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contents

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president's MESSAGE

BY DAVE RULE

The International Institute of Ammonia Refrigeration is growing, both within the United States and abroad, thanks to the use of natural refrigerants and IIAR's efforts to bring awareness of their value to other countries.

This year's annual IIAR Natural Refrigeration Conference and EXPO, convening March 3-6 in Phoenix, is both a reflection of that growth and an opportunity to build IIAR's membership and extend adoption of natural refrigerants to new groups of end users.

As we welcome returning IIAR members, new members and invited guests, we also would like to call attention to IIAR's accomplishments in the past year and the opportunities we have for further achievements in the coming months.

One of the most interesting developments, seen in the new format for the conference, is the growing adoption of natural refrigerants in the commercial refrigeration market, where exciting new technological advancements are making ammonia refrigeration safe and feasible for those applications.

This year, IIAR has partnered with North American Sustainable Refrigeration Council to put together a conference agenda that offers a technical program which embraces commercial refrigeration as well as our traditional industrial market. The technical program will include technical papers, panels, and workshops presenting specific topics that are relevant to engineers and management, working in the commercial as well as in the industrial sector of our industry.

To broaden ties and mutual understanding between both sectors, IIAR has made a concerted effort to extend invitations to key individuals in refrigeration to ensure that engineers and management staff of end users, equipment manufacturers and contractors who work in the supermarket industry are well aware of the IIAR conference. We want to be sure that key personnel on the commercial side learn of the benefits of participation in this educational and networking opportunity. We anticipate that a significant number of people working in the commercial sector will attend this year's conference.

Members and staff of IIAR have been quite active this past year. Among the accomplishments are the new Academy of Natural Refrigerants online programs that offer certificate credentials for both the English and Spanish-speaking member community, a number of new publications addressing safety management and ammonia piping selection methods, as well as new online access to videos and other educational materials aimed at multi-facility training needs.

People attending this year's conference will have a great opportunity to review these new publications in the IIAR Expo Knowledge center and to learn more about these new member services and publications.

One of our most exciting initiatives is IIAR's international outreach, through our growing chapters program and the interest other countries have in adopting IIAR standards.

Costa Rica, which Yesenia Rector, IIAR International Director and I visited in January, is at the forefront as it moves along the path toward full regulatory acceptance of ammonia. To accomplish that, the country needed to be sure that ammonia facilities were designed, installed, managed and decommissioned properly. To that end, IIAR has been working with Costa Rica's College of Electrical, Mechanical and Industrial Engineers as well as government officials led by Costa Rica's First Lady, Claudia Dobles Camargo. They have recently completed converting measures and translating regulatory language and the country has now adopted IIAR-2, IIAR-4 and IIAR-8.

The next step for Costa Rica is to educate stakeholders about the intricacies of the newly adopted standards. While Yesenia and I were there in January, we held a seminar on the new regulations and IIAR will assist with educational programing that's been developed as part of the ANR.

Costa Rica and our IIAR Chapter are taking a leadership position in this work, with several other countries in Central America now interested in pursuing a similar path to safety standards in their countries. We are confident that these efforts will have a significant impact on the safe use of natural refrigerants in this region while protecting the quality of our environment.

At our March conference, David Solis, the Central American and Caribbean IIAR chapter chair will deliver a presentation about Costa Rica's adoption of IIAR standards and progress in the Latin American region on adopting regulatory support for ammonia refrigeration.

So, I welcome you to the 2019 IIAR Natural Refrigeration Conference and EXPO, and expect that you will find many interesting and challenging opportunities to participate in these and other important programs to make the world a better place through the safe and sustainable use of natural refrigerants. I look forward to seeing you at the conference.

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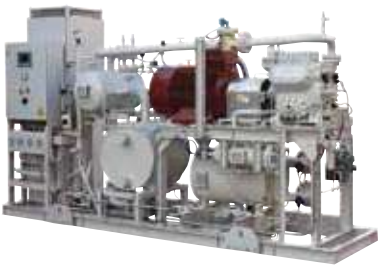

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chairman's MESSAGE

MIKE LYNCH

As I wind up my year as chairman of IIAR, I look back and see all the wonderful accomplishments that you – our members and committees have achieved, setting the stage for even more in the year ahead.

I am excited about the dedication of our incoming chair, Bruce Nelson, and the prospects for continued advancement of our industry and potential for expansion as we look at new opportunities offered by IIAR's embracing of technological development and its potential for expansion. Bruce and our Board of Directors have a clear vision of what IIAR can do and where we would like to see it go in coming years, particularly in the broadening acceptance and applications of natural refrigerants.

Among IIAR's significant accomplishments in the past year has been finalizing the curriculum for the Academy of Natural Refrigerants, which will help promote the safe and efficient operation of industrial refrigeration.

IIAR's greatest asset is the vibrancy and engagement of its various committees. It has been encouraging to experience first-hand how well our committees are attended by volunteers and how active our membership is in advancing and supporting the work of IIAR's committees.

Among the biggest achievements to come out of the past year's Standards Committee work has been a new CO2 standard. The document has been finalized and approved, bringing it to the point where it can be sent out for its first public review. Meanwhile, the committee has also readied IIAR-6, our much-needed standard for end users on maintenance and inspection, which is close to its final version. These are two examples of the vital work that is being done by our committees.

IIAR-6 and the CO2 standard are probably the two standards that will be the most applicable to our industry and for end users in the years to come. The CO2 standard broadens the refrigeration community's exposure to natural refrigerants, expanding our organization's focus to encompass commercial applications for natural refrigerants - and expanding IIAR's membership by becoming relevant to a new group of engineers, contractors and end users.

Now, because low charge systems and other technology developments are opening the door for natural refrigerants in so many traditional and new applications, our new CO2 standard is more important and timely than ever.

Another IIAR achievement I'm proud of this year is the Ammonia Refrigeration Low Charge Manual (ARM LC), which has just been voted on and approved by the IIAR board of directors, the result of so much time and effort at the committee level. As increasing numbers of end users are considering low-charge, more equipment engineers and manufacturers are designing and selling such systems. The manual will give much-welcomed guidance for operating low-charge systems.

Given the level of regulation our industry faces, many end users are re-evaluating the PSM/RMP 10,000 pound regulatory threshold. Having this document available provides much needed guidance for selecting and operating systems under that threshold, and goes a long way in supporting our membership.

All of these achievements are really the result of the hard work and volunteerism of our members, who are IIAR's greatest asset. I would like to thank everyone who has volunteered their time and committed themselves to participate – your effort is really starting to pay off.

I'd like to take this opportunity to call for your renewed membership, for your increased participation and leadership in IIAR's committees and development of conference technical papers. Whether you get involved as a committee member or as a tech paper author, or in some other way, your involvement is what makes IIAR a great organization.

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.

You have an unparalleled opportunity to influence the policies, codes and standards that shape our industry. Our committees span all of these areas and beyond, and they all depend on your help and support. To that end, we'll be focused once more on the work of our committees this year, especially in the regulatory arena, where we've continued to build relationships on behalf of our industry. As chair of IIAR, I have new-found respect for how important this work is, as well has how rewarding it can be.

This year's Natural Refrigeration Conference and Expo, will feature for the first time a technical program track for the commercial refrigeration side of our industry. The development of the commercial refrigeration technical program has been a collaborative effort between IIAR and the NASRC, and we look forward to welcoming that new group to the meeting. The conference in Phoenix is a great place for members to start getting involved in what is a group effort. We invite and look forward to everyone's participation and to Bruce Nelson's leadership in the year to come.

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OLD GAME, NEW CARDS

Corrosion Resistance Gets Renewed Attention as Stainless, New Coatings Move into Market

Maintenance costs, particularly for labor, are increasing, and the traditional material specified for piping and valve systems – painted carbon steel – is changing as end users search for solutions to minimize maintenance and increase reliability.

"The presence of corrosion creates specific issues, particularly with uninsulated valves and controls, that must be managed by those in the refrigeration industry," said Bob Czarnecki, a member of the International Institute of Ammonia Refrigeration board of directors. "Designers must consider corrosion issues as portions of most refrigeration systems will operate below ambient dewpoint, and operators must provide ongoing maintenance to mitigate the presence of corrosion."

The upcoming ANSI/IIAR-6 Standard for Inspection, Testing, and Maintenance of Closed-Circuit Ammonia Refrigeration Systems speaks to the industry's awareness of corrosion and what needs to be done.

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Traditionally, corrosion problems have been met by keeping the valves painted, but that is an expensive, labor-intensive process. Other solutions now available include use of stainless steel, which does not corrode over the typical useful lifespan of a valve, and proprietary coatings that protect against corrosion, providing operators with choices to balance initial cost with ongoing maintenance expenses.

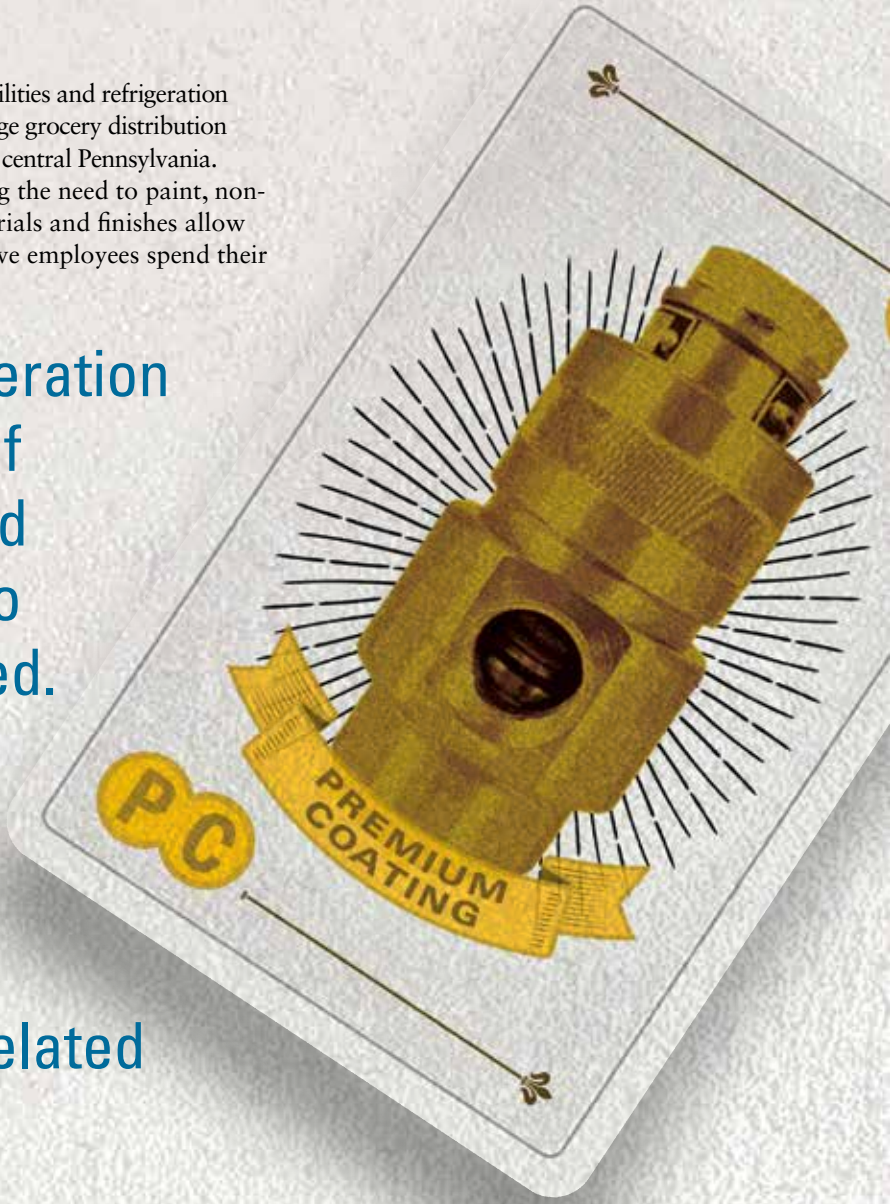
More efficient design and maintenance decisions that make the best use of personnel can help improve operations given the industry-wide labor shortage. As the labor shortage in industrial refrigeration worsens, facility managers are looking for new ways to free existing personnel by eliminating maintenance functions requiring staff hours that could be used for higher-level tasks.

"Painting is a constant maintenance headache from our end. It takes time and money, and we could do other things," said Chris Greiner, utilities and refrigeration tech lead at a large grocery distribution center located in central Pennsylvania.

By eliminating the need to paint, non-corroding materials and finishes allow operators to have employees spend their time on tasks that improve their systems' overall operation. Greiner said a refrigeration operator/technician's time would be better spent on preventive maintenance, such as calibrating temperature, pressure and ammonia detectors, testing safety systems, and replacing belts, changing oil filters and lubricating the equipment. Time could also be spent cleaning the refrigeration equipment, physically observing the refrigeration compressors, evaporators and condensers to pick up on subtle changes in noises and vibrations that could be leading to an issue or monitoring operation and making adjustments to the control system, which would reduce energy usage and unnecessary equipment wear.

"Valves in industrial refrigeration applications are the life of a refrigeration system and what allows the system to operate and be maintained. The minute a valve does not work, it can equal temperature loss, product loss, downtime, and even create safety-related problems that need to be immediately mitigated."

– Jim Hower, sales director of industrial refrigeration for Danfoss



"Also from a safety aspect, some of the valves could be located at locations [that are difficult to access and could create hazards]," Greiner said. "From an environmental point of view, the less paint we have to use the better for the environment and the person doing the painting."

Jim Hower, sales director of industrial refrigeration for Danfoss, noted that corporate food processing and cold-storage end users have a finite amount of resources. "Spending money to staff full-time refrigeration operators just to maintain and service refrigeration valves is no longer an option in many cases. Operators need to be highly skilled, multi-disciplined, and there is a huge shortage in the industry," he said.

"Valves in industrial refrigeration applications are the life of a refrigeration system and what allows the system to operate and be maintained," Hower

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said. "The minute a valve does not work, it can equal temperature loss, product loss, downtime, and even create safety-related problems that need to be immediately mitigated."

Without valves, refrigeration systems wouldn't be possible. "They control what happens in the system. From both a safety standpoint and functionality and maintenance standpoint, the valves are absolutely critical," said Chuck Taylor, president of CRT Design.

A typical industrial refrigeration system may have hundreds of valves that automatically open and close daily to maintain building or product temperatures, and shutoff valves are what allow portions of the system to be serviced independently while the rest of the system continues to function, Hower said.

Inspectors have a good reason for caring about valves because they must function properly in the event of an emergency.

Nick Nechay, president of Independent Refrigeration Services Inc., said valves are often the forgotten piece of industrial refrigeration systems. "They're usually in an area that is on the roof or somewhere that no one is looking at every day," he said. "No one thinks about them until they don't work."

Nechay added that everyone is working to avoid external corrosion as an issue. Refrigerated facility owners are taking a new approach to maintenance, making operational decisions and specifying equipment for long-term efficiency.

> The industry is experiencing higher standards for facility visibility from customers and regulators, which emphasizes the need for properly maintained systems. Even if corrosion isn't creating a mechanical issue, it gives the perception the system isn't adequately maintained.

Dave Schaefer, chief engineer at Bassett Mechanical and a member of the International Institute for Ammonia Refrigeration board of directors, said the most significant advantage to the latest technologies is less maintenance and reliable performance. "There is more and more interest due to mechanical integrity concerns," Schaefer said.

Harold Streicher, vice president of business development for Hansen Technologies, said Hansen has developed its Anti-Corrosion Technology to minimize the risk of corrosion. "We want to help make the asset last as long as it can and improve its mechanical integrity as it relates to Process Safety Management," he said, adding that Hansen's proprietary ACT coatings will last longer than zinc plating and may in some cases approach the expected life of the valve. "It greatly extends the life to first-service."

Eric Johnston, director of process safety management for American Foods Group, has been using Hansen's ACT coating for a little more than a year. Johnston said he was interested in the coating for American Foods Group's plant with smokehouses. "It is a really corrosive environment with the lactic acid in the air," he said. "We were having a lot of issues with corrosion on the outside of the valves."

Johnston said that formerly new valves would experience corrosion within six to eight months of installation. "We'd have to clean it off and paint it. We'd use a nice two-part epoxy, and it would last six months to a year," he said.

Today, American Foods Group has installed seven control banks with the ACT coating and said he has seen good results. "We are just over 18 months on the first valves and there is no rust,"

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he said, adding that if he gets two years out of the valves before having to paint them, the ACT coatings will have proven to be economical.

For Johnston, corrosion creates a food-safety issue even if it isn't a mechanical issue, while Bassett's Schaefer said specific applications, such as a spiral freezer, are ideal candidates for new coatings or stainless steel. "You wouldn't want rust flakes getting in food products," he said.

Taylor said that from a corrosion standpoint, the corrosion is normally more of an appearance issue than a safety and functionality issue. "It isn't usually a danger issue where it is going to rust through," he said.

The industry is experiencing higher standards for facility visibility from customers and regulators, which emphasizes the need for properly maintained systems. Greiner agreed that even if corrosion isn't creating a mechanical issue, it gives the perception the system isn't adequately maintained. "I don't like for an inspector to come in and look at my system and see [corrosion]. They see that, and it becomes a perception issue," he said.

Greiner said corrosion on valves is a big issue for the distribution center, which serves more than 200 stores. "Most of our valves are outside on the rooftop. We try to keep up with everything for OSHA standards and PSM," he said, adding that the company is always doing maintenance to keep corrosion at bay.

The distribution center where Greiner works has both painted and plated valves. As valves go through their normal heating and cooling cycles, metal expands and contracts, which causes paint to crack over time. "It peels off, and it is always wet, so that creates opportunity for corrosion," Greiner said.

Another option is stainless steel, which involves cost and availability trade-offs.

Greiner said he would like to go to stainless steel valves, but they aren't available in all of the sizes he needs. "I'm hoping in the future we could have some stainless valves for every application or size and have them be affordable enough that people would go for it," Greiner said.

Johnston said he too has looked at stainless steel valve options but said cost can be an issue and they don't come in larger sizes needed for industrial refrigeration.

Cyrus Shank Co. offers stainless steel options in all but three of its valves that are up to one-and-a-half inches. The remaining sizes are in the process of getting certified.

Nechay said he has seen a push from customers who want stainless steel valves in their space, particularly those focused on food safety. "They don't want to deal with rusting carbon steel valves in a production space," he said, adding that because there is added cost, it would only work for customers that are willing to pay the premium expense.

Mike Effrein, a sales engineer for Hantemp Controls, said the use of stainless steel is a growing trend in industrial refrigeration. "Industrial refrigeration facilities typically serve the food and beverage market," he said, adding that stainless steel is easier to keep clean than painted surfaces and less prone to surface contamination. "Maintaining a clean and hygienic working facility is critical. Because stainless steel is corrosion-free, it is the go-to material for wash-down areas in such facilities."

Hantemp Controls manufactures stainless steel ball valves, control valves, check valves, gauge valves, flanges and float switches. In addition to reducing maintenance expenses, stainless steel can provide added strength benefits because its physical properties allow it to be rated for higher pressures and lower temperatures. Due to the types of valves Hantemp manufactures and their functionality, Hantemp has been able to reduce weight through the use of stainless steel.

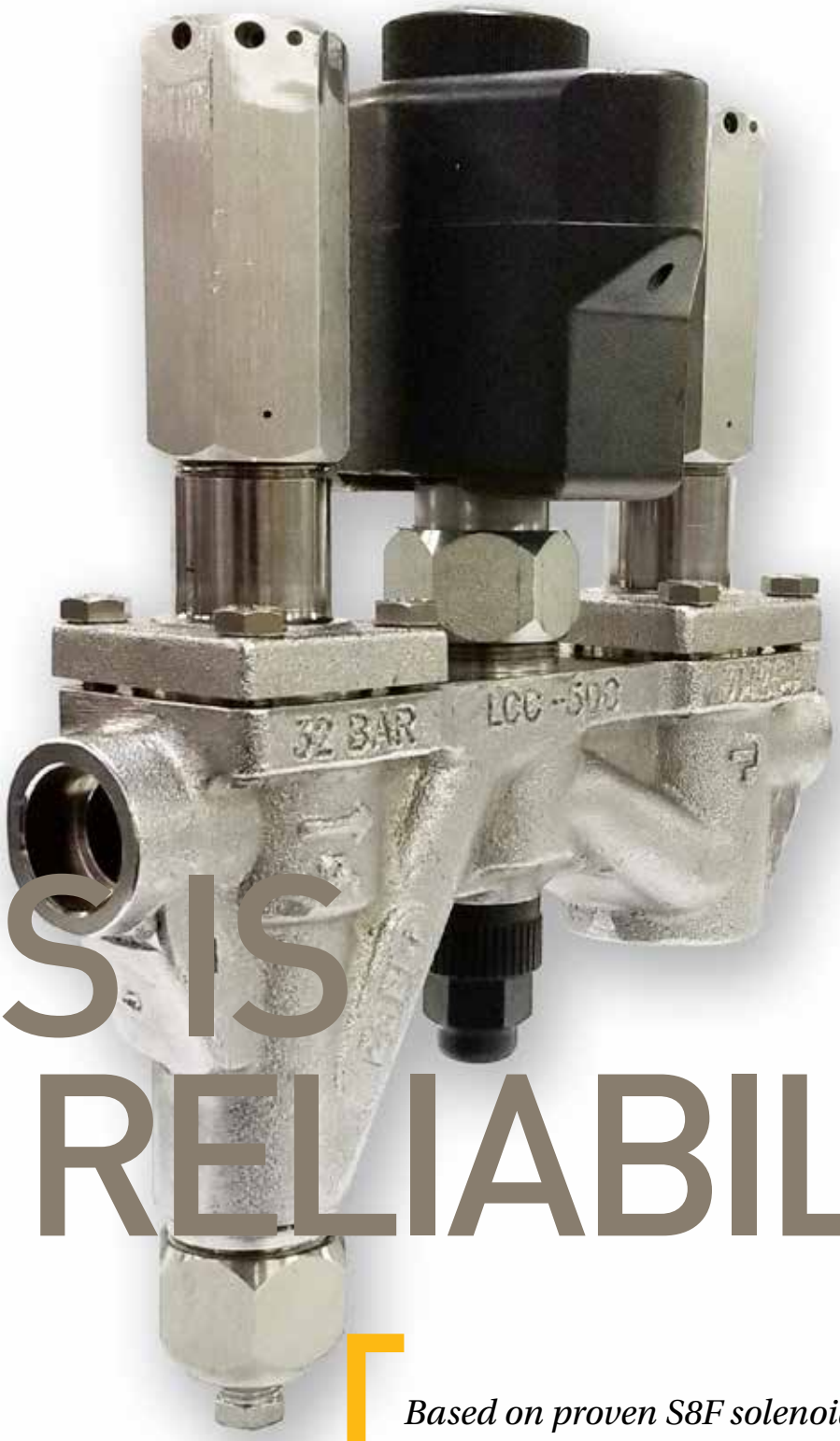
Despite its advantages, a large number of clients aren't taking advantage of stainless steel options, Taylor said. "We spec thousands and thousands of valves and very few spec the stainless," he said. "It is primarily because people don't see the value of the corrosion prevention compared to the cost [premium]."

Today stainless valves can cost three to four times more than traditional valves. "If you get down to one-and-a-half to two times the cost, it would probably [become more acceptable]," Taylor said.

Manufacturers have been responding to the market trend of corrosion-resistant products not only with coatings, but also by introducing expanded stainless steel product lines at more competitive price points as the volume continues to grow. Hower said Danfoss has realigned pricing to be less than two times the price of carbon steel back in early 2018 recognizing this trend and seeing the opportunity.

The increased cost of stainless steel valves is a consideration when designing the system, so it is the end user who has to weigh the decision. For Greiner, the cost of stainless would be acceptable if he could get the sizes he needs. "To me, it wouldn't be so much an ROI I'm interested in. If you put stainless in, you know it is going to get a return," he said.

The cost of a valve not working usually far exceeds the unit's purchase



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Zinc coatings on valves do extend the life of the valve and system by providing a more durable surface treatment capable of not corroding and have a much higher adhesion rate than traditional industrial paint.

price, which is why quality products are favored in this industry, Hower said. "The valves need to perform hundreds or thousands of times flawlessly in order to not cause a maintenance problem that requires human operator intervention," he said.

Less corrosion results in less maintenance and greater serviceability, Czarnecki said. He added that coatings are becoming more popular and offer a less expensive option to stainless steel.

Facilities can spec stainless steel valves while still using carbon steel piping. However, on new builds locations typically spec stainless steel pipes if they are opting for stainless steel valves. "In the past, this would have been done with a mechanical or flanged connection, but weld-in style valves have recently become very popular due to their low leak potential. This application would require a transition weld carbon-to-stainless, but this should not be an issue for a qualified contractor," Nechay said.

Danfoss's Hower said the company is extending the life of products in industrial refrigeration systems in multiple ways. "Some of this is through life-cycle testing and redesign, and some of it is through material choices and upgrading to more durable designs compared to what was traditionally available to the market," he said.

Danfoss offers corrosion-resistant coatings, such as zinc, forged carbon steel bodies instead of cast steel, and stainless steel components and valves, Hower said.

Zinc coatings on valves do extend the life of the valve and system by providing a more durable surface treatment capable of not corroding and have a much higher adhesion rate than traditional industrial paint. "Zinc is a sacrificial layer. It gives itself up instead of the iron," Streicher said.

However, zinc-coated valves do require painting because the ammonia can react with the zinc and discolor it, Taylor said.

Cyrus Shank Co. offers carbon steel valves with a black-oxide coating, which can help fight corrosion. The black-oxide coating is impregnated with oil to give it more corrosion resistance. Turco said customers can place a corrosion resistant paint on top of the black-oxide coating.

Cyrus Shank also offers painted ductile iron valves along with aluminum options, but Turco said he would always recommend stainless steel valves because they generally provide the most corrosion resistance because of their high amount of chromium.

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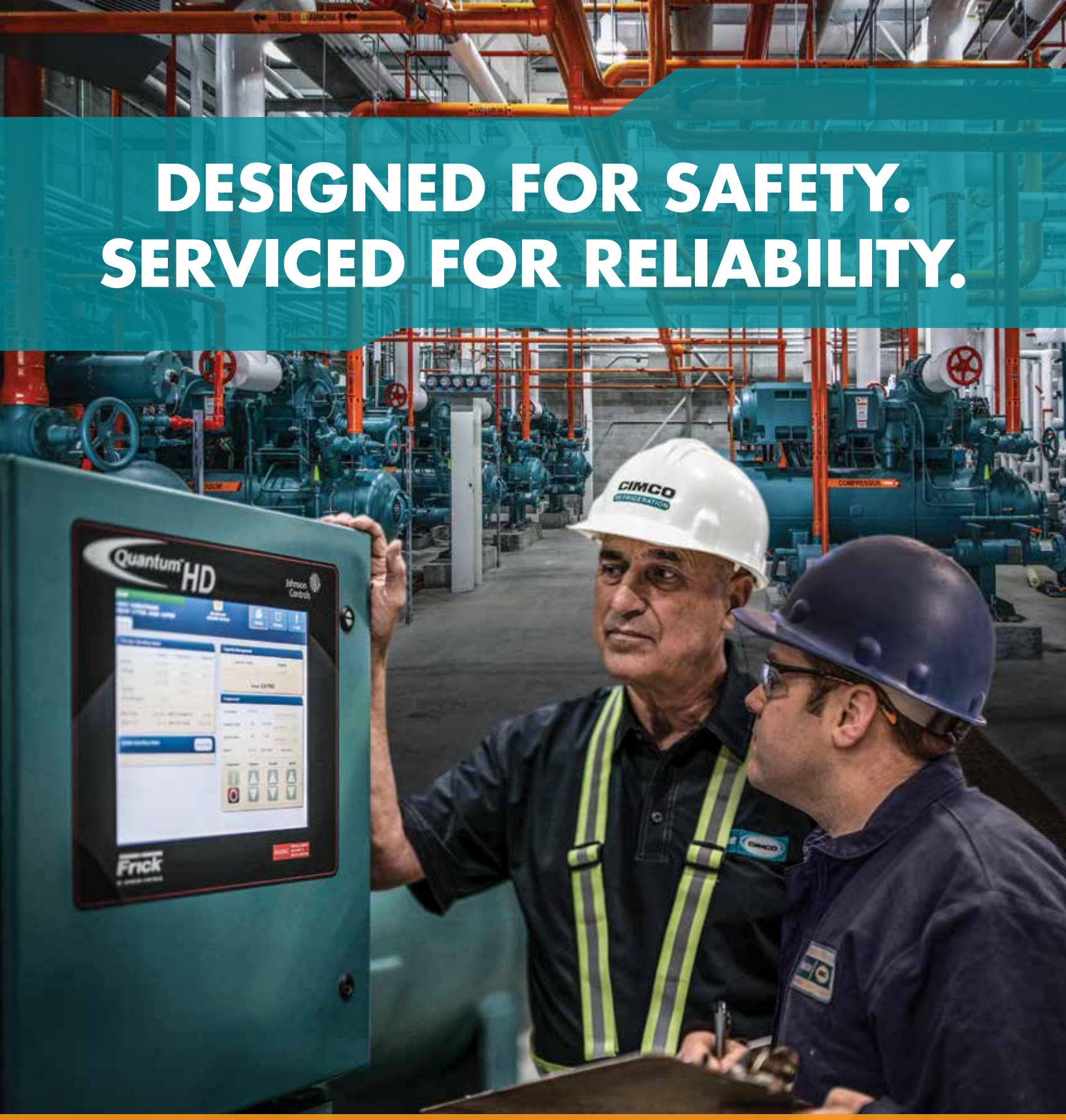

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The Sustainability Challenge

BY BRUCE NELSON

To date, activities within the International Institute for Ammonia Refrigeration have dealt exclusively with ammonia safety and ammonia refrigeration systems. That's who we are, where we come from and what we've done well. Recently, however, it has become clear that IIAR needs to take up the challenge of promoting the safe and efficient use of all the natural refrigerants – ammonia, carbon dioxide, hydrocarbons, air and water. Suddenly we find ourselves in the position of analyzing and making comparisons between these natural refrigerants regarding the benefits and preferences of using one over the other, or in various combinations.

This will create an interesting dynamic in IIAR that we have not had to navigate before. It will be up to us to manage this transition carefully so that practitioners of the various working fluids are given equal time and a fair hearing within our venues to promote their new ideas and technologies in ways that are fair and unbiased.

IIAR's mission is to rigorously study all aspects of this industry to encourage dialogue and discovery in order to make the best use of all the natural refrigerants. We are obligated to understand which refrigerants are best suited to a particular application using sound science and research methodologies and to share our findings with the community.

Sustainable – that is to say energy efficient -- use of the natural refrigerants is an important aspect of our mission. The energy efficiency of a refrigeration system is related in part to the working fluid itself, as in the inherently higher energy efficiency of an ammonia refrigeration system compared with a transcritical CO2 system. Efficiency is also related to the design and arrangement of components and in how the system is operated. For example, a well-designed two-stage low-charge ammonia refrigeration system with VFD direct-driven reciprocating compressors will run with significantly less power consumption than will a conventional single-stage pumped-ammonia system using screw compressors.

IIAR's mission is to rigorously study all aspects of this industry to encourage dialogue and discovery in order to make the best use of all the natural refrigerants.

It is also important to note that the differences in energy efficiency between different compression technologies can be amplified at part-load operation. Industrial refrigeration facilities are typically designed to operate at the hottest time of the year at the hottest time of the day; however, once the plant is switched on, it invariably lives its life at 50 or 60 percent of that full-load capacity. The part-load efficiency of the plant becomes profoundly important to power consumption. A careful examination of the part-load efficiency of compressors, fans, heat exchangers, pipework and every other part of the system is critical to managing the total cost of ownership of a facility and understanding that facility's overall environmental impact.

Reducing the effects of our refrigeration systems on climate change is a part of the mission of IIAR. By applying natural refrigerants we are significantly reducing direct carbon emissions compared with the synthetic refrigerants. But direct emissions are only a part of the total amount of carbon emitted by a refrigeration plant over its lifetime -- approximately 10% of the total. The other 90% of carbon emissions are due to the amount of power consumed, which is affected by the energy efficiency of the system. To reduce the total carbon footprint of our systems, we need to understand how to make our systems operate as efficiently as possible.

I and others believe it is time for IIAR to create an Energy and Sustainability Committee that is tasked with researching, educating, and advocating this very important issue. In the same way that IIAR has taken up the challenge of developing safety standards that can be used by regulatory bodies, it should also be developing guidance and documents that will influence energy codes and sustainability guidelines in ways that can be adopted directly by code bodies.

This new Energy and Sustainability Committee presents us with a new opportunity to do the right thing for both the public and the planet - truly a worthy challenge!

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Costa Rica Adopts IIAR Standards

In late January Costa Rica officially adopted several standards from the International Institute of Ammonia Refrigeration to govern ammonia refrigeration facilities in the country. Costa Rica is the first to take such a progressive move in Latin America, and others in the region are taking note.

"Because of what's happening in Costa Rica, other Latin American countries are taking an interest, particularly Argentina, Ecuador and Colombia. Costa Rica did it efficiently, so these other countries are reaching out to us to see how they can emulate that," Yesenia Rector, IIAR's International Director, said. "It's a significant step toward developing safe norms within the industry in all Latin America."

"It's a snowball effect, and Costa Rica is the pioneer," she added. "They're setting the example."

Costa Rica has always been forward thinking in regards to energy efficiency and global climate change, Rector said. The country has made a commitment to be 100 percent carbon neutral by 2021, and the adoption of IIAR standards is a major step in that direction.

"Costa Rica is one of the greenest countries in the world," Rector said. "They are being very aggressive in reducing their carbon footprint… They're doing everything they can to reach their goal."

Part of that is the effort to make use of more natural refrigerants, with a specific focus on ammonia. However, it's not enough to simply make this switch – the country needed regulations in place to ensure these facilities were designed, installed, maintained and decommissioned properly.

Moving in that direction, Costa Rica began exploring IIAR regulations several years ago, and realized they were the standards they would like to see used in their own country. The process of converting measures and translating the regulatory language was completed recently, and the country has now formally adopted IIAR-2, IIAR-4 and IIAR-8.

In late January, Rector along with IIAR President David Rule and others traveled to Costa Rica to hold a seminar educating local end users, engineers, designers and contractors about the intricacies of the newly adopted standards as well as to meet with Claudia Dobles Camargo, Costa Rica's first lady.

"Costa Rica is one of the greenest countries in the world. "They are being very aggressive in reducing their carbon footprint… They're doing everything they can to reach their goal."

– Yesenia Rector, IIAR's International Director

The standards are now being adopted by Costa Rican facilities on a voluntary basis, but IIAR is working with the allied association CIEMI, Costa Rica's College of Electrical, Mechanical and Industrial Engineers, and CFIA, to codify them into regulatory frameworks. "The first lady is in full support of this," Rector said. "She's a very strong supporter."

After the standards are codified into regulation, the next step for IIAR is to organize educational programming in the country. "We'll guide them and provide them with materials that we've developed already as the part of the Academy of Natural Refrigerants," Rector said. "That's what we're concentrating on next."

David Solis, the Central American and Caribbean IIAR chapter chair will deliver a presentation about Costa Rica's adoption of IIAR standards and the progress Latin America is making regionally at IIAR's annual conference in Phoenix in March.

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Lockout/Tagout (LOTO) of Manually Operated Hand Valves

Trying to understand and properly apply standards and regulations is not only a time consuming effort, but also challenging. The Occupational Safety and Health Administration (OSHA) has Standard 29 CFR 1910.147, titled "The control of hazardous energy (lockout/tagout)", which is commonly referred to as "Lockout/Tagout".

In Section **1910.147(a)(1)(i)**, it states, "This standard covers the servicing and maintenance of machines and equipment in which the unexpected energization or startup of the machines or equipment, or release of stored energy, could harm employees. This standard establishes minimum performance requirements for the control of such hazardous energy."

Note that applying locks to maintain manual valves in a given position during normal operation does not fall within the scope of 1910.147(a)(1)(i). An example would be locking open a valve that a process hazards analysis team has recommended should be locked open to reduce the possibility of trapped liquid causing overpressure in some part of the system. A lock might also be applied to keep a valve closed that feeds a portion of the system that has been pumped down and is temporarily out of service. (Parts of the system permanently out of service should be isolated by removal of the ammonia and disconnection from the active system).

Typically, application of 1910.147 would be the isolation and electrical lockout/tagout of a compressor, a condenser fan and/or pump, an evaporator, electrically controlled valves, etc. When referring to manual operated hand valves, some argue this is a grey area since manual hand valves cannot be unexpectedly automatically opened, but could they release stored energy? Obviously, anhydrous ammonia, which is used as a refrigerant, is considered an extremely hazardous substance and safe work practices must be followed. However, manual hand valves require intentional operation to change their position, and bumping a valve is not usually likely to cause it to unexpectedly open. So, when do hand valves get locked out and/or tagged out? Some viewpoints include:

- Manual hand valves that are within a qualified operator's or technician's control would not unexpectedly open or release stored energy. The area of "control" could be within sight of the operator or technician. It could be argued that someone else could manually operate the valve, but since the manual hand valve(s) is within sight of the controlling person, such an oc-

currence would be extremely unlikely.

- Most manual hand valves in a refrigeration system are not required to have their position changed in the normal operation of the system. The control of refrigerant flow is most often by electrically or pneumatically operated control valves. Also, if a manual hand valve position must be changed, it is only done by a trained and authorized individual. In addition, quite often manual hand valves, as well as control valves, are located in restricted areas and/or areas requiring equipment to access each valve's location.
- In an emergency, manual hand valves can be used to reduce a potentially dangerous release or greatly limit a release. For example, while trying to reduce the amount of ammonia released, some manual hand valves may be closed while others remain open to allow the pump-out of the portion of the system or equipment involved in the incident. This timely action can have the potential to greatly reduce the amount of refrigerant released. Locking out these manually operated hand valves could actually make the situation more dangerous and/or could cause a delay in responding to control and stop a leak.
- Anecdotal information suggests there are instances where the lockout/tagout of manual hand valves is not commonly done. Following are a few examples:
  - During a pump-out, some portion of the system will have the liquid and/or hot gas sources shut off using manual hand valves while the pressure (and any refrigerant) are reduced to a zero pressure (potential energy) state. At that point, the suction manual hand valve is closed isolating the portion of the system being pumped out. Once it is verified that there is no remaining refrigerant in the isolated section, the intended work can continue. If appropriate, the rest of the system can be placed back into operation as intended. If a valve unexpectedly leaks while the work was being done on the isolated portion and the valve was locked out, a person would not be able to immediately respond to stop the leak. This can happen if the active (charged) portion of the system builds pressure after the isolating manual hand valve has been closed, perhaps from heat gain. The valve itself may gain heat and expand slightly causing what was once a tightly closed valve to weep.
  - Replacing pressure gauges is a common task, and this procedure is commonly done without a LOTO procedure being followed. The manual hand valve for isolating the pressure gauge is within total and exclusive control of the technician during the entire process.
  - During maintenance work on a control valve, the technician typically uses the manual hand valves to isolate the control valve. The technician has complete control of the manual hand valves associated with the control valve and remains at the assembly until the control valve is placed back into a safe operational state.
  - Oil draining manual hand valves are most often not locked out, however, they should have a plug or cap at the outlet of the valve or the valve's extended draining pipe line when not in use. Typically, oil draining manual hand valves and their piping discharge arrangements are located in restricted areas. The plug or cap is removed from the manual hand valve or from the end of the draining pipe line as part of the draining procedure. The oil draining manual hand valve is not locked out at any time during the procedure, even though the improper opening of this manual hand valve can (and has) lead to a significant release. Following LOTO procedures in an oil draining process typically would not make sense.

