ammonia in a system, take the time to find out what really is operating and the conditions of operation. Don't assume you know that answer already.

Putting more Action in your Emergency Action Plan

In an emergency situation, every minute counts, and having a plan in place allows first responders and public safety officials to contain most threats before they grow into an unmanageable problem.

During the Las Vegas Safety Day event, the Ammonia Safety and Training Institute, the Las Vegas Hazmat Team and others, including Michael Winburn, vice president of operations at Shetakis, which operates a cold storage facility in Las Vegas, came together to demonstrate how advanced planning can save critical time.

Gary Smith, president of ASTI, an organization with the mission to "make ammonia the safest managed hazardous material in the world," said nearly 200 industrial responders and government and public safety officials attended the event, which was held March 27 and 28.

A PLAN IN ACTION

Winburn and his team took on the role of plant incident commander to demonstrate how effective it was to use his command team to address a safety situation and was able to show how he and his team accomplished the entire process, starting with the initial discovery, in seven minutes.

Winburn has worked closely with ASTI to create useful, detailed checklists as part of the company's safety plan. "The magic of ASTI is stepping back and looking at it more in depth and different ways to make those plans better. You can have plan A, which meets the regulatory requirements, and then Plan B that really goes in depth," Winburn said.

Smith said he has been working on safety plans for 10 years to take the technically difficult measures out of the planning process and create easy-to-follow checklists which operators can use to engage with their players. "You train with it a few times [and] it becomes muscle memory," he said, adding that the checklists have been designed to help operators provide upfront information that tells their teams the hazard zone, the level of concern and their assignments. "They have a checklist of their own, so they start engaging."

To demonstrate the plan, Winburn and first responders created a video, which has resonated with those who watched it. "A lot of people have come to me and said, 'This all makes sense,'" he said, adding that different people learn in different ways. "I had a friend who has been in the refrigeration industry for 18 years who was at Ammonia Safety Day. He saw the video and said, 'I've been doing this for 18 years. I've helped various customers maintain their equipment and plants. I've been a part of evacuation drills, but it all pulled together after watching the video.'"

View the video at https://ammonia-safety.com/one-plan-response/.

Smith said it is possible for any operation to create a similar plan. "People have to understand the importance of not boxing yourself in by thinking you can't do these things. Don't undersell your people or think they can't rise to the occasion," he said.

In addition to providing guidance on the plan, Winburn said the team at ASTI has helped open up the communication between industry, first responders and regulators, which was especially helpful because he hadn't made progress on that front despite repeated attempts. Since then, he has had multiple municipalities, the Federal Bureau of Investigation and the North Las Vegas Police through his building. "As far as taking down some of the barriers to getting the organizations together, ASTI has been key in that," he said.

Winburn credited his team for their dedication to safety. "There is one of me and 90 more people that work at Shetakis. Without the support cooperation and desire to be better as a company from everybody, I could never do my job," he said.

REAL-WORLD APPLICATION

The knowledge gained at Safety Day events was put into action recently by Captain Richard Nudd, a hazmat technician and a member of the Las Vegas hazmat team. Nudd attended the Safety Day this year as well as in 2017, and recently was called to a leak at an old plant, Desert Gold Food Co. Nudd was able to apply his knowledge and resolve the situation quickly after the initial call came in, reporting a strong smell of ammonia spreading 500 to 1,000 feet from the facility, Smith said.

Nudd and his first-in crew advanced on the release with limited support from the plant manager who said that the leak had been stopped but the odor was getting stronger. "Captain Nudd understood the high/low side concerns, from our class last year," Smith said. "He asked if the leaking evaporator had been pumped down and isolated. The answer was yes, but he could see that the plant manager was unsure. The lead operator and contractor had been called and were not on the scene."

Nudd asked to see the cold room where the leak was occurring and as he and his team approached, they could hear the hissing of the release. "Captain Nudd called the lead operator for the plant on the phone," Smith said.

The operator explained where the two valves were located that isolate the evaporator. "The firefighters closed those valves and immediately heard the release hissing stop," Smith said.

Nudd took a video of the cloud developing in the room and used his four-gas monitor to read the percentage of ammonia in the room, which was about 120,000 ppm. "He considered the need for positive pressure ventilation, but the building was about 300,000 square feet and had many intervening rooms and add-on cold boxes between the ventilation inlet and outlet exhaust," Smith said.

The room had a drainage system, so Nudd called wastewater and told them that he wanted to send some aqueous ammonia their way, and they gave the okay. "They sprayed the cloud with fog spray and immediately reduced the 120,000 ppm concentration of ammonia vapor by about 75 percent, as the aqueous ammonia escaped through the floor drain," Smith said. "Las Vegas public works monitored their drainage plan and coordinated with Captain Nudd on any concerns."

Ultimately, there were no concerns as Las Vegas public works has more

than 300 miles of drainage system plus dry containment catch basins to move the storm water flow before processing the ammonia through their wastewater plant, Smith said.

Next, Nudd used the water streams to support positive pressure ventilation by placing the streams on the exhaust outlet. "The total time on the scene was 4.5 hours. If the same problem were to occur today, they could deal with it even faster," Smith said.

"During our work with the two-day safety day we got Lance Cranford and Captain Nudd together. We also created a master map and Blue Playbook for Desert Cold that showed how the plant and fire department were gaining a higher level of cooperation and future planning," Smith said.

EPA, state emergency response commission representatives and local inspectors were all in the audience and supported the cooperative approach. Desert Gold is working with C&L Refrigeration who has willingly implemented over $400,000 of improvements to the plant, Smith said.

CONTINUED PARTNERSHIPS

Emergency response requires a team approach, and the Las Vegas Safety Day event helped bring responders together. "Last year there was a lot of anxiety about not having a good Tripod relationship between the responders, industry and government, particularly between city and county interests," Smith said.

This year Carlito Rayos, emergency manager from the City of North Las Vegas, Soleme Barton, assistant emergency manager, and Richard Volez from C&L Refrigeration organized the first meeting of local industry, government and public safety. "They have formed a Community Advisory Organization with bylaws, officers, membership and an on-going agenda," Smith said.

During the event, ASTI also featured the Henderson Industrial Community Advisory Panel that has an on-going relationship that supports joint effort in managing hazardous materials.

The spirit of collaboration has reached far beyond Las Vegas. In 2016 Kathryn Lawrence, chief of emergency prevention and preparedness for Region #9 EPA (California, Arizona, Nevada and Hawaii) called a meeting of local, state and federal Occupational Safety and Health Administation and Environmental Protection Administration leaders. ASTI was invited to share thoughts about how to improve the working relationship between government, industry, and public safety to improve the effectiveness of prevention, preparedness and response to hazmat emergencies, Smith said.

Anhydrous ammonia was the target chemical to demonstrate a new and better way to "prevent emergencies or stop them small." Lawrence found the funding to perform Safety Day training within Region #9. By the end of 2018, EPA and ASTI will have provided safety day training to more than 1,000 participants.

Smith said that the EPA, IIAR, and ASTI are working to improve the effectiveness of first responders, and the safety day event moved the groups closer to that goal. "We broke down barriers between tripod players and supported the efforts of local leaders to engage a long-term solution to the challenges they jointly face," he said.

IIAR Advances Regulatory Reform Proposals

iiar government RELATIONS

BY LOWELL RANDEL, IIAR GOVERNMENT RELATIONS DIRECTOR

President Trump has made regulatory reform a high priority for his administration. Trump has signed several executive orders on regulatory reform and task forces have been established at regulatory agencies to identify opportunities for regulatory relief.

With the positive climate for regulatory reform, IIAR has been exploring regulatory changes that would provide regulatory relief while improving safety in the ammonia refrigeration industry. This process has resulted in the development of the following three proposals that have recently been sent to the Occupational Safety and Health Administration (OSHA) and the Environmental Protection Agency (EPA).

Proposal I: Update IDLH ammonia and allowable APR usage based on latest science and technology.

CURRENT POLICY:

The current IDLH for ammonia is 300 ppm. The original IDLH for ammonia was 500 ppm but was revised down to 300 ppm. IDLH values are established to ensure that a worker can escape from a contaminated environment in the event of failure of the respiratory protection equipment, and to indicate a maximum level above which only a highly reliable breathing apparatus, providing maximum worker protection, is permitted. The highest level of protection is required above IDHL levels, which means SCBA must currently be used when entering a facility during a release event with ammonia concentrations about 300 ppm.

PROBLEM:

The current IDLH level limits the ability of trained facility personnel to mitigate the impacts of an ammonia release.

Since the IDLH level was revised to 300 ppm, the performance of personal protective equipment, and particularly APRs, has dramatically improved.

Limiting the use of full-face air-purifying respirators (APRs) above 300 ppm hinders the ability of facility personnel to engage in emergency shutdown and life-saving efforts to rescue and/or escort those out of an affected area. The limitation also prevents a rapid assessment of the problem and the allowance for an immediate fix. These are unnecessary restrictions that can have a negative impact on health and life safety and inhibit the ability to minimize the impacts of a release.

Data supports an increase in the IDLH level to 500 ppm and permitting the use of an APR to accomplish critical tasks (defined by a standard operating procedure) for up to 30-minute exposure of levels that do not exceed 1,000 parts per million. Since the IDLH level was revised to 300 ppm, the performance of personal protective equipment, and particularly APRs, has dramatically improved. APRs have consistently been shown to work reliably at levels of several thousand ppm for ammonia. OSHA's Maximum Use Concentration for a full-face respirator is 50 times the Permissible Exposure Level which, for ammonia, equates to 2,500 ppm.

SOLUTION:

Allow the use of APR respirators to help mitigate incidental impacts of releases up to 500 ppm. Personnel who have been trained to follow standard operating procedures should be allowed to wear APRs to engage in critical tasks such as rescue and emergency shutdown at levels up to 1,000 ppm for a maximum of 30 minutes of exposure. By allowing the use of APR up to 1000 ppm, personnel will have adequate protection and, even in the event of APR failure, sufficient time to escape the situation.

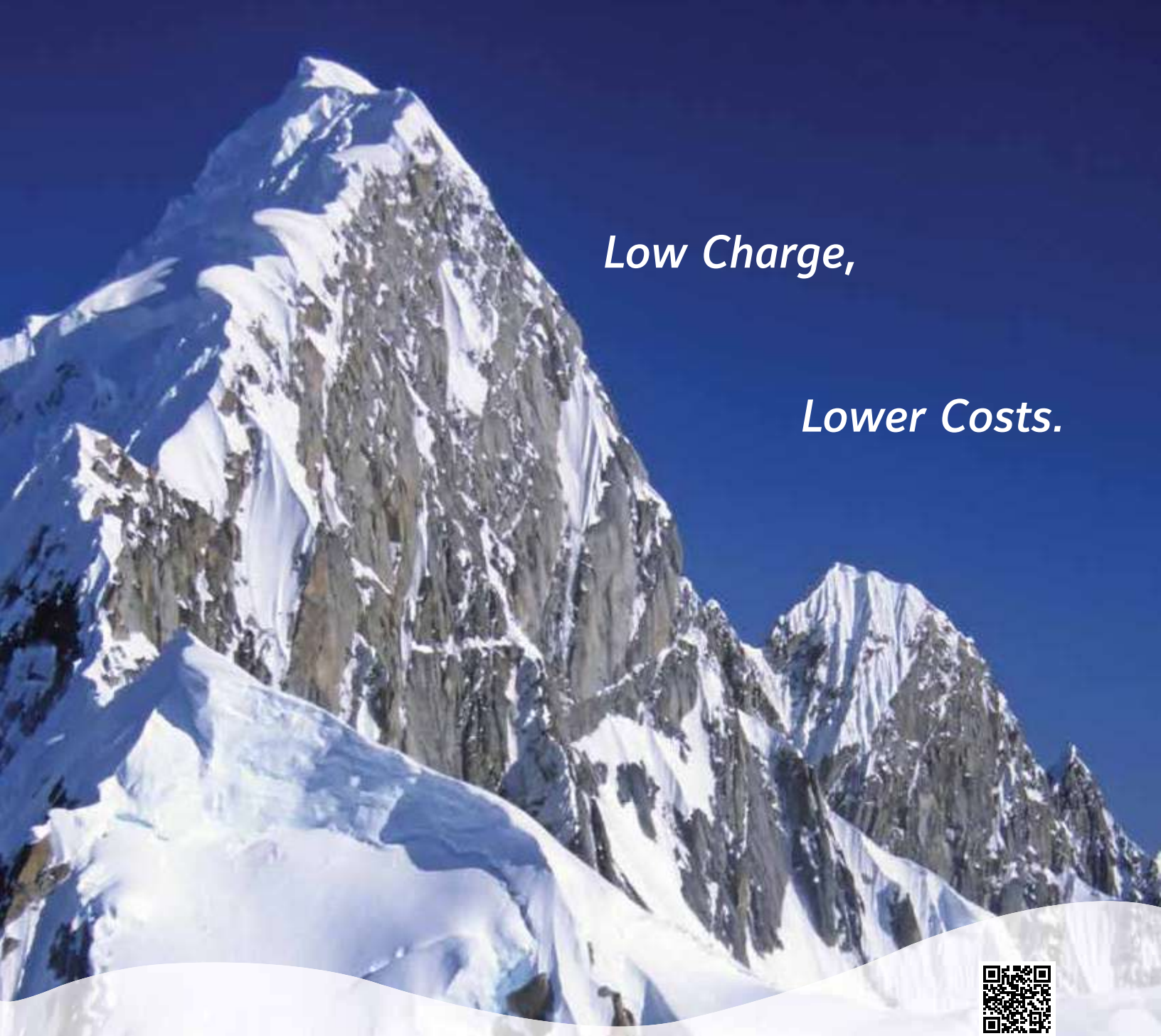
Proposal II: Revise the Interpretation of "Immediate" to mean 15 minutes for local reporting and eight hours for national and state reporting.

CURRENT POLICY:

Under current policy, an ammonia release above the reportable quantity of 100 pounds over 24 hours must be reported "immediately". While the term "immediately" has not been defined in regulation, the EPA interprets "immediate" to mean 15 minutes from the time the facility knew about the reportable release. Under the current interpretation, notifications must take place at the local, state and national levels within 15 minutes or the facility will be vulnerable to citations.

PROBLEM:

The current interpretation of "immediate" results in the occupation of critical facility resources that could otherwise be used to evaluate and respond to the ammonia release. The first 30 minutes of an ammonia release are critical to minimizing health and life safety risks, as well as mitigating off-site conse-



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quences. In many cases, release quantities and impacts can be minimized with quick action by facility personnel.

Contacting local responders within the first 15 minutes is important, as local authorities are positioned to respond and have a meaningful impact on the situation. Equally important is the rapid assessment and action by facility personnel. Many ammonia facilities have a small number of employees and diverting these resources can hinder the ability to take critical actions in the first 30 minutes after a release.

Notifying the National Response Center (NRC) and state authorities does not serve the same purpose as the notification of local authorities, because national and state notifications do not trigger actions that will assist in the short-term response to the release at the facility. Delaying the national and state notifications will allow the facility to better utilize its resources during the first critical minutes after a release. If the facility makes the appropriate local notification within 15 minutes, the impact of delaying national and state notification is minimal.

SOLUTION:

EPA should revise its interpretation of the term "immediate" to mean 15 minutes for local notifications only. National and state notifications should be made within eight hours of knowing about the release. Facilities should be able to focus on the situation at hand and fully utilize its resources to minimize the impacts of the release. Facilities should not be cited for reporting violations if they make local notifications within 15 minutes and national and state notifications within eight hours.

Proposal III: Develop a New Reportable Quantity for Aerosol Releases of Ammonia.

Notifying the National Response Center (NRC) and state authorities does not serve the same purpose as the notification of local authorities, because national and state notifications do not trigger actions that will assist in the short-term response to the release at the facility.

CURRENT POLICY:

The current reportable quantity for ammonia is 100 pounds over a 24-hour period. This applies to both aerosol and liquid releases of ammonia. The 100-pound reportable quantity was established based on risks to aquatic life with ammonia releases into water.

PROBLEM:

The characteristics of liquid and aerosol ammonia releases are very different. The current 100-pound reportable quantity for liquid releases is appropriate, as liquid releases could reasonably impact water sources. However, aerosol releases are very unlikely to impact water sources.

The amount of ammonia needed to result in a negative environmental impact is much greater for aerosol releases. Aerosol ammonia quickly dissipates into the air, minimizing the risk of environmental impact. In many cases, releases occur in machine rooms, where proper emergency ventilation is required by EPA and OSHA regulations. These ventilation systems immediately kick-in at set ammonia concentrations, dispersing the released ammonia into the atmosphere.

The current reportable quantity level of 100 pounds for all ammonia releases results in reporting and response to releases that pose no significant threat to the environment. In addition, it is very difficult and impractical to measure 100 pounds of aerosol release in 15 minutes. The current policy results in significant over-reporting of minor releases as facilities work to avoid citations. This over-reporting of non-life safety ammonia releases ties up critical fire, hazmat teams and other resources that may be needed for emergencies involving other health and life safety response priorities. In addition, the unnecessary deployment of multiple emergency response personnel and equipment can cause traffic hazards. Finally, the reporting burden, particularly given the current interpretation of "immediate" as 15 minutes, ties up important facility resources that could be used to assess and address the release situation.

SOLUTION:

A new category for reportable quantities of aerosol releases of ammonia should be established. The reportable quantity should be set at 500 pounds within a 24-hour period. The current 100-pound reportable quantity should remain intact for liquid ammonia releases when 100 pounds has been released within 24 hours. The creation of a separate reportable quantity for aerosol releases of ammonia would make the agency's reporting policy much more risk-based and reduce the unnecessary deployment of critical emergency response resources.

IIAR strongly believes that raising the IDLH to 500ppm, revising the definition of "immediate" for release reporting and creating a new reportable release quantity for aerosol ammonia releases are common-sense reforms that will improve safety while reducing the burden on industry. IIAR is actively engaging with OSHA and EPA to advance these proposals as regulatory reform efforts continue.

IIAR Remembers: Jim Wright

A longtime member of IIAR, two-term board member, friend and mentor to many in industrial refrigeration, Jim Wright was known for his tireless passion for a job well done, and his warm, generous spirit, which he shared freely with friends and colleagues.

Highly regarded in the industry, Wright's friends and colleagues say he was one of the most well-respected engineers in the field, and that his passing will leave a noticeable absence, both at the industry level and individually in the hearts and minds of many.

"He was always a pleasant guy – you could tell he was one of the best engineers in our industry and always knew what he was talking about. He was an excellent knowledge base," said Dave Rule, president of IIAR and longtime friend. "He was passionate about his work, but he also cared about the people he was working with."

Wright ran a successful consulting engineering business, Wright Engineering Associates, for over two decades and was widely considered one of the premier thought leaders in the refrigeration industry, but friends say it was his attitude and work ethic that set him apart. "Aside from his refrigeration knowledge, he was known for his honesty and integrity," Rule said. "He always presented a positive attitude in everything he did. He always had a smile, he was always very friendly, and always trying to help."

Doug Scott, a colleague and friend who worked with Wright for decades, said Wright will be remembered as one of the leading industrial refrigeration consulting engineers in the country. "He was collaborative, he was considerate, he was inclusive. He was resolute that work should be done right, with a fairness to everyone involved. He had a tremendous amount of integrity."

Scott adds that Wright was a life-long learner and was excited to find new solutions to complex problems. "There were challenges in the most recent projects I worked on with him that required doing things that had never been done before," he said, "but he could think through it and come up with the best solution for the challenge."

Ted Styskel, another long-term friend and colleague, agrees that by every measure Wright was one of the most innovative members of the industry. "He was an excellent engineer and a great mentor to so many people. He was a rare individual who was so open to sharing all of his knowledge and resources. He was really highly thought of by so many people."

Styskel said what really stood out about Wright was his ability to communicate and collaborate. He had the ability to pull people together and bring out the best in them, not only in his professional life but in his personal life, too. "He had a real gift for bringing people along and encouraging them," Styskel says. "To me, he was an incredible mentor; I learned so much from him and he will be greatly missed."

Wright worked on a number of different committees in IIAR and was extremely supportive of the organization. "He was always willing to help; you could always count on him to provide strong knowledge and good advice," said Rule. "It was a real privilege to know him. I was honored to work with him. I considered him a friend to the industry as well as a personal friend."

Adolfo Blasquez, who worked with Wright for nearly 40 years professionally and served with Wright in various capacities at IIAR over the years said he'll miss Wright for his sense of humor, his work ethic, and his way with people. "He was a true professional and a true friend," he says. "For myself and so many others in this business, I can tell you without any doubt, Jim Wright will truly be missed."

Although Wright knew he was ill, he still attended the IIAR conference in Colorado Springs. Rule says he used this opportunity to visit with his friends and colleagues – those who he worked with and knew so well for so long – one last time. Although he knew the conference was one of many "lasts" for him, Wright approached it with his characteristic positivity and reflected an inner peace and acceptance.

"Even knowing how sick he was, he still made the effort to travel to the conference just to say goodbye to everyone," Rule said. "That's really impressive to me that he'd do that. He just wanted to share that time with all his friends."

While Wright was passionately dedicated to his career, many would say his faith in God was his strongest conviction. He regularly attended the First Evangelical Free Church of Fullerton, Calif., and his strong moral center rooted in his beliefs guided everything he did, both personally and professionally. "You could tell his inspiration came from his strong faith," said Rule.

Andrea Collins, Condenser editor and friend, agrees Wright's faith inspired everyone he knew. "The amazing thing about Jim was that he had this rock-solid faith – uncommon faith – Christian evangelism was a big part of his life," Collins said. "His passion for his life and his work was contagious."

Wright will certainly be remembered for his contributions to the industry, but more than that, he will be remembered as a genuine, compassionate man who cared deeply about his relationships, his family and his religion. "You walked out of his office feeling better than when you went in," Rule said. "That's the kind of man he was."

Best Practices in Managing an OSHA NEP or EPA GDC Inspection

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ABSTRACT

This paper gives ammonia refrigeration professionals guidance on Occupational Safety and Health Organization (OSHA) National Emphasis Program (NEP) or United States Environmental Protection Agency (EPA) General Duty Clause (GDC) inspections and the regulations and documents that govern them. Specifically, the paper discusses the following items:

1. How facilities are chosen for a NEP inspection.
2. What comprises the NEP inspection process, including
a. Pre-inspection document requests (Appendix A provides examples),
b. Responses to an inspector's arrival at your facility,
c. OSHA priority for conducting inspections,
d. Opening conference,
e. The inspection,
f. Closing conference,
g. Opportunity for an informal conference with OSHA, and
h. Types of citations and maximum penalties for each.
3. What comprises EPA GDC inspections, including
a. The GDC as defined under the Clean Air Act, Section 112(r)(1);
b. Who the GDC applies to;
c. Facility obligations under the GDC;
d. How the EPA chooses where to inspect;
e. The emphasis on ammonia refrigeration;
f. Frequently cited discrepancies; and
g. Best practices for GDC facilities.

To summarize, this paper

ï Will provide enhanced awareness of how facilities are chosen,
ï Provide examples of documents typically requested during an NEP inspection,
ï Gives a better understanding of best practices for the inspection process,
ï Define the GDC and identify typical discrepancies found, and
ï Gives clear guidance on preparing for NEP and GDC inspections.

HOW FACILITIES ARE CHOSEN FOR AN NEP INSPECTION

In a recent OSHA Directive, CPL 03-00-021, effective January 17, 2017, OSHA added EPA Level 1 and Level 2 processes to the Programmed Inspection and NEP selection criteria. This directive also provided some criteria on how facilities are targeted for an NEP inspection:

Complaint or referral:

- If a complaint or referral is received relating to a process safety management (PSM)-covered process and it involves an application of the PSM standard, then the area director (AD) shall evaluate the complaint or referral item(s) according to the field operations manual (FOM) and conduct an inspection using this instruction.
- If the complaint or referral item(s) is (are) initiated due to a complaint or referral related to a contractor employer, inspections of both the contractor and host employer should be conducted.
- If the complaint or referral item does not involve an application of the PSM standard (for example, a complaint about fall protection hazards in a PSM- covered process), then the inspection or inquiry will normally be limited to the complaint and referral item(s)/subject(s). However, if the facility has not already been inspected using this instruction, a concurrent inspection using this NEP may be conducted at the AD's discretion.

Accident or catastrophe:

When an accident or catastrophe occurs in a facility that contains a PSM-covered process and it

- Involves an application of the PSM standard, then the inspection will include the accident investigation item(s)/subject(s) and a chemical NEP inspection using this instruction.
- Does not involve an application of the PSM standard, then the inspection will normally be limited to the accident investigation item(s)/subject(s). However, if the facility has not already been inspected using this instruction, a concurrent chemical NEP inspection using this instruction may be conducted at the AD's discretion. In other words, if OSHA is in your facility for an accident investigation not related to PSM, they may conduct an NEP at the same time if they choose.

EPA Risk Management Program (RMP) facility information:

As OSHA's PSM standard also covers most RMP facilities, the specific site's RMP information is a resource that can be helpful in PSM NEP inspections. For instance, compliance safety and health officers (CSHOs) can use RMP data to determine

- Whether employers consider themselves to have either an RMP- or a PSM- covered process;
- Which RMP-covered chemicals and quantities are on site;
- What RMP program level the operator assigns and reports, which can give insight into whether the process is PSM-covered or if the operator claims a PSM exemption;
- If any incidents have occurred that were required to be reported to the RMP accident database;
- What prevention and mitigation measures exist as reported by the operator; What off-site consequence analysis (OCA) data are required of operators (employers) to analyze their RMP-covered process worst-case and alternate case release scenarios of covered chemicals (Note: OCA data can provide information about potential worker exposures during releases).

To assist in the coordination of enforcement inspections, regional PSM coordinators may contact their local EPA RMP coordinators to share inspection information/ results.

In a new OSHA Directive published January 17, 2017, the Chemical Facility PSM NEP guidance was modified to include petroleum refineries. The results of this change include the following:

- Refinery inspections began in fall of 2017.
- OSHA will use 15 questions during inspections, whereas previous refinery inspections had 39 broad document requests and 98 questions. The dynamic list of questions is not made public.
- No pre-inspection questionnaires or document requests are required.
- The purpose of inspection is to "spot-check" PSM documents.
- A single CSHO can conduct inspections.
- On-site contractors are included in the inspection.
- OSHA will share NEP inspection findings with the EPA for facilities under an RMP.

This new guidance could soon apply to ammonia (NH_3) facilities, as it will allow OSHA to perform NEP spot checks quickly and with fewer personnel.

WHAT COMPRISES THE NEP INSPECTION PROCESS

If your facility is selected for an OSHA NEP inspection, you may receive a written request for documents to be sent to OSHA for review. Consider delivery by certified mail, FedEx, or UPS, with a return receipt requested. Do not send original documents, and do not give them access to any electronic files or your PSM software database. Always meet the deadline given for submission of the documents and do not send more than they ask for. Appen-

dix A includes a list of documents typically requested for an NEP inspection. Your organization should keep a detailed log of all documents provided to OSHA and any documentation that they were received.

OSHA may then request additional documents, or clarification/ additional information on the documents provided. OSHA has up to six months to review the documents, visit the facility if they choose, or issue citations based on your written program and/ or items they find during a facility visit.

During the review of your documents, OSHA may decide to visit your facility and target any discrepancies discovered in your program. For example, if your program lacks current inventory calculations in your process safety information (PSI), they may try to determine what your current inventory is, any NH_3 purchases made, and how you track it (if at all).

If an OSHA compliance officer comes to your door, you are permitted, by law, to refuse to allow the OSHA compliance officer access to your facility. *However, in most cases, that is a bad idea*. Some companies have wrongly believed that refusing entry would give them time to "fix" their safety problems before the compliance officer returns with a warrant and probably several more compliance officers. A compliance officer could suspect that your company has something to hide, conduct a very detailed inspection, and spend more time at your plant.

When the compliance officer arrives at your facility, he or she will present credentials and state his or her name and the purpose of the visit. Verify the compliance officer's identify prior to allowing access. Feel free to call the local OSHA office to verify that they have a compliance officer with that name and badge number. Verifying their identity is normal and expected by compliance officers.

The compliance officer should be given a site safety orientation after his or her identity is verified. Consider including all potential hazards at the facility, the person who will escort the inspector to the egress route, and the location of external meeting areas. The escort will stay with the inspector at all times and is responsible for the inspector's safety in an emergency.

Inspections must take place during normal working hours for your facility. If no member of your management team or safety team is available, inspectors will allow up to two hours for one to show up. Compliance officers encourage employee/ union representatives to participate in the inspection. They especially like when members of your PSM team participate and may even ask for members to participate.

If your facility does not have a PSM team, consider forming one as soon as possible. The plant manager, plant engineer, and some of the process technicians should be on this committee. Also, because PSM standards require employee participation, consider having employees from other areas of your facility participate as well. This is a different committee from your plant safety committee. The PSM team's purpose is solely for your NH_3 process, or any external factors that could affect the covered process. The PSM team should meet at least monthly, take minutes and attendance, and track progress on any issues that may arise, open audit items that need to be completed, or any significant repairs or rebuilds. This team can also be a resource for incident investigations and creating/tracking management of change (MOC).

The inspector will hold an opening conference and explain to the group participating in the inspection the purpose of the visit and how the inspection will proceed. If you have not previously provided them, the compliance officer may request some or all of the documents listed in Appendix A. Having these documents available is best; however, you normally get up to four hours to provide them. Again, *do not provide documents that they do not ask for.* Regardless of the purpose of the inspection, OSHA has the right to examine your PSM documents at any time, so be ready. During the opening conference, inform the inspector if you have any proprietary or trade secrets at your facility and request that any pictures or videos taken in those areas be safeguarded and returned after any citations are resolved and closed.

During the actual inspection/walk through, if the inspection is targeting a specific area, such as the engine room, take the inspector to that area via the *shortest possible route* and on an outside route if possible. If the compliance officer has previously reviewed your documents, he or she may already have an area, or system that he or she wants to see. However, anything the inspector sees during the route is "fair game" and can be cited, so don't provide them with anything that is not targeted. The compliance officer *must comply* with your employee safety and any food safety requirements. He or she should be allowed to take pictures and videos of your facility. If you refuse, the inspector could return with a warrant.

He or she will safeguard any and all trade secrets as discussed during the opening conference. Consider having your safety or management representative take pictures and/ or videos of whatever the compliance officer takes. Take lots of notes about items the inspector mentions during the inspection. The compliance officer will normally interview employees in private and ask them about safety training and their knowledge of the facility's emergency action plan and the PSM program.

Any employee may approach the compliance officer to ask questions and/or make comments at any time.

Federal law strictly prohibits employers from retaliation against any employee who interacts with the inspector in any way. OSHA is very strict about this, and the inspector will note the names of all employees they interact with during the inspection.

When possible, correct items that are found while the inspector is present. These items will be labeled by the inspector as CDI, or corrected during inspection. This will not prevent a citation, but will normally reduce the penalty.

The inspection will end with a closing conference. The compliance officer will briefly summarize findings and note items that may have been CDI. He or she will also explain your legal rights and what to expect next. The compliance officer investigates and reports findings to the OSHA area director, but does not write the citations or recommend penalties. The area director will write citations, determine penalty amounts, and send to them to your facility. The area director has six months to get these sent to you, although it normally doesn't take that long.

You also have an opportunity to attend an informal conference, which is normally held at your local OSHA area office. This is an opportunity to sit down with the compliance officer and area director to discuss the inspection and possibly reduction of the penalties. Most companies taken advantage of the opportunity to meet, as the result is often reduced penalties and/or changes to the citations.

As of August 2, 2016, penalties assessed for inspections taking place after November 2, 2015, were increased by 44%. State programs are required to raise their fines at least as high as the new federal rate. OSHA will continue to reduce the maximum fine based on the size of the company and other factors.

The types of citations in order of severity and the maximum penalties per violation are

1. **De Minimis:** A safety suggestion or concern that does not meet the criteria for another type of citation. No penalty.
2. **Not Serious:** A violation that has a direct relationship to job safety and health, but probably would not cause death or serious physical harm. $12,934 maximum per citation.
3. **Serious (all PSM citations are at least serious):** A violation where the probability is substantial that death or serious physical harm could result and where the employer knew, or should have known, of the hazard. $124,709 maximum per citation
4. **Repeat:** A violation of any standard, regulation, rule, or order where, upon re- inspection, a substantially similar violation is found. (If your company has multiple facilities, and OSHA finds the same violation at your other facilities, they can cite you for a repeat violation for *citations issued for the past seven years*.) $129,336 maximum per citation.
5. **Willful:** A violation where the employer knowingly commits or commits with plain indifference to the law. The employer either knows that what he or she is doing constitutes a violation, or is aware that a hazardous condition existed and made no reasonable effort to eliminate it. $129,336 maximum per citation. In addition, if an employer is convicted of a willful violation of a standard that has resulted in the death of an employee, the offense is *punishable by a court-imposed fine or by imprisonment for up to six months, or both. A fine of up to $250,000 for an individual, or $500,000 for a corporation, may be imposed* for a criminal conviction.
6. **Failure to Abate Prior Violation:** Failure to abate a prior violation may bring a civil penalty of up to $12,934 per citation for each day the violation continues beyond the prescribed abatement date.

WHAT COMPRISES EPA GDC INSPECTIONS

What Is the General Duty Clause?

Under the Clean Air Act, Section 112(r)(1), the General Duty Clause states that "The owners and operators of stationary sources producing, processing, handling or storing such substances [i.e., a chemical in 40 CFR part 68 or any other extremely hazardous substance] have a general duty [in the same manner and to the same extent as the General Duty Clause in the Occupational Safety and Health Act (OSHA)] to identify hazards which may result from such releases using appropriate hazard assessment techniques, to design and maintain a safe facility taking such steps as are necessary to prevent releases, and to minimize the consequences of accidental releases which do occur" (EPA, 2000).

The General Duty Clause has been in effect and enforceable since November 15, 1990. It applies to any facility where extremely hazardous substances are present. The General Duty Clause is a performance-based authority recognizing that owners and operators have primary responsibility in the prevention of chemical accidents. The EPA believes that owners and operators who have these substances *must adhere, at a minimum, to recognized industry standards and practices* (and any government regulations) to be in compliance with the General Duty Clause.

The General Duty Clause applies to "owners and operators of stationary sources producing, processing, han-

dling or storing any extremely hazardous substances" (OSHA, 1970).

"Stationary source" is defined in Section 112(r)(2)(C) as "any buildings, structures, equipment, installations or substance emitting stationary activities (I) which belong to the same industrial group, (ii) which are located on one or more contiguous properties, (iii) which are under the control of the same person (or persons under common control), and (iv) from which an accidental release may occur" (EPA, 2000).

WHAT ARE THE OBLIGATIONS UNDER THE GENERAL DUTY CLAUSE?

The General Duty Clause imposes the following primary obligations on the owners and operators of stationary sources:

1. Identify hazards that may result from accidental releases, using appropriate hazard assessment techniques;
2. Design and maintain a safe facility, taking such steps as are necessary to prevent releases; and
3. Minimize the consequences of accidental releases that do occur.

HOW DO THE EPA REGIONS PRIORITIZE FACILITIES TO VISIT?

1. Stationary source has an accident (or a "near miss" that could have been an accident) that warrants an investigation.
2. Stationary source appears in agency databases for having repeated releases.
3. Industry hazard is identified after a similar source has a major accident.
1. A state or local government official or other member of a community asks for assistance with a particular source.
4. A source asks for assistance regarding a particular hazard.
5. Stationary sources have a significant quantity of an extremely hazardous chemical in close proximity to population centers or sensitive populations (e.g., schools, hospitals, etc.).
6. OSHA makes contact after an inspection reveals hazards that could cause a release.

Research also indicates that if a particular company has releases involving first responders and/or violations of the RMP and GDC, that company may also its facilities targeted in other EPA and OSHA regions.

WHY IS NH_3 REFRIGERATION EMPHASIZED?

In February 2015, the EPA published an enforcement alert titled "Anhydrous Ammonia at Refrigeration Facilities under Scrutiny by U.S. EPA." This enforcement alert used as examples six cases with significant issues at NH_3 facilities. Two of those issues were releases, three were RMP violations, and one was a GDC violation.

The enforcement alert also stated that between 2012 and 2015, releases at nine refrigeration facilities resulted in major property damage, numerous injuries and hospitalizations, and several deaths. These releases also resulted in $8.4 million in civil penalties and $10 million in supplemental environmental projects (SEPs).

Under the General Duty Clause heading, the enforcement alert stated, "Recent GDC cases indicate that some facilities may not be taking required steps to design and maintain safe facilities or take precautions that would minimize the consequences of an accidental release of ammonia."

WHICH DISCREPANCIES ARE CITED MOST FREQUENTLY?

According to the *EPA Combined Enforcement Policy, Appendix A*, published in June 2012, common failures that resulted in violations include:

Failure to identify hazards

- Failure to identify chemical or process hazards that may result in accidental release or explosion.
- Failure to consider risk from adjacent processes, which may pose a threat to the process.
- Failure to consider safety considerations adequately given the facility's siting (e.g., when the facility is located in close proximity to residential neighborhoods, sensitive ecosystems, and/or industrial parks containing industries utilizing listed hazardous substances).

Failure to design and maintain a safe facility, taking such steps as are necessary to prevent releases

- Failure to design and maintain a safe facility. In determining this factor, consider the facility's physical conditions, applicable design codes, federal and state regulations, and recognized industry practices and/or consensus standards.
- Failure to provide for sufficient layers of protection. An additional layer of protection would have prevented a release or explosion (i.e., enclosed and secure engine room).
- Failure to use updated design codes.
- Failure to implement a quality control program (MOC) to ensure that components and materials meet design specifications and to construct the process equipment as designed.
- Also, design failures include commonsense design flaws or inadequate equipment, such as failure to include sufficient instrumentation to monitor temperature, pressure, flow, pH level, etc. Other design flaws include lack of emer-

gency shutdown systems, overflow controls, instrumentation interlocks, and use of failsafe design.

- Failure to provide for or properly size pressure-relieving devices on a tank or vessel subject to pressure.
- Failure to train employees as to the hazards that they may encounter. Failure of operators or employees in implementing or following operating instructions or company rules.

Failure to minimize the consequences of accidental releases that do occur

- Failure to develop an emergency plan that specifically addresses release scenarios developed from hazard identification and historical information.
- Failure to follow the emergency plan or to coordinate with the local emergency planning committee or local emergency management agency.
- Failure to monitor any shutdown (decommission/drain NH_3) of a facility.

HOW DO NH_3 FACILITIES THAT ARE UNDER THE THRESHOLD QUANTITY COMPLY WITH THE GDC?

The information presented to this point emphasizes that complying with the GDC is vital for our industry. Do not assume that the EPA will not visit a small facility below the threshold quantity (TQ) and levy substantial civil penalties and SEPs.

Furthermore, having a safe and healthy workplace for employees is an obligation and maintaining a safe environment for the neighbors is a civic duty regardless of the quantity of NH_3 at the facility.

The best place to start is to implement the *IIAR Ammonia Refrigeration Management Program 2005* (ARM). This program is designed for facilities with less than TQ of NH_3, which is 10,000 lb. for federal OSHA and the EPA, but some states will have a lower TQ.

Keep up with current and new guidance from RETA (education and training of process operators); IIAR; the American Society of Heating, Refrigerating and Air- Conditioning Engineers (ASHRAE), the National Fire Protection Association (NFPA), and your state and local municipal codes.

Once implemented, consider conducting periodic compliance audits to verify the ARM program's effectiveness.

A FINAL WARNING: DISCRETION IS ADVISED

If your facility is not subject to OSHA's PSM standard or the EPA's RMP requirements, ensure that inspectors know that the facility has developed an ammonia refrigeration management program, not a PSM or RMP. Otherwise, during visits by EPA or OSHA officials, if they are told that your facility is "complying with PSM standards," they may ask to review your 14 elements of PSM or ask if you have filed an RMP.

In the research done to prepare this paper, a GDC case summary discussed a situation where an EPA inspector came on location and asked how much NH_3 they had at their facility. The employee answered "Oh, we are well over 10,000 pounds." The EPA cited them for not maintaining an accurate inventory. The facility then had to spend two months and a lot of money to prove that its inventory had consistently been 9,000 pounds or less.

The EPA and OSHA work with each other now more than ever. Seeing the EPA show up at your facility within a couple of weeks after an OSHA inspection is not uncommon. This was previously listed among the reasons for the EPA to determine facilities to target for a GDC inspection.

A best practice is that every facility

- Has a designated person, or persons, trained to greet and answer questions for any inspectors that come to your facility.
- Discourage unqualified employees from answering specific questions about the plant. This can only be accomplished by training all employees on the procedures to be followed if OSHA or the EPA visits your facility.
- Only give the inspectors what they ask for. They typically review every document that is provided to them before and during any inspection, and any discrepancies found in these documents are citable by OSHA and EPA.

Most of all, BE PREPARED, BE COMPLIANT, and BE READY!

The views and opinions expressed in this paper are solely those of the author and do not necessarily reflect the opinions, policy, or position of Dean Foods Company or any of its affiliates.

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Appendix A. OSHA NEP Pre-Inspection Document Request Samples

OSHA – DOCUMENT REQUEST #1 COMPANY: XXX REQUESTED DELIVERY DATE: XXX	
ATTACHMENT A	
Item	Description
01	Provide all injury and illness logs (OSHA-300 & 300A) for the last 3 full years plus the current year to date.
02	Provide the legal name of the facility/company, tax identification number, SIC code, and NAICS codes.
03	Provide the number of employees controlled by the company at the facility, and the number of employees corporate wide (USA).
04	Document(s) exhibiting a summary description of the facility PSM program and PSM "Manual" if appropriate.
05	Document(s) exhibiting or a listing of personnel by name and position responsible for implementing the PSM standards with various elements.
06	Document(s) exhibiting the organizational structure (Organizational Chart) showing Position/Title and name of person in the position.
07	Document(s) exhibiting Hazard Communications (HAZCOM) policy/ procedures for this facility. IF you use corporate procedures as a part of your establishment procedures, please provide any and all corporate procedures developed and implemented as part of your establishments program procedures.
08	Document(s) exhibiting Respiratory Protection policies/procedures for this facility. If you use corporate procedure as a part of your establishment procedures, please provide any and all corporate procedures developed and implemented as part of your establishments program procedures. This request includes fit testing results and medical evaluations.

OSHA – DOCUMENT REQUEST #1 COMPANY: XXX REQUESTED DELIVERY DATE: XXX	
ATTACHMENT A	
Item	Description
09	Document(s) exhibiting the maximum intended chemical (Anhydrous Ammonia) inventories in pounds (lbs.), the method used for determining the maximum intended inventory amount, and procedure/methods used to ensure that the maximum intended inventory is not exceeded.
10	Document(s) exhibiting a procedure/guideline for receiving fresh or make-up Anhydrous Ammonia, certificate of analysis and bills of lading in last 5 years.
11	Document(s) exhibiting PPE Hazard Assessments for the facility including the ammonia refrigeration system.
12	Document(s) exhibiting or a listing of all Ammonia Related Incidents in the past 5 years including the current year classified by type (first aid, near-miss, environmental, etc.) including the title and the location in which the incident occurred in the facility.
13	Document(s) exhibiting all near-miss investigation summaries completed for the facility in the last year including the current year for Ammonia Related Incidents. Document(s) to include complete report such as but not limited to the root cause analysis if completed, written schedules for actions or findings to be completed or addressed, and documentation of how actions and/or findings were resolved.
14	Document(s) exhibiting the electrical classification of the ammonia refrigeration engine room.
15	Document(s) exhibiting the facility's energy control/lockout-tagout (LOTO) program for this facility. If you use corporate procedures as a part of your facility program, please provide any and all corporate programs developed and implemented as part of your facility's program.

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ATTACHMENT A	
Item	Description
16	Document(s) exhibiting management of change (MOC) policy/procedures for this facility. If you use corporate procedures as a part of your facility program, please provide any and all corporate programs developed and implemented as part of your facility's program.
17	Document(s) exhibiting or a listing of employee-completed training. Documents that show the name of employee, type of training received, and date the training was completed (please do not provide training content).
18	Document(s) exhibiting the ammonia refrigeration operators training including content specific to the operation of the ammonia refrigeration system including certificates if appropriate.
19	Document(s) exhibiting or a listing of all workers (i.e., hourly and supervisory) involved in the operation of the ammonia refrigeration systems including names, job titles, work shifts, start date in the unit, and the name of the person(s) to whom they report (their supervisor).
20	Document(s) exhibiting the process flow diagrams (PFD) for the ammonia refrigeration system.
21	Document(s) exhibiting Piping and Instrumentation Diagrams (P&IDs) including legends for the ammonia refrigeration system.
22	Document(s) exhibiting a narrative description/process overview for the processes of the facility.
23	Document(s) exhibiting the date of the original start-up and the last upgraded for the ammonia refrigeration system.
24	Document(s) exhibiting each date and the quantity that anhydrous ammonia was increased to the ammonia refrigeration system in the last 5 years.

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25	Document(s) exhibiting the facilities Mechanical Integrity (MI) procedures (program and task specific instructions) related to the inspection, testing, servicing, repair, alteration of pressure vessels, addressing insulated and non-insulated equipment, frequency of inspections, steps to be taken when insulation is found damaged or inadequate, and when frequency of inspections are to be altered or modified, and piping and relief system equipment. If you use corporate procedures developed and implemented as part of your establishments program, procedures are to be included.
26	Document(s) exhibiting the design codes and standards employed and utilized for the installation and maintenance and on-going mechanical integrity of the ammonia refrigeration system equipment and components.
27	Document(s) exhibiting or a listing of critical safety equipment and instruments (interlocks, safety devices, emergency shutdowns, etc.) for the ammonia refrigeration system.
28	Document(s) exhibiting or a listing of current MI deficiencies/exceptions within the ammonia system in the last 2 years.
29	Document(s) exhibiting or a listing of pressure vessels included as part of the ammonia refrigeration system indicating the vessel functional item number/ descriptor, description of service and location.
30	Document(s) exhibiting or a listing of safety relief devices associated with the ammonia refrigeration system indicating the device functional, item number/ descriptor, description of service, equipment being protected, relief set point and location.
31	Document(s) exhibiting or a listing of oil drain locations in the ammonia refrigeration system.

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32	Document(s) exhibiting procedure(s) for draining refrigeration oil from the ammonia refrigeration system.
33	Document(s) exhibiting the Standard Operating Procedures (SOP) for the ammonia refrigeration system including but not limited to Initial Start-up, Normal Operations, Temporary Options, Emergency Operations, Emergency Shutdown, Normal Shutdown, Safe upper/lower limits and steps to avoid deviation from the safe upper/lower limits, Start-up following a turnaround or after an emergency shutdown, and unloading anhydrous ammonia.
34	Document(s) exhibiting last two annual certifications of the Standard Operating Procedures (SOPs) for the ammonia refrigeration system.
35	Document(s) exhibiting the facility's Emergency Action Plan and/or Emergency Response Plan/Procedures.
36	Document(s) exhibiting or a listing of all contractors (company name) that perform work on site along with trade/service being provided for the ammonia refrigeration system in the last 2 years.
37	Document(s) exhibiting procedures/policies to evaluate contractor safe performance and programs for the facility.
38	Document(s) exhibiting all contractor injury illness logs for the facility in the last 5 years.
39	Document(s) exhibiting the ammonia refrigeration engine room ventilation system design information including the design codes and standards utilized, normal and emergency ventilation sizing and operational requirements (describe how it works), and equipment (exhaust fans) specifications.
40	Document(s) exhibiting the ammonia detectors' range and set points for emergency shutdown, ventilation system activation and alarms active.

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Item	Description
41	Document(s) exhibiting the intervals and last 2-year testing results of the ammonia detectors, evacuation alarm system and alarms activation system.
42	Document(s) exhibiting the procedures used for bypassing or disabling a device such as but not limited to an ammonia system interlock, alarm(s), detectors, or shutdown system.
43	Document(s) exhibiting the facility's last two (2) Process safety management (PSM) compliance audits including findings, recommendations/ findings, checklists and/or documents used to conduct the audit, and recommendation(s)/findings status reports.
44	Document(s) exhibiting the procedure(s) for system logs for the ammonia refrigeration system.
45	Document(s) exhibiting system logs information for the last 10 days for the ammonia refrigeration system.
46	Document(s) exhibiting the procedure(s) for the establishing thickness measurement locations (TMLs) for vessels and piping for the ammonia refrigeration system.
47	Document(s) exhibiting Process Hazard Analysis (PHA) policy/procedures for this facility. If you use corporate procedures as a part of your establishment procedures, please provide any and all corporate procedures developed and implemented as part of your establishments program procedures.
48	The initial process hazard analysis (PHA) for this facility. This includes document(s) exhibiting PHA reports, PHA worksheets, checklists (such as those that may be used for additional human factors & facility siting issues), actions to address findings and recommendations promptly, written schedules for actions to be completed, documentation of findings and recommendations, and documentation of the resolution of any findings and recommendations.

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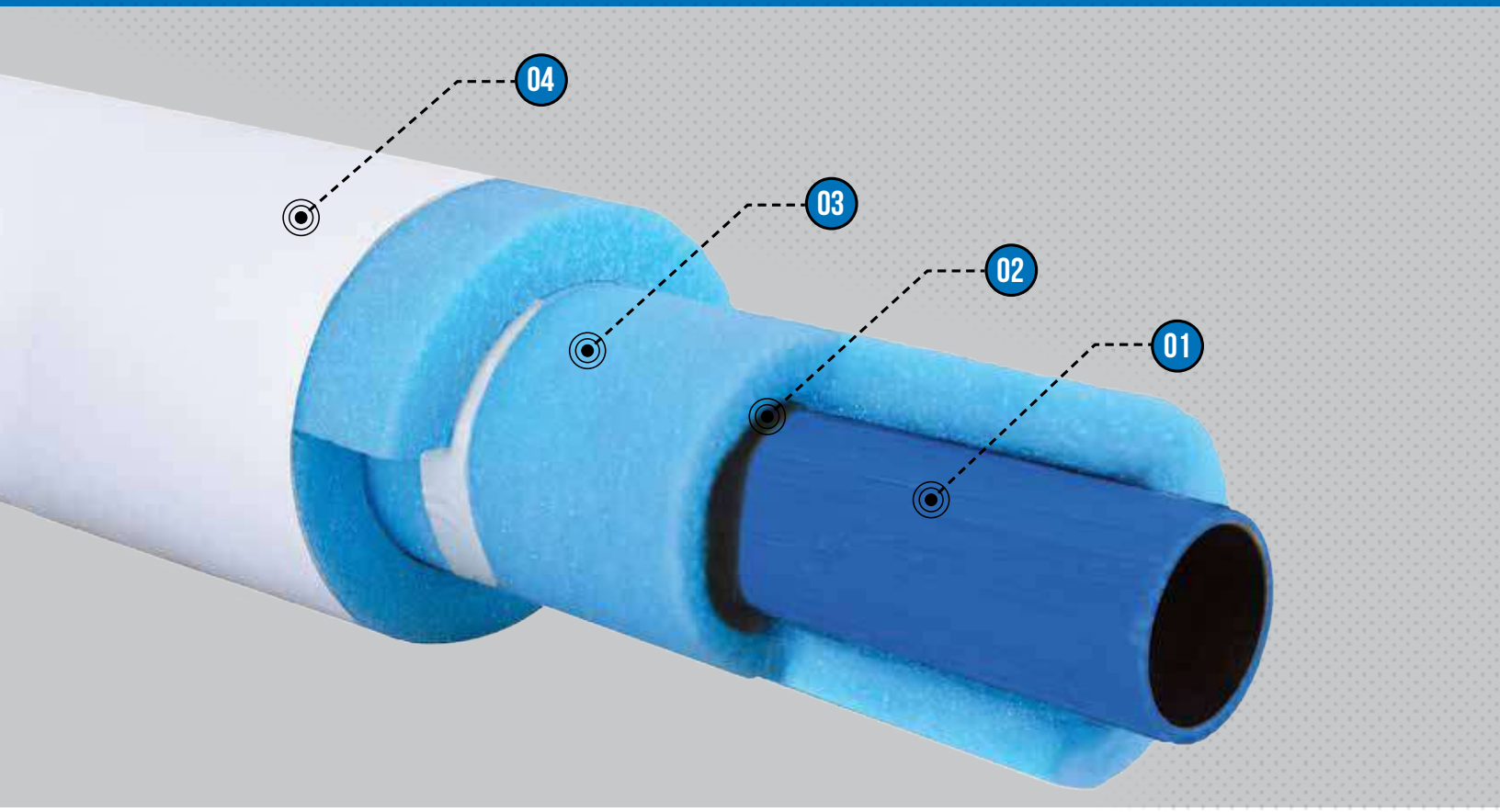
49	The most recent update/redo or revalidation process hazard analysis (PHA) for this facility. This includes document(s) exhibiting PHA reports, PHA worksheets, checklists (such as those that may be used for additional human factors & facility siting issues), actions to address findings and recommendations promptly, written schedules for actions to be completed, documentation of findings and recommendations, and documentation of the resolution of any findings and recommendations.
50	Document(s) exhibiting the completed work orders, design codes and standards utilized and written testing procedures (Full and/or Partial) for interlocks and/or safety instrumented controls such as but not limited to the following systems: 1. Pressure Cut Out on Compressors (High & Low) 2. Compressor Oil Pressure Differential Cut Out 3. Compressor High Temperature Cutout 4. Engine Room Emergency Ventilation 5. Emergency Stop Button 6. Level Controls (HIGH & LOW) Note: If pressure gauges are used in testing and inspection, include the gauge testing and calibration results, certifications, and frequency.
51	Provide a list of management of changes (MOC) including title, date and status for the ammonia refrigeration system in the last 5 years.
52	Provide management of changes (including all documents associated with) for the following 1. Expansion of the engine room and addition of the ammonia refrigeration system.

THE OPTIMAL COLD SERVICE SYSTEM



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03 Dow® Styrofoam™ insulation provides long-term stable R values.

04 The insulation is covered with Polyguard ZeroPerm® or Insulrap™ vapor retarders to keep the insulation dry. Or complete the system with our Alumaguard® family of flexible weatherproof cladding products.

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