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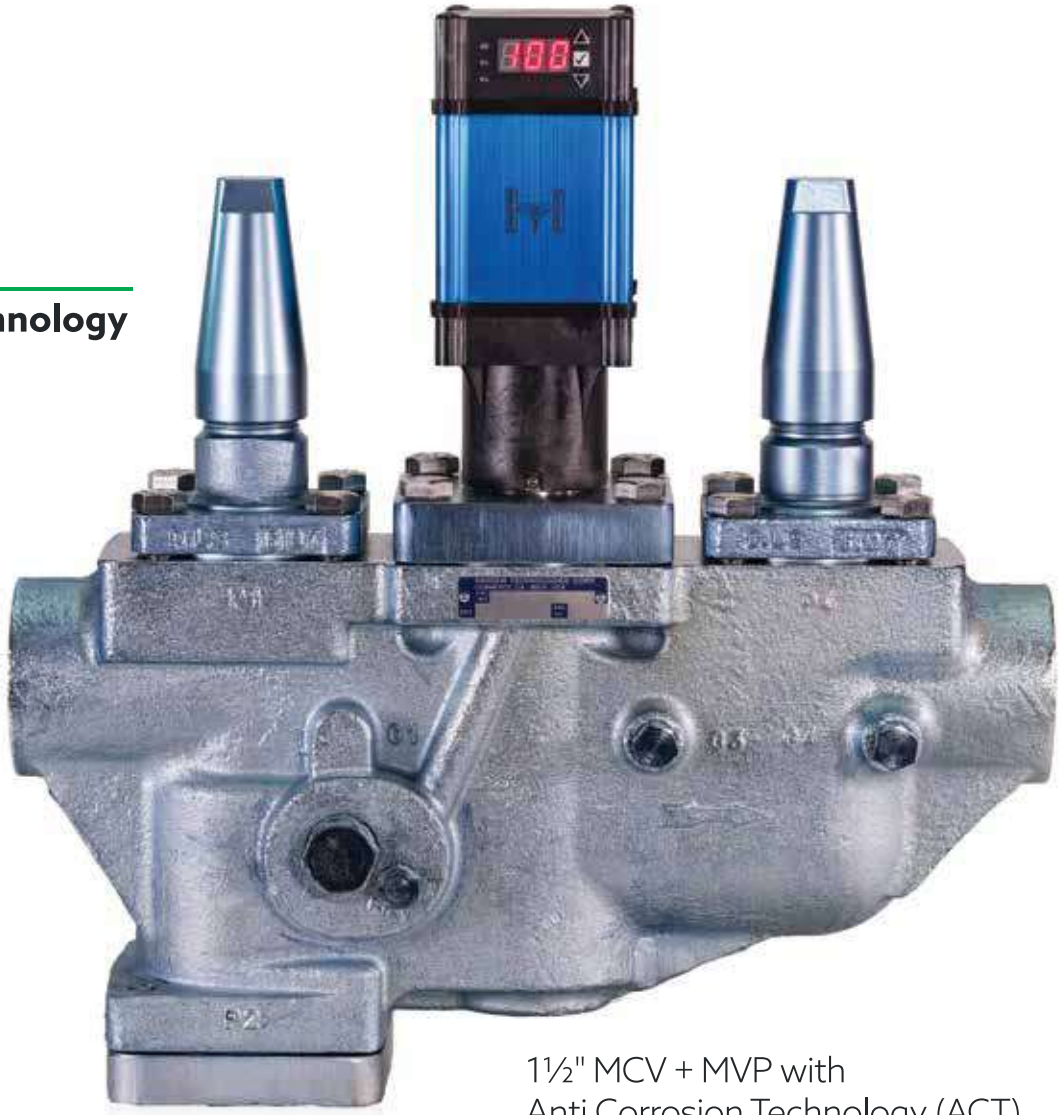

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president's MESSAGE

BY GARY SCHRIFT

Moving Forward While Sitting Still

This month, IIAR's big news is that our IIAR 2021 Natural Refrigeration Conference & Heavy Equipment Expo originally scheduled to take place March 28-31, 2021 in Palm Springs, California, has been rescheduled to be held June 20-23, 2021, in Palm Springs, California.

This change was first announced by our IIAR Chairman, Dave Schaefer, and I'd like to be the first to weigh in on the changes we've made to IIAR operations, and the conference, in particular, to keep pace in what has been an unprecedented year.

The later conference date will hopefully provide the needed time for a successful campaign against Covid-19 leading to a safe and successful in-person event for IIAR. We were one of the first organizations to have to cancel our 2020 conference and one of the first to hold a virtual conference. We would love to be the first organization in our industry to again hold a much-anticipated physical event.

We hope our first in-person event in 2021 is exciting for you, so please register now but feel assured you are at no risk. We realize with such an unpredictable climate; we may have to cancel the in-person event. If we do, the decision will be made in early March 2021 to avoid any costs such as shipping of materials and equipment and canceled flights. IIAR will refund all your registration, booth, and sponsorship fees 100%.

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In these virtual times, the initiatives asked for by our members continue to be advanced by our committees and staff. IIAR standard updates for IIAR-2, IIAR-4, and IIAR-8 are near completion. The new standard IIAR-9, Minimum System Safety Requirements for Existing Closed-Circuit Ammonia Refrigeration Systems, was released this past spring and the new IIAR Guideline for Developing an Energy Control Plan for Manual Hand Valves in Ammonia Refrigeration Systems was just completed and is now available. Our Series I, II, and III training videos continue to be updated to match the updates to standards and guidelines and are now available for online access through the IIAR Learning Management System (LMS). Soon to be added to our LMS Academy of Natural Refrigerants online course content will be The Basic Design of Ammonia Refrigeration Systems.

We are beginning online "Talk it out" small group sessions with our members to discuss topics asked about by our members. From these and other outreach with members, we hope to learn how IIAR initiatives can be improved and what other needs remain unfulfilled. Please stay healthy, happy, and in contact with me and others regarding the activities performed by your association and how you can get involved!

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chairman's MESSAGE

BY DAVE SCHAEFER

As we all know Covid 19 has affected almost every corner of the globe. It's been a very active year for everyone because of the pandemic. Our IIAR staff worked very hard to pull off, among other things a very successful industry-first all-natural refrigerant virtual conference. Our committees have also been very active despite meetings that are now, of course, conducted remotely.

Our industry has its own special challenges to stay in operation and keep everyone safe. How do I stay compliant with Process Safety Management? How do I conduct an audit if I can't go to the site? What types of equipment do I use? How often and how do we best clean our facilities? How do we keep the air safe? Every day there are new questions.

The Board of Directors and the Executive Committee decided to create a task force to try and address questions that impact our industry as they come up. In other words, all of our members are impacted somehow. For example, how will air handling equipment will be built and installed? How can Process Safety Management programs be managed with C19? The way building HVAC systems are operated. The way we travel. How do we receive training? The list goes on and on. Topics covered by the new Covid 19 webpage offer information to the questions that apply to manufacturers, contractors, consultants, academics, and especially end-users.

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I am very happy to be part of the task force group that includes Jeff Carter, Jenna Emmons, Eric Johnston, Lowell Randall(staff), Eileen McKeown(staff), Jeremy Klysen, Jacqueline Kirkman, and Gary Schrift. The task force developed a webpage that has the following categories; Regulatory Information, Best Practices, Technology, and People Management. Please take a look at the www.iiar.org website.

The webpage will be updated as new information becomes available. We also have had content contributions and links sent in from Keith Hazzard and Peter Jordan which are greatly appreciated. If you have suggestions, find information that is not on the page, or have updates that might help fellow IIAR members, please pass it along through the suggestion form, we're all in this together. The suggestion form is located at the bottom of the page.

https://www.iiar.org/IIAR/COVID19/IIAR/About_Us/Coronavirus_Information.aspx?hkey=814de566-0345-4b5e-84b9-a637dbc88e84

We are also planning on a webinar in early December where you can ask some of the committee members and others about their experiences.

The links and information are for your reference and can be used as a tool to aid in establishing your companies or facility's policies and procedures.

All things will pass and I really am looking forward to seeing you in Palm Springs June 20-23, 2021. It will be a big step in getting back to normal. I hope all of you have a safe and happy holiday season.

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Growing GREEN

HOW NATURALS ARE GAINING A SHARE OF NEW MARKETS

Hydrofluorocarbons occupy a market space that is very large and diverse ranging from residential through all types of commercial to industrial. While HFCs appear to be a good choice from a perceived safety benefit, they are still pollutants and increasingly regulated chemicals. Regulatory requirements are forcing HFC users to make a switch to lower global warming potential systems, and it is impacting different markets in different ways.

Kurt Liebendorfer, vice president at EVAPCO, said natural refrigerants are more competitive in specific markets, including the large food and beverage supply chain, the pharmaceutical industry, some niche energy markets, some sports markets such as ice rinks and arenas, as well as industrial markets such as manufacturing plants and chemical and petrochemical facilities.

"Market adoption in these markets is really accelerating over the last couple years," Liebendorfer said. "As this success continues in these core markets, then natural refrigerants will be well-positioned to further expand into other traditional HFC markets."

Liebendorfer said hydrocarbons are becoming prevalent in display cases and refrigerators, CO_2 has growing adoption in supermarkets, and low-charge ammonia is growing in food cold storage and distribution.

Tristam Coffin, president of Livingstone Consulting, said natural refrigerants have always been in competition with HFCs on the industrial front. On the commercial refrigeration side, they are beginning to come into competition.

Glenn Barrett, an engineering manager at D.C. Engineering, said transcritical CO_2 is now considered the system of choice by a few large commercial grocers. For commercial refrigeration

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systems, CO_2 has a much easier path to implementation and acceptance when compared to ammonia.

"ASHRAE standard 34 classifies ammonia as a group B2L refrigerant, meaning the testing standard considers it to be toxic and have flammability concerns," Barrett said. "The current codes and standards do not allow ammonia to be used in many of the applications where traditional HFCs have been used, whereas CO_2 is rated as an A1 refrigerant, and therefore it has enjoyed a wider acceptance."

Although there have been a few ammonia system designs, it is not a generally accepted refrigerant in commercial applications, Barrett said. "The main reasons are the ROI and the ability to find technicians who can confidently and safely service an ammonia system," he said. "When ammonia systems have been deployed, it has generally been done through cascade refrigeration systems which increases the first cost and, in this application, reduces energy efficiency due to the double heat exchange."

Another challenge with natural refrigerants is that they are not a drop-in solution," Coffin said. "You can't just put them in an existing system. Therein lies the challenge."

Christina Starr, senior policy analyst with the Environmental Investigation Industry, a non-profit environmental organization, said synthetic low-GWP refrigerants aren't drop-in either. "At a minimum, there is some type of a redesign of a system. In general, whether you're talking about a natural or a synthetic, when you start transitioning to truly low-GWPs there's some degree or flammability, toxicity, or high-pressure to manage, so you're talking about replacing major components of a system. In either case, we need a long-term view," she said.

LOW-CHARGE AMMONIA SYSTEMS

Low-charge ammonia systems are rapidly increasing in the marketplace, Liebendorfer said. "This is true for the newer versions of traditional central plant ammonia systems that are reducing their historical large charge designs, but even more so for the new packaged units, such as Evapcold, that are growing in popularity," he explained. "This technology is rapidly growing in the food and beverage market, where ammonia is already dominant, but also has tremendous potential to grow into new markets as well due to the benefits of ammonia as a refrigerant."

Obviously keeping the ammonia away from the public and the employees who work in grocery stores is the only viable option, Barrett said. "Therefore, the ammonia must be contained outside of the building and in relatively small charge amounts. This highlights the challenge of finding commercially available and cost-effective ammonia components," he said, adding that the industry also needs service technicians who are competent in the use of ammonia.

Tom Wolgamot, principal at D.C. Engineering, said the commercial industry will continue to be leery of low-charge ammonia systems until the maintenance considerations can be fully proven, and the ROIs justify the possible higher complexity and additional design considerations.

Up until about five years ago the prevalent use of natural refrigerants typically meant they incorporated a lot of custom engineering to be applied on a project-specific basis, but over time, people and companies have incorporated the ability to replicate these proven designs into packaged systems and improve them, Liebendorfer said. "The continued increasing quantities of pre-engineered manufactured systems will reduce the cost of low charge ammonia packaged systems and chillers, while also making ammonia safer to use thru increasing research and development of pre-engineered and tested technologies," he said.

THE CHILLER MARKET

Natural refrigerant chillers can beat-out HFC chillers based on lower energy consumption, longer life span, and being better for the environment, Liebendorfer said.

"I think CO_2 is taking a foothold on commercial space," Coffin said. "CO_2 is always going to play a critical role either on its own or with other natural solutions, for example, ammonia over CO_2."

Coffin said industrial use of CO_2 is also increasing. "There are a lot of regulations around ammonia, especially when you get to high-charge systems. That is raising the question of can we reduce the charge of ammonia or go to CO_2 as the sole refrigerant," he said.

Most ice rink systems use a chiller and pipe glycol or another secondary fluid under the ice sheet, which has allowed ammonia to be safely and widely used in an indirect system. "If you were using an HFC in a large supermarket refrigeration system, it pipes the refrigerant to the display cases," Starr said.

The greatest obstacles for CO_2 or ammonia chillers infiltrating the HFC chiller market right now are higher cost and their path to market. "The path to market for CO_2 and ammonia packages or chillers is through contractors, consultants, and suppliers that understand these new technologies, while HFC packages or chillers are more widely understood by the larger HVAC market and supply chain, all of which does not yet understand the new natural refrigerant technologies," Liebendorfer said. "For example, trained service providers in the use of ammonia and CO_2 is limited in the larger HCAV&R market."

The HFC industry has driven down cost by mass-producing systems. "Commercial HFC chillers by and large are pre-engineered mass-produced products and this evolution occurred over several decades and brought down their cost once they became off-the-shelf products," Liebendorfer said.

To expand further into the traditional HFC market, the same dynamic has to happen with the natural refrigerant systems, such as ammonia and CO_2 to lower their average cost point. "To really expand in all commercial air conditioning and refrigeration markets, they have to become more cost-competitive with commercial HFC systems," Liebendorfer said. "This is off to a good start but will take time to catch up."

EVAPCO and others are spending a lot of time pre-engineering standard and proven designs, manufacturing them in increasing quantities, and bringing down the cost of production. "The continued increasing quantities of pre-engineered manufactured units will reduce the cost of packaged ammonia systems, while also making ammonia safer to use through increasing research and development of pre-engineered technologies," Liebendorfer said.

Chillers, which by design provide a secondary fluid stream to the occupied space such as chilled water or glycol, is

the only method to apply ammonia to everyday, commercial occupied spaces, Liebendorfer said. "This is a great application, but its best fit is for larger cooling loads associated with larger buildings where economies of scale benefit ammonia due to its better energy efficiency and longer life span," he said.

Coffin said it is important to standardize around a plethora of solutions. "We need to look at those systems or solutions that can be standardized and start to scale and scale quickly," he said. "I would encourage people to look at the solutions and when considering adoption not let the perfect be the enemy of the good."

Barrett explained that costs are becoming competitive for transcritical systems. A recent study published by the North American Sustainable Refrigerant Council showed that CO_2 transcritical systems are the same or have a lower first cost than a traditional HFC system. However, he said other issues with deploying CO_2 are complexity and the relatively higher operating pressures. "There is still a need for additional technician training and opportunities to improve the energy efficiency through smaller systems with the additional suction groups, deployment and use of Ejectors and parallel compression designs," he said.

Liebendorfer said pre-engineered packaged CO_2 volatile brine systems, another growing natural refrigerant technology, are fairly new to the U.S. but have had great success in Japan and are growing in Europe as well.

"CO_2 volatile brine could be a good solution for direct refrigeration in such applications as supermarkets, small cold storage facilities, and ice rinks. However, for large occupied spaces in the commercial market, where HFC chillers are dominant, the cost barrier and path to market barrier will be the obstacles," Liebendorfer said. "In addition, challenges in scaling this technology for large applications or large facilities will need to be addressed."

Coffin said he is seeing limited scenarios where end users are using brine solutions, not necessarily CO_2 brine, for thermal storage to shift demand. There are also several commercial CO_2 brine systems deployed. "The trouble with a secondary solution is you're pumping a lot of fluid around, which tends to be less efficient," he said, adding that brine tanks can take up space, so real estate becomes an issue.

While there is a growing market for natural refrigerant chillers, OEMs are trying to read the market indicators on the direction they go. "Even if the market indicators are out there, sometimes there are dots that need to be connected," Coffin said.

For natural refrigerants, policy plays a huge role in adoption. "If we want to tackle the effects that refrigerants have on climate change and promote new technologies it is going to come down to the government regulating high GWP refrigerants."

– David Fauser, director of sales for CIMCO Refrigeration.

THE ROLE OF REGULATIONS

For natural refrigerants, policy plays a huge role in adoption. "If we want to tackle the effects that refrigerants have on climate change and promote new technologies it is going to come down to the government regulating high GWP refrigerants," said David Fauser, director of sales for CIMCO Refrigeration.

Starr said that one of the problematic things that have happened in the past in the U.S., from a regulatory standpoint, has been a very incremental worsts first approach. The government through the EPA's SNAP program has taken a very incremental approach going chemical to chemical sector by sector, banning the worst first," she said.

The Kigali Amendment, however, is a phase-down, but there is a strong possibility it could ultimately phase out HFCs. "That is something industries should be aware of in terms of long-term decision making. They should be targeting net-zero emissions by mid-century," Starr said. "We very much expect that what we could call transitional solutions being introduced in the form of HFC blends would need to be replaced in the near to medium term."

Liebendorfer said it is a foregone conclusion, albeit a slow process, that the federal government will implement regulations as well, particularly under the new administration. "The regulations will certainly accelerate the adoption process outside of our current slices of the pie," he said.

As regulations phasing out HFCs nationally faded, states are moving forward with their own regulations as part of the U.S. Climate Alliance. There are currently 25 states that have joined the alliance.

"Many of the states have already backstopped the federal regulations," Starr said, adding that California is in the process of finalizing some proposed regulations to require low-GWP refrigerants in large stationary refrigeration and commercial and residential refrigeration systems.

California picked up the mantle and ran with it, Liebendorfer said. "California is in the process of enacting the phase-downs based on dates," he said. "I now have people in California saying, 'I will consider ammonia or let's look at CO_2.'"

The California Air Resources Board has said that by 2030 supermarkets need to reduce the GHG impact of all of the refrigerants in existing locations by 2030. "It gives them the target to meet. They could meet it through fully

replacing their existing systems with natural refrigerants, which would be a significant reduction impact," Starr said, adding that natural refrigerants become the most common technology for a supermarket in California going forward.

CARB regulations, which are expected to be finalized in December, will also address ice rinks. California has proposed a 150 GWP threshold for new ice rinks. For replacement ice rinks, existing facilities could have 750 GWP (learn more about ice rinks on page XX).

Fauser said California is key because people look to the state as the leader. "California's leadership position recognizes that natural refrigerants offer a superior option to synthetics on so many fronts. I believe other territories in Canada and the USA will follow California's lead and more than just our environment will benefit," he said.

"We expect other states, such as New York, which have very ambitious climate goals to achieve net-zero emissions. They're looking for every possible low hanging fruit. HFCs are one," Starr said.

END-USER EDUCATION

As HFCs phase-down, end users can either turn to naturals or take a transitional step with lower-GWP (under 150) synthetics. While synthetics tend to be viewed as a safer commercial option, they aren't the best long-term choice, Coffin said. "Just because they're not toxic doesn't mean they aren't a pollutant. We need to get this under control in the next 10 years to avert an all-out climate crisis," he said.

Those within the industry said end-user education is important to advancing natural refrigerants as HFC replacements. "There is this question for a lot of the industry of what will be allowed in the long term," Starr said. "When can we stop transitioning? That is exactly where natural refrigerants come into play."

"Those who think about the long term will hopefully look to naturals as a solution because they are regulatory proof," Coffin said.

"In most cases, you're not going to be able to build your way out of the regulation. You're going to have to look at existing systems, which means there will be important thought on what to do with existing infrastructure, Coffin said. "Let's not think of this as the next R-22 phase-out. Let's be thinking long term and strategize around scenarios," he said.

There are scenarios where end-users and owner-operators have an opportunity to retrofit to a lower GWP, but that isn't the end game, Coffin said. "If the end goal is zero GHGp and, in reality, carbon neutrality is becoming the norm, it needs to become the end goal. People should be thinking longer term, but that isn't always how the financial plan works," Coffin said. "If the short-term option is to retrofit and that is the cheapest option and end-users aren't thinking further out, they may do that, but I would encourage everyone to at least take a hybrid approach."

In the supermarket sector, for example, the equipment has a 15-20 year lifespan. "If you are a food retailer right now, something you're installing in 2020 will be around until 2040 or later," Starr said, adding that the equipment could be obsolete by the end of its lifespan. "If you are doing a significant replacement with a new system, you should be looking at natural refrigerants. It would be a poor business decision not to look at natural refrigerants."

Coffin said he suggests end users go for the lowest GWP option when systems become end of life. "That strategy around building different scenarios is critically important in my opinion and not something enough folks are thinking about at the moment," he said.

Natural refrigerants are phase-out proof, unlike HFOs, which have drawbacks from an environmental perspective and have other implications for the ecosystems and the food pyramid, Starr said.

Fauser said that even the major suppliers have coined these new refrigerants as a transitional option. Ultimately, HFOs will cost owners more because they will have to be replaced, he said.

"If you look at the supermarket industry, in 2020 that market already went through three changes in synthetic refrigerant. Now they have to go to something else," said Benoit Rodier, director of business development for CIMCO Refrigeration.

What's more, some ice rink operators had to replace perfectly good systems as part of the R-22 phaseout. "Now they have the following choice in front of them. They're going to go with transitional synthetic refrigerant or something fully natural so they're not having to change again," Rodier said.

There are several companies marketing HFOs. "Marketing by these companies portrays HFO blends as environmentally friendly while reinsuring owners they are making a sustainable choice," Fauser said, adding that while these transitionary refrigerants have lower GWPs than HFC refrigerants, they are still hundreds of times more damaging to the environment than naturals as are not viable options, even in the medium term. "I always suggest to our clients to use CARB as the benchmark to decide if it is a low- or high-GWP refrigerant. That is the sort of de-mything we need to get out there."

Rodier said CIMCO Refrigeration always asks customers about their criteria, and customers are typically concerned with the long-term cost of ownership and the environment. Yet they may be considering something synthetic, which doesn't line up with their criteria.

There are politics in everything, Coffin said. "You can't patent natural refrigerants. Anytime there is money to be lost, and in this case, there is money to be lost, there is going to be pushback from the companies developing the lower GWP synthetics out there," he said. "Understandably, no one wants to lose market share."

Natural refrigerants have less of a voice because unlike their synthetic counterparts there is less money to be made on them, Coffin said. "The OEMs sell equipment. They aren't selling refrigerants," he explained. "There are folks out there that are representing ammonia and other naturals, including IIAR and NASRC, and representing the industry, but there is not a fleet of salespeople and lobbyists around natural refrigerants."

Grassroots climate concern and consumer concern is growing, Starr said. For example, consumers can go to climatefriendlysupermarkets.org to find grocers reducing HFCs. "You're seeing people want to take action from their home," she explained. "We're doing a lot of work to raise the profile of refrigerants among the green consumer. We're starting to see some opportunities and traction for that."

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IIAR Focuses on Year-Round Education, Prepares for 2021's Annual Meeting

IIAR has several educational offerings available for its members, ranging from online training classes and webinars to technical seminars at its annual meeting, and the association is continually working to improve and enhance all it offers. The past year put a spotlight on how content is delivered, and IIAR is engaging members and reviewing its past success as it plans future content.

LISTENING TO MEMBERS

Member feedback is a critical component of IIAR's educational programs. To increase member communication, IIAR President Gary Schrift has formed virtual discussion forums that launched in November. "With COVID, I have had no opportunity to personally meet with new members at conference, meetings, or other venues," he said.

Even with the larger online seminars IIAR offers, everyone is muted, so there is no forum for back-and-forth conversion. "So, my idea for our 'talk it out' sessions was to have small online conference calls with 20 members or fewer where everyone can speak," Schrift said. "Secondly, rather than me or IIAR determining the topics, I wanted to know what interested our members, and thus all topics are based on member input."

There will be no planned presentations during the discussion forums. "It will be an open forum, hopefully generating good discussions providing instantaneous feedback," Schrift said.

The first topic was on member dues. "The plan is to use this feedback to shape future member rates and benefits," Schrift said, adding that other discussion topics could be used to shape the conference or other educational offerings.

PIVOTING IN 2020

IIAR's annual meeting is one of the association's most extensive educational events. The 2020 conference scheduled for March 15-18, just days after the World Health Organization declared COVID-19 a pandemic and President Trump declared a national emergency. IIAR quickly reacted, canceled its in-person conference, and jumped into action to create a virtual event. The virtual event ran live May 18-June 5, and the recorded sessions are available on-demand until March 25, 2021.

"We didn't know what to expect as the timing put IIAR as one of the very first organizations to have a virtual conference," Schrift said.

Dave Schaefer, chief engineer of Bassett Mechanical and IIAR chairman, said going virtual was unchartered territory for IIAR. "The staff did a fantastic job pulling this together from scratch," he said.

IIAR focused on delivering its technical sessions, workshops, and technomercials. The virtual sessions had as many people in them as during IIAR's live, face-to-face conference, said David Sainato, director of education for IIAR. "The top eight of them had over 100 participants, which is a good size," he said.

The best gauge of success was the number of requests for professional development hours. "If you're on-site somewhere, there are only so many hours in the day, so there isn't as much opportunity to hit up multiple sessions," Sainato said.

Schaefer said because the virtual conference was spread over three weeks, he could attend all of the classes he wanted and earned even more continuing education credits than usual. "In the past, I would have to look at the tech papers either before or after the conference. That was a positive," he said.

The virtual conference's two most popular topics revolved around ammonia safety and energy efficiency in industrial refrigeration. "They are two very strong trends in the industry, and it is not surprising that in 2020, those topics came up as the most popular based on attendance. It looks like the same thing will follow suit for 2021," Sainato said.

Industry vendors who took part in technomercials got good "bang for their buck" during the virtual meeting, Sainato said. "Five of those were in the top 20 most popular programs. Folks aren't only coming for the big issues we propose. They're coming to look at our vendor offerings and get some questions answers," he said.

Despite the last-minute change to an online conference, the event was a financial success. "Thanks to the registrants who paid 35 percent of their original in-person conference registration fees to attend the virtual conference and sponsors and exhibitors who paid a reduced amount to be recognized during our three-week virtual event, we were able to cover 100 percent of our hard costs. Those consisted of the software and vendors needed for the virtual production and the many costs already spent and non-recoverable for the in-person conference," Schrift said.

Schrift said the biggest takeaway from the virtual event was that IIAR can successfully deliver technical content virtually with some advantages over in-person events. Those include having content available to those who can't attend in-person or attend the in-person event but have scheduling conflicts at the time of a live session.

"The pandemic provided us an opportunity to review the conference structure to determine what is important to members during the conference, and what future changes we could make to in-person conferences," Schrift said, adding that the changes made to go virtual provided some ideas for use in future hybrid models. "However, at this point, it is too early to tell what future changes will improve future conferences."

PLANNING FOR 2021

IIAR is planning for its members to meet in-person for its next conference, scheduled June 20-23, 2021, in Palm Springs, California. "Face-to-face is ideal because you get to see colleagues and friends," Schaefer said.

IIAR has already received proposals for the 2021 technical sessions at its annual conference and has accepted 18

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technical of them. "Occasionally, we'll get some drop out from people who are overextended, or the research isn't finished by the time we get the materials," Sainato said, adding that of those 18, five will be delivered in Spanish.

IIAR is continuing to provide information on industrial systems and is adding sessions focused on commercial refrigeration systems, Sainato said. "It is a slightly different audience. We're finding that our members are dabbling in that area and want more information about energy efficiency and system design of commercial refrigeration establishment," he said.

The opening Sunday education program will be getting the most out of the IIAR piping handbook, which was just revised, Sainato said. "There is some interesting software with that we want to show people who to use," he said

Schrift said some virtual content for 2021 and beyond seems like a good idea for those who can't attend an in-person conference. "The biggest feedback was it was nice to see every session they wanted to see. Because we spread it out over three weeks, most people could see every session live, and if they couldn't, they could watch it streaming," he said.

IIAR is still determining what type of hybrid virtual features to offer. "There is a cost to providing virtual content, so we are looking at how we can provide these virtual hybrid features while having additional revenue to cover these costs. Thus, we are evaluating what virtual offerings provide value at a justifiable cost," Schrift said.

CREATING ONGOING LEARNING

As part of its offerings, IIAR is also looking at increasing collaboration with its partners, such as GCCA, RETA, IRC, and ASTI, to grow its educational offerings and develop joint training sessions. "I want to avoid duplication of effort with multiple organizations developing training on the same topic and to create a single source for each topic of training that all of our members rely on for quality information," Schrift said.

What's more, the Academy of Natural Refrigerants is growing, Schaefer said. "We're adding classes all the time," he said.

IIAR offers regular webinars and aims to have them monthly, Schaefer said. He added that IIAR's committees have continued to work virtually. "In actuality, a lot of the committees work virtually," he said. "Process safety management and code compliance groups meet quarterly."

IIAR is also continuing to move forward on updating existing standards, including IIAR-2, IIAR-4, and IIAR-8. "A lot of progress has occurred despite not being able to get together in person," Schaefer said.

Schaefer said IIAR is looking at ways to become less dependent on the conference revenue in the future. "We're still a financially sound organization, but it is always good to say, 'Is there a better way to do this?'" he said, adding that IIAR has a task force that focuses on lowering costs and increasing revenue.

Some of that comes down to increasing membership. "I know our name is IIAR, but a better name would be all-natural refrigerants because we cover CO_2, hydrocarbons, and ammonia, and we have been moving in that direction for quite a few years now," Schaefer said.

IIAR has a CO_2 standard and a hydrocarbon standard that is coming out. "I suspect that will bring in more members because it involves different types of equipment in some cases. Use of those other natural refrigerants is also growing," Schaefer said. "Adding to our membership makes the industry safer and improves and increases educational opportunities."

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Industry Groups Support CARB Rule Encouraging Low-Global Warming Potential Refrigerants in Ice Rinks and Stationary Refrigeration Equipment

California is on track to become the first regulator to address the global warming potential of refrigerants used in ice rinks.

"That isn't to say ice rinks aren't covered in other regulations, but it's the first to target ice rinks specifically, which could set a global precedent," said Christina Starr, senior policy analyst for the Environmental Investigation Agency. "That's why it's so important to have a 150 GWP threshold, which sends the right signal about what is feasible in this sector."

PROPOSED CARB REGULATIONS

The Environmental Investigation Agency and International Institute of Ammonia Refrigeration and have joined together to encourage the California Air Resources Board to enact the proposed regulations, which would reduce emissions of hydrofluorocarbons and encourage the use of low-global warming potential refrigerants in ice rinks and other stationary refrigeration equipment in the state beginning in 2024.

CARB wants to avoid mandating impossible or significantly negatively impactful regulations. "Thus, when proposing that all new ice rinks use refrigerants of less than 150 GWP, which means ammonia or CO_2, they wanted to be certain that this could technically be accomplished and that it would not have a negative impact on the ice rink operations," said Gary Schrift, president of IIAR.

CARB reached out to IIAR on the application of ammonia and CO_2 for ice rinks, and IIAR provided the information the board requested. "We took one step further and, along with EIA, wrote a letter to CARB supporting the initiative and received over 100 signatures from companies supporting this initiative," Schrift said.

IIAR members can be sure that new ice rink refrigeration systems will use ammonia or CO_2, Schrift said. "By using ammonia or CO_2, we are all contributing to a sustainable world by using a 0 or 1 GWP refrigerant, that is natural, low cost, environmentally friendly, and in most cases, is the most efficient, and thus uses less electricity and thus less carbon release due to fossil fuels used for generating electricity," he said.

Schrift said the majority of ice rinks in California already use ammonia. "For brand new ice rink facilities, they would be required to use a refrigerant less than 150 GWP, the refrigerant already being used by 80 percent of their peers," he said. "For existing ice rinks, the current CARB recommendation is that when they need to replace their refrigeration system completely, they would need to use a refrigerant with a GWP less than 750, which does allow them to use a limited number of new HFO's that have GWPs in the 600's, or ammonia/CO_2."

Starr said CARB reasons that there might be some local permit issues with ammonia in some limited regions of California. "In almost all cases, except one or two counties with local permitting issues, California is finding there is no need for any refrigerant over 150 even when replacing an existing ice rink system," she explained. "So what we're asking now is to reflect that in the proposed regulation by narrowing the 750 GWP exemption for existing facilities."

IIAR and EIA have asked CARB to reconsider the 750 GWP threshold for existing ice rink systems. Instead, the groups recommend that if an existing system already uses a refrigerant below a 150 GWP, that it also be required to replace their system with a refrigerant less than 150 GWP, which would be ammonia or CO_2, Schrift explained.

"Thus, if they accept our consideration, the only ice rinks that would be allowed to use an HFO under 750 GWP would be an existing facility that is using a currently high GWP refrigerant such as R-22," he said.

CONSUMER EDUCATION

David Fauser, director of sales for CIMCO Refrigeration, said that natural refrigerants have been used in the ice rink industry since rinks started back in the early 1900s. Even after synthetics were introduced, they were only common in certain geographic pockets depending on local regulations and political themes. "In the ice rink industry, naturals always made sense from a performance and energy perspective.

However, even in the midst of increasing environmental regulations and rising energy costs, transitional, synthetic blends are being introduced to the market as a sustainable alternative. The industry is seeing concentrated marketing efforts by Chemours, for example, which has a marketing agreement with the National Hockey League to build awareness and brand credibility for HFO/HFC blends within the industry.

Chemours' marketing campaign is centered on sustainability, and it is important for those investing in systems to understand HFO/HFC blends will ultimately be phased out and they are not sustainable from a business or environmental perspective. "For most of our customers, this is a 25-year or more investment, and there is no way that any rink system installed today with a transitional refrigerant such as 513A will still be in operation in 2045," Fauser said.

Benoit Rodier, director of business development for CIMCO Refrigeration, said the company always asks its customers about their primary criteria. Typically, customers' No. 1 criteria is the long-term cost of ownership. "No. 2 is that they want to be good with the environment and want to make the right decision for the next 50 years. "In some cases, we can see there has been so much lobbying in the background, they're considering something synthetic, and it has nothing to do with their own criteria," he said.

CARB'S NEXT STEPS

Regulations can play a critical role in spurring the adoption of environmentally friendly systems, and CARB is working to meet state requirements to reduce emissions levels in a relatively short time. "Reducing release of medium- or high-global-warming-potential refrigerants is just one pillar of their plans to meet this legal goal," Schrift said.

CARB will hold an online hearing on the proposed regulation in December and stakeholders may also submit public comments in writing. If approved at CARB's board meeting later in December, this will become a final regulation.

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Why IIAR Needs Energy Performance Benchmarking More Than Ever

STEFAN JENSEN, SCANTEC

All industry sectors across the world ranging from utilities, manufacturing, food preservation through to comfort cooling, food storage and transportation face unprecedented challenges concerning energy efficiency improvements and emissions reductions.

The International Energy Agency (IEA) has called for an improvement in the energy efficiency of air conditioners of 50% by 2030. The Global Cooling Prize targets an improvement in the energy efficiency of air conditioners by a factor of five.

Huge public and private sector investments are targeting the de-carbonization of the electricity grid. Private sector investments in photovoltaic panels have reached unprecedented growth rates in some nations.

Norway banned the use of fossil fuel for space heating in 2020. Several major vehicle manufacturers have signaled the discontinuation of the internal combustion engine by 2030.

The ammonia refrigeration industry will not be immune to these challenges. The Paris Climate Treaty, which targets carbon neutrality 2050, will force legislators and regulators to focus their efforts where the rubber hits the road – namely at minimum energy performance benchmarking.

What is minimum energy performance benchmarking? Minimum energy performance benchmarking is when legislators implement a regulatory framework that requires compliance with maximum energy consumption values of systems by all stakeholders.

Typical metrics are maximum energy consumption in kWh per ft² of lettable area for commercial buildings. For public housing in both the U.S. and the EU, maximum specific energy consumption values have already been set, partly to address the issue referred to as "energy poverty". Energy poverty is a result of split incentives between developers and tenants.

Other typical metrics are kWh•ft^{-3}•year^{-1} for refrigerated warehouses, kWh•ton^{-1} for blast freezing operations and ice manufacture, and kWh•l^{-1} for high-temperature process chillers.

For compliance, the Seasonal Energy Performance Ratio (SEPR) must be verified at four reference points representing the annual temperature profile.

Why is minimum energy performance benchmarking a regulatory development that the ammonia refrigeration industry must prepare for? It is because it is a matter of maintaining and growing market share for this industry segment.

Most practitioners within the ammonia refrigeration industry are probably of the view that ammonia refrigeration systems are very energy efficient. It is certainly correct that some are. However, there are published examples of ammonia refrigeration plants consuming ten times more energy than they need to.

A common metric used for energy consumption in refrigerated warehouses is Specific Energy Consumption (SEC) in kWh•m^{-3}•year^{-1} (kWh•ft^{-3}•year^{-1}) where volume refers to refrigerated volume.

Figure 1 shows recorded SEC's for a range of different plant concepts all originating from a single entity. The small green star represents a relatively small centralized, low charge NH_3 system in the subtropics of the Southern hemisphere.

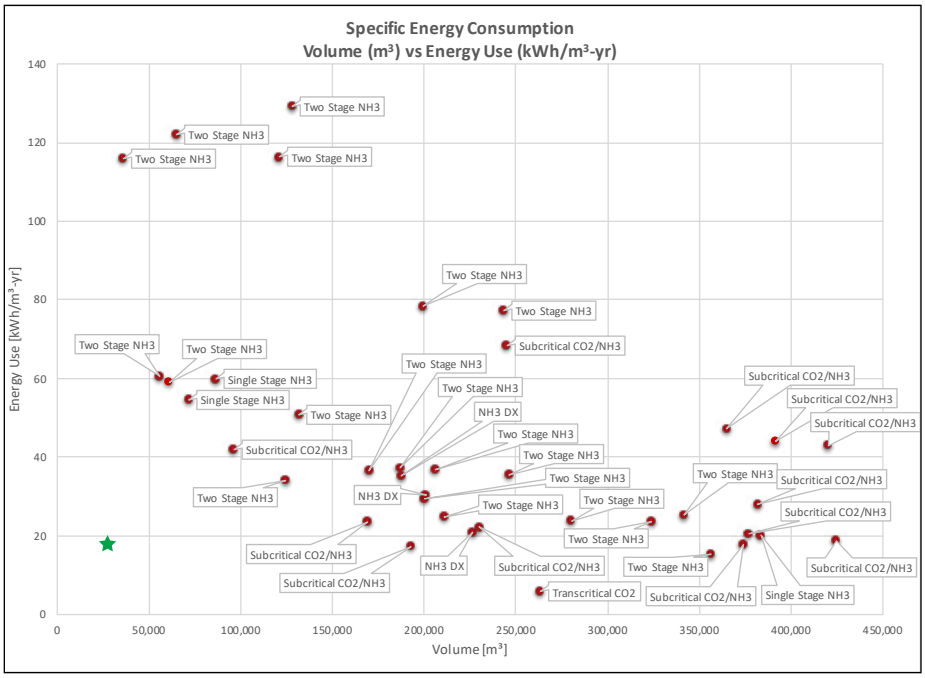

Fig. 1. Example of Specific Energy Consumption (SEC) values for North America

The introduction of a minimum energy performance benchmark represented by the equation:

$$SEC = 16{,}000 \times V^{-0.61}\ [kWh \cdot m^{-3+}year^{-1}]$$

where "V" is refrigerated volume in m³ would likely make >90% of the facilities shown in Figure 1 non-compliant. Unless the ammonia refrigeration industry understands the measures needed to ensure compliance, it will inevitably lose market share in a regulatory environ-

ment as described above.

How then may compliance with a minimum energy performance benchmark be assured?

The simple answer to this question is renewed focus on system part load energy efficiency.

Almost all refrigeration systems are oversized. This is a practice that has evolved because of the practical experiences gathered by industry stakeholders throughout the existence of mechanical refrigeration. This is not necessarily a bad thing, but the consequences of oversizing on energy performance may not be widely understood.

Most NH_3 based liquid overfeed refrigeration systems include no means of regulating the capacities of the NH_3 pump flow(s) as a function of load. If therefore, the system is designed for an overfeed rate of three to one at full load, the overfeed rate becomes 15 to 1 at 20% load.

Refrigerant pipeline pressure drops increase as a function of rising overfeed ratios. Wet return line and riser pressure drops can be up to sixty times greater than the pressure drop in equivalent pipelines conveying saturated vapour only.

What is more concerning is that the consequences of excess overfeed ratios and riser flow reversals in terms of overall system energy performance remain largely unidentified and unquantified.

The system design changes that are required to improve the energy efficiencies of new ammonia refrigeration systems challenge some very deeply entrenched design practices throughout the ammonia refrigeration industry globally.

The system modifications required within existing ammonia refrigeration plant to reduce the energy consumption of these are equally challenging but in a different way to new plants.

Many plant owners/operators are likely to question the relevance of "interfering" with a perfectly good system that has given no trouble in the past. Presenting a compelling business case in these scenarios will require dissemination and presentation of unbiased technical information.

Disseminating and presenting unbiased technical information is an area where IIAR has a long record of excellence. Improving the energy performance of new and existing ammonia refrigeration plant is an obvious area for IIAR to continue to excel.

PSM Safety and Compliance in the Age of Pandemics

BILL LAPE, SCS ENGINEERS

Our world has turned upside down in 2020: close to 9.5 million confirmed cases of COVID-19 in the U.S; over 233,000 deaths in the U.S.; people being quarantined or sheltering in place; social distancing; non-essential businesses shut down; essential businesses operating with skeleton crews; essential businesses having to implement enhanced sanitation procedures, social distancing, PPE requirements, employee health screening; visitor restrictions; the list goes on and on and on.

The distractions that occur because of all of this often cause us to forget some of our core safety programs, including process safety management (PSM) of our ammonia refrigeration systems. We are tempted to think that the immediate concerns with COVID-19 are a higher priority than our management of change, our hazard analyses, our system and equipment inspection testing and maintenance, and our operator training, to name just a few things.

In reality, these safety programs that are part of PSM program are just as important today, if not more so. With much of our workforce sidelined due to illness, or sheltering in place due to fear, shortcuts are often taken to keep the "Fringles" rolling off of the production lines. The safety programs often lie forgotten on a book shelf, gathering dust. It is during these times that it is critical that we continue to evaluate how effectively our PSM program is being implemented. As the implementation lapses, so too do the safeguards that help to ensure that the ammonia stays in the pipes.

However, during a pandemic, it is often not possible to conduct a PSM compliance audit on site using third parties. While there is no requirement in either 29 CFR 1910.119, the PSM standard, or in 40 CFR Part 68, the RMP rule, that audits be conducted by third parties, they are often preferred due to the "normalization of deviance" that is often suffered by someone who is exposed to the program and the facility on a daily basis. So, what are the options?

While OSHA and EPA have offered some regulator relief during the pandemic, simply postponing the audit until the pandemic is over is not an advisable option. While you may not be subject to a fine for postponing, you will fail to catch any deficiencies in your programs that may have appeared with the advent of requirements put in place to contain the spread of the virus.

A better option would be to go ahead and perform the audit, but do so virtually. How is this done, you ask? Well, the initial steps are much like how you would respond to a request for information from OSHA or the EPA. The auditor will send you a list of the written programs and documentation that will be reviewed. It is then up to the facility to gather this information and pass it along to the auditor.

The auditor will want to review all of the Process Safety Information, including the SDS sheet on file for ammonia, the Maximum Intended Inventory of ammonia in the system, the Block Flow Diagram, the Piping & Instrumentation Diagrams, the design codes and standards employed in the construction of the system, the relief system design and design basis, the ventilation system design and design basis, the materials of construction documentation, the maximum and minimum safe limits of the system, the consequences of deviation, the description of the safety systems in place, etc.

The auditor will want to see all of the previous Process Hazard Analyses and the recommendation tracking lists from each one. The auditor will want to see the operating procedures in place for the ammonia refrigeration system. The auditor will also request to see the previous two compliance audits along with the recommendation tracking lists for each one.

The facility will also need to supply copies of the employee participation, training, contractor control, mechanical integrity, management of change, Pre-startup Safety Review, Emergency Planning & Response, Incident Investigation, Hot Work Permitting programs. These will be reviewed by the auditor. The auditor may inquire if the facility has considers any part of the ammonia refrigeration system to be a trade secret.

As part of the evaluating the facility's compliance with 40 CFR Part 68, the RMP rules, the auditor will also ask for copies of the facility's hazard assessment, which includes the worst and alternative case release scenarios and their offsite consequence analyses, as well as the facility's five year accident history. The auditor will ask for documentation on the management system that covers how the programs that satisfy the RMP rules are developed and implemented. They will also ask for a copy of the current Risk Management Plan that was submitted to the EPA.

Once the auditor has all of the requested information listed above, they will evaluate the written programs and studies against the requirements in 29 CFR 1910.119 and in 40 CFR Part 68. This first step is to ensure that what the facility states that they are going to do in their programs meets the requirements in the PSM and RMP regulations. There is, however, a second step to the audit, and that is to evaluate if the facility has properly implemented their programs.

To do this, auditor will ask to see the following documents to help gauge implementation of the programs: PSM- Team meeting records, including records of consultation with employees; certification records for the operating procedures; training records of employees working on/around the ammonia refrigeration system; contractor qualification records, including records of their training regarding the hazards of the process, their work, the applicable safety programs that apply to their work, and the facility's emergency action plan. The facility will also need to supply any incident investigation records, emergency action or response training records, records of emergency drills conducted, and records of coordination with local responders. The auditor will also want to review any managements of change conducted, along with pre-startup safety reviews. The auditor will request inspec-

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tion, testing, and maintenance records for the ammonia refrigeration system and its equipment. Any available hot work permits will also be reviewed as part of the audit.

These records serve to provide a 30,000 foot view of how well the facility has implemented their PSM/RMP programs. To get to a 20,000 foot view, the auditor will schedule at least one, but possibly multiple, conference calls to discuss the documentation supplied and clarify any inconsistencies or gaps. To get a 10,000 foot view, the auditor will request the opportunity to interview key personnel, like the Facility Maintenance Manager, the EHS Manager, refrigeration operators, and possibly the Plant Manager, This can be done via Skype™, Zoom™, MSTeams™, or some other conferencing software.

To really see the program up close, a facility walkthrough is critical. It is needed to validate not only the written programs and records, but also the answers provided by employees during the interview process. There are multiple options for completing a walkthrough. If limited access to the facility is allowable with the pandemic restrictions, then a brief (1-2 hour) physical walkthrough is preferable, depending upon the travel time and expense needed to conduct such a visit. If the physical visit is either not allowed, or is not worth the time and expense relative to the overall cost of the project, then there are several virtual options.

The best option for a virtual walkaround is through the use of a streaming camera like a Go-Pro™ coupled with a phone call, or via FaceTime™. This gives the auditor the ability to "see" the facility through the eyes of the person filming and to hear it as well. However, if a Go-Pro™ is unavailable, or FaceTime™ is impractical due to data usage concerns, then the use of photographs is another option. The downside to photographs is that the auditor must be familiar enough with the facility in order to properly direct the photographer on what to shoot. Also, if something needs a closer look, the use of a photograph will require that the auditor ask the photographer to shoot more pictures to clarify.

Once the auditor has all of the necessary information, they will create a report detailing and deficiencies found either in the written programs themselves or in their implementation. The auditor should send a draft copy of the report to the facility so that they have an opportunity to review the information presented and give them an opportunity to refute any findings they wish by providing additional documentation. They may even request a conference or video call to discuss the findings. Once the facility has had this opportunity to review and refute, then the auditor will issue a final report. This report must then be kept on file by the facility after they certify it.

While conducting compliance audits remotely is not the most efficient way of performing them, it is a viable option when a microscopic virus has limited the ability to meet face to face. Performing them remotely not only keeps the facility in compliance with the regulations, but also helps to ensure that deficiencies are identified in a timely manner so that the facility may take steps to address them, thus keeping their employees and the public safe from a catastrophic release of anhydrous ammonia.

Pre-Emergency Readiness is Well Managed Business

JEN ALLEN, ALLEN SAFETY LLC

As much as we don't like to admit it, ammonia leaks happen. Even in systems we feel we manage and care for exceptionally well. But with increasing turnover resulting in less experience on off-shifts, where management presence is the lightest, and increased wear and tear from heightened demands being put on aging equipment, leaks are just part of the business. However, with some time spent on pre-emergency planning and emergency response, we can get ahead of this ever-looming vulnerability, making leaks a well-managed part of the business. Join us for our two-part series; covering in this edition Pre-Emergency Readiness, with our next edition covering Emergency Response, to help ensure any leaks at your facility result in a well-choreographed response, and not an uncoordinated major catastrophe.

EMERGENCY PLANNING & LEPC COORDINATION

There are multiple OSHA and EPA guidelines that can apply when you use ammonia as a refrigerant, and based on the quantity on-site, OSHA 1910.119 (PSM), 1910.120 (Emergency Response), SARA Tile III, Tier II, and TRI, as well as CERCLA, RCRA, and the Clean Air Act all may apply to your site. Taking a 10,000-foot view of these regulations, they essentially tell employers if you choose to use toxic chemicals, it's your responsibility to have a robust, well thought out plan to keep your employees and the community safe, notify the correct people to let them know you have ammonia and the quantity, as well as if you have any releases. A key takeaway here is, a facility's local and regional HAZMAT teams are there to help and support, but the responsibility is placed firmly on the employer to have plans for safely and effectively managing any releases. OSHA's 14 element PSM program plays a significant role in ensuring a system runs safely, and alongside mechanical integrity, accurate process safety information, thorough employee training, SOPs, management of change and pre-startup safety procedures, and efficient management of audits and their findings, emergency planning and coordination is a cornerstone in ensuring an ammonia system is also run responsibly.

The first step in preparing for an emergency is to begin writing an emergency plan. To do so, your location will need key information from local emergency planning officials and committees. It's important to note that, not all fire departments have HAZMAT teams, and those that once had equipment and training may have experienced budget cuts, so you'll want to ask the following questions:

- Does your area have a paid or volunteer Fire Department?
- Do they have a HAZMAT team, or would your responding HAZMAT team be the Regional team?
- Is the HAZMAT team stationed near you, across town, or in a different town altogether?
- How long will it take them to respond to you?
- Who will show up first? The HAZMAT team or a regular truck?
- Once HAZMAT arrives on site, how many minutes before they can enter the hot zone?
- If they have a HAZMAT trained team, how often do they get called out?
- Is there a possibility they could be on a call for another facility if you have a leak? If so, what is their protocol for responding to you?
- Do they have any fixed facility ammonia refrigeration experience? How would they know what to do?
- How much will we be billed if they respond to a leak at your site?

CONSIDER YOUR RESPONSE OPTIONS… AND THE COST:

One of the biggest deterrents to an internal HAZMAT team is the perceived cost of purchasing and maintaining equipment and training employees. In addition to those concerns, there are multiple risk factors and response options that warrant management team consideration:

- What type of response will we have? Will it be offensive, defensive, or third party?
- Will our team respond in Level A, Level B, APRs, or all of the above? None of the above?
- How much will we spend on the purchase and maintenance of HAZMAT equipment?
- How much will we spend on training our employees?
- How long would we have to have production down before the training and equipment paid for itself?
- How much product loss would we have to incur before the training and equipment paid for itself?
- If only a trained operator can turn valves at our site, are we comfortable letting a fire department with limited refrigeration experience turn valves at our location?
- Are we comfortable letting a third party determine how much product loss and downtime we experience as a result of their response time and if they can correctly follow an SOP for an unfamiliar system?

ERPS AND EAPS:

Based on your management team's comfort level and answers to these questions, your team may determine having an internal HAZMAT team is a helpful management tool if parts don't come in on time, capital funding doesn't get approved, weather or a contractor delays

a project, or you have to wait until the weekend to perform major repairs and maintenance. Conversely, your management team may still feel uncertain regarding the benefits of an internal team and choose to rely on a third party for HAZMAT responses. Regardless of the decision, your facility will need to document their emergency response plan (defensive, or no HAZMAT response), or their emergency action plan (offensive responses). Include information in your plan such as leak investigation plans and procedures, evacuation protocols that include at what parts per million (PPM) your facility will evacuate for ammonia if you'll have offensive and/or defensive leak responses or no emergency response to any ammonia leaks identified above evacuation levels, victim decontamination and triage protocols, and any steps required to return the facility back to normal operations. To maximize the effectiveness of this plan, you'll want to steer away from vague language and include site-specific explanations on your location's procedures and response capabilities, including the role of any third-party support.

A vital part of these response plans will include how you define an emergency, and what do you consider a HAZMAT response. To outline what that looks like at your location, ask your team if you have "nuisance" leaks? How big are they? At what point does a "nuisance" leak turn to a "regular" leak? 100PPM leaks are not the normal operation of our systems, but they're not unheard of either. If you have something leaking that should not be, ammonia PPM is above your evacuation level for employees not wearing PPE, and you have other employees put on PPE to manage the event, those employees are acting as HAZMAT responders in that moment which requires training. Just as a knife handler or palletizer would receive hands-on training on the job they're expected to do, a refrigeration operator should have training on leak responses that extends beyond reading the emergency portion of an SOP.

SOPs

It's a well-known requirement that ammonia systems have SOPs outlining how to run the system and everything in it. As an industry, we've made "we follow the SOP" our battle cry when asked how we know a procedure or process is correct. Because of this reliance, it's important to understand the evolution of the SOPs at your facility, which in turn can drive your confidence level in their accuracy. Who wrote them? Someone on-site, or were they done by a third party off-site at the initial system startup? When were they last updated? Are they site and equipment specific, or are they mostly boilerplate? Who is reviewing the SOPs, and do they know what they're looking for when reviewing? SOPs can play a huge role in emergency preparedness and planning in that they have built-in emergency response sections. However, if that section cannot be accomplished or isn't specific, they can also lead to a false sense of security, leaving a location vulnerable without even realizing it. Ensuring your SOPs are accurate can go a long way just in itself in ensuring a smooth emergency response.

WE'RE GOING TO HAVE A TEAM. NOW WHAT?

If your management team has decided to have a HAZMAT team, you will first want to focus on determining who should be on the team, and medically qualifying those employees. When selecting team members, it's best to think big and have a deep bench to pull from if multiple entrants cannot pass pre-entry vital screening in the field, leak or victim management requires multiple entry teams, and for leaks that happen on nights, weekends, holidays, or adverse weather to ensure you have enough people to run a response. This can include your refrigeration operators, maintenance technicians, safety, environmental, human resources, nursing, security, and production employees. You'll also want to work with your local medical providers to have employees complete medical clearance forms and HAZMAT physicals, fit tests, put together guidelines for pulmonary function tests, and to help you outline what your team's pre-entry vital "cut-offs" for blood pressure, pulse, and temperature will be.

Your next step will include the purchase of gear for the response styles you will perform at your facility. A good place to start would be by working with your HAZMAT trainer for equipment styles, types, and quantities- provided that they are not receiving an incentive from any vendors. This list may include Level A and B suits, steel-toe chemical resistant boots, hard hats, hearing protection, gloves, respiratory equipment (APRs, SCBAs, etc.), tape, meters, and decontamination supplies. As equipment comes in, it's important to set up monthly PMs to ensure the equipment is inspected and ready for use once your team has completed training.

PICKING THE RIGHT TRAINER FOR YOU:

Possibly the most important bit of knowledge to have when selecting a HAZMAT trainer is that there are no "trainer" certifications to teach HAZMAT courses, which can leave you two options: internal training, and external training. When evaluating internal training, consider the trainer's past experience with PSM, refrigeration, fixed facility HAZMAT response, and the legal liability they're having to accept. If things went badly during a leak, would they end up being collateral damage and released from their job? Is there a potential for civil lawsuits? External trainers have professional liability insurance, is there any insurance in place to protect them?

When considering an external trainer, you will find there are many to choose from, so asking the right questions will become vitally important. You will want to look for a company where trainers have done real HAZMAT responses so that the first time their ideas are tested isn't when your team has a leak. You will also want to ask how recently they've had a response, and how active they are in your industry/field to ensure the information they're training your team on is relevant to your business and up to date. Look for certifications, such as a certified hazardous materials manager (CHMM) certification, or HAZMAT experience with a prior job. When hiring a company, inquire about the trainer visiting your site to ensure they (and not just the company owner) have some of this same experience, and ask about any trainers doing training part-time. Why are they only part-time, and, if they're not "all in," is that who you want doing your training? And yes, even in COVID times, always exercise caution when considering the use of computer programs or virtual training. Consider if the processes can effectively simulate the current conditions employees would be responding in, and if they can accurately identify gaps

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WHAT SHOULD (AND SHOULDN'T) YOUR TRAINING COVER?

In short, your training should cover exactly what your team is expected to do. This should include your team's limitations, your company's safety protocols, any PSM/RMP plans, applicable OSHA and EPA law, donning and doffing your company's equipment, vitals protocols, victim management, and decontamination. To cover these subjects, a 24 hour initial HAZMAT Technician course for new team members is adequate, with an 8 hour HAZMAT Technician refresher course every 12 months thereafter to keep their certification current. Yes, this requirement applies even during COVID times if you continued running production and would expect your team to respond to a HAZMAT event.

For anyone managing a HAZMAT response, an Incident Command course is required, with a 24-hour Initial Technician certification (and annual refresher thereafter) being the prerequisite. Incident Command refreshers are conducted every 2-3 years after the initial IC course, provided that the attendee's HAZMAT Technician certification is maintained annually. But with 40-hour classes offered, this begs the question, is more hours for your initial course better? Depending on what is covered maybe, but maybe not. 40-hour classes typically cover hazardous waste, cleanup, and disposal and do not cover the requirements outlined in OSHA's 1910.120 emergency response codes. If you expect your team to shut down and stop a leak or remove a victim from a hot zone, then a 40-hour class would not be necessary or adequate for covering those skillsets. At the end of any HAZMAT training conducted, be it 8, 24, or 40 hours, you find your trainer didn't cover something, you'll still need to cover that information with your teams internally, remembering that if it isn't documented, it didn't happen.

A heavy focus on skillsets beyond your team's limitations, or that don't apply at your site can leave your team feeling confused, and lacking confidence in the tasks they will perform. To ensure good use of your team's time and money, what shouldn't your training cover beyond awareness level? Fire guidelines (NFPA) if you're a fixed facility where OSHA applies, training on equipment that isn't yours, responses to railcars or bulk chemical tanks if your team doesn't have those on-site, plug and patch responses if you won't plug/patch barrels or totes, and hazardous waste cleanup and disposal if your team will use your current hazardous waste hauler to remove contaminated items from your site after the emergency is over.

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Responses happen all over the country on a regular basis. But with thorough preparation, we can plan for and minimize any vulnerabilities at our locations, making effective emergency planning and preparedness good for business. This allows us to manage our facilities with a focus on continuous improvement, safety, and efficiency and goes a long way in eliminating the days of running our locations reactively.

Jen Allen *is the Vice Present for Allen Safety LLC, which specializes in confined space rescue training, HAZMAT training, customized safety audits, and PSM compliance audits.*

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Real or Virtual?

BY KEM RUSSELL

Life during the past several months has been a challenge when deciding if something might be done "for real" or must be done "virtually". This past July I was scheduled to be a back-up guide for groups of young men as the various groups attempted to hike up nine prominent peaks in my area. Needless to say, COVID-19 stopped that activity. However, I was still interested in doing those peaks, several of which I had never done.

For the peaks I had not attempted, I searched on the internet for information on the trailhead location, trail conditions, and pictures/videos. Using an app on my cell phone I planned out and created virtual routes, some of which were off-trail. Five of the peaks I did with either one of my son's or a daughter, and four I did alone. The actual "real" hiking of these peaks was enjoyable and I learned more doing them than I did only experiencing them "virtually". However, the virtual information greatly helped me be more prepared for the real experience.

During the last several months all of us have had to experience many real-world activities virtually. One of the first major industrial refrigeration events impacted was the IIAR annual conference. Fortunately, knowledgeable and dedicated people worked hard to provide the IIAR virtual conference. Just recently RETA also successfully hosted its annual conference virtually. Not being able to go to the conferences to socialize, participate, and see new advancements in the exhibit halls was disappointing. But participating in the IIAR and RETA virtual conferences still provided a valuable learning experience.

As the world and our lives morphed I found more and more opportunities to participate in virtual meetings and presentations. As information about virtual opportunities has spread, people who have not had the opportunity to be involved in organization meetings have, many for the first time, been able to participate and increase their knowledge by the experience. I know more than a few refrigeration operators who have never been able to take advantage of IIAR or RETA conferences or meetings, for whatever reasons, who now virtually have the chance to learn more in their field of industrial refrigeration.

There have been many lessons learned as we all have participated in these virtual experiences. One thing to understand is that none of the virtual presentations I, and likely you, have participated in have been produced by a multi-million-dollar theatrical production company. Those putting on and participating in virtual presentations have been learning, sometimes with great frustration, what works and what doesn't in an attempt to stay connected and continue to learn while in our isolation.

In this virtual world, one of the first lessons I learned was that trying to do audio and visual for all participants, or even some, sometimes doesn't work, and that can change from minute to minute. Often the audio works, but the download and upload speed of video results in poor quality, or no video. This varies with location, speed, and stability of the internet connection.

This lesson struck home when I and a colleague did an internet connection test for an upcoming training class. Due to COVID-19 restrictions and guidelines, we couldn't go to the facility, nor could they come to us. So the facility, along with us, decided that doing the required training virtually was the only way to get it done. We were successful in establishing an audio connection with the lady at the facility, but it was very poor. We could only catch about half of what she said, and she, us. Fortunately, she had a landline phone with a speaker, which worked great. Audio problem solved. Then we did a test of a sample PowerPoint and linked video.

The PowerPoint seemed to work well, but when we clicked to play a linked video, we waited for her reply. And we waited and waited. Finally, she replied, "All I see is a black square in the middle of the screen". Hmm, that's not good. Then after about a minute, she said "Now I can see the video, but it's very choppy and hard to watch or hear."

We could run the PowerPoint, communicate using a speakerphone, but could not play any videos. In many of the virtual presentations you attend, videos may be a large part of the learning experience and enhance the knowledge of participants about what is being presented. Whether it's rebuilding a valve, a pump, examples of how to approach an ammonia leak, etc., actually seeing it, even virtually is valuable.

What did we do? We loaded all of the videos onto an internet transfer program for download, and they could have them "onsite" to play. We also developed a playlist for which videos to play, and when. With that problem solved we were ready to do the virtual class when the day and time arrived. However, on the day of the class, the internet provider had a major problem and there was no internet over a large area of the State for several hours.

Technology is great when it works. Don't give up.

Another lesson learned has to do with audio. During IIAR and RETA conferences you likely noticed that participants, other than the presenter and host were "muted". At the beginning of the COVID-19 "virtual world," some presentations attempted to have audio input available to all persons on the call. The result was that some people coughed, moved their chair, the dog

barked, the kids yelled, etc. and everyone else on the call heard the noise, which detracted from the presentation. I would guess most people didn't realize or even think about it that the sounds coming from their COVID-19 protected location were being transmitted to everyone.

Major virtual presentations will have participants muted, but your participation can still occur by clicking the "Hand Raised" tab, the "Chat" tab, or the "Q/A" tab. Using one of these access methods allows participants to ask questions of the presenter, usually during the question and answer portion of the presentation. Take advantage of this great opportunity to learn and understand more about the topic, in a much less threatening "virtual" environment. One caution I would give to hosts and presenters is that sufficient time should be allowed for questions to be asked, or some means planned for questions to be addressed later after the presentation is over. I am fairly fast on the keyboard, but during some of the presentations at a recent virtual conference, the host only allowed a few seconds for questions, which was much too short for me to type in a question. Maybe I should have just submitted "WAIT!!"

Still, this is a great opportunity for anyone to advance their understanding by watching and then asking questions during virtual presentations. Yes, during the past months some presentations may not have been as good as they might have been, but they are getting better as we all learn how to use new software tools to present and participate in the virtual world.

There are many new opportunities available for anyone who can get on the internet. We can likely advance the knowledge, understanding, and safety of many who work in the industrial refrigeration field by telling them about these opportunities. Some day we will get back out into the real world, hopefully without a mask or being socially distanced. Being personally there engaging in "hands-on" learning and participation is extremely valuable. It won't be long and we will see a full year of the effects of COVID-19. This is has been one of the great lessons learned due to this COVID-19 experience, we can still learn by participating virtually.

The Mathematics of Filling Tax Brackets

Utilizing (or "filling") the lower tax brackets is a simple, yet often overlooked, tax planning strategy. Consider the fictional case of Chuck and Debbie to help you better understand the mathematics of filling the lower tax brackets in order to improve your overall tax situation.

Chuck and Debbie both recently retired at the age of 65. They estimate their 2020 income will be $55,000 (including $10,000 of qualified dividends). They will take the standard deduction when filing their 2020 federal tax return. In 2020, the standard deduction for married couples who are both age 65 and older is $27,400.

FULLY UTILIZE THE 0% CAPITAL GAINS BRACKET

If Chuck and Debbie want to fully utilize the 0% capital gains bracket, they must first calculate taxable income by subtracting the standard deduction ($27,400) from their total income ($55,000). Based on this calculation, Chuck and Debbie's taxable income is $27,600.

In order to determine the amount of long-term capital gains they can realize without paying additional income tax, Chuck and Debbie must subtract their taxable income ($27,600) from the maximum 0% capital gains threshold ($80,000). Based on this calculation, Chuck and Debbie can realize $52,400 of long-term capital gains without paying additional income tax.

When determining how much room remains in the 0% capital gains bracket, keep in mind that ordinary income is counted first, with long-term capital gains and qualified dividends stacked on top. For example, if a married couple has $70,000 of ordinary taxable income plus $20,000 of long-term capital gains and qualified dividends, the $70,000 of ordinary income is counted first. Consequently, only half of the couple's long-term capital gains and qualified dividends fall into the 0% capital gains bracket. The remaining half is taxed at 15%.

IMPLEMENT STRATEGIC ROTH CONVERSIONS

Instead of realizing additional long-term capital gains, Chuck and Debbie decide they would rather convert a portion of their traditional IRA assets to a Roth IRA. They hope to utilize the 12% ordinary income tax bracket without moving any of their $10,000 of qualified dividends into the 15% capital gains bracket.

Chuck and Debbie's total taxable income (including the Roth conversion) must not exceed $80,000 if they want to avoid having their qualified dividends taxed at the 15% capital gains rate. Accordingly, in order to determine the amount of traditional IRA assets to convert to a Roth IRA, Chuck and Debbie must subtract their taxable income ($27,600) from$80,000. Based on this calculation, the couple can convert $52,400 from a traditional IRA to a Roth IRA without exceeding the 12% ordinary income tax rate or the 0% capital gains rate.

If Chuck and Debbie instead choose to convert $52,650 to a Roth IRA, their taxable income would total $80,250 (the top of the 12% ordinary income tax bracket). However, because capital gains stack on top of ordinary income, $250 of qualified dividend income would be pushed into the 15% capital gains bracket.

CAPITAL GAINS AND DIVIDENDS

Tax Rate	Married Filing Joint & Surviving Spouses		Single	
	Taxable Income			
	Minimum	Maximum	Minimum	Maximum
0%	––	$80,000	––	$40,000
15%	$80,001	$496,600	$40,001	$441,450
20%	$496,601	––	$441,451	––

Remember: Qualified dividends are taxed at long-term capital gains rates, and non-qualified dividends are taxed at ordinary income tax rates.

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Taxable Income		Tax Rate	OrdinaryTax Calculation
Minimum	Maximum		
––	$19,750	10%	10% of taxable income
$19,751	$80,250	12%	$1,975 + 12% of the amount over $19,750
$80,251	$171,050	22%	$9,235 + 22% of the amount over $80,250
$171,051	$326,600	24%	$29,211 + 24% of the amount over $171,050
$326,601	$414,700	32%	$66,543 + 32% of the amount over $326,600
$414, 701	$622,050	35%	$94,735 + 35% of the amount over $414,700
$622,051	––	37%	$167,307.50 + 37% of the amount over $622,050

While there are many advantages to fully utilizing lower tax brackets, taking additional taxable income can have negative consequences in certain situations. For example, doing so may lead to an increase in the taxability of Social Security retirement benefits or higher monthly Medicare premiums. Before implementing either of the strategies discussed above, you should speak with a tax professional.

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.

IIAR Works with Allies Across the Globe on Committee Work and Standards

IIAR has expanded the number of memorandums of understanding (MOU) it has with countries, with Spain and Australia becoming the last two countries to become IIAR's Allied Organizations. Other countries with MOUs include Columbia, Chile, China, and Costa Rica.

As part of the MOU with Spain, the Association of Cold Companies and their Technologies (AEFYT), and IIAR will be joining forces to work together to defend the use of energy-efficient, safe, and economically viable technologies; and promote the use of natural refrigerants, which have a low environmental impact.

"The impetus that ammonia and other natural refrigerants have taken within sustainable refrigeration makes the dissemination and research of these technologies necessary. The agreement with IIAR will allow the associated companies of AEFYT to participate in the development of this industry, as well as to have privileged access to the advances that are produced in this regard," said Roberto Solsona, president of AEFYT.

Gary Schrift, IIAR president, said establishing synergies between AEFYT and IIAR will impact the information that companies receive to advance in the development and implementation of sustainable cold systems, which is a demand from the industry and society. "Likewise, it will allow us to advance in research to achieve increasingly efficient refrigeration facilities," he said.

In Australia, The Australian Institute of Refrigeration Air Conditioning and Heating (AIRAH) and IIAR signed their MOU on Oct. 14 to further a more effective and beneficial exchange of knowledge and ideas in the HVAC&R industry. As a result of this MOU, AIRAH representatives are actively participating in IIAR's committees contributing to the committees' work.

IIAR's international work is also focused on expanding the influence, use, and availability of IIAR Standards. "IIAR is the standards organization for ammonia refrigeration within the United States. We are an ANSI-accredited organization and IIAR standards are recognized by several international codes and standards. This helps the industry thrive, as these standards provide recognized and accepted practices within the industry," said Yesenia Rector, International Director for IIAR. "IIAR standards provide a 'common language,' so to speak, and they're proven to work. It just makes sense to use those. Why re-invent the wheel?"

In India, IIAR is working on finalizing the MOU with the Bureau of Indian Standards. "It is moving along, and it is in the final stages of being signed," Rector said,

explaining that the IIAR standards will be used as a base for the development of Indian standards for ammonia refrigeration systems. "It is going to start with design, and then it will move onto installation and operation."

IIAR staff is also assisting its colleagues in Singapore in the development of a national standard for ammonia refrigeration systems. "They are in the first stage of developing the standards," Rector said.

Rector added that IIAR is starting to work with Argentina on its national norms. "We're going to do a phased agreement. We just signed a confidentiality agreement with the organization in Argentina," she said, adding that the working groups should begin working soon.

Furthermore, by working together with global partners, the natural refrigeration industry benefits from standardized educational programs and shared information. "These partners are now active in the committee work of IIAR. We are becoming a truly international organization. If our colleagues and allies across the globe get involved with our committee work, we are ultimately enriching IIAR's material and standard's content," Rector said.

"The impetus that ammonia and other natural refrigerants have taken within sustainable refrigeration makes the dissemination and research of these technologies necessary. The agreement with IIAR will allow the associated companies of AEFYT to participate in the development of this industry, as well as to have privileged access to the advances that are produced in this regard."

– Roberto Solsona, president of AEFYT

Policy Implications of a Biden Presidency

iiar government RELATIONS

BY LOWELL RANDEL, IIAR GOVERNMENT RELATIONS DIRECTOR

While there are still some uncertainties about the final results of the 2020 elections, including key runoff elections for two Senate seats in the state of Georgia, it is important to look at the potential policy implications of a Biden presidency. As with all presidential administrations, there will be some policy changes that can be accomplished simply through executive action. Both the Obama and Trump Administrations were very active in issuing Executive Orders to advance policy objectives. It is expected that a Biden Administration would follow this trend and issue a series of Executive Orders very quickly after being sworn into office. Many of the first actions will reverse Trump executive actions and reset to Obama-era policies.

Other policy changes will require Congressional action. Democrats maintain a slim majority in the House of Representatives. The fate of the Georgia Senate runoffs will determine which party controls the Senate. If Republicans win at least one of the runoff elections, they will retain control in the Senate. Should Democrats take both seats, the Senate will be evenly split between Republicans and Democrats, with Vice President Harris casting the tie-breaking vote. This would give Democrats control of the House, Senate, and White House, making it much easier to advance their legislative agenda.

OSHA COVID-19 Temporary Emergency Standard

One immediate policy area that will impact all businesses, not just industrial refrigeration, will likely be in workplace health and safety-related to COVID-19. Under the Trump Administration, OSHA has taken the approach of providing guidance to industry on steps to control transmission of COVID-19 in the workplace. This has been criticized by labor advocates and has resulted in several states issuing their own temporary emergency standards that require businesses to take specific actions on COVID-19.

It appears very likely that a Biden Administration led OSHA would move quickly to enact a national temporary emergency standard, moving away from guidance to enforceable requirements. While the details of such a temporary standard are not certain, OSHA could make following CDC and OSHA guidance a regulatory requirement as well as implementing various training and documentation requirements. This would be similar to the approach taken by states including Virginia that have established their own emergency COVID standards. Such a policy could be implemented quickly, without Congressional action, and set the stage for a longer rulemaking process to create a permanent regulation on infectious disease control in the workplace.

Climate Change and HFCs

On the campaign trail, Biden made addressing climate change a priority. He has pledged that the U.S. will reach net-zero greenhouse gas emissions by 2050. One of the first expected actions is bringing the United States back into the Paris Climate Agreement, which has the goal of limiting global warming. Biden has proposed investing $1.7 trillion in clean energy and green jobs, ending fossil fuel subsidies, and banning on new oil and gas permits on public lands. Some analysts have estimated that Biden's plan would reduce greenhouse gas emissions by about 75 gigatons of carbon dioxide by 2050, decreasing global warming by 0.1°C by the end of the century.

In addition to rejoining the Paris agreement, it is very likely that a Biden Administration will push for ratification of the Kigali Agreement. The Obama Administration supported the Kigali Agreement, which incorporates the reduction of HFCs as a part of the Montreal Protocol. Under the Obama Administration, EPA began taking steps to curb HFC usage but those efforts were halted when courts ruled that EPA does not currently have the authority to regulate HFCs under the Clean Air Act. Ratification of the Kigali Agreement would give EPA the authority needed to resume policies aimed at reducing HFCs, which would impact the use of many freon-based refrigerants that have higher global warming potentials. Such a move would present opportunities for further promotion of natural refrigerants such as ammonia and CO_2.

Kigali is one of the few climate policies that has bipartisan support and also enjoys some support from industry. In fact, bipartisan legislation has been introduced during the last two Congresses that would give EPA the authority to regulate and reduce the use of HFCs. Even with control of Congress so closely divided, Kigali could be one of the less controversial climate policies that could be able to find enough support from both parties to get approved.

As the industry looks forward to 2021, there will be policy challenges and opportunities presented by a Biden Administration. Moves to curtail future HFC use could present opportunities to advance natural refrigerants. At the same time, regulations related to ammonia are likely to be revisited and have the potential to become more burdensome. And, as the world tries to move past the COVID-19 pandemic, businesses will likely be subject to additional rules for protecting workplaces from the risks of COVID-19 transmission. IIAR will continue to work closely with policymakers and industry partners to promote and protect the interests of the industrial refrigeration industry.

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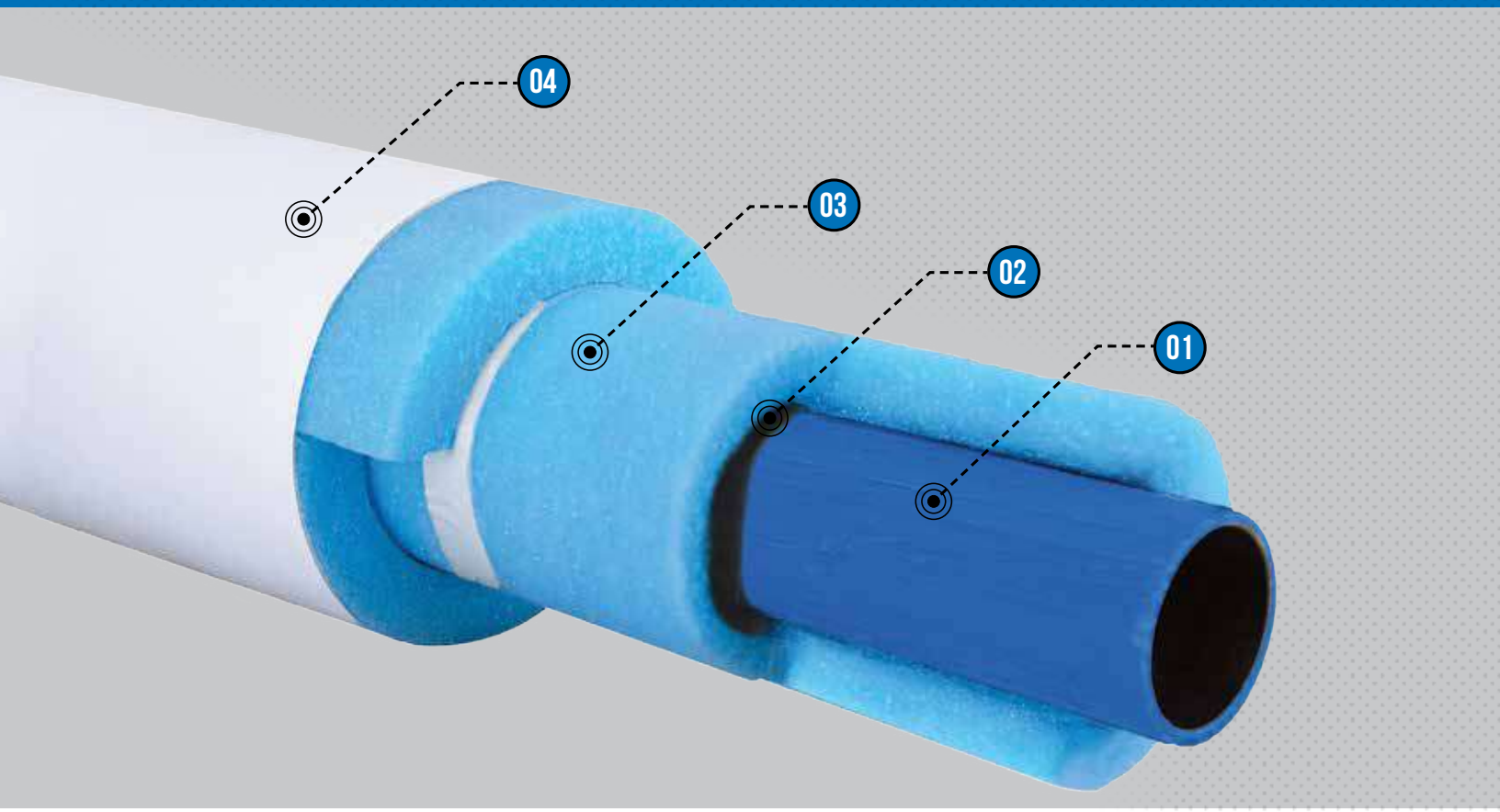

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