Another challenge is that interpretations of the LOTO Standard in other industries are not completely applicable to our refrigeration industry, resulting in questionable citations. When it comes to manually operated hand valves, the language is unclear and our own industry has not published any clear guidance on this issue.

In an effort to better understand what is being done in the refrigeration industry, the IIAR Safety Committee developed a list of questions for a survey, which was done in December 2018. There were 127 responses to the survey. Briefly, the survey indicated the following:

- Most companies, small or large, do have a LOTO program and do feel a LOTO program should apply to their refrigeration system, including manual hand valves.
- Over 80% responded that they believe their LOTO program is being applied to every manual hand valve in their system, even for routine tasks. This raises the question of whether the results are accurate, or if possibly those responding to the survey are not the refrigeration technicians who work on, or operate a system. Field observations have shown that use of LOTO may not be used in small or large companies as much as the people filling out the survey think.

Additional information about the survey results will be presented at the Workshop "Lessons Learned in Ammonia Refrigeration: Making Our Industry Safer", at the IIAR Annual Conference in Phoenix, AZ on March 5th, at 1:10 pm to 2:55 pm.

The refrigeration industry should have a guideline for the application of LOTO. There should also be consistency in its use. There should not be a gap between what we think is being done and what is actually occurring. If an industry-developed guideline is created, regulators would naturally refer to it rather than citing interpretations of the LOTO standard that might not be entirely applicable in the refrigeration industry. The survey is just one step in a process to develop a guideline specifically for the industrial refrigeration industry. It is hoped that with input from the Safety Committee, other members of IIAR, IIAR Staff, and other stakeholders, a guideline can be developed that can be widely accepted by our industry and eliminate or greatly reduce the gray area that presently exists in application of the LOTO Standard.

AMMONIA REFRIGERATION FOUNDATION

news

DAVE L. RULE
PRESIDENT, IIAR

Dear Colleagues,

The new calendar year is an exciting time for everyone to look forward to the opportunities presented and to establish their philanthropy plan for the year. As you consider giving back to others, I would like to invite you to support your Ammonia Refrigeration Foundation. Your contributions will continue to support the scholarships and veterans outreach programs that attract new talent to our industry and the necessary research programs to improve the quality and efficiency of the industry as a whole.

The dollars you contribute to your Foundation will continue to move these exciting programs forward:

- **SPONSOR HIRING OUR HEROES EVENTS**
- **THREE NEW SCHOLARSHIPS FOR ENGINEERING STUDENTS WITH CONFIRMED INTEREST IN REFRIGERATION**
- **THREE CONTINUING SCHOLARSHIPS FOR ENGINEERING STUDENTS COMPLETING THEIR DEGREES**
- **COMPLETION OF THREE RESEARCH PROGRAMS WITH SIGNIFICANT BENEFIT TO YOUR INDUSTRY**
  - Insulation study to determine best practices and procedures
  - Ammonia Data Correlation to establish new piping selection criteria
  - Ammonia CFD Analysis to determine analytics for detector recommendation and locations

The Ammonia Refrigeration Foundation is a 501(c)(3) education and research organization, which means all donations are fully tax deductible. Whether you choose a large corporate gift, participate in our individual giving program, set up a planned gift, or participate in this year's annual William E. Kahlert Memorial Golf Tournament in Phoenix, it's never been easier to give back to your industry.

The return on your investment has never been more important. Industry research, a growing scholarship program and the many other activities the Foundation supports are making your industry a better, safer and more rewarding place for all of us to work.

I hope you are as excited as I am to see our Foundation giving back so much to the industry we have all devoted our professional careers to serve. Please take time now to contribute, or better yet, establish a planned giving program for 2019. Your financial support will continue to sustain these important Foundation programs.

As an industry pioneering natural refrigerants at a time of immense technological and environmental change, your support will help us define what the future looks like for years to come.

Sincerely,

David L Rule

David L. Rule
President, IIAR

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Foundation Research Projects Summary

The Ammonia Refrigeration Foundation is dedicated to furthering the advancement of the knowledge and technology that drives the growth of natural refrigerants. The Foundation's three ongoing research projects are helping the industry address and solve specific technical problems as well as contribute new information to the code and regulatory communities. Here, the Foundation's research project leaders give a summary of where and how project information is being produced and used.

RESEARCH PROJECTS
RISER PIPE STUDY:

The energy efficient operation of industrial refrigeration systems depends upon, among other things, the proper selection and sizing of the suction line connecting the outlet of the evaporator to the compressor. The performance of the refrigeration system becomes more sensitive to pressure drop in suction lines as temperatures decrease, the most sensitive applications being freezing and blast freezing. Excessive pressure drop can cause severe penalties to the performance of the system, resulting in operational inefficiencies and high levels of power consumption.

One part of this suction piping that has not been well understood to date is what is referred to as a wet-suction riser. This section serves to carry ammonia leaving a blast freezer evaporator that is installed at floor level upward to join suction piping in the ceiling space, or on a rooftop. This wet vertical riser carries a mixture of liquid and vapor in the case of pump recirculated refrigeration systems. If not sized properly, these lines can significantly contribute to the pressure drop in the suction piping.

A number of years ago, ASHRAE initiated a research project which funded the construction of an ammonia wet suction riser at the DTI (Danish Technological Institute) Laboratory in Aarhus, Denmark to study pressure drops in these systems. The Ammonia Refrigeration Foundation contributed financially to this research and subsequently funded a follow-up project using the same test facility to examine pressure-drop behavior in these risers in regard to entrance effects, comparing the behavior of 90-degree elbow inlets vs p-trap inlets.

Another recently completed project, funded exclusively by ARF and with the permission of ASHRAE, has taken the measured data from the DTI tests and created a correlation that allows for the accurate prediction of pressure drop in ammonia wet-suction risers. The project has produced a technical paper describing the work, a software program that allows the user to accurately select pipe sizes for these risers and determine behaviors over changing loads, and a manual selection method for wet-suc-

tion risers which will be included in the revised Ammonia Piping Handbook.

"All of these deliverables will be presented at the Phoenix Annual Conference. It is anticipated that this new information will be well received by the IIAR membership," said Bruce Nelson, President of Colmac Coil and chair of the Project Monitoring Subcommittee. "It was my pleasure to chair the monitoring subcommittee for this project and to work with the other subcommittee members and researchers - all experts in the field of refrigeration and two-phase flow."

INSULATION STUDY:

IIAR and the ARF approved and funded a research project titled, "Development of a Mechanical Insulation Installation Guideline for Refrigeration Applications." The principal investigator on this project will deliver a non-proprietary, detailed, and thorough installation guideline for mechanical (pipes, tanks, and equipment) insulation systems in refrigeration applications including a complete and proper treatment of vapor-retarder joints, insulation joints, and insulation system terminations. Additionally, the project will deliver a procedure for use during and after installation assuring the quality of an insulation system as it is installed and compliance of the installation to the new installation guidelines.

"The IIAR/ARF research project related to insulation is very important to the refrigeration industry," said Jim Young, chair of the Insulation Research Project Monitoring Subcommittee. "Insulation immediately begins saving the facility owner money mainly by reducing energy usage, and this savings will continue for as long as the insulation system is in proper operating condition."

The project requires visits to numerous sites. Some of these facilities have well-functioning insulation systems, and some do not. Some of these sites are to have insulation systems under construction and some are to have poorly functioning insulation systems undergoing repair.

At each of these sites, in-depth investigations will be launched into the facility's installation methods and the opinions of the facility owners will be collected. The pros and cons of various installation methods will be gathered, along with any recommendations the facility owner or contractor has for improvements in the materials and installation methods used. Where the insulation systems are being repaired, the project will document the cause of the problems and what is being done in the repairs as a remedy.

"This project will generate a high-quality installation procedure for refrigeration mechanical insulation systems and a quality control process to assure that this installation procedure is being followed," Young said. "This is critical because the best insulation system design using the best materials will fail and will fail quickly without proper installation."

CFD STUDY:

The goal of this research is to provide scientific analysis to aid in developing code language concerning ammonia detector placement in cold rooms, says Brian Eudaly, IIAR's CFD study leader.

Current code language specifies the location of a detector where ammonia from a leak is expected to accumulate. This language sometimes results in costly confusion between various stakeholders including fire marshals, end users, contractors, and detector manufacturers. The results of this project will be used as a scientific basis for developing more precise IIAR code language concerning placement of ammonia detectors in cold rooms.

The project is using proven CFD, computational fluid dynamics, modeling software and techniques to simulate a variety of ammonia release scenarios for three configurations of cold storage and processing rooms. These three rooms are intended to produce conclusions that are applicable to a majority of cold rooms in the industry.
Rooms represented are as follows:

- +35 deg Cooler with ceiling-hung evaporators, populated with pallet racks of product;
- -10 deg Freezer with evaporators in a penthouse populated with pallet racks of product;
- +40 deg Processing room with ceiling-hung processing air units populated with representative processing equipment and product.

Hundreds of potential sensor locations are modeled in each room so that response times of each location can be compared in the different scenarios.

Sensor locations in each model include grids at four elevations in the room: one foot off of the floor, five feet off of the floor (breathing height), midway between floor and ceiling, and two feet below ceiling. Additionally, multiple sensors are located in the freezer penthouse.
Release conditions simulated are as follows for each room.

- defrost - fan at release off, all other fans on - ammonia defrost return conditions.
- diffusion1 - all fans off - ammonia defrost return condition.
- diffusion2 - all fans off - ammonia defrost supply condition.
- normal - all fans on - ammonia normal supply condition.

A total of 366 simulations have been completed which has provided the data set to begin analysis of optimum detector location(s).

The analysis is proceeding as follows:

- From CFD simulation output extract time to detect 25 ppm for all detectors and scenarios.
- Identify detector and detector array with total minimum time to detect 25 ppm summing the lowest time to detect for all simulations.
- Identify ammonia concentration in the room's breathing zone at time of detection with the detector combination(s) identified above.

Time to detect and maximum breathing height concentrations will be provided for the best arrays of single and multiple sensors in each room. This will give scientific data to the question of how many sensors should be put in a room and where they should be located.

This comprehensive data set and analysis will be provided to IIAR code committees as a scientific basis for developing more precise code language recommendations on ammonia detector placement in cold rooms.

Machinery Rooms in Europe and USA: Sprinkler Systems

BY MONIKA WITT, EURAMMON

Machinery rooms are enclosed zones with mechanical ventilation, separated from public space and accessible only to authorized personnel. They serve primarily as dry and protected places for the components of a refrigeration system, mainly compressors and pressure vessels, but also additional equipment, for example in secondary systems the evaporator and/or water cooled condensers.

The machinery room ensures that only authorized personnel, familiar with the characteristics of refrigeration systems, can be in contact with the equipment containing ammonia. Taking a look at the entire refrigeration system we can certainly all agree that the chance for an ammonia leak is nowhere greater than in the machinery room, since the high pressure is created here and most of the liquid is stored here. The machinery room is usually the place where most maintenance takes place and this increases the chance for potential accidents.

It makes therefore sense to use utmost care when designing, installing and maintaining the equipment in the machinery room.

Regulations are therefore based on achieving this in the best way. For example they define how to design and built the machinery room properly and what safety devices are required to ensure nobody gets harmed.

I do not want to get into details where the regulations differ slightly, but would like to bring up one issue that is handled quite differently on both sides of the pond, namely the requirement for sprinkler systems in the machinery room. In USA sprinkler systems are mandatory, whereas in Europe it is more or less prohibited to use them except under certain pre-conditions (EN378-3. section. 5.14.3.3).

One of the persons in strong opposition to sprinkler system was the well-known Anders Lindborg, an honorary life member of IIAR.

The reason for prohibiting sprinklers from European point of view is that in the event of a leak the ammonia should be confined to the machinery room without introducing unnecessary energy which would cause ammonia liquid to evaporate, as the gas volume is much more difficult to handle compared to the liquid. Adding water to liquid ammonia would introduce energy and evaporate the ammonia resulting in an enormous increase of volume (about 170 times) which increases the risk to people and spreads the ammonia vapour over much larger distances.

Keeping the ammonia in its liquid form minimizes the risk. According to German official bodies (i.e. Mr. Köritz) sprinkler systems do not belong in machinery rooms. (In order to wash down 1l ammonia about 30.000 l water would be needed).

It is possible that this requirement has been added since sprinkler lobby intervened because in some countries insurance fees would be higher compared to systems not having a sprinkler system. An older version of EN378 stated that sprinklers were not permitted in machinery rooms. The latest version, after vigorous lobbying from certain quarters, states that sprinklers are required but only if they meet certain restrictions, namely that

- The sprinkler heads are individually activated by high temperature (> 141°C)
- There is no manual override of the system
- The system conforms to the European Standard requirements

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CONFERENCE CHAIR'S MESSAGE

IIAR 2019 NATURAL REFRIGERATION CONFERENCE & EXPO

Welcome to the 2019 IIAR Natural Refrigeration Conference & Exhibition!

We are coming off of a very successful conference in Colorado Springs last year where we celebrated our 40th IIAR Annual Conference. This year we are pleased to return to Phoenix after many years. The last time we were here was in 1981 and the conference, our organization and our industry looked very different. At that time, we were only focused on industrial ammonia refrigeration, and we had just begun the work to create a suite of industry safety standards and technical publications. We have come such a long way since then!

Recently, we have added the Academy of Natural Refrigerants to provide education and credentialing for our members. As well as focusing on our mission to support all natural refrigerants for our industry. Also, through our partnership with NASRC, our members will also have the opportunity to participate in a dual track of technical programs to address both the commercial and industrial sectors of our industry.

All of that work starts here, at our annual conference through the hard work and dedication of our committee members. So how can you participate in this great mission of ours? Two words … get involved!

The work of our committees is really the cornerstone of our institute and activities. I'd like to use this message to not only welcome you to this year's conference, but also to encourage you to find a committee whose work you can participate in and become passionate about.

Once again, in 2019 we have a record level of support from our sponsors and members with an outstanding exhibit hall. With more technical presentations than ever before, more exhibitors in non-heavy equipment conference than we have had in past conferences, and a great turnout from registered attendees.

This year includes our Energy Efficiency program that has already attracted many registrants and will help us to continue to bring timely, useful advancements in the industry to our members.

In order to stay connected, please take a moment to download the IIAR Conference App. It continues to be updated to provide you with more services and improve your overall conference experience. The App will allow you to access:

- Conference Maps & Event Schedules
- Direct Communications with Attendees
- Daily IIAR Event Updates
- And, an improved QR information retrieval system

Monday night we will continue the tradition of kicking off the conference with an evening out to network with your industry colleagues and spend time with friends. This year it will be held at the "Duce," this is an eclectic venue that is as retro as it is modern. Attendees will enjoy unique food stations, beverages, and entertainment. Please refer to your conference guide or the conference App for more details of this fun, entertaining evening.

It is with great gratitude that I want to thank our staff and executive committee that have dedicated a lot of time and effort to ensure your conference experience is the best if can possibly be this year.

Our conference keeps growing every year, and if you're a longtime IIAR member, welcome back. If you're new here, I hope you enjoy the energy and enthusiasm of your colleagues.

Welcome to Phoenix and enjoy the conference!

Best Regards,

Dave Schaefer,
2019 Conference Chair

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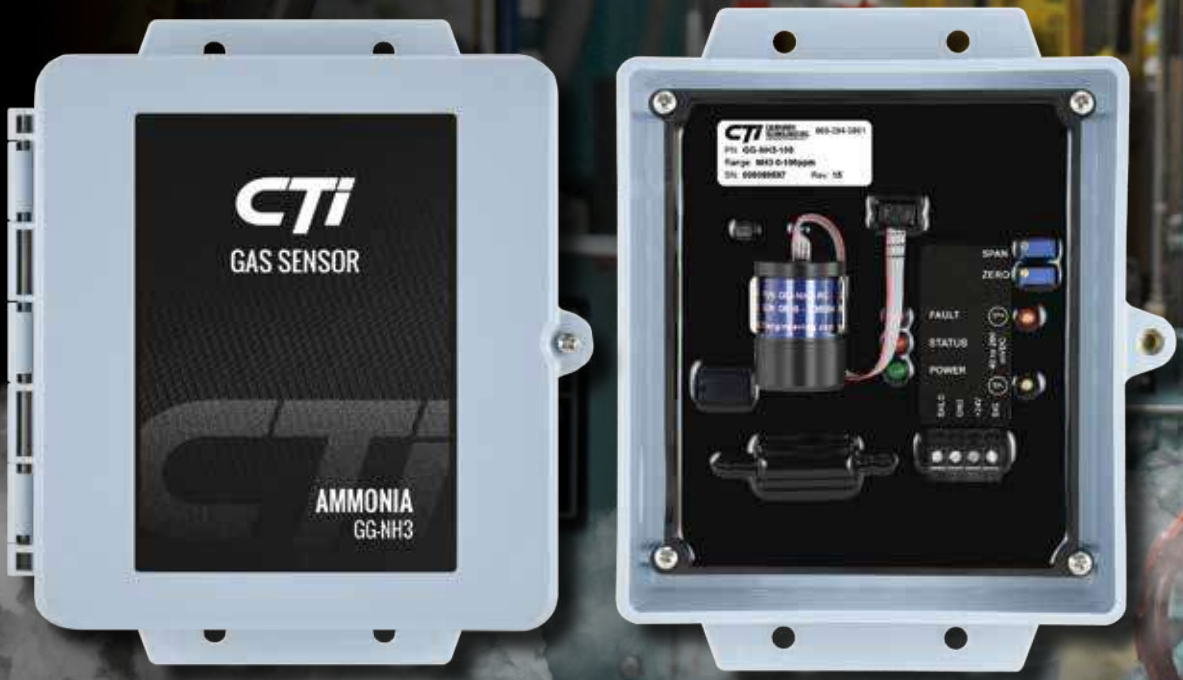

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IIAR's Conference Tech Papers Expand to Include Commercial Sector

One main focus of the technical program this year was to help educate commercial decision makers and designers. "Commercial end users are starting to become more interested in natural refrigerants," Eric Smith, IIAR's vice president and technical director, said. "Now people are beginning to wonder about their applications – how well it's been going, the difficulties they've encountered and which natural refrigerants they should choose."

The first paper Smith highlights offers insights into exactly that. Authored by Dustin Lilya, Specialty Services Production Manager of DC Engineering PC, the paper provides a historical review and comparison of early natural refrigeration systems and goes on to compare the most popular modern systems being adopted in the commercial space. The paper serves as a tool to help end users and designers select which type of system would work best in their application while considering costs, regulatory frameworks and environmental benefits.

"This is essentially a paper that would help people understand the nuances of all the different natural refrigerants that might be available to them for use in a commercial system, Smith said. "It gets into the pros and cons and provides an energy analysis [of different refrigerants]."

Related to this is a paper titled Propane/CO2 Cascade Systems: A Buckshot Solution in a Magic Bullet World. "This is essentially a discussion about the construction process for a constructed system and the hurdles that had to be cleared to get this done. It goes on to discuss the various technical aspects of that system now that it's been installed," Smith said.

In 2016, Whole Foods Market opened the first and only supermarket in North America that uses a commercial propane/CO2 cascade refrigeration system, according to the paper's author, Tristam Coffin, the grocery chain's director of sustainability and facilities. "During a time when international standards organizations are struggling to reach consensus over raising the maximum propane charge size in self-contained cases from 150 grams to 500 grams, the Santa Clara, Calif., refrigeration system uses 231 pounds of propane safely, reliably and inexpensively," the paper states.

The purpose of the paper is to help others understand the viability of these systems by presenting performance and experiential data and to show that commercial systems using unconventional refrigerants can – and should – be considered in new construction.

A second focus of the technical paper program this year was the proactive approach to worker safety and protection of the International Institute for Ammonia Refrigeration – particularly as it relates to personal protective equipment. This is in line with IIAR's cooperation

with the National Institute for Occupational Safety and Health (NIOSH) regarding an expanded range of use for respirators in emergency action facilities, Smith said. The of first these papers, titled Personal Protective Equipment Applications for Ammonia Refrigeration, authored by Ed Johnson, PSM Engineering Manager - Dean Foods, helps reinforce the concept of wearing proper personal protective equipment when servicing an ammonia refrigeration system, Smith said. The paper gives guidance for assessing workplace hazards and presents information to help readers better select and maintain the different types of personal protective equipment necessary for their facilities.

The paper offers an analysis of different categories of protective equipment and advice for selecting, deploying and maintaining this equipment. "This safety assessment is a living document, and should not sit on a shelf and collect dust. Consider reviewing it annually as a part of your required annual [protective equipment] program audit, which is required by OSHA standards," the paper's conclusion reads. "As new technology provides us with safer alternatives to your current program, your annual review should evaluate this newer and safer [personal protective equipment] for implementation at your facilities."

The second paper, titled Emergency Action Plan Non-Response Policy Can Be a Mistake, authored by Gary Smith, President of the Ammonia Safety Training Institute, offers a thoughtful examination of what should be done in the case of an emergency. "What the author is trying to do here is convince the regulators of our industry that people can use a less sophisticated version of a self-contained breathing apparatus to mitigate leaks and to perform rescue of colleagues under dangerous conditions," Smith said.

Some facilities count on an energy action plan rather than an emergency response plan, Smith goes on to explain. Under an emergency action plan, many facility managers rely on the local fire department to mitigate leaks and perform rescues. This often takes time, and there is no guarantee the emergency responders have the equipment or training to be effective.

An emergency response plan, on the other hand, requires dedicated on-site staff as well as expensive training and equipment – often this isn't feasible. An emergency response plan requires tremendous investment, and in the other, your hands are tied." Smith said. This places facility managers in a precarious position. However, the paper provides a third option. Having a specific, relatively inexpensive pressurized escape hoods and emergency escape breathing apparatuses would allow an individual to escape a high concentration but also enter a high concentration under prescribed conditions to mitigate leaks or rescue colleagues.

The paper offers five examples of lessons learned from catastrophic ammonia releases and calls for the industry to step up and meet the challenge. "Industrial employers can significantly reduce the threats of ammonia injury and death rates. The fix is simple, the cost is negligible, and if done properly the increased safety will net a small profit on the company's balance sheet," the paper states. "All it takes is leadership initiative and manager discipline for operators and responders to engage situational awareness, engage pre-event readiness, wear basic personal protective equipment, and improve local emergency planning and training of operators and first responder firefighters."

Charitable Contributions from IRAs

The Pension Protection Act of 2006 first allowed taxpayers age 70½ and older to make tax-free charitable donations directly from their IRAs. By making a qualified charitable distribution (QCD) from an IRA directly to a qualified charitable organization, older IRA owners were allowed to exclude up to $100,000 annually from gross income. These gifts, also known as "charitable IRA rollovers," would otherwise be taxable IRA distributions. The law was originally scheduled to expire in 2007, but was extended periodically through 2014 by subsequent legislation and finally made permanent by the Protecting Americans from Tax Hikes (PATH) Act of 2015.

HOW QCDS WORK

You must be 70½ or older in order to be eligible to make QCDs. You simply instruct your IRA trustee to make a distribution directly from your IRA (other than SEP and SIMPLE IRAs) to a qualified charity. The distribution must be one that would otherwise be taxable to you. You can exclude up to $100,000 of QCDs from your gross income each year. And if you file a joint return, your spouse (if 70½ or older) can exclude an additional $100,000 of QCDs. Note: You don't get to deduct QCDs as a charitable contribution on your federal income tax return - that would be double-dipping.

QCDs count toward satisfying any required minimum distributions.

Caution: RMDs are calculated separately for each traditional IRA you own, but may be taken from any of your IRAs.

Caution: Your QCD cannot be made to a private foundation, donor-advised fund, or supporting organization [as described in IRC Section 509(a)(3)]. Further, the gift cannot be made in exchange for a charitable gift annuity or to a charitable remainder trust.

WHY ARE QCDS IMPORTANT?

Without this special rule, taking a distribution from your IRA and donating the proceeds to a charity would be a bit more cumbersome and possibly more expensive. You would request a distribution from the IRA and then make the contribution to the charity yourself. You'd include the distribution in gross income and then take a corresponding income tax deduction for the charitable contribution. But due to IRS limits, the additional tax from the distribution may be more than the charitable deduction. And due to much higher standard deduction amounts ushered in by the Tax Cuts and Jobs Act passed in 2017, itemizing deductions may have become even less beneficial in 2018 and beyond, rendering QCDs even more potentially appealing.

QCDs avoid all this by providing an exclusion from income for the amount paid directly from your IRA to the charity - you don't report the IRA distribution in your gross income, and you don't take a deduction for the QCD.

CAN I NAME A CHARITY AS BENEFICIARY OF MY IRA?

Yes, you can name a charity as beneficiary of your IRA, but be sure to understand the advantages and disadvantages.

Generally, a spouse, child, or other individual you designate as beneficiary of a traditional IRA must pay federal income tax on any distribution received from the IRA after your death. By contrast, if you name a charity as beneficiary, the charity will not have to pay any income tax on distributions from the IRA after your death (provided that the charity qualifies as a tax-exempt charitable organization under federal law), a significant tax advantage.

After your death, distributions of your assets to a charity generally qualify for an estate tax charitable deduction. In other words, if a charity is your sole IRA beneficiary, the full value of your IRA will be deducted from your taxable estate for purposes of determining the federal estate tax (if any) that may be due. This can also be a significant advantage if you expect the value of your taxable estate to be at or above the federal estate tax exclusion amount ($11,400,000 for 2019).

Of course, there are also nontax implications. If you name a charity as sole beneficiary of your IRA, your family members and other loved ones will obviously not receive any benefit from those IRA assets when you die. If you would like to leave some of your assets to your loved ones and some assets to charity, consider leaving your taxable retirement funds to charity and other assets to your loved ones. This may offer the most tax-efficient solution, because the charity will not have to pay any tax on the retirement funds.

If retirement funds are a major portion of your assets, another option to consider is a charitable remainder trust (CRT). A CRT can be structured to receive the funds free of income tax at your death and then pay a (taxable) lifetime income to individuals of your choice. When those individuals die, the remaining trust assets pass to the charity. Finally, another option is to name the charity and one or more individuals as co-beneficiaries. (Note: There are fees and expenses associated with the creation of trusts.)

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

John Yencho Retires from Hansen

We respectfully announce the retirement of one of Hansen's most dedicated and long-term contributors - John Yencho. John has been a key contributor to our success over his 34+ years of service and the industry. Although he is officially retiring, we expect him to remain involved with Hansen's on-going innovation efforts.

John has shared his time and technical expertise with industry through his many years of involvement with IIAR - as a Board member, committee member (Standards and Co2) and as a technical presenter. He has also presented at various international conferences and industry associations.

For those who do not know John as well, he began his journey with Hansen Technologies in July of 1984, almost at its conception. He was instrumental in developing many of the valves and technical equipment that we are still building today. John's most recognizable accomplishment was designing and helping introduce the Auto-Purger, which makes refrigeration systems more efficient by removing air and other non-condensible gas.

We will be honoring John by dedicating our headquarters in Burr Ridge, Illinois, as the "John A. Yencho - Innovation Center".

Was it Communicated?

BY KEM RUSSELL

Some may recall the statement made in the 1967 movie "Cool Hand Luke," "What we've got here is failure to communicate." Clear and understood communication is important in almost all interactions we have. As important as good communication is, we still have challenges in making it happen.

Communication of information has changed a lot in just the last couple of decades. For example, a short time ago I was discussing an ammonia release that occurred in the 80's. Information that may have changed what was planned and done in that incident actually had been available since the late 60's, but communicating that information was slow. Information was shared by print, telephone conversation, attending a meeting/conference, or watching the "reel" movie of the test. (Today a lot of people have no idea what a reel movie is.) Now, if something happens literally anyone in the world can have access to or know of that information in minutes, maybe even seconds. Also, a good share of communication now is done by email and/or text, which is convenient and fast, but can lose some important meaning that is transmitted by in-person, one-on-one communication.

Having quick access to important data can improve safety, if we put in the effort to read and/or listen, and understand the information as it relates to what we are doing, or plan to do. However, with the speed at which we can now access data, many have the tendency to skip over information that doesn't "pop up" fast enough.

Now, if something happens literally anyone in the world can have access to or know of that information in minutes, maybe even seconds. Also, a good share of communication now is done by email and/or text, which is convenient and fast, but can lose some important meaning that is transmitted by in-person, one-on-one communication.

Communication between people can lead to good results or unaccepted consequences. Here are a few examples where there was a "failure to communicate".

Many years ago I was a ski patrol working most winter weekends helping injured skiers, but also skiing some amazing powder runs. At the resort I worked at we allowed ski patrol from other resorts to also patrol, if they could prove their qualifications.

One Saturday a guy from another State checked in, and after reviewing his qualifications we told him "OK, let's go see how you ski." He was interested in skiing "steep and deep", which we had lots of.

Two of us took the visitor up to the top of the highest lift, and told him. "Stay with us". We took off down a steep chute, which opened onto a moderately steep open area. When we reached the top of the open area we stopped and let the visitor catch up. He was very excited, and couldn't wait to get more. I told him, "OK, you stay with us, and follow us." His response "Great! Let's go!" So, off we slid, with powder flowing over our shoulders, and into our mouth's as we snaked our way down through the powder.

We were having a lot of fun, but my final words "follow us" completely left our visitor's conscious mind. This particular open slope area was located above a 15 to 20 foot cliff band, with lots of trees below it. We knew this, and having skied this many times knew where to go. The visitor became so thrilled with the run that he didn't follow us, but skied right off the cliff.

We were somewhat in shock, thinking "Oh man this is going to be bad!" We cut around the end of the cliff band and traversed over to where the visitor would have landed. We found him stuck deep in the snow. He was a very lucky man. He didn't break anything, except one pole. He was still a little in shock, but told us "I remembered what you said, about following you, but that was

after I was in the air with nothing but tree tops below me".

Fortunately, he had landed right between trees and tumbled for a short distance in the soft powder snow.

When someone communicates to us, we need to listen and understand, not assume what is being communicated. It can also help if we verify the other persons understanding of what we are trying to communicate. If we or they don't clearly understand the communication "we or they" should ask for clarification. Also, as illustrated by the above example, not getting distracted, could save our life.

Communication in some form and the training process are inseparable.

Training to safely and properly do a procedure in a refrigeration system is very important. At one fairly large facility, they had developed both operating and maintenance procedures and trained on those procedures. A new person had recently started working in the refrigeration department and was going through training to be qualified to perform various procedures. One, was oil draining.

The written oil draining procedure was read by the new person. The next step was for the new person to watch a qualified refrigeration operator actually do the procedure. Then the new person would do the actual procedure while being observed by a qualified refrigeration operator.

This three step process could have qualified the new person to perform the oil drain procedure by himself. However, additional means of verifying understanding was not done. It was assumed that from reading the written procedure, observation of the procedure being done, and hands-on under supervision the knowledge of how to properly and safely do the procedure should have been communicated, unfortunately not in this case.

The trainee did not understand the importance of the sequence of steps in the procedure. He did not ask questions for clarification, but assumed he knew and the procedure was "No big deal". When he did the draining procedure, which involved an oil pot, he did not wear the required gloves for protection, nor did he close off the hot gas pressure to the vessel. He was surprised and shocked at the speed that the oil and ammonia vapor came out of the drain valve. The ammonia oil mixture covered about half of his right hand, resulting in blistering of his thumb and index finger. Fortunately, he had no other injuries. However he was strongly motivated to transfer to another department.

Here is another example of failure to communicate that was nearly deadly.

At a recent new system construction, half of the system was being started up while the other half had some punch list items being corrected. The refrigeration foreman had instructed one of the workers to complete some work in a particular zone. In this case both the foreman and the worker had both assumed they understood each other. Neither did. The worker went to the specified work area and in his mind, knew that a correction needed to be made on the liquid supply line feeding into a vessel. There was an isolation valve marked, located in the line just downstream of where the workers was going to make his modification. He started cutting into the liquid line, but very fortunately made the cut slow, and he stopped when he noticed the smell of ammonia.

The line he was cutting into was high pressure liquid ammonia. The foreman did not intend for the line to be cut, since it had previously been reviewed, pressure tested, and accepted. The foreman also assumed the worker understood that the liquid supply lines were under ammonia liquid pressure throughout the facility. The workers assumption of doing work that didn't need to be done, nor verifying what he was actually supposed to do very nearly resulted in a major release, with potentially significant injury or worse to the worker.

Whenever we are communicating some important information we should try to confirm that the information is being understood. This can be done by:

- Verbal questioning to confirm understanding
- A written sign-off that the person indicates they understand (although this can be an assumption, and a person is just signing a form to get it over with)
- A written test to verify understanding
- Observation (hands on) verification of understanding.

Communication is a two-way street, each party fully participating, listening, questioning, and understanding. At work, home, or wherever, learning the lessons to good communication can make life happier and safer. Don't have a "failure to communicate".

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Supreme Court Declines to Hear HFC Case, EPA Proposes Removing HFC Leak Requirements

iiar government RELATIONS

BY LOWELL RANDEL, IIAR GOVERNMENT RELATIONS DIRECTOR

On January 18, 2019, President Trump signed legislation to extend the authority for the Chemical Facility Anti-Terrorism Standards (CFATS) program. CFATS, administered by the Department of Homeland Security (DHS), was set to expire on January 19th unless legislation was enacted to continue its authority. Industry and DHS called for reauthorization to prevent a lapse in authority. Both cited the importance of certainty for the regulated community and government in continuing efforts to secure chemical facilities.

The legislation extends CFATS authority for 15 months. There were efforts to provide a longer-term extension of authority for a period of two years, but Senator Ron Johnson (R-WI), Chairman of the Senate Homeland Security Committee, was reluctant to pass a longer reauthorization without including reforms to the program.

Sen. Johnson has questioned the effectiveness of the CFATS program. He has introduced legislation that would revise the program and address concerns raised about the operation of CFATS. Johnson's proposed legislation would:

- Reauthorize the program for five years
- Require DHS to determine compliance costs for the government and industry
- Make the personal surety requirements mandatory for Tiers 1 and 2 and optional for Tiers 3 and 4
- Exclude cybersecurity as a performance standard
- Provide incentives for facilities participating in a DHS-recognized industry-run security program.

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Sen. Johnson agreed to the 15-month extension but has indicated his continued desire to reform the CFATS program for the future. The additional 15 months will enable Congress, stakeholders and DHS to consider these and other potential programmatic changes. IIAR will continue to engage with DHS, Congress and industry partners as the process moves forward.

CFATS BACKGROUND AND HISTORY

The CFATS program was originally established in 2006 to enhance security at facilities with certain chemicals. The focus of CFATS is to reduce the risk of terrorist attacks targeting chemical facilities. The focus on security distinguishes CFATS from other regulations facing the ammonia refrigeration industry such as Process Safety Management (PSM) and the Risk Management Program (RMP), which are focused on human and environmental safety.

CFATS ensures high-risk facilities have security measures in place to reduce the security risks of certain chemicals that DHS has designated as "chemicals of interest" (COI). Ammonia is one of 300 chemicals of interest regulated by the program. Facilities that possess the threshold quantity of a chemical of interest are covered by the program. Covered facilities must file a Top Screen with DHS within 60 days of acquiring the threshold quantity. DHS then assesses the information provided in the Top Screen to determine the relative level of security risk present at the facility. Those facilities deemed to be

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high risk are placed into tiers and are required to develop site security plans to address 18 risk-based performance standards. According to the Congressional Research Service, as of June 2018, approximately 40,000 facilities had submitted Top Screens, with 3,367 of those being placed into high risk tiers.

The CFATS program has had a mixed history. During the first years of operation, the program was dependent on annual authorization through the Congressional appropriations process. DHS faced challenges in program administration that led to a significant backlog in processing facilities. CFATS was the subject of seven Government Accountability Office (GAO) reports since 2012. In addition, concerns have been raised about the accuracy of the data being used to evaluate and place facilities into risk tiers.

DHS has made progress in recent years, catching up on the backlog and moving forward with approvals of site security plans at the highest risk facilities. The last Congressional action to reauthorize CFATS included program improvements. In 2016, DHS also revised its risk tiering methodology.

CFATS AND AMMONIA

Ammonia has been included as a chemical of interest since the beginning of the program. The threshold quantity to file a Top Screen is 10,000 pounds on-site. This is slightly different than threshold quantities for PSM and RMP, which are based on the quantity of a chemical present in a specific process. In August 2018, DHS issued a flyer to industry clarifying the reporting requirements for facilities with ammonia. The flyer was intended to increase industry awareness about the program and reduce confusion about what facilities need to file a Top Screen.

Historically, only a small number of ammonia facilities were deemed to be high enough risk to be placed into tiers 1-4. However, the recent change in methodology has had an impact on the number of ammonia facilities being placed into Tiers 1-4. Since the revision, a increasing number of ammonia facilities have been identified as higher risk and placed into tiers 1-4. This increased impact on ammonia facilities has raised questions about the new methodology and how ammonia being viewed by DHS. IIAR is in an ongoing dialogue with DHS to ensure that information related to ammonia facilities is being evaluated appropriately.

Facility security is a priority for IIAR and its members. While there have been some bumps in the road with CFATS implementation, IIAR has enjoyed a constructive relationship with DHS. The reauthorization of CFATS is a positive step in maintaining a consistent and predictable policy environment so facilities can make security decisions with a higher level of confidence. IIAR will continue to work with DHS, Congress and industry partners to ensure that future CFATS policies provide the needed framework for security while treating ammonia facilities fairly and appropriately.

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