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LEANING INTO NATURAL REFRIGERATION

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Leaning into Natural Refrigeration: IIAR Celebrates Global HVACR Women Week

In 1916, when Margaret Ingels walked out of the University of Kentucky, mechanical engineering degree in hand, no one could have predicted that this woman, the first in the United States to receive that degree, would go on to help shape HVACR and blaze a trail for other women in engineering.

By the midcentury, she had worked to perfect the sling psychrometer for Carrier and was advocating for women in the profession alongside other female engineers.

Now, UK-based organization World Refrigeration Day, is continuing Ingels' work – spotlighting other women in HVACR to raise their visibility for younger women contemplating entering the field – with Global HVACR Women Week.

"Not only does everybody have a responsibility to do this, it makes practical sense; to grow our industry we need to involve everyone," said International Institute of All-Natural Refrigeration President Gary Schrift. "[Ingels] knew that and was able to open the door for other women's contributions to our industry."

Shrift said IIAR is invested in following that example by participating in the HVACR Women Week event this year – a global community initiative connecting women and their colleagues across heating, ventilation, air conditioning, refrigeration and heat pumps.

Each organization participating in the event chooses a way to highlight women, and this year, IIAR has chosen to spotlight its almost fifty percent female staff with interviews and profiles published by the Global HVACR Women Week and the Natural Refrigeration Review, IIAR's magazine.

"The Week is intended to make women's contributions across HVACR more visible, strengthen professional relationships and help local industry communities connect," said Stephen Gill, Head of Secretariat for World Refrigeration Day®. "IIAR's community [brings] an especially valuable perspective."

IIAR's current Chair, Jeanna Emmons, is the organization's first woman to lead IIAR. Emmons said her position feels like an important moment for the organization.

"I think what this role represents to me is that after twenty-five years of the door being cracked open [to women], me being in this position and Lesley Schafer [IIAR's incoming Board Chair] being next in line means the door has been kicked open," said Emmons.

"Everyone is welcome at IIAR. It's important that [leadership] mirrors the membership. And we've finally done that in my opinion."

"The Week is intended to make women's contributions across HVACR more visible, strengthen professional relationships and help local industry communities connect."

Meanwhile, having shared goals as a volunteer organization can help women unlock their contributions to an industry, said IIAR's Chair-Elect, Lesley Schafer. "This environment lifts us all up, from my experience the reasons we're there are very equalizing."

Schafer said that relationships with other women are another big reason she's felt a sense of accomplishment within IIAR and natural refrigeration.

"It's because of Jeanna that I got involved. She said 'you shouldn't be scared, come to these meetings!' So I got involved in the compliance and standards committee meetings. The chance to respond to these needs that our industry has makes you feel like you have a say, not just in helping shape the industry, but also in your own future."

That environment of empowerment can go a long way in making women feel comfortable enough to make contributions in the first place, said Schafer. "I appreciate that we are involved directly in the conversation [at IIAR]. I feel like I'm in a room with equals, at this point it feels like family."

Stephanie Smith, IIAR's Marketing Committee Chair and Board member underscored the importance of the encouragement she received from other women in the field.

"A lot of people have things they bring to the table – or contributions to the industry that they don't realize they can make," said Smith. "When I came here, I didn't know anyone, but then Beth Fox [IIAR's past Marketing Committee Chair] asked me to be the committee Vice Chair and then I became the Chair. It's that open acceptance of 'sure

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let's do it' and the willingness to incorporate new perspectives and opinions" that helps women make contributions to natural refrigerants.

Smith said that the industry's ability to incorporate women's voices has changed dramatically in the last decade, spurred on in part by the efforts industry organizations have made to include them. "I noticed when I started out in mechanical engineering it was a 20 to one ratio [of men to women]. That's changed a lot. Our industry has taken big strides in the grassroots and community."

For Fox, serving as the first female Marketing Committee Chair was an exciting opportunity to help lead the organization. "Knowing that I had support from multiple folks in the industry gave me the courage and strength to do it," she said. "In general, IIAR has always welcomed and supported women in those roles. It's so inspiring and gives me hope for the future – knowing that there are women who are up and coming trailblazers. Our industry is in a good spot."

Yesenia Rector, MPH, CARO, Vice President – Education, Outreach and Events, IIAR, said that the industry's culture has evolved in a way that encourages women to get more involved.

"I think IIAR's staff at this point works more efficiently and more creatively because we're adding different types of minds, different perspectives and experiences. We have more of a variety of that within IIAR now and that's a recipe for success. You cannot move forward without embracing diversity," said Rector.

She added that her own experience has shaped what she would like to give back to the next generation of professionals in refrigeration.

"There's a lot that you have to do as a woman and a leader, sometimes it's easy to feel defeated. I had to prove my education, my preparation [to participate], but now I can encourage other women that they don't have to show that they deserve to be here [before they can contribute]."

Rector said that often, having a more senior leader willing to lift the people they work with up is key for an organization.

"When women see other women in an industry, they tend to go towards it. The women on IIAR's Board have grown in such leadership roles and have set up a great example of new talent in our industry."

Dayna Martínez, PhD, IIAR Education Programs Manager said she appreciates the role she has at IIAR because it allows her to make a contribution to developing the workforce on behalf of the industry.

"It's really exciting for me to see these powerhouse women in leadership," said Martínez. "For me, the major contribution I've made so far is helping make this technical knowledge available to the professionals who are advancing the industry. That's very rewarding."

Martinez said IIAR's environment of collaboration has supported her as well. "It's things that are as simple as walking around the conference Expo with Mike Chapman [IIAR Vice President of Operations] and he's really taking the time to explain all the components of a system to me. IIAR has provided the education and time needed to get me up to speed."

Natalie Clay, IIAR's Membership Coordinator echoed Martínez's comments, saying that although she had no background in natural refrigeration, she still felt supported by the organization.

"When I first started, I had no familiarity with what IIAR does and no connection to the industry. But everyone was super helpful in bridging that gap for me, I never felt silly for asking a question," said Clay.

Clay said one big signal of support that the organization gave to her was to double the allowed maternity leave as a permanent change to employee policy when she was starting a family.

"Definitely my colleagues are invested in helping. This experience has felt very collaborative and very equal, Gary cares just as much as Yesenia and they put the same amount of effort into building these opportunities."

Rym Omniewski, IIAR's Meetings and Expo Administrator agreed with Clay that a supportive environment can help people who want to work with IIAR or natural refrigerants get into the field.

"I had ten years as a teacher before I was hired by IIAR. They really helped me bridge that knowledge gap," said Omniewski. "Gary has made sure that all of us, not just the tech people, understand what the industry is about."

Now she says she can focus on lifting the organization up in turn. "I enjoy looking for the business opportunities through the conference and events and support the people who are moving the industry forward."

Lisa Berryman, IIAR's Senior Operations Services Manager, agreed with Omniewski that IIAR is invested in helping employees succeed.

"Inclusion is built into the work we do," said Berryman. "Recently, IIAR for the first time has had officers on the board who are women. Seeing board members in positions of leadership is empowering for me and other women at this organization."

"There's a level of support here – it is them having an open mind and listening to everybody and having a voice."

Berryman said that foundation of inclusion helps her pass the same on to IIAR membership. "I'm in a unique position to lift everyone up, I can be a partner to members in helping them navigate our administrative environment."

While IIAR can be supportive internally, it's the foundation of the organization that helps everyone succeed in the broader industry, said Catalina Aragón, IIAR Central America & Caribbean Chapter Chair and IIAR's first female Chapter Chair in Central America.

IIAR's support meant that "I didn't need to prove anything, I just got to work with [IIAR] and it was very easy," said Aragón. "I am not an expert in refrigeration, but I've learned a lot. I never thought I was going to be involved in this industry, but I have certainly been learning from them, they gave me this job and I'm going to work at whatever is needed."

Aragón added that it is important to her for other young engineers in Costa Rica to see that so many of IIAR's leaders are female. "In every field, if you see someone that is different – in an important position, you think 'I can do that."

"It's always that way, when something is not common and there's a change in point of view, it always inspires confidence in someone else."



"It's really exciting for me to see these powerhouse women in leadership."

IIAR Calls for ANR Proposal Candidates

IIAR is reaching out to get member involvement on a major initiative.

Yesenia Rector, Vice President – Education, Outreach and Events, has issued a request for proposals for the development of two Academy of Natural Refrigerants (ANR) certificate courses.

The ANR RFP is a formal process that will result in a paid contract position while the webinar submission process will be more of an ongoing, volunteer-based effort.

The Academy of Natural Refrigerants

"We're open to any professionals that would feel they have a good grasp on how to create programming for ANR," said Rector. "We'll analyze proposals and choose the best fit."

Rector said IIAR staff is responsible for ANR programming, so managing the selection of a contractor will fall to staff. "This is more of a staff project, there are programs that we are tasked with updating, specifically the education program. As our standards get developed, the certification courses are updated to support new standards as they are coming out."

Rector said the effort to find a contractor to help develop new ANR courses is consistent with how the first ANR courses were created and in some ways is a return to the original ANR strategy.

"The first ANR courses were developed this way," said Rector, adding that a decision was recently made to return to that development. "We had been doing updates internally with staff, and we decided we want to improve the certificate registrant's experiences by creating a different kind of programming. That's why we're going out now with an RMP to give these courses a refresher."

"We're doing interviews now to hire a professional to create courses specific to these standards," she said. "It's part of our effort to improve certain offerings."

IIAR said the update includes the following courses: ANSI/IIAR 3-2022 and ANSI/IIAR 5-2025 course; the ANSI/IIAR 7-2025 and ANSI/IIAR 8-2026 course; and the ANSI/IIAR 4-2026 course.

According to IIAR, "Our goal is to make these courses more practical and engaging, with a greater focus on helping learners understand how to apply the standards rather than simply restating their requirements."



Webinar Spotlight: The Language of Air

Psychrometrics is the language of air. And for many facility or production issues, speaking that language often means looking beyond refrigeration as the only option available to solve moisture control problems.

Tom Peterson, founder and CEO of Climate by Design International (CDI), has spent more than three decades building custom desiccant dehumidification systems for facilities where dry air needs go beyond what can be accomplished with refrigeration alone. By applying the science of psychrometrics to a few common facility problems, "we're not just moving air," Peterson said. "We're controlling the environment."

"Refrigeration can only solve your moisture problem to a certain point, whereas with a desiccant, you can go way beyond what refrigeration alone can do," said Peterson. Many people don't think of applying psychrometrics as a solution to the problems they encounter because they're just not used to a thought process that might involve beyond-the-refrigerant reasoning, he added.

"Not everyone has that experience factor [that would lead them to consider psychrometrics]. They may have been taught to think only in tons of refrigeration, because our industry is so focused on refrigeration alone," he said. "But there are limits to how dry you can get with just refrigeration before you start dealing with things like frost, sequential defrost, and other problems."

Peterson applies a desiccant air handling unit to help solve most of these problems. Inside the unit is a wheel filled with desiccant that continually turns, rotating slowly between two airstreams. " The airstream we are conditioning is moisture filled. That airstream goes into the wheel and the wheel adsorbs that moisture. To then remove the moisture from the wheel it turns into another airstream where the moisture is then ejected to atmosphere."

Many people don't know there is a solution to many of their common moisture problems, or generally speaking, they accept the management of moisture issues because they don't know they have a viable solution to the problem, said Peterson.

"Once people find out what a desiccant is, they start finding many places where dry air can be their friend." Peterson said there are four main areas where applying psychrometrics can take the guesswork out of solving the moisture related production issues that get the most attention:

1. WASH DOWN RECOVERY

Wash-down recovery in protein rooms can turn into a significant moisture problem quickly. When wash down occurs in a typical 45 degrees processing room, and 140-degree hot water is used for sanitation, "condensation on cold surfaces is dripping everywhere, and so you have to recover that room and get it back to condition before you can start production again, said Peterson.

"After sanitation, it takes time to get that room back down to temperature and a moisture level below the point where it can condense. Using a desiccant air handling unit can increase by a 4- to 10-fold factor the amount of drying that can be done. You get that room back faster."

2. LOADING DOCK SAFETY ISSUES

The second most common place moisture related issues can crop up is the cold storage loading dock, said Peterson, where issues come either from a potential safety risk, i.e., slippery floors, or from a maintenance issue when evaporator fans collect frozen vapor and become unbalanced, bearings and motors then fail. Providing a desiccant unit to dry the air in the vestibule – so that moisture from outside air can't get into a freezer or cooler in the first place – is a preventative solution.

3. PRODUCT ISSUES

A third common area where moisture control can become important is in the more product-relatedprocesses, where moisture in the air is an issue that impacts the product itself. Too wet of an environment can cause moisture-regain in the product itself. This issue commonly crops up in applications where a product is meant to be dry. It must be prevented from absorbing moisture, like in pharma applications where moisture can affect the precision of pressing out pills, or in food applications where a crispy texture is needed, where moisture might cause a product to stick to itself or the packaging.

4. IMPROVING ENERGY EFFICIENCY

Sometimes, controlling moisture with a desiccant might simply be an easy way to improve energy efficiency in freezers or coolers, said Peterson. "There can be an energy payoff to paying attention to psychrometrics. Most of the time, the financial rewards come in increased productivity and increased safety, but there can also be operational benefits like improved energy efficiency as well."

When it comes to applying psychrometrics to solve these problems, "we have to look at all of the factors affecting moisture-in-air as interrelated," said Peterson. "We need to construct a comprehensive understanding of all of them in a given situation and understanding the psychrometric chart allows us to be able to know any two conditions and then understand all the others.."

Peterson is the presenter of the IIAR Webinar "Psychrometrics, The Science of Moisture in Air," available to IIAR members through IIAR's educational resources. During the webinar, he reviews several important principles for decision making including how he uses seven factors to determine an overall picture of a given facility's psychrometrics, including: 1) vapor pressure; 2) dew point; 3) relative humidity; 4) wet bulb; 5) dry bulb; 6) enthalpy, and 7) the density of air.

Tony Lundell, IIAR's Senior Director of Standards and Safety, said the webinar covers an often-overlooked strategy for managing moisture. "Where moisture needs to be removed from the air below the freezing point, an air handling unit with a desiccant wheel in it is a great option."

"Managing moisture so it helps your product, prevents wasted energy, and reduces maintenance, is where the payoff for paying attention to psychometrics comes in – in the science of moisture in air," said Peterson.

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IIAR Set to Release Hydrocarbon Standard in 2027

After nearly eight years of development, IIAR's hydrocarbon standard is set to be published in early 2027. The standard is the second comprehensive safety standard for a refrigerant other than ammonia, following the publication of IIAR's CO2 standard in 2021.

Hydrocarbons have long been seen as one of the most promising natural refrigerant replacements for F-gases in commercial refrigeration systems. While they are already in wide use in commercial systems, concerns over flammability have traditionally kept their use limited in industrial applications.

However, as refrigerant options narrow due to new environmental concerns over PFAS contamination from hydrofluoroolefins, or HFO refrigerants, traditional concerns may no longer figure as prominently in refrigerant decisions. Especially when those concerns include how to apply the refrigerant safely, a factor that can be addressed with an IIAR safety standard.

Don Faust, IIAR's Standards Committee Chair, said IIAR's standard is meant, in part, to open the door to the wider industrial use of hydrocarbons by addressing safety through IIAR's well-established consensus process.

"I don't think that the future of natural refrigerants will be a competition between ammonia, CO2 and hydrocarbons," said Faust. "The future is going to be finding the right refrigerant for the right applications."

In the case of hydrocarbons, those applications will grow when barriers like safety concerns are addressed.

From that perspective, "it's a chicken or egg situation. What comes first, development of the technology or industry adoption?" said Faust. He added that IIAR's consensus process solves the adoption problem.

"IIAR has created a common framework that reflects the industry's safety culture. The hydrocarbon standard is about providing a framework for safely adopting another natural refrigerant," said Faust. "With ammonia and CO2, we addressed the toxicity and pressure hazards and now with hydrocarbons we're addressing flammability."

Many hydrocarbons make great refrigerants. They are natural, have zero ODP, a GWP less than four, and are categorized as non-toxic, said Bruce Nelson, former IIAR Board Chairman. "Hydrocarbons are compatible with copper and with many low-cost components, such as hermetic and semi-hermetic compressors, expansion valves, and heat exchangers used in the HVAC and commercial refrigeration industries. Compatibility with standard compressor lubricants, desiccants, and elastomers is also excellent."

"The hydrocarbons are already in wide use – for cooking, heating, transportation, and power generation. Based on these characteristics the hydrocarbons are the only natural refrigerants that can match or beat the F-gases in commercial refrigeration systems on the basis of first cost and energy efficiency," said Nelson. "Given the above, one must ask: "Why are we not making more use of the hydrocarbons as refrigerants?" The answer of course is flammability."

Faust said that foundation of safety is what lays the groundwork for the adoption of any new IIAR standard.

"We have the ability to create standards that reflect a great amount of industry knowledge through the commitment of volunteers who know how to write them."

The new hydrocarbon standard was especially complex because it was written to encompass all relevant fire code.

"A lot of us thought this would be a simple standard," said IIAR's Hydrocarbon Subcommittee Chair, Joe Pillis, adding that the standard turned out to be more complex than expected. "The more we researched how many codes in the U.S. we had to comply with, we realized it was not as straightforward," he said.

Pillis said five major codes were considered: NFPA 1, the International Building Code, the International Fire Code, the International Mechanical Code and the Uniform Mechanical Code.

"There are many codes that already have language around hydrocarbons used as refrigerants. We wanted to write a standard that is compatible with all of these codes," said Pillis. "It made [the standard] more of a difficult task because we have an extensive code foundation here. We went through all of the codes and generally picked the most stringent. That's what ended up in the standard."

The result was a 381-page "cradle to grave" standard that covers every aspect of safe use, from startup to maintenance to decommissioning. The standard has been through five public reviews over eight years and arrives just in time for the next major shift in regulation, the potential phase-out of HFO's.

"The regulations out there that reduce the environmental impact have narrowed the number of possible refrigerants," said Pillis. "Even if [HFO's] get through all the GWP limits, they're likely to have PFAS and TFA regulations to contend with next."

"People don't want to face that HFO's and A2Ls may be phased out because of the PFAS concerns."

Pillis said that may be the thing that makes IIAR's hydrocarbon standard especially relevant. "What's left [in terms of usable refrigerants] are ammonia, CO2, and hydrocarbons. We have safety standards for ammonia and CO2, so we needed a standard for how to build safe hydrocarbon systems. And that's what we built."

The new standard has six parts, covering: design installation, start-up, inspection testing and maintenance, decommissioning, and general safety requirements.

In addition to the basics, the standard addresses three areas that might be of particular interest to IIAR members. First, it specifies Class 1 Division 2 electricals regardless of whether a refrigeration system is installed in a machinery room or outdoors.

Second, there is no allowance in the standard for hydrocarbons to be used in a direct system to an occupied space. The standard specifies that there must be a secondary coolant.

The third area covers exhaust from the machinery room or from relief devices. "Exhaust from mechanical ventilation systems serving machinery rooms capable of exceeding 25 percent of the LFL or 50 percent of the Immediately Dangerous to Life or Health (IDLH) shall be equipped with approved treatment systems to reduce the discharge concentrations to those values or lower," said Pillis. There are similar treatment requirements on a discharge from relief devices on any system with more than 6.6 pounds of refrigerant.

That requirement could force users to install a treatment system for relief valves and exhaust under the standard, such as absorption systems or flare, but also leaves some of the decision-making power with designers.

There is an exception in the standard that says: "The refrigerants may discharge directly to atmosphere outdoors if the authority having jurisdiction, or AHJ determines, upon review of an engineering analysis prepared at the expense of the owner, that a significant fire, health, or environmental hazard would not result from an atmospheric release. The analysis must be documented and retained on-site."

"Systems may be able to discharge to atmosphere if an authority having jurisdiction, or AHJ, determines that [as an option] upon a review of an engineering analysis," said Pillis. "That part of the standard allows a designer to have a consultant do an engineering analysis of their case. If the consultant says no environmental hazard exists, then they can discharge to atmosphere."

Pillis said IIAR members should expect publication of the standard in 2027 following its IIAR Board of Directors November 2026 vote.

He added that the standard may lay the groundwork for wider adoption of hydrocarbons, just as the question of whether or not to choose hydrocarbon systems becomes more relevant to the industry.

"I think that as refrigerant choices diminish hydrocarbons will be considered because they can be used in such a wide variety of applications, providing they can meet safety requirements. And now IIAR has a standard that shows users how to meet those requirements."

The requirements laid out in IIAR's hydrocarbon standard are specific to industrial and commercial refrigeration," said Pillis.

"This is a tremendous resource because it represents the collective knowledge of our task group and ANSI's consensus process. We have documented much of this specialized knowledge in one place with this new standard. It's much more along the lines of the CO2 standard [as a comprehensive safety standard] than IIAR's suite of standards for ammonia."

Nelson agreed, saying, "IIAR is breaking new ground with this standard. We've done this to benefit our industry and accelerate the uptake of the use of all natural refrigerants."

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GOVERNMENT RELATIONS

BY LOWELL RANDEL, IIAR GOVERNMENT RELATIONS DIRECTOR

2026 Midterms and Trump's Regulatory Agenda

The U.S. 2026 midterm elections in November 2026 resulted in sweeping gains for Democrats in both the House of Representatives and the Senate.

Democrats will take control of both chambers in January 2027 with larger majorities than Republicans had for the last two years.

How will this shift in control impact the regulatory environment and President Trump's regulatory agenda?

President Trump remains in control of the executive branch with broad powers to promulgate and enforce regulations. Trump has a very full (de) regulatory agenda that is in various stages of the rulemaking process. For example, the Environmental Protection Agency (EPA) is in the process of finalizing the Common Sense Approach to Chemical Accident Prevention rule, which will rescind or modify many provisions of the 2024 Safer Communities by Chemical Accident Prevention (SCCAP) related to the Risk Management Program (RMP). The EPA is also undertaking a 610 Regulatory Flexibility Act review of RMP that could also result in regulatory action. IIAR has been actively participating in both of these EPA activities. Representatives of the NORM Task Force has held multiple meetings with EPA representatives and IIAR has submitted detailed comments.

The results of the election do not change EPA's ability to complete the rulemaking process for these and other proposed rules. However, Democratic leaders have signaled their intention to conduct rigorous oversight of the Trump Administration, which will include scrutiny of the rulemaking process and agency enforcement policies.

Primary jurisdiction over EPA in the Senate is with the Environment and Public Works Committee. The current ranking Democrat on the committee is Sheldon Whitehouse (D-RI), but he is expected to become chairman of the Judiciary Committee. Sen. Jeff Merkley (D-OR) has announced that he will seek to become chairman of Environment and Public Works and is the leading candidate. Rep. Frank Pallone (D-NJ) is expected to lead the House Energy and Commerce Committee, which has primary jurisdiction over EPA.

> While Democrats made strong gains in the House and Senate and will have majorities in both chambers, the next two years will be a divided government where the Executive and Legislative branches exercise their unique powers to try and advance their policy objectives.

The Trump Administration also has OSHA rulemakings of potential interest to the industrial refrigeration industry on its regulatory agenda. However, most of them are in the early stages of the rulemaking process. Nonetheless, Congressional oversight of OSHA is also likely over the next two years. The Senate Committee with OSHA jurisdiction is the Health, Education, Labor, and Pensions (HELP) committee. Sen. Bernie Sanders (I-VT) is expected to take the chairmanship in January. In the House, the Education and Workforce Committee has OSHA jurisdiction.

There are reports that incoming Democratic committee leaders

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have already begun preparations for aggressive oversight of Trump regulatory actions at EPA and other agencies. Committees of jurisdiction have subpoena power and letters directing the preservation of documents have already been sent to key agencies ahead of Democrats assuming committee control. It is expected that committees will utilize their powers to conduct numerous oversight hearings in 2027. When EPA finalizes the Common Sense Approach to Chemical Accident Prevention rule the Democrat led committees will likely bring in agency officials to express their concerns about the rule contents and process. These hearings don't have the ability to change finalized regulations, but can be used to highlight areas of Democratic concern and potentially lead to other actions.

One of the tools that the Democratic majorities have to address concerns with rules finalized by the Trump Administration is the Congressional Review Act (CRA). The CRA enables Congress to pass legislation that overturns new rules enacted by agencies. The CRA has a unique set of rules and process. Once a final rule is received by Congress, have 60 legislative days to introduce a joint resolution of disapproval. The resolution must pass both chambers with a simple majority. This means the filibuster cannot be used in the Senate to block CRA resolutions. It is important to note that the President still retains veto power over CRA resolutions, so it is unlikely that such resolutions would reach veto-proof majorities in either the House or Senate. While getting a CRA fully enacted is not likely in this environment, it is a tool the Democratic majorities may utilize to draw attention to regulatory actions in which they strongly disagree.

A final way that the new Democratic majorities can impact regulatory enforcement is through the budget and appropriations process. President Trump has proposed significant cuts to both EPA and OSHA in previous years. Less funding results in few resources to support inspectors in the field. Democrats have fought against cuts to EPA and OSHA and will likely work through the budget and appropriations process to strengthen funding for EPA and OSHA enforcement.

While Democrats made strong gains in the House and Senate and will have majorities in both chambers, the next two years will be a divided government where the Executive and Legislative branches exercise their unique powers to try and advance their policy objectives. Regulatory policy battles are likely to also bring the Judiciary branch into play with legal challenges coming from multiple directions as these issues evolve. IIAR will continue to engage with agencies and Congress to promote and protect the interest of the industry.



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IIAR Opens Sponsor and Attendee Registration for 2027 Conference

The IIAR Annual Conference and Heavy Equipment Expo is less than five months away, with exhibit space and sponsorship opportunities starting to fill up completely, said Yesenia Rector, IIAR Vice President – Education, Outreach and Events.

The Expo is the largest event dedicated exclusively to the natural refrigeration industry as well as one of the fastest growing association events. Exhibitors in 2027 will showcase their equipment, products, and expertise next in Tampa, Florida, April 4-7.

"The floor plan is looking fantastic," said Rector. "It's now time to make sure that if you're thinking about exhibiting, grab your booth now because they are selling fast."

Rector said some exhibit space is still available. Several of IIAR's Natural Refrigeration Foundation sponsorships are still available.

Meanwhile, IIAR's new sponsorship program has streamlined the sponsorship process and made additional benefits available.

"The program is new this year," said Rector. "We wanted to make these benefits more flexible and make it easier to participate for our sponsors and I think we achieved that with this new program."

The program has several tiers, each corresponding with different sponsorship levels. "We're starting with the silver tier, which has really easy and clear benefits, and from there, sponsors can add on their own opportunities or expand beyond the silver tier to the gold or diamond level."

New fee structures for the conference attendees will also be available, including options for non-member registration. "There's a lot happening this year," said Rector. "There's a buy-one-get-one-free program for end users. That's a great deal because members and non-members are both eligible to get a free pass when they buy a full-conference registration."

Rector said guest registrations are another great option for people who are not part of the industry but would like to accompany a registrant to the conference. Guest registrations are $100 and student registrations are free again in 2027.

IIAR Exhibitor Space and Sponsorship Opportunities are Still Open

The IIAR Annual Conference and Heavy Equipment Expo is the largest event dedicated exclusively to the natural refrigeration industry. Bring your equipment, products, and expertise to Tampa, Florida and meet the people who use, specify, and shape them.



See the current floorplan and choose where your company belongs.

Exhibitor Benefits:

- Bring your team. Receive two full conference registrations for every 100 sq. ft. of exhibit space.
- Connect before and after. Receive eligible attendee lists approximately 2–3 weeks before and after the conference.
- Be seen. Your 30-word company description appears on the conference website, in the IIAR Member App, and in the online and printed Conference Guide.
- Show what's new. Apply to present a **Product Showcase at the Expo.** These premium opportunities are selling fast!
- Plan ahead. Exhibiting in 2027 gives you priority booth selection for 2028, following returning sponsors. Our 50th conference is coming to Portland in 2028, and it's a milestone you'll want to be part of.

IIAR 2027 Conference Registration is Open

Join the natural refrigeration community in Tampa, Florida, April 4–7, 2027, for technical education, networking, industry collaboration, and the largest Heavy Equipment Expo focused exclusively on natural refrigeration.

For nearly five decades, the IIAR Annual Conference has brought together the professionals advancing safe, sustainable, and innovative natural refrigeration. In Tampa, attendees will have opportunities to explore peer-reviewed technical education, discover the latest technologies and industry solutions, and build connections with engineers, contractors, operators, manufacturers, end users, and other industry leaders.

Whether you're returning to the Conference or planning to attend for the first time, #IIAR2027 is your opportunity to learn, connect, and engage with the natural refrigeration community in one place.

IIAR STANDARDS UPDATE

BY TONY LUNDELL, SENIOR TECHNICAL ADVISOR – STANDARDS, PUBLICATIONS, & EDUCATION

A Lockout/Tagout (LOTO) Procedure is a "Safe Work Practice"

Specifically, a LOTO Procedure:

1) Prevents unexpected startup of machines or equipment.

2) Isolates hazardous energy such as electrical, hydraulic, pneumatic, mechanical, chemical (refrigerants), thermal, or stored energy.

3) Protects employees from serious injuries, including electrocution, crushing, amputation, burns, or other accidents.

4) Ensures only authorized personnel can remove the lock and restore power after work is safety completed.

It is crucial to understand how a LOTO Procedure is applied to control hazardous energy while servicing and maintaining machines and equipment.

An owner must have an established Energy Control Program that utilizes a LOTO Procedure.

It is important to identify and understand definitions, communication, periodic inspections, training, retraining, certification, and additional requirements for LOTO compliance.

Using a Lockout/Tagout program to control hazardous energy is important because employees serving or maintaining machines and equipment may be exposed to serious physical harm or death if hazardous energy is not properly controlled.

The "Purpose" of a LOTO Procedure is to "Protect Employees."

The Occupational Safety & Health Association (OSHA) standard for the "The Control of Hazardous Energy (Lockout/Tagout)" to disable machinery or equipment preventing the release of hazardous energy while the employees perform servicing and maintenance activities is Title 29 CFR 1910.147. Subpart J outlines measures for controlling hazardous energy. Subpart O covers minor tool changes, adjustments, and servicing activities if they are routine, repetitive, and integral.

Types of Energy are: Electrical, Mechanical, Hydraulic, Pneumatic, Chemical (Refrigerants), Thermal and Other Sources.

Preventing "Unexpected Energization" or "Startup" or the "Release of Stored Energy" during servicing and/or maintenance is a key requirement for the LOTO Procedure to "Protect Employees."

It is important to check if there are state regulations for the control of hazardous energy.

Title 29 CFR 1910.333, Subpart S sets forth requirements to protect employees working on electrical systems such as circuits & conductors.

Title 29 CFR 1910.147 has definitions for affected employee, authorized employee, capable of being locked out, energized, energy isolation device, energy source (of multiple types of energy), hot tap, lockout, lockout device, normal production operations, servicing and/or maintenance, setting up, tagout, and tagout device.

On October 7th, 2026, the IIAR Webinar "Permit to Work: Lockout/Tagout Procedure" was delivered and recorded and can be viewed any time from the IIAR Website under Education/Webinars.

Since January 2nd, 1990, energy isolation devices were required to be designed to accept a lockout device. This feature is required when machinery or equipment is replaced, majorly repaired, renovated, modified, or newly installed.

Most manual Refrigeration valves with wheels or handles can accept a lock and valves with stem caps can use a plate that can be fitted to different sizes along with a cable or chain and lock for locking them out.

Examples of energy isolating devices designed to accept a lockout device

An Emergency Control Program requires the development of an Energy Control Procedure that is documented and utilized for the control of potentially hazardous energy when employees engage in servicing and maintenance activities of machines and equipment. The Energy Control Procedure clearly and specifically outlines a Scope, Purpose, Authorization, Rules, and Techniques that provide means to enforce compliance.

Means to enforce compliance include, but are not limited to:

- **A specific statement** of the procedure's intended use.
- **Specific procedural steps** for shutting down, isolating, blocking, securing, placement, removal, transfer, and responsibility.
- **Specific testing requirements** to determine and verify the effectiveness of Lockout Devices, Tagout Devices, and Other Energy Control Measures.

The employer shall provide Locks, Tags, Chains, Wedges, Key Blocks, Adapter Pins, Self-Locking Fasteners, and Other Hardware for isolating, securing, and blocking machines and equipment from energy sources.

Lockout and Tagout devices shall be capable of withstanding the environment's weather conditions, moisture, and chemicals and not deteriorate or corrode. Where wording is used (e.g., name, date, etc.), it shall remain legible. They shall be standardized within the facility for color, shape, size, print, and format. They shall be substantial (robust) to prevent inadvertent or accidental removal without the use of excessive force, bolt cutters, or metal cutting tools.

OSHA 29 CFR 1910.269, Subpart R for Electric Power, Generation, Transmission, and Distribution requires a minimum unlocking strength of no less than 50 pounds and shall have the general design and basic characteristics of being at least equivalent to a one-piece, all-environment-tolerant nylon cable tie or chain. The cable tie or chain can be nylon, stainless steel, or plastic and the tag shall have a grommet to make it robust enough.

The tag shall provide a warning against hazardous conditions by included a "Legend" that states such as: "Do Not Start", Do Not Open", Do Not Close", "Do Not Energize", or "Do Not Operate."

The employer shall conduct a "Periodic

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Inspection" of the Energy Control Procedure at least annually to ensure the procedure requirements are being followed. The "Periodic Inspection" shall be performed by an authorized employee other than the employee(s) utilizing the Energy Control Procedure being inspected. The "Periodic Inspection" includes a review with each authorized employee who performs lockout and/or tagout at the facility of their responsibilities under the Energy Control Procedure being inspected. The employer shall certify that periodic inspections have been performed. Certification shall include:

- Identification of the machine or equipment
- Person(s) performing the lockout and/or tagout
- Person doing the inspection
- Date of Inspection

The employer shall provide training and communication to ensure the purpose and function of the Energy Control Procedure are understood by the employees and that knowledge and skills required for energy controls are acquired by the employees for safe application, usage, and removal. This includes that the employer provide training and communication to "Authorized Employees" for the recognition of hazardous energy sources, the type and magnitude of energy available in the workplace, and the methods and means necessary for energy isolation and control. Training and communication is also required for the "Affected Employees" for the "Purpose" and use of the Energy Control Procedure.

Retraining is required if there is a change in job assignments, changes in machinery or equipment, and/or changes in the Energy Control Procedure. Retraining is also required if new hazards are presented and if inspections reveal deficiencies in employees' knowledge. Retraining is key to "Reestablish Employee Proficiency".

Employers shall certify that the employee training and retraining has been accomplished and kept up to date. The "Certification" shall contain each employee's name and the date(s) of the training and/or retraining.

An authorized employee shall be the only employee to put their lockout and/or tagout device on before the work starts and remove it after the work is done. Another person cannot put a lockout and/or tagout on for someone else.

Rules regarding "Notification of Employees" state that "Affected Employees" shall be notified by the employer or authorized employee of the application and removal of lockout and/or tagout devices. Notification shall be given before the controls are applied and after they are removed.

Group Lockout and/or Tagout can be done when a crew, craft, or department are "Affected Employees" or are involved with work requiring Lockout/Tagout. The primary responsibility is vested in an authorized employee for a set number of employees working under the protection of a group lockout or tagout device. The authorized employee for the Group Lockout can ensure the individual group members are protected and not put at risk or be vulnerable to any type of hazardous energy before they proceed with a lockout/tagout.

Preparation for Lockout/Tagout is "Key" for preventing harm or injury from any type of hazardous energy. Not being put at risk or being placed vulnerable to any type of hazardous energy is best!

Another resource for awareness or consideration that is separate from OSHA is ANSI/ASSP Z244.1-2024, *"The Control of Hazardous Energy – Lockout, Tagout, and Alternative Methods"*, which is approved by the American National Standards Institute (ANSI) and provided from the American Society of Safety Professionals (ASSP).

Where ammonia refrigeration system manual hand valves are required to be locked and tagged for safe isolation, A *"Guideline for Developing an Energy Control Plan for Manual Hand Valves in Ammonia Refrigeration Systems"* is available from IIAR. The IIAR Webinar mentioned above correlates with this article and has additional information pertaining to Lockout/Tagout Procedures. If you have any questions, information, or would like to share experiences, please reach out to IIAR Staff.

Are you making the most of your IIAR membership?

Explore the IIAR Resource Center for valuable tools and information.

iiarresources.com



The Importance of Communication

BY KEM RUSSELL



Have you ever had someone not correctly follow or understand your instructions? I feel pretty safe in saying the answer is a 100% "Yes". The failure to correctly follow communicated instructions may have been the fault of the instructor (how the information was or was not communicated), the person receiving the information (they didn't understand, didn't care, or both), or the fault of both the giver and receiver.

How we communicate, depending on the situation can be extremely important. Some of you may remember a famous quote stated in the 1967 movie "Cool Hand Luke", staring Paul Newman. The statement is made by the prison camp Captain, "What we have here is, failure to communicate."

We may think we are doing an outstanding job presenting our information and instructions. However, we should always consider how to improve our method and means of presenting information so there is not a "failure to communicate" and the intended information is properly transferred.

I remember a funny experience I had last winter while attempting to instruct a young boy on how to snow ski. As a ski instructor I had been assigned to teach this first time skier. My plan was to start by teaching him some very basic moves that would be helpful for as long as he ever skied. One of the first basic moves was a side step up a very gentle slope. While standing beside him I said, "Pick up your right foot and move it uphill." I had to change my entire method of instruction and communication when he, very innocently said, "Which is my right foot?" His level of knowledge required me to think of a much different approach than teaching intermediate or advanced skiers. I had to start at an even more basic level and teach him body awareness and where his body parts were in space.

While growing up I often worked with my dad or one of his employees while modifying existing or constructing new refrigeration systems. As time pasted I learned how to gas weld smaller line sizes. On one occasion while working on an ammonia system that was pumped out for modifications my dad quickly explained to me what I could do while he went to work on another part of the system. There were several other lines in my work area, but I was confident of what to do so I started measuring, cutting pipe, and welding on fittings. I had just finished my work when my dad returned and looked at my work. "Well, son, those are good looking welds, and the lines look straight and level. The only issue I see is that you have the liquid line tied into the hot gas line." The communication from my dad to me didn't account for my lack of understanding of what lines were what or what they did. Fortunately, the correction only took a short time.

Our communication to someone needs to not just be clear but must consider their knowledge level and their understanding. For many people, their education and experience with ammonia refrigeration systems in design, construction, and operation and maintenance makes it seem very straight forward. Many others may not have that level of experience or understanding.

Recently I was again made aware of a lack of understanding of an important part of ammonia refrigeration systems. That part is the relief system. On-going communication, both written and verbal, should happen to increase the knowledge and understanding of designers, construction personnel, and system operator/maintenance personnel about relief systems.

In my experience, it is rare that I find a relief system (valves and discharge piping) that does not need some correction. The correction may be fairly minor, or a major change. For newer systems, built in the last 15 years or so, changes are typically minor.

Fortunately, there are many very helpful resources that can be used to guide us in design, construction and maintenance of relief systems. ANSI/IIAR 2 Standard for Design of Safe Closed-Circuit Ammonia Refrigeration Systems, Chapter 15 "Overpressure Protection" provides important and helpful information on the entire relief system, relief devices, and relief inlet and discharge piping. Another good source of information is the IIAR Refrigeration Piping Handbook, Chapter 6, "Piping for Pressure Relief Devices". Other information can be found in several past IIAR technical papers.

Depending on a person's education and experience the information about relief valves and systems can be challenging to understand. A designer may have a proper relief system design but the person installing the relief system may not have the same depth of knowledge and understanding. How the relief system information is

We should always consider how to improve our method and means of presenting information.

A designer may have a proper relief system design but the person installing the relief system may not have the same depth of knowledge and understanding.

communicated as to what is intended and what is acceptable and not acceptable should be clearly understood. The following are some examples of errors between the intended design and what gets installed that I have seen:

- The inlet connection of the relief device installed is larger than the relief connection size on the protected pressure vessels. The line or valve size between these two connection points may be larger, but the area of the inlet of the relief device is not to be larger than the area of the relief connection on the pressure vessel.

- The relief device discharge line size is smaller than the relief device outlet size. I am surprised when I find this, and it has not been a one-time occurrence. The size of the relief device discharge line can only be equal to or larger than the outlet size of the relief device.

- The relief device installed has much more flow capacity than needed. The relief discharge line capacity is sized on the calculated flow capacity of the relief device, taking into account the inlet pressure losses. I guess people think that a little is good and more would be better. Not so. Whatever the relief device flow capacity is, the associated relief discharge line size must accommodate that flow without creating excessive backpressure. A higher flow rate usually requires a larger line size to keep the valve backpressure below a determined limit. Also, the larger line size may unnecessarily increase the system installation cost.

- Multiple relief devices connected into a common header and the main header size is either equal to or one size larger than the outlet of the largest relief device. On checking the relief discharge piping design, this improper sizing most often results in excessive backpressure so the relief devices will not function properly. The main header can be sized on what might simultaneously relieve, which should be based on good engineering judgment for the particular system. The main header could be designed to handle all relief devices discharging simultaneously which would be a conservative approach but may result in a much larger than needed main header size and added cost. Sizing the header for only the flow of the largest relief device may be too limiting on what might actually occur.

- The relief discharge piping is not properly connected resulting in the release of ammonia at a location(s) that could cause panic and/or serious injury. I have seen this several times.

Possibly it was forgotten that the entire relief discharge system must be securely connected? In one particular case an unconnected joint was found during an actual ammonia relieving event. The person trying to tighten up the leaking connection did not have the proper PPE to be protected. Fortunately, no one was injured but it could easily have gone the other way.

You may think of other relief system errors that you have experienced. Relief system design, proper construction, and correct maintenance are all very important, so that it can continue to function as a valuable safety system. How this information is clearly and accurately communicated can make a big difference.

The preceding has focused on the relief system, but all aspects of an ammonia system are important. Don't have a "failure to communicate" and end up with an unhappy, if not disastrous situation.



Colombia Adopts IIAR Standards

Colombia has become the second country in Latin America to officially finalize the adoption of several IIAR standards as national norms.

Working with ICONTEC, the Instituto Colombiano de Normas Técnicas y Certificación, or the Colombian Institute of Technical Standards and Certification, Colombia's national standards body adopted the ANSI/IIAR-1, ANSI/IIAR-2, and ANSI/IIAR-3 standards, through NTC 6572 Parts One, Two and Three.

Bolívar Monroy, IIAR's Colombia Chapter President said IIAR's work with ICONTEC created the three official norms, based on IIAR standards.

NTC 6572-1 is based on ANSI/IIAR-1. It establishes definitions and terminology used in ammonia refrigeration, