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CONDENSER

Building the BASE

IIAR RELEASES CO_2 STANDARD, IIAR-2 UPDATE, NEW GUIDELINES

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president's MESSAGE

BY GARY SCHRIFT

In this issue of the Condenser, we're looking at how IIAR's mission continues to shape the world of refrigeration, even as that world is constantly shifting. From our standards writing efforts to new training program development, the task of influencing and even guiding regulatory activity so that it keeps pace with new technology and an ever-evolving business landscape – falls to us.

These constant evolutions and re-evaluations extend even to our own organization, its membership structure, and IIAR's plans for the future.

As a membership group, I'm especially proud of our ongoing performance on important initiatives like standards development and this year's significant change in IIAR's membership structure

It's no surprise to anyone that the world has changed in unforeseeable ways since late 2019. Everything from the way we do business to the ways we meet, even to the ways we try to hold on to practices that worked in the past, and need a new place in the present, has changed.

That's why your IIAR Strategic Planning committee and Membership Task Force members have been evaluating the IIAR membership structure since last year, searching for ways to make the organization more relevant and accessible to members than ever before.

As your IIAR president, I'm happy to report that your Board of Directors voted to change IIAR's membership structure at the most recent board meeting held on October 7, 2021.

All changes to membership fees, benefits, and structure will begin with next fiscal year's membership which begins July 1, 2022

Moving forward, IIAR's membership will include access to a broader range of benefits and services. Starting next fiscal year, payment of your membership fee will now include one Academy of Natural Refrigerants online training class per year; one online training video per year; online access to the content recorded from our in-person IIAR annual conference, including technical sessions, workshops, and technomercials; and downloads of all IIAR's standards.

The next substantial change includes the addition of group membership fees. Membership will start with a standard $1,000 fee for the first member from a company, who will also be the voting member. From there, a $2,000 fee will include five full individual memberships from the same company, 1 voting, 4 associate members. A $4,000 fee includes 10 memberships, $6000 includes 15 memberships, $8000 includes 20 memberships and a $10,000 fee provides 25 full memberships and with the option to add additional full memberships at $100 per person for as many members from the same company as possible. All members, voting or associate will have access to the online training content of ANR classes, videos, and conference technical presentations noted above. For academics, students, retired, code groups, insurance companies, and regulatory agencies the individual membership fee will be $100.

I hope that these substantial changes will give our smaller IIAR member companies a positive incentive to add their employees who would like to participate in IIAR, as well as encourage everyone to take advantage of the new level of broader access to IIAR's standards, training, and educational materials.

After implementing the change to IIAR's membership structure, your Board of Directors and IIAR staff are tackling several key initiatives for the coming year. With the release of IIAR-2 2021, which you will read about in this issue, there has been an outpouring of questions and clarifications requested on the newly updated standard. Our standards committee is already reviewing these requests and is off to the races in formulating responses.

Next up will be the update of IIAR-1 and IIAR-3 as well as the development of a new hydrocarbon standard.

As a membership group, I'm especially proud of our ongoing performance on important initiatives like standards development and this year's significant change in IIAR's membership structure. Both will serve to advance our influence and enthusiasm for what we do every day. These are significant steps forward for our industry in our mission to improve regulatory guidance and the general level of safety in all our facilities.

I'm looking forward to continuing that mission when we return to IIAR's annual conference in Savannah, Georgia, this coming year. And as always, you, as an IIAR member, represent the experience and institutional knowledge that keep our facilities, operators, and the public safe. Your participation and membership are vitally important. See you all in Savannah!

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chairman's MESSAGE

BY ERIC JOHNSTON

It's amazing how quickly a year (or two) can go by. Our 2022 annual conference, March 6-9 in Savannah, Georgia, is on the horizon already, and while that means we're approaching the last annual meeting during my term as Chairman, this year's conference represents something much more important – a return to in-person conferences and the beginning of many exciting developments for IIAR and its members.

In each membership year, the annual conference is the place to kick off new programs and initiatives for the year ahead. In 2020, and 2021 we met several important goals, even as we were meeting remotely and adjusting to the challenges of an unprecedented in our time global pandemic.

While the pandemic certainly disrupted life as we knew it, it also presented an opportunity for change and a challenge to make that change lasting and positive. I believe we met that challenge head-on, and we will now build on those achievements in the months ahead.

As IIAR members, the programs we support are made possible by the hard work of our committees and the volunteer members who run them. IIAR continues to focus on providing our members with the safety standards, regulatory support, industry technology, and other member services that are necessary to operate an ammonia system in today's environment.

While the pandemic certainly disrupted life as we knew it, it also presented an opportunity for change and a challenge to make that change lasting and positive. I believe we met that challenge head-on, and we will now build on those achievements in the months ahead.

Each opportunity for sharing knowledge and information, such as our annual conference, our Academy of Natural Refrigerants program, and the many other IIAR initiatives we advance every day, is a chance for us to build and strengthen the resources we have available for our members.

We are constantly at work, developing the world's largest and best information resource for our membership and the industry in general. One of the best parts of being IIAR's Chairman over the past year has been the opportunity to be part of this work, and now, to showcase it at our upcoming annual conference.

Our 2022 exhibit hall is packed with the best in technology and expertise from across our industry. I hope you'll make plans now to take advantage of the opportunity to see the best your colleagues and business partners have to offer in the latest equipment, products, and services available in natural refrigeration.

I'd also like to highlight the IIAR technical program, an essential part of the work we do. It's the best way to engage in the ongoing conversation about new ways of doing things with other professional engineers. I hope you'll make it a priority to read the work of your peers and stop into a live presentation to take part in a technical paper discussion.

I'll end this month's column with a challenge to IIAR members and nonmembers alike. This year, become your industry's best advocate by taking an active role in your continuing education.

Get involved in the work of the IIAR committees and lend your voice and experience to one of our many member projects. With your help and hard work, IIAR and our industry is poised for unprecedented growth.

Although we are still months away from a long-awaited in-person meeting, I am already looking forward to seeing many of you at the conference. And beyond that, I'm looking forward to seeing where the achievements of the past few years take us as we move towards the future of our industry.

WILLIAM E. KAHLERT MEMORIAL GOLF TOURNAMENT

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Building the BASE

IIAR RELEASES CO_2 STANDARD, IIAR-2 UPDATE, NEW GUIDELINES

The International Institute of Ammonia Refrigeration's history is rooted in standards, and the association has released its latest update to IIAR-2, which was first released in 1974, and its first-ever safety standard for carbon dioxide IIAR CO_2.

"The benefit of a standard is to bring consistency to safe systems," said Trevor Hegg, vice president, product development, industrial refrigeration, and water systems for EVAPCO Inc.

Eric Smith, IIAR's vice president, and technical director said the process of writing standards is never-ending. "New technologies come out that allow safety to be accomplished in new and different ways and design standards do and should reflect new technologies and new observations in the industry and observations of what problems need to be addressed," he said.

Also, how standards are being used can change. "Regulatory agencies rely more and more on IIAR standards when inspecting refrigeration systems and consequently we don't want them to be too lax or too onerous," Smith said.

Maybe even more important is the knowledge and experience users gain over time that can improve a standard. "We've done these systems for so many years and generally we can find ways to make systems inherently safer through experience. The standards capture history well," Hegg said.

IIAR-2 has incorporated 47 years of history to get to its current state, Hegg explained. "Fast forward to CO_2. There weren't many standards dealing with

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CO_2, so you have a huge variety of different systems," he said.

While IIAR was founded with a vision to create standards related to ammonia, end-users and manufacturers requested that IIAR develop a standard for CO_2. The IIAR Board of Directors embraced the idea and viewed it as a way to promote the use of CO_2 and attract new members to IIAR, Smith said.

The new standard brings consistency to which systems should be designed and how to design safe systems, Hegg said.

IIAR has a long history of the development of standards for natural refrigerants. Over the course of the last 15 years, IIAR ammonia standards have become the basis for the model building codes in the U.S. and many other countries.

IIAR has a long history of the development of standards for natural refrigerants. Over the course of the last 15 years, IIAR ammonia standards have become the basis for the model building codes in the U.S. and many other countries.

The recent publication of the IIAR CO_2 2021 standard is part of a progression of efforts that started over 20 years ago. "My first inspiration for CO_2 refrigeration was at an IIAR conference in Long Beach, California," said John Collins, industrial sales manager for Zero Zone Inc.

"During this conference, in a panel session led by Professor Will Stoecker and other leaders, a vision for IIAR to lead the development of CO_2 refrigeration was first proposed to our organization." Efforts to publish the IIAR CO_2 Handbook were started with the initial publication in 2010.

Focused efforts to expand IIAR's scope beyond just ammonia have continued with the development of the IIAR CO_2 Standard starting in 2015 and the IIAR Hydrocarbon Standard starting in 2018. This sustained effort by many volunteer members of the Standards Committee, the Board of Directors, and staff have continued to build on IIAR's position as a natural refrigeration organization.

Now, IIAR is focusing on CO_2's more central role in the world of natural refrigerants. "It is clear for many scenarios, particularly light industrial and commercial refrigeration, that there is a significant advantage to using CO_2 over synthetics and often over ammonia systems," Smith said. "CO_2 systems are becoming more and more prominent, and we felt like there needed to be an association that would champion its use."

In addition to providing guidance on utilizing safe systems, Hegg said standards can even provide more flexibility to end-users as they make decisions, particularly with new technology. "Now they know what a CO_2 system or what a hydrocarbon system will ultimately need," he said.

IIAR-2 SAFETY STANDARD UPDATE

IIAR released the updated IIAR-2 Standard in September. The association has been working on the update for several years. "We had collected roughly 200 observations and questions that were addressed before the entire publication was put out for public review. Subsequent to public review, we addressed 200 public comments. It was a very intense effort," Smith said, adding that IIAR considers every comment.

IIAR also had bi-weekly meetings for about a year. Then those turned into weekly meetings for about another year. "There was a group of about 20-30 people who regularly participated in these meetings, and I can't praise them enough for their dedication to getting this done," Smith said. "Their dedication to meeting and discussing all of the comments and working through the resolutions on a regularly scheduled basis was the only way that we would have been able to finish."

Hegg said there is value in taking time to gather public comments. "When you get this whole body of people commenting on a standard, writing, commenting, and re-writing, it leads you down the path of having a dependable standard," he said. "We take comments very seriously and many times we're adjusting our language."

Smith said it is difficult to write language that states only the intended meaning and does not imply anything else. "Every phrase must be considered and carefully constructed such that it removes ambiguity as much as possible," he said.

The latest version sets members up for the next five to ten years, and Smith said IIAR standards are critical to natural refrigerants' future. "If accidents were to become more prominent, then people would avoid using ammonia. It would be detrimental to not only our industry but also the economy," he said, adding that the cold chain is a critical part of national infrastructure.

THE NEED FOR A CO_2 STANDARD

Because CO_2 systems were not all that prominent historically, there was scant guidance on their construction, installation, and maintenance. Collins said IIAR has created an important resource to all of the industry by bringing together experts to crystalize what is needed to safely design, build, operate and maintain CO_2 systems.

"CO_2 is a developing area of refrigeration and we have been not only putting together a standard that captures the requirements for CO_2 systems but also to some degree working with an evolving industry that is rapidly applying new technologies," Collins said.

By creating a CO_2 standard, IIAR is providing the minimum level of quality

that manufacturers and end-users need, Smith said. "Also, one reason we did it is to be able to promote CO_2 use in a way that we thought would not be done otherwise," he explained.

Tony Lundell, senior director of standards and safety for IIAR, said CO_2 runs at higher pressures than ammonia, so it requires more strength integrity as it circulates. "There is a little more sophistication in its operations and maintenance," he said.

The CO_2 standard will standardize the means and methods of construction for industrial and large commercial refrigeration systems and provide a more even playing field to manufacturers and contractors in the industry. "This is obviously a benefit to owners and users so that people will be able to count on a minimum level of quality and safety when it comes to construction consistency," Smith said.

This standard should be considered a companion standard to AHRAE 15, but it goes further than ASHRAE 15 by providing requirements for construction installation, testing, and maintenance that ASHRAE 15 does not address in detail, Smith said.

Lundell noted that, "The standard would be applicable to industrial and commercial systems, meaning production facilities, grocery stores, and warehouses."

There are several layers of approval needed to develop a standard, Lundell explained.

First, the intention must be published by ANSI. Then a consensus body is formed by inviting interested persons to review the work and the process. When a standard is complete, the subcommittee, then the standards committee, then the consensus body, and finally the IIAR Board of Directors must all approve the content and the process in that order. "To be ANSI approved, a standard must be developed according to strict adherence to ANSI approved IIAR procedures and the ANSI Essential Requirements. ANSI verifies the process through periodic, thorough audits," he said.

The same format was used for both IIAR 2 and the CO_2 Standard. "The CO_2 standard is really more analogous to most of the IIAR standards on ammonia. It addresses design, inspection, start-up, and maintenance in the same way several of the IIAR standards for ammonia cover them individually," Smith said.

Collins said an effort is underway to get the CO_2 standard adopted into the international and uniform codes. "Those approvals are pending," he said. "We're eagerly anticipating the outcome of those final hearings."

The publication of the IIAR CO_2 Standard brings the industry a valuable resource in a document that can be referenced as a basis for the proper use of this developing technology. Collins said the CO_2 standard fills a gap that has existed in many of our building codes and standards.

"However, because the industry until recent years hasn't really utilized CO_2 to the extent it is becoming used, it hasn't been an identified gap," Collins said. "This fills that gap and, now that we have thousands of CO_2 systems around the world, it is timely. It has been a growing requirement and is only getting greater."

The CO_2 standard was needed to deliver beyond only general guidelines that previously existed, Lundell said. The CO_2 standard developed includes more in-depth design requirements, as well as installation, startup, inspection, testing, and maintenance minimum requirements.

Collins said an effort is underway to get the CO_2 standard adopted into the international and uniform codes. "Those approvals are pending," he said. "We're eagerly anticipating the outcome of those final hearings."

Because CO_2 systems were not all that prominent historically, there was scant guidance on their construction, installation, and maintenance.

IIAR-2 Updates Address Detection, Ventilation and More

The International Institute of Ammonia Refrigeration has released the latest version of IIAR-2, which covers the design of safe closed-circuit ammonia refrigeration systems. IIAR-2 was first released in 1974 and received its last major update in 2015.

"Any change is important for various reasons. The real reason is that sometimes it is a matter of safety, other times it is a matter of clarification," said Eric Smith, IIAR's vice president, and technical director. "This revision was the result of opening the entire document up for review and public comment as is required periodically according to IIAR and ANSI procedures. The committee addressed over 400 internal and external comments in painstaking detail, resulting in this latest version. The volunteer committee members and the public reviewers deserve a great deal of recognition for their years of hard work on this project."

Tony Lundell, senior director of standards and safety for IIAR, said the latest version has an updated title: Standard for Design of Safe Closed-Circuit Ammonia Refrigeration Systems. Previously it was called the Standard for Safe Design of Closed-Circuit Ammonia

Refrigeration Systems.

IIAR-2 addressed several issues, including a change in ammonia detection and alarms. "Essentially, through risk analysis, research, and a lot of discussion, the committee decided that it was critical for emergency ventilation systems to be more reliable," Smith said. "The National Electric Code requires that electrical equipment in a machinery room be either classified as Class I, Division II or that the room be ventilated upon detection of ammonia. Because it is critical that emergency ventilation systems are triggered by ammonia detection, these systems must be reliable and consequently, the requirements for ammonia detection have been enhanced."

Therefore, with some exceptions, machinery rooms are now required to have at least two detectors that are triggered at the same level to activate emergency ventilation.

Another big change is that IIAR has integrated the fire code requirements for emergency pressure control systems. "The good news is that emergency pressure control systems (EPCS) will be required only when the authority having jurisdiction requires them. An EPCS is presented as one option along with diffusion tanks as a means of mitigating relief valve system releases," Smith said. "By including this we are confident that fire codes will defer all ammonia refrigeration requirements to our standard beginning in 2024."

The standard now permits discharge to the atmosphere, when permitted by the AHJ after an evaluation, or alternatively, providing an EPCS or a dilution tank (rather than both). Prior to this edition of IIAR-2, it was often required to provide both redundant systems.

There were many minor changes made to improve clarity, function, or safety, and users of the standard should review it in its entirety. But additional significant updates to IIAR-2 include:

- New and revised definitions.
- A new requirement is that evaporators and condensers must comply with ANSI B31.5, when not constructed to the Boiler and Pressure Vessel Code.
- Clarifications on the requirements for eyewash/safety showers.
- Changes to machinery-room exhaust and ventilation equipment requirements and proof of operation requirements.
- New requirements for evaporators concerning design for freeze protection and design for frozen products.
- Revised requirements for equipment enclosures.
- A new requirement to pressure-protect any equipment with a volume of greater than 0.5 Ft3, regardless of whether it is constructed per the ASME Boiler and Pressure Vessel Code.
- A significant revision of the appendix providing guidance on hydrostatic protection.

New appendices in IIAR-2 include:

- O: Designing to Avoid Component Failure Caused by Abnormal Pressure or Shock.
- P: Removal of Water from a Refrigeration System.
- Q: Guidelines for the Identification of Ammonia Refrigeration Piping and System Components.

The History of ANSI/IIAR-2 BY TONY LUNDELL

The first edition of **ANSI/IIAR-2** was released in 1974.

Revisions occurred in 1978, 1984, 1992, 1999, 2008, 2014, 2014 Addendum, & 2021

In 2008, the title was, "ANSI/IIAR 2-2008 *Equipment, Design, and Installation of Closed-Circuit Mechanical Ammonia Refrigeration Systems."*

ANSI/IIAR 2-2008 Addendum A was in 2010, which Included Machinery Rooms, Ventilation, & Relief Piping Material

ANSI/IIAR 2-2008 Addendum B was in 2012, which included Flange and Valve Installation

ANSI/IIAR 2-2014 – The standard was revised for safe design, becoming "ANSI/IIAR 2-2014 *Standard for Safe Design of Closed-Circuit Ammonia Refrigeration Systems".*

This version removed installation, startup, and most maintenance requirements. This permitted the standard to address only the minimum requirements for designing safe closed-circuit ammonia refrigeration systems.

Some of the major changes include:

- Design and Installation Considerations Affecting Construction
- Refrigeration Equipment Located in Areas Other Than Machinery Rooms
- Packaged Systems and Equipment (because of growth in smaller system)
- Instrumentation and Controls
- Ammonia Detection and Alarms
- An (Informative) Appendix A for including Explanatory Material that correlated with the Standard's normative (required) sections.

ANSI/IIAR 2-2014, Addendum A:

- Required the review and considerations of 53 pages
- Four (4) Public Reviews were done which had 149 comments
- Highlights included:
  - Ammonia-based absorption systems were added
  - Clarification of the grade of ammonia required
  - Prohibits the use of fusible plugs
  - Added provisions to align requirements with ASHRAE 15
  - Added clarity to ammonia detection and ventilation requirements for packaged systems

The latest version, **ANSI/IIAR 2-2021**, was released in September 2021.

EPA Grants IIAR's Petition for Increased Hydrofluorocarbon Restrictions

The Environmental Protection Agency has granted a petition from the International Institute of Ammonia Refrigeration and its industry partners to use the agency's authority under the American Innovation and Manufacturing Act to restrict the use of hydrofluorocarbons within the refrigeration sector.

EPA will now have two years to propose and finalize rulemakings addressing this and other petitions and expects the forthcoming rules will provide a clear regulatory landscape that will help the transition to more climate-friendly alternatives, the agency said.

"This is a significant opportunity for IIAR to take a leadership role and it is very encouraging that EPA has granted IIAR's petition," said Lowell Randel, director of government affairs for IIAR. "It places the organization in a very good position to play that lead role in working with other stakeholders and the EPA to shape the ultimate policy."

EPA will now have two years to propose and finalize rulemakings addressing this and other petitions and expects the forthcoming rules will provide a clear regulatory landscape that will help the transition to more climate-friendly alternatives, the agency said.

The AIM Act directs EPA to address hydrofluorocarbons by phasing down production and consumption, maximizing reclamation and minimizing releases from equipment and facilitating the transition to next-generation technologies through sector-based restrictions. The agency's first proposed rulemaking under the AIM Act would set the HFC production and consumption baseline levels from which reductions will be made, establish an initial methodology for allocating HFC allowances for 2022 and 2023, and create a robust, agile, and innovative compliance and enforcement system, the agency said.

IIAR's petition, which was sent to EPA Administrator Michael Regan, requested that the EPA limit the use of refrigerants of 150 or greater GWP in the refrigeration sector in general (both commercial and industrial). The petition identifies several areas, including food retail, cold storage warehouses, and manufacturing, where these limits could be set in place. IIAR was joined by co-petitioners, the Refrigerating Engineers and Technicians Association, and the Ammonia Safety & Training Institute.

In the petition, Gary Schrift, IIAR's president, said the association believes that California's framework for HFC phase-down can serve as a good model for EPA's implementation of the AIM Act. However, IIAR petitions to go further regarding Chillers for Industrial Refrigeration. "Subsection (i) of the AIM Act on 'Technology Transitions' authorizes EPA to 'restrict, fully, partially or on a graduated schedule, the use of a regulated substance in the sector or subsector in which the regulated substance is used,'" according to the petition.

In a letter to Schrift granting the petition, Regan said, "The EPA intends to move swiftly to develop a proposal and will continue to engage with stakeholders as we proceed. However, please note that a petition grant does not mean that the agency will propose or finalize requirements identical to those in your petition."

IIAR is continuing to work with other groups who submitted petitions to find common ground and consensus moving forward, Randel said.

Regan said that granting IIAR's petition along with others submitted was "another step forward in advancing President Biden's commitment to tackle the climate crisis, as we work to phase down and restrict the use of super-polluting HFCs as Congress directed. In less than a year, EPA has already begun implementing the AIM Act to build a strong foundation, moving the United States away from these climate-damaging chemicals."

Regan said the agency looked forward to working with IIAR and all stakeholders in the next steps of the process.

As part of its petition, IIAR wrote that the technology has existed for decades in the design and manufacturing of chillers for industrial process refrigeration using natural refrigerants for all temperature ranges. The association told EPA the use of natural refrigerants including CO_2, ammonia, and hydrocarbons will significantly and positively impact global warming reduction goals using refrigerants with ultra-low refrigerant GWP values and increased operational energy efficiency of these refrigeration systems.

IIAR recommended that the chillers for industrial process refrigeration restriction take effect on Jan. 1, 2026, to provide manufacturers, contractors, and owners the time to meet the needs created by this excellent single-step approach.

CO_2 Standard Provides Guidance on Growing Segment of the Industry

The International Institute of Ammonia Refrigeration has released its safety standard for CO_2 closed-circuit systems. The standard covers all phases of the CO_2 system lifecycle, from design, installation, and start-up to inspection, testing, and maintenance. It encompasses the CO_2 portion of a cascade system, systems using CO_2 as a secondary fluid, systems operating part- or full-time in the transcritical cycle, and heat pumps.

During the development of the CO_2 Standard, it first went through a prepublic review receiving over several hundred comments that were addressed, then progressed through four public reviews receiving 186 comments that were all addressed, said Tony Lundell, senior director of standards and safety for IIAR.

"We made a significant effort in this process to engage and encourage the involvement of a wide range of individuals, many not traditionally involved with IIAR," Collins said. "Our task group included members who work in the commercial side of refrigeration in retail and other non-industrial applications. This was an important part of assuring the document covers all CO_2 applications and was key to gaining the broad acceptance that allows this standard to serve the entire industry."

Part One of the Standard defines the scope and purpose along with key definitions and references. Part Two of the Standard provides requirements for proper design. Key aspects of CO_2 system design include:

- Location of equipment
- Carbon dioxide leak concentration limits
- CO_2 refrigerant specifications
- System design pressures
- Suitable materials and components
- Overpressure protection
- Monitoring equipment and levels

Parts three, four, and five of the Standard cover installation, startup, and inspection, testing, and maintenance. This is a comprehensive standard that covers all aspects of CO_2 refrigeration from the initial system design concept to construction and through the operating life of the equipment. IIAR has compiled in the IIAR CO_2 standard what is covered for ammonia in multiple standards from IIAR-2 through IIAR-7.

Lundell said there are several benefits to CO_2 as it is a natural refrigerant with zero ozone-depleting potential and a global warming potential rating of one. Anhydrous ammonia, the leading natural refrigerant, has zero ODP and zero GWP. CO_2 is non-flammable and is not toxic, which simplifies install requirements and reduces many of the safety restrictions compared to ammonia. Compared to synthetic refrigerants, the heat transfer characteristics of CO_2 are more attractive and CO_2 refrigerant is less expensive. These characteristics coupled with the realities of the changing regulatory environment are driving a shift toward CO_2 refrigeration which is rapidly gaining momentum.

CO_2 must operate at higher pressures than other refrigerants, but a system designed to the IIAR CO_2 Standard is safe. The properties of CO_2 offer great opportunities for cost-effective, high-performing, systems with more compact components and smaller piping than feasible with other refrigerants. The technology of today's CO_2 refrigeration systems has advanced over the last 20 years to be efficient, cost-effective, and relatively easy to install and operate.

There is still more work to be done. "Given the quantity of new applications where we're seeing CO_2 being installed now, it is becoming more and more apparent that we need more development. We're looking at next steps in terms of developing the standard further," Collins said.

There are likely opportunities to use the Ammonia Refrigeration Foundation and IIAR's Research Committee to conduct research that will benefit the CO_2 Standard. "IIAR has a tremendous group of members and a lot of resources and we're in a good position to synthesize a lot of what the industry has out there," Collins said.

This includes drawing from the knowledge of our colleagues in Europe where CO_2 has been more widely used in the last 20 years than in the U.S.

Part One of the Standard defines the scope and purpose along with key definitions and references. Part Two of the Standard provides requirements for proper design.

"We're seeing more transcritical refrigeration systems. If people are using these systems, they need to understand what is appropriate in terms of using them and constructing them and they need somewhere to look to," said John Collins, industrial sales manager for Zero Zone. "Transcritical CO_2 is something that is somewhat of a mystery to many people."

Collins said many people have experience working with the requirements of ammonia, especially around the detection, ventilation, and managing the risks and hazards of ammonia, but are less familiar with the properties of CO_2. "Carbon Dioxide has a safety classification as an A1 refrigerant, not a B2 refrigerant, and as such the requirements for design are different than ammonia. It is a learning process for many people to understand what a different refrigerant requires," he explained.

The safety standards for CO_2 are different than they are for ammonia and even different from other A1 refrigerants. "Because we have a dedicated standard to CO_2, we're able to provide a depth of background and be sure that the particulars that are unique to CO_2 are properly addressed," Collins said.

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IIAR Releases Critical Task Guideline

The International Institute of Ammonia Refrigeration (IIAR) has recently published the first edition of a new guideline titled "Critical Task Guidance for Ammonia Refrigeration System Emergency Planning."

The "Critical Task Guidance" was designed to assist employers, government regulators, and public safety emergency responders who prepare emergency procedures to address ammonia incidents. The document was developed by consensus among members of IIAR, the Refrigerating Engineers and Technicians Association (RETA), the Global Cold Chain Alliance (GCCA), and the Ammonia Safety and Training Institute (ASTI) and reflects insights from various regulatory agencies.

"This guidance is intended to be integrated into site-specific plans to address pre-event readiness and ammonia release actions. It addresses emergency action training requirements, emergency action planning, and advocates for the use of air-purifying respirators (APRs) and the circumstances in which they should be used. It is intended to be integrated into new emergency action plans and/or emergency response plans. It can also be used to strengthen existing plans," said Tony Lundell, senior director of standards and safety for IIAR.

The guideline identifies three critical tasks associated with the safe operation and maintenance of ammonia systems and response to an unplanned ammonia incident—preparation, escape and system emergency control and rescue.

"It is designed to avoid and address ammonia incidents," Lundell said, adding that responders often aren't prepared to deal with an ammonia situation and need additional information.

For example, the guideline recommends wearing an APR when working aloft on equipment that is near charged ammonia systems. This will not only increase the person's awareness that care should be taken but also prepare them should an incident occur.

The guideline addresses the need and applicability of dealing with medical and rescue duties included in facilities' Emergency Action Plans and/or Emergency Response plans, as required by 29 CFR 1910.38 and/or 29 CFR 1910.120. It also outlines the extent to which a technician could take offensive or corrective actions when dealing with a release, which can help to mitigate them and keep them from becoming more problematic.

The guideline identifies three critical tasks associated with the safe operation and maintenance of ammonia systems and response to an unplanned ammonia incident—preparation, escape and system emergency control and rescue.

It also establishes a protocol of awareness training, the necessity of communications, and an incident command system. The guideline offers information about APRs, interpretations of applicability, a sample leak investigation procedure, guidance on heroic rescue, a sample teaming agreement for local emergency response groups, a sample emergency action checklist, and other useful information.

Lundell noted that it is important to understand the guideline should be used to augment plans and does not constitute a complete plan.

Companies can reference this guideline and use it as a Recognized and Generally Accepted Good Engineering Practice (RAGAGEP) if so desired. "By a company declaring a publication is used as RAGAGEP in their programs it will be enforced through PSM/RMP, a local requirement, and/or by the General Duty Clause (GDC)," Lundell said.

However, it is not mandatory to do so. Companies can simply integrate the recommendations into their plans in part or whole. But regardless of their choice, they must still meet the minimum requirements of the regulations. The guideline simply helps them address the specific topics covered within it.

The "Critical Task Guideline" was created because there was a lack of best practice emergency plan information for medical, rescue, and emergency system control available to employers and emergency planners to address the most threatening part of an ammonia operator's world, explained Gary Smith, president, and chief executive officer of ASTI.

"Cal-OSHA was aggressively going after industry because emergency action plans lacked substance and value when defending the worker from a sudden release of ammonia. This occurs during maintenance, service, repair, and a sudden failure within the ammonia refrigeration system," Gary Smith said, adding that Cal-OSHA was correct in pointing out the issue.

The regulations are not specific. They are performance standards that are often interpreted to mean that companies should simply evacuate a facility and call 911 in response to any emergency. This approach can be problematic in many ways in that the first 30 minutes of a release is usually the most critical time. This is when small releases can be stopped, systems shut down, and an orderly escape and evacuation should be carried out, said Eric Smith, IIAR's vice president, and technical director.

"The most frustrating part of the problem was that most of us knew the answer to the problem but adding or changing OSHA regulations is a very difficult process," Gary Smith said. "We felt that a better solution would be to give advice to the industry that they could use to upgrade their Emergency Action Plans so that injury of workers would be significantly reduced."

IIAR, ASTI, RETA, and GCCA all worked together to create the guidance, which Gary Smith said was a sensible solution and a win on all sides. "I think we hit

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the bullseye on this one," he said. "From the standpoint of the leadership, I would say collectively we did a good thing."

Gary Smith said Cal-OSHA has reviewed the guideline and said it is an excellent compromise between simple evacuation and a full HAZWOPER response requiring specially trained technicians and equipment. He added that a favorable outcome in the TECO case would enhance the importance of this new guideline to safely address releases, whether they are incidental or not.

Gary Smith said the bottom line is that no one should suffer serious injury or death because of an ammonia release if they follow the guidance. He added that 90% of the problem is solved if the operators wear the right type of respirator.

The publication is being published as a guideline, rather than a standard or a bulletin. Bulletins were developed before most of the IIAR standards were created, and before the advent of OSHA's and EPA's promulgation of Process Safety Management and Risk Management regulations. The bulletins covered many of the topics that are now covered by standards. "IIAR decided over a decade ago to end publication of bulletins in favor of ANSI developed standards where applicable," said Eric Smith, IIAR's vice president, and technical director.

Standards relay prescriptive requirements and undergo the ANSI process of development and review. The industry must follow the standards and regulators are obliged to observe them. Bulletins contained a lot of informative material that was not deemed to be necessary to mandate for minimum safety requirements. So, in keeping with the concept to retire bulletins, such informative information was either included in standards' appendices or was re-branded as guidelines. "New informative information on specific topics is being published as guidelines, such as this guidance on emergency action plans," Eric Smith said. "While it did not undergo the ANSI development process, it's was a collaborative effort relaying a compilation of good information from various authoritative resources."

Guidelines, like the bulletins before them, do not undergo the ANSI process and their use is not mandated by any code or regulation, Eric Smith said. "They are published to help the industry, typically end-users, develop their own methods for high-quality programs that aid them in efficient, safe, and compliant operations," Smith said.

"And while guidelines are not developed per the ANSI method, they are vetted by a broad range of industry professionals, including contractors, end-users, engineers, consultants, academics, and manufacturers, who participate on the committees that develop or review them as well as the IIAR Board of Directors, which ultimately decides to publish them or not," Eric Smith explained.

IIAR standards and bulletins serve as the information that regulators respect as "gospel" while a guideline is a collection of good information that has no official standing in the regulatory world, Gary Smith said. "It's a compilation of good information from many sources outside of the reign of the regulators," he said.

The guideline is now available for purchase. Like all IIAR guidelines, it will be subject to periodic review by relevant committees.

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As HFCs are Phased-Down, Disincentives for Ammonia Must be Avoided

iiar government RELATIONS

BY LOWELL RANDEL, IIAR GOVERNMENT RELATIONS DIRECTOR

With the passage and ongoing implementation of the American Innovation and Manufacturing (AIM) Act at the federal level, some states are also taking actions to phase down hydrofluorocarbons (HFCs). As policymakers move away from HFCs, it is also important that ammonia policies be kept in an appropriate balance, to avoid unintended consequences of policies that may serve as disincentives for facilities to move to natural refrigerants. A good example of such policies can be found in the State of New Jersey.

The New Jersey Department of Environmental Protection (NJDEP) has initiated a rulemaking to begin its process to phase down HFCs. The rulemaking, Docket Number: 06-21-05 Proposal Number PRN 2021-058 Greenhouse Gas Monitoring and Reporting, focused on establishing a baseline of HFC use, monitoring, and reporting. The International Institute of Ammonia Refrigeration (IIAR) provided oral comments during an NJDEP public meeting and also submitted written comments regarding the state's policies. IIAR comments focus on the importance of a holistic look at New Jersey state policies and the removal of disincentives for companies to transition from (HFCs) to natural refrigerants such as anhydrous ammonia.

IIAR shares NJDEP's goal of reducing emissions of greenhouse gases with high global warming potential. However, in addition to the current rulemaking being considered, the State of New Jersey should address current barriers to companies wanting to transition from HFCs to anhydrous ammonia. The use of natural refrigerants such as anhydrous ammonia will play an important role in providing climate-friendly refrigeration solutions. The majority of industrial refrigeration facilities in the United States already utilize anhydrous ammonia as their primary refrigerant. Industry overwhelmingly chooses ammonia because it is the most efficient refrigerant for industrial applications. The one exception to the widespread use of ammonia is the State of New Jersey. The Toxic Catastrophe Prevention Act (TCPA) and the New Jersey Refrigeration Operator licensing requirements, as they currently apply to ammonia refrigeration systems are the most restrictive in the United States and serve as strong disincentives for facilities to move away from HFCs.

IIAR estimates that the initial cost to come into compliance under the TCPA is approximately $32,500 and the annual cost after that is over $21,000. It is important to note that the TCPA comes on top of the U.S. Environmental Protection Agency's Risk Management Program (RMP) and the U.S. Occupational Safety and Health Administration's Process Safety Management requirements. Because federal regulations are in place to address the very same hazards as TCPA, there will be no diminishment in safety to workers or the environment should anhydrous ammonia be removed from the TCPA.

The second barrier is the New Jersey Refrigeration Operator licensing requirement that mandates a 24-hour Gold Seal operating engineer. New Jersey is the only state with such licensing requirements, which place a significant economic burden on facilities using ammonia as an industrial refrigerant. Requirements for trained Refrigeration Operators in Federal regulations such as PSM and RMP already ensure that qualified personnel are operating ammonia refrigeration systems. Additionally, the requirements do not take into consideration the increased automation and safety features built into modern ammonia refrigeration systems. Current rules for gold seal operators were implemented long before automation and other widely adopted safety features were prevalent. On average, it is estimated that these licensing requirements result in a minimum of $100,000 in additional costs annually for facilities in New Jersey.

Combined, the TCPA and operator licensing requirements cost facilities in New Jersey using anhydrous ammonia over $120,000 more annually than their counterparts in neighboring states. These policies provide a direct deterrent to facilities looking to transition from HFCs to ammonia and put the State of New Jersey at a disadvantage when competing for jobs and economic growth. These policies continue to take a toll on the growth of the refrigerated warehousing industry in New Jersey, as well as the broader food sector.

As the State of New Jersey and other jurisdictions move forward with policies designed to reduce the use and emissions of HFCs, removing unnecessary regulatory burdens on ammonia would eliminate major disincentives for companies wanting to transition from HFCs to a natural refrigerant with zero global warming potential. This will be an important consideration as US EPA and OSHA look at potential revisions to the Risk Management Program and Process Safety Management regulations. IIAR will continue to work with policymakers to promote the use of natural refrigerants and advocate for the appropriate balance of policies to avoid any potential disincentives for the transition to ammonia.

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Improving PHAs With Sample-Safeguards Checklists

JAMES HADLEY, P.E.

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For many ammonia-refrigeration systems, a what-if/checklist process-hazard analysis (PHA), with brainstorming about unique situations enhanced by a comprehensive safeguards checklist, provides a robust method for identifying hazards, analyzing risks, and developing any needed recommendations.

More collaboration on sample documents would help the industry complete better PHAs. The technical and legal tools for collaboration are improving rapidly, ranging from artificial intelligence to better revision-tracking software, and also including widely used copyright and licensing approaches.

Whether improving PHA methods for ammonia refrigeration is needed, and if so, how, has been discussed in the industry recently. For over twenty years, the what-if/checklist PHA method has typically been used to evaluate refrigeration systems that contain 10,000 pounds or more of ammonia refrigerant in the USA. Some facilities have used hazard and operability (HAZOP) studies instead, and the 2021 IIAR conference included a technical paper on "The Case for HAZOP," by Stephanie Smith, P.E., Risk Management Professionals, Inc.

A full HAZOP study is appropriate for processes with unique science or engineering, which may include parts of some ammonia-refrigeration systems. Often ammonia-refrigeration systems are designed to code, handbook, and manufacturer recommendations, and a good checklist covers most of the ground.

It would be very difficult to quantitatively compare PHA methods by what matters most — how much they improved safety — because:

- multiple checks help ensure safeguards are in place (if a PHA team didn't catch something, a building inspector, contractor, maintenance manager... might);
- a PHA team's effort may compensate for the pros and cons of the method they use, and;
- ammonia refrigeration PHAs have often used blended methods, including some what-if questions resembling the methods of a HAZOP study (pressure, temperature, level... is high or low, here or there) and others resembling failure modes and effects analysis (this or that mechanical, electrical... component fails in some way).

AN ADDITIONAL SOLUTION

One approach to improving a what-if/checklist PHA is to start with a sample document that has:

- fewer but broader what-if questions, to help the PHA team catch unique situations;
- more detailed sample safeguards (also called controls), which serve as a checklist, and;
- sample lists of causes and consequences, which may be modified as needed.

For comparison, based on a small sample:

- some HAZOP and what-if/checklist PHA reports, for ammonia-refrigeration systems, have 300 to 400 scenarios, whose safeguards include 10,000 to 20,000 letters, approximately;
- recent safeguard-checklist focused what-if/checklist PHA reports have 130 to 145 scenarios, whose safeguards include 50,000 to 65,000 letters, approximately.

With a longer sample-safeguards list, a big part of the PHA team's effort becomes comparing sample safeguards to the planned or as-built system and deciding if any need to be implemented.

The goal is a PHA that's both comprehensive and easier to complete.

AVOIDING CANNED PHAs

The desire to avoid "canned" PHAs, that don't get adequately customized, has led to under-appreciating the benefits of having sample cause, consequence, and safeguard wording, that only get customized as needed. These benefits include:

- a more comprehensive starting point (avoid missing well-known hazards and safeguards);
- saving time and avoiding exhausting/frustrating the PHA team (burnout);
- easier to see what is unique about a refrigeration system or facility, which may create unusual risks, by using revision tracking to compare the customized to the sample PHA reports, and;
- easier to aggregate the results across many facilities, to gain an understanding of which hazards and safeguards are widespread because the causes, consequences, and safeguards are semi-structured data.

Semi-structured data is facilitated by giving sample causes, consequences, and safeguards both names and descriptions. The PHA team can then select these by name, modify the description as needed, but only modify the name if necessary. If an owner of many refrigeration systems then compares PHA reports between their facilities, they'll see mostly the same names for causes, consequences, and safeguards, with differences in their descriptions.

SHARING ANONYMIZED PHA DATA INDUSTRY-WIDE

Some industries, via companies that are members of the Center for Chemical Process Safety, have started to compile anonymized PHA data from multiple facility owners to improve their PHA efforts. The cost and effectiveness of these artificial-intelligence approaches may depend on the quality of PHA reports and other documents used as inputs. This type of collaboration may allow better comparisons of PHA methods, than the limited attempt made above, in this article.

COLLABORATING ON SAMPLE PHA REPORTS ESPECIALLY SAFEGUARDS CHECKLISTS

IIAR standards provide a starting point for sample safeguards that PHA teams may review.

IIAR 9-2020, Minimum System Safety

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Requirements for Existing Closed-Circuit Ammonia Refrigeration Systems, calls for completing minimum system-safety evaluations by about March 2025 and every five years thereafter. If a PHA is done in the meantime, shouldn't it at least check if these minimum system safety requirements are met?

IIAR 6-2019, Inspection, Testing, and Maintenance [ITM] of Closed-Circuit Ammonia Refrigeration Systems, which is a required "normative" reference of IIAR 9-2020, describes ITM safeguards that a PHA team could compare to a facility's ITM practices.

The design and building codes and standards that may apply to a refrigeration system and its supports, based on its location and installation start date (or building-permit application date), likewise can serve as checklists. In recent decades, these usually include one or more IIAR-2 editions, the ASME and other codes & standards they reference, and any applicable building codes.

The contents of IIAR handbooks and guidelines, such as The Refrigeration Piping Handbook, could make a checklist too long, but a checklist can reference them, and the PHA team may turn to them as needed, such as for information on avoiding shocks or upper limits for flow velocities in piping.

PHA teams should look further than the minimum requirements in standards. Safeguards identified by prior PHA teams over the years help do this. Some PHA leaders have compiled these, in documents or even just in their memory, to provide suggestions during PHA team meetings.

Collaborating on lists of sample safeguards, or entire sample PHA reports could aggregate this experience, from many PHA teams. Most of a PHA team's effort, and hopefully the value they create, results from their evaluation of a specific facility and refrigeration system, producing customized recommendations. Collaborating on sample documents would help focus attention on this site-specific effort and would still allow competition between who best leads PHA teams to provide the needed customization.

COLLABORATION TOOLS

If a goal is making sample PHA documents widely available and with changes well tracked, some free tools that could help include the following.

- Git and GitHub allow tracking and sharing large sets of text documents. They also allow branching, for example, if two groups of people can't agree on a change to a sample document, the document could be "branched," with each group making their own version, and with the ability to view the differences between the branches as time goes by and more changes are made. The flexibility and informality of developing sample documents in this way would help distinguish them from standards, to which regulators may try to enforce compliance.
- Legal tools for licensing sample documents (and computer code, etc.) that get modified for commercial use, which to date have protected contributors from liability, include the Apache, Creative Commons, MIT, and other licenses.

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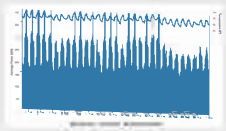

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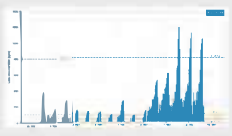

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Bitcoin: Fad or The Future?

If someone told you about an investment that has made some people millionaires overnight and has both several high-profile supporters and a global reach, would you be tempted to invest? If you were then told that the same investment also could lose most or all of its value almost overnight, and you might not have access to your money when you need it, how would it sound now?

You've just confronted the debate surrounding the digital phenomenon known as Bitcoin. An alternative currency that exists strictly as digital code, Bitcoin has received a lot of attention. But is it an investment? A network of computers? An underground economy? The future of currency? If you're wondering what all the fuss is about, here's a brief introduction to Bitcoin, how it works, and some of the potential pitfalls it presents.

BITCOIN AS CURRENCY

Bitcoin isn't a company but rather a virtual currency supported by a peer-to-peer, computer-based electronic cash system first outlined in 2009 by an anonymous person or group using the name Satoshi Nakamoto. Unlike printed currency or coins that are minted, Bitcoin is created by "mining" — using complex software to solve complicated mathematical computations (or contracting with a mining company to do it for you). Solving a problem creates a so-called "block," and the computer that solved it is rewarded with a set number of digital bitcoins, each of which is simply a set of one public and one private cryptographic key. (The units are generally "bitcoins," while the general system is "Bitcoin.") The number of solutions that can be discovered globally per hour (and thus the number of "blocks" created and bitcoins mined) is limited by the system's software code. The total number of bitcoins available to be mined eventually is said to be limited to 21 million. However, most users acquire bitcoins either by buying them with physical currencies such as dollars or accepting them as payment for goods and services.

Advocates argue that the advantages of the system are: (1) it's not controlled by any government's central bank, (2) a global virtual currency facilitates global commercial transactions, (3) every block and Bitcoin transaction is recorded in a public ledger known as "the blockchain," and (4) the payer and payee are anonymous, much like a cash transaction, though recorded transactions are visible to anyone. However, that anonymity has attracted charges that its chief use so far has been for illegal activities such as money laundering; in October 2013, the FBI shut down the Silk Road Bitcoin exchange and seized its assets.

HOW DOES A BITCOIN PAYMENT WORK?

Just as a physical wallet holds paper money and change, a digital wallet stores the private software keys that are bitcoins. It makes or receives payments by communicating with the network of other Bitcoin wallets. A growing number of well-known merchants and services now accept Bitcoin as payment. Physical bitcoins, with embedded software keys, are also being minted. However, acceptance of bitcoins as payment is entirely at a seller's discretion; there is no guarantee you'll be able to spend them where you want to or get the value you expect. Also, as outlined below, problems at some exchanges have sometimes impeded access to Bitcoin funds.

Note: *Bitcoin payments are irreversible. Once you complete a transaction, it cannot be reversed.*

Purchases can be refunded, but that depends solely on the willingness of the establishment to do so.

SPECULATING IN BITCOIN

Bitcoin's usage as a currency is a ripple compared to the tidal waves of investment speculation it has fueled. "Investing" in bitcoins simply means acquiring them through one of the methods outlined above. However, to say that Bitcoin as an investment is volatile is an understatement. Its value has fluctuated wildly as speculation and confidence in it have ebbed and surged. At the beginning of 2017, one bitcoin was worth about $1,000, and in March 2021 the price topped $60,000 for the first time. In between, Bitcoin investors have been tested — over and over — by gut-wrenching price declines.[1]

For the 12-month period through March 13, 2021, the price of Bitcoin rose more than 1,000%, driven, in part, by a stimulus-fueled surge of trading through brokerage accounts and investing apps.[2] But there was also a noteworthy increase in interest and demand from mainstream U.S. corporations and financial institutions. For example, one long-established U.S. bank announced that it will hold and transfer Bitcoin and other cryptocurrencies on behalf of clients, a major credit-card processor is incorporating cryptocurrencies into its network, and several widely used payment and banking apps already provide various crypto services.[3]

Despite its current lack of connection to any central bank, Bitcoin has been vulnerable to actions by individual governments. In 2013 and 2017, Chinese regulatory crackdowns were accompanied by drastic declines that cut Bitcoin's value in dollars by more than half.[4] In January 2018, regulators ordered the closing of mining operations that were creating more than three-fourths of the world's supply of Bitcoin.[5]

Extreme volatility has led to problems for people trying to make payments in bitcoins. It's hard to use a currency when you're not sure from day to day whether the amount in your virtual wallet is worth enough to buy a Tesla or a tank of gas. Complicating the issue is the fact that the value can vary on different Bitcoin exchanges.

Worse than not knowing how much your bitcoins will buy is not knowing whether they're available to buy anything at all. Cryptocurrency has been subject to cyberattacks that have halted trading briefly on several exchanges.

And at one point, one of the largest exchanges abruptly declared bankruptcy and announced that nearly half a billion dollars worth of bitcoins held there had vanished (though a portion of that amount was subsequently said to have been located). In addition, law-enforcement scrutiny of digital transactions to combat money laundering could interfere with the ability of Bitcoin holders to spend or exchange their funds. If the assets of a digital platform or exchange are seized, as they were with Silk Road, access to digital wallets could be restricted.

THE WILD WEST RIDES AGAIN

So far, regulatory oversight of Bitcoin has been spotty. The currency is not backed by either a government or any physical asset such as gold. Major exchanges are located around the world, and the decentralized nature of the system makes it more challenging for government regulators to get a handle on it. Unlike accounts at FDIC-insured banks, there is no protection for possible loss from a digital wallet. Moreover, a fraudster could pose as a Bitcoin exchange, intermediary, or trader in an effort to lure victims to send money, which is then stolen.

The Internal Revenue Service has said it will treat Bitcoin holdings as property rather than as a currency for tax purposes. That means the sale or exchange of bitcoins that have gained in value since they were acquired could potentially trigger a tax liability. Also, payments made in bitcoins are subject to the same information reporting requirements as any other payments made in property. And wages paid in bitcoins must be reported on a W-2 form and are taxable as income, like any other wages.

Speculation hasn't been limited to the currency itself. Much as the Internet did in its early days, Bitcoin also has spawned an entire ecosystem of startup companies and venture capitalists that want to be part of building out the technology and infrastructure involved in creating and transferring it. In addition to multiple exchanges, companies have begun providing data on the virtual currency's price and status and creating Bitcoin-based products. As with early Internet companies, such ventures are likely to involve a high degree of uncertainty and risk.

Virtual currency still faces a lot of challenges. If you're considering exploring Bitcoin, either for transactions or as a speculative investment, you should become far more familiar with it than simply relying on this discussion. And because of the issues outlined above, you should be prepared for dramatic price swings and only use money that you aren't relying on for something else.

1-2) Yahoo! Finance, March 17, 2021

3. The Wall Street Journal, February 19, 2021
4. The Wall Street Journal, February 2, 2018
5. The Wall Street Journal, January 11, 2018

IMPORTANT DISCLOSURES

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Ready? Really Ready?

KEM RUSSELL, P.E

Having a well-thought-out and functional emergency plan can be challenging. I have seen some very good emergency plans, but I have also noticed that several plans are not as complete as they could be. This seems to be a tough lesson to learn, and you may have experienced this. Let me start with an example of a conversation similar to what I have heard many times, and then give some considerations for improving an emergency plan.

"Hey, boss can I talk with you a minute?"

"Sure, I have some time. Come on in."

"Boss, I have been working on updating our emergency plan for each of our plants and have some questions."

"OK. Questions like what?"

"Well, our emergency plan is written as an 'Action Plan', not a response plan since we don't have enough people trained to have a response team. So, we rely on the local responders which is the Fire Department near each of our plants. But as far as I know none of the Fire Departments that will respond to help have hazmat capability. Is that right?"

"Hmmm, well I'm not sure about that but we are included in the community emergency plan."

"Oh good. I was going to check that out, but I was wondering if we should consider providing the local responders with what they might need to be able to respond to an ammonia release?"

"That has been considered but it would be too costly, so we are good by being included in the community emergency plan."

In the above discussion of an emergency action plan are the plants/facilities prepared for an ammonia incident? I think improvements can be made.

Fortunately, most ammonia systems are well designed, well built, and well maintained so emergency situations rarely happen. Many facilities with an "Emergency Response Plan" (ERP) do regular training with their emergency teams, employees, and local responders and these facilities are likely in good condition to deal with an ammonia emergency. One advantage to having a well-developed and functioning ERP is that you can be part of the solution in offensively dealing with an emergency. You also should have more input and possibly control into what happens in dealing with an emergency. However, many ammonia facilities don't have the people to properly support a response team and those facilities have an "Emergency Action Plan" (EAP) to protect people as they coordinate with local responders in dealing with an ammonia emergency.

All facilities are to have in place an EAP that properly addresses the element stated in OSHA 29 CFR 1910.38 (these elements would also be included in an ERP). In reading this regulation notice it does not address offensively responding to an emergency but rather "procedures for reporting a fire or other emergency." Many facilities rely on their local responders to do the offensive actions for any type of emergency. EPA has stated that they do not intend to force a facility to develop emergency response capabilities, so facilities rely on being included in their community emergency plan prepared under EPCRA (Emergency Planning and Community Right-to-Know Act) regarding a response to a potential release, and on their local responders being able to deal with whatever the emergency is.

In addition, The General Duty Clause (GDC) of §112(r)(1) establishes that owners and operators of stationary sources producing, processing, and storing extremely hazardous substances have a general duty to identify hazards associated with an accidental release, design and maintain a safe facility, and minimize consequences of any accidental releases that occur. Ammonia is classified by EPA as an extremely hazardous substance, and as stated in the GDC the owner or operator is responsible to minimize the consequences of any accidentally released chemical. Can your facility depend on local responders being able to appropriately handle an ammonia emergency? In many locations, the local responding organizations do not have the staff, training, nor equipment to respond to ammonia releases. So how might a facility develop its emergency plan to address who will respond?

Some possible approaches come to mind:

- An ERP could be developed. This depends on the staff at a facility, but possibly sufficient employees could be trained to function as a hazard response team. This may require additional costs to purchase appropriate personal protective equipment (PPE) and to provide the necessary training. With your own team in place, you would still coordinate with your local responder(s) and between you and them have a much better chance of successfully dealing with an ammonia emergency. For facilities that have processes that contain 10,000 lbs. or more of ammonia the updated Risk Management Plan rule states that facilities will coordinate with local emergency response officials required by § 68.93, the owner or operator shall consult with these officials to establish an appropriate frequency for tabletop exercises, and shall conduct a tabletop exercise before December 21, 2026, and at a minimum of at least once every three years thereafter." Field exercises should also be done and the updated rule states "coordination with local emergency response officials required by § 68.93, the owner or operator shall consult with these officials to establish an appropriate frequency for field exercises."
- Coordinate with the local responders and see what they need to be prepared to deal with an ammonia emergency. Again, for facilities that have processes that have 10,000 lbs. or more of ammonia the updated Risk Manage-

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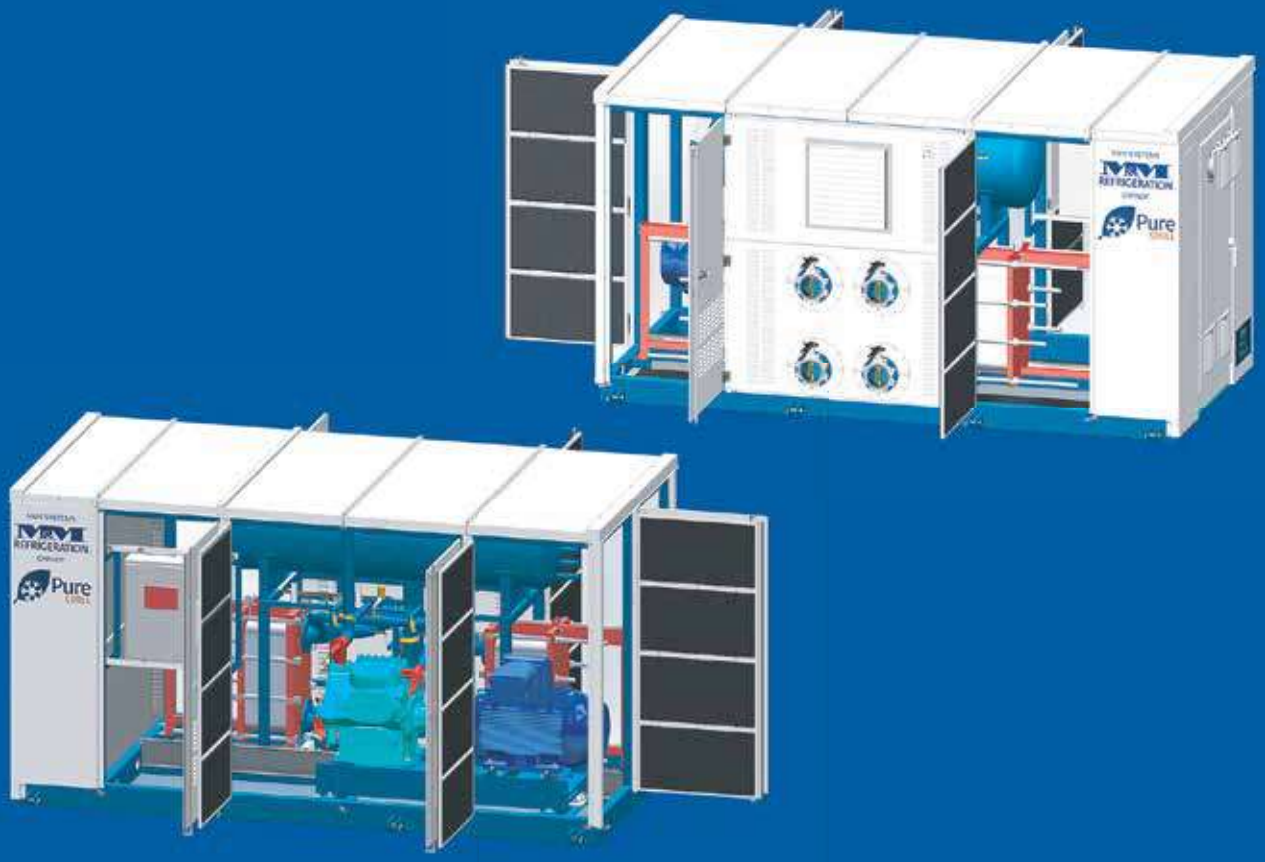

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ment Plan rule states "The owner or operator performs the annual emergency response coordination activities required under § 68.93." This annual coordination must have occurred by December 19, 2024." During this coordination, it should be determined how an ammonia emergency will be dealt with. It may be discovered that something needs to be done before the local responders are ready. This coordination with local responders should also be done for smaller facilities that have less ammonia as part of fulfilling the intent of the General Duty Clause.

- If you have an EAP and your local responders cannot handle an ammonia emergency, then during your coordination efforts determine if a neighboring group has hazmat capability. Through a mutual aid agreement possibly that group could respond. How far away that group is, will be an important consideration. If, for example, it would take them three hours or more to get to your facility, that probably is not going to be much help.
- The local responding organization may need help to be able to respond to an ammonia emergency. This could be done by providing them with ammonia-specific hazmat training so they better understand what might be done to deal with an ammonia release safely and possibly offensively. The purchase of additional PPE may not be required since local responders i.e., Fire Departments likely already have much of what would be needed, but if not, that could be worked out. The training that the local responders may need might best be done with both the facility and local responders together. Both groups participating in this training will help coordinate efforts and plans, plus meet annual required coordination for Risk Management Program facilities.
- Are there other groups or organizations that could respond to an ammonia emergency? This might be a local ammonia refrigeration contractor who has employees trained as "Hazardous Material Technicians," or an all-hazards materials contractor. Most states have emergency response groups or organizations that may be able to assist, or at least help determine what may be best to consider in responding to an emergency. Again, the length of time for a group or organization to arrive on-site would be an important consideration.
- Review your ammonia system(s) looking for what might be done to mitigate a possible ammonia release quicker. This could be accomplished by developing or reviewing procedures to isolate equipment or sections of a system (it might be found that installing system isolation valve at some locations would be helpful); how to pump down equipment or sections of a system; how to properly shut down equipment or sections of a system, etc. These procedures should also be supported by ongoing review and training with all appropriate personnel and possibly other employees could be trained to assist.

Because you have ammonia and are responsible for it, is your facility really prepared for an ammonia emergency, which includes knowing what local responders can and can't do? Meet with your local responders to coordinate and discuss your emergency plan considering what will be done to protect your people, the surrounding public, and the environment. Don't leave gray areas in your plan. That's the lesson to learn.

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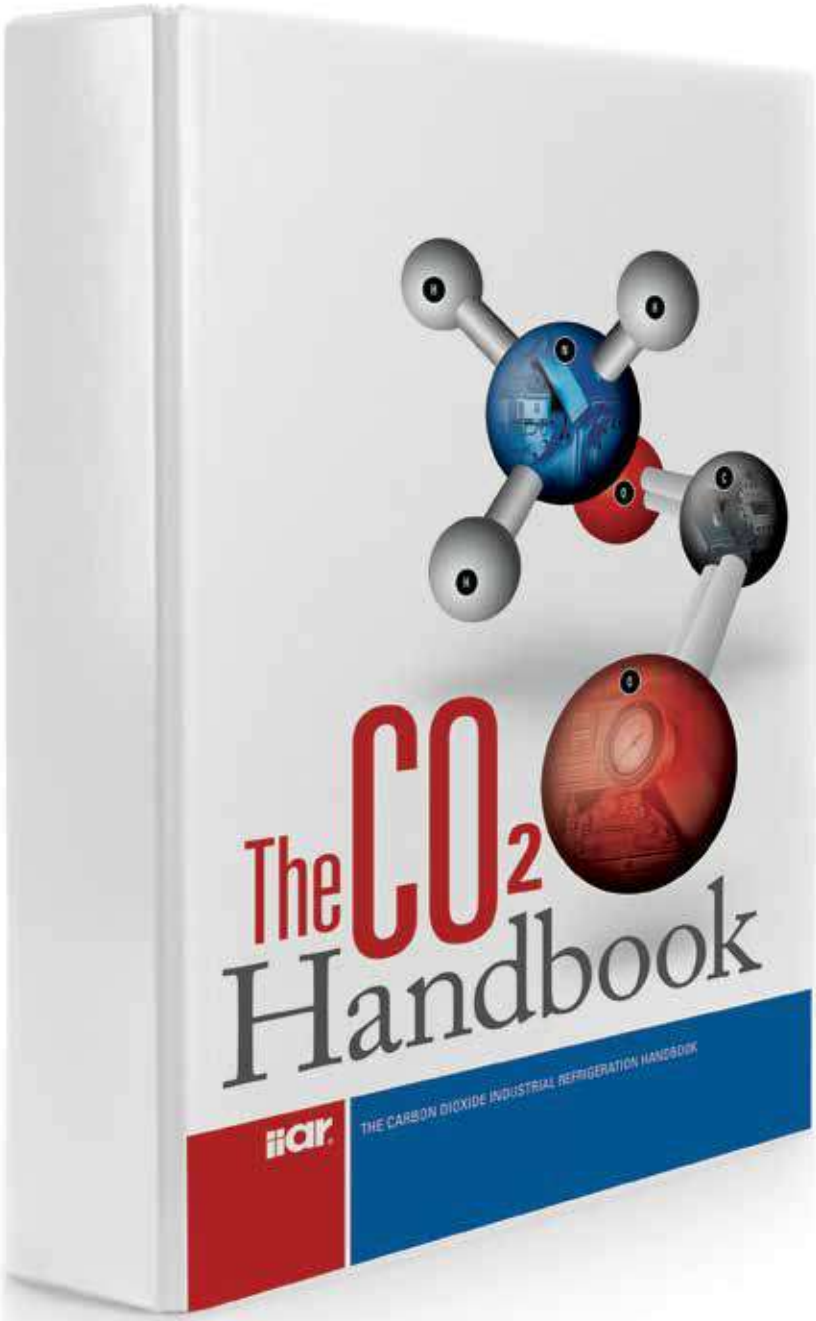

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IIAR Participates in Coalition Amicus Brief to the Court Regarding Release Investigations

ERIC SMITH, P.E., VICE PRESIDENT AND TECHNICAL DIRECTOR, IIAR
LOWELL RANDEL, DIRECTOR OF GOVERNMENT AFFAIRS, IIAR

The Occupational Safety and Health Administration ("OSHA") is appealing to the U.S. Court of Appeals for the Eleventh Circuit a recent decision by the Occupational Safety and Health Review Commission ("OSHRC"), and an administrative law judge that favored the Tampa Electric Company ("TECO"). The case surrounds actions that TECO performed when responding to a release of ammonia that occurred at a power generating facility. TECO uses ammonia to reduce nitrous oxide emissions that are a byproduct of power generation. The technicians responding to the release used their training to ascertain the extent of the release, assess the problem, and stop the release. In doing so, they did not wear respiratory protection and were not injured when performing these functions. TECO was issued a two-item serious citation alleging violations of the Hazardous Waste Operations and Emergency Response ("HAZWOPER") standard, 29 C.F.R. § 1910.120. These citations were challenged through the OSHRC.

The case surrounds actions that TECO performed when responding to a release of ammonia that occurred at a power generating facility. TECO uses ammonia to reduce nitrous oxide emissions that are a byproduct of power generation.

The legal and even the technical arguments of the case are beyond the scope of this summary. However, the following generally describes the initial decisions of the case.

The first item was vacated by the judge because OSHA did not prove that TECO's performance-based emergency action plan was inadequate. OSHA did not appeal that part of the decision. Only Item 2 of that citation was further reviewed. It alleges a violation of 29 C.F.R. § 1910.120(q)(3)(iv) and proposes a $9,054 penalty because TECO employees who responded to the ammonia release did not wear positive pressure self-contained breathing apparatuses (SCBA). The judge also vacated this item, and OSHA sought Commission review. The majority of the commission agreed with vacating this item on the ground that the response was not an "emergency response," based on the language of the definition of "emergency response."

OSHA's appeal brief to the Eleventh Circuit repeats its original arguments that because TECO did not know exactly how much ammonia had escaped, and others at the site had symptoms of ammonia exposure, TECO should have assumed that the release was uncontrolled and that their employees could have been exposed to a hazardous situation which in OSHA's opinion constitutes the basis for an "emergency response." There are several important issues at hand. First is the limit of OSHA's authority in enforcing an OSHA performance standard, versus a prescriptive standard. Stated a bit differently: How much room for interpretation and discernment is an employer permitted to use when deciding the best plans for a particular facility? Another issue relates to whether an employee can be said to be in the "immediate release area" if they are not there to witness a release. Another major issue is whether the release was "uncontrolled" at all, as the ammonia was released by control equipment in accordance with its designs. All these issues tie back to the language of the standard that defines and permits certain response actions to be performed if criteria are met.

It is IIAR's opinion that the outcome of this case before the Court is potentially crucial to the food industry and many other industries that use ammonia in their processes. Should OSHA prevail, IIAR fears that nearly any release would be considered uncontrolled, and not incidental. This could be a severe detriment to the food industry and others that use ammonia. IIAR also believes that requiring the use of SCBAs and level A suiting could have the opposite effect on safety in many circumstances. First responders and hazmat teams regularly train with and use protective equipment, compared to the relatively rare major accidental releases of ammonia in a facility where such equipment is not regularly used by the well-practiced. Many end-users are not positioned to employ, train, and outfit a HAZWOPER response team. As our industry has observed, these considerations may cause employers to adopt minimal emergency action plans where they simply do not address releases but instead call emergency services, delaying response, potentially delaying assistance to victims of exposure, and perhaps allowing a minor incident that is easily controlled to become a major one. IIAR believes that the use of industry-developed procedures, training, and PPE can be used to address most releases successfully and safely.

IIAR has joined with other similarly concerned trade associations to express concerns with OSHA's interpretation of the rule. The court will be considering the case in the coming months.

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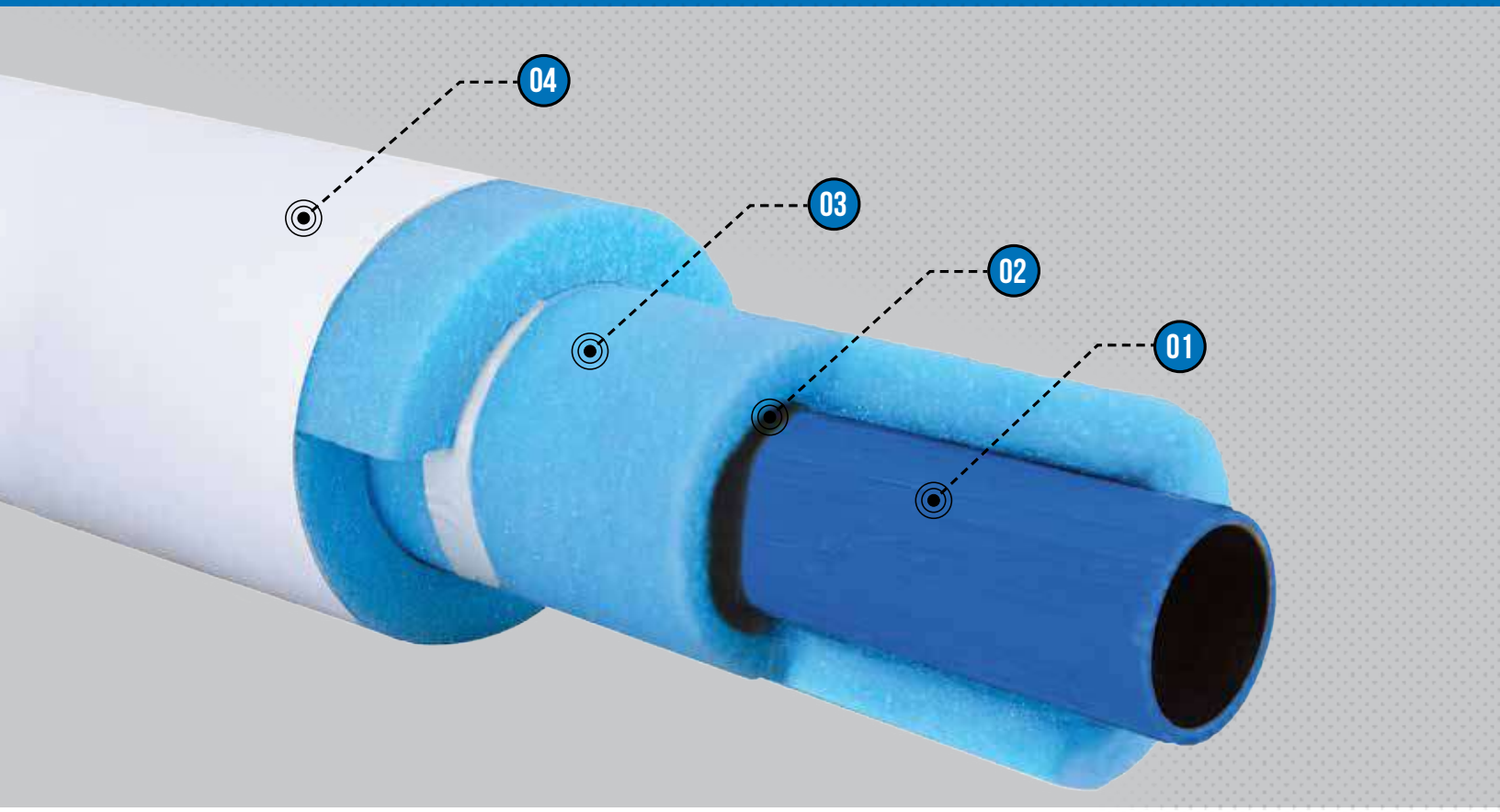

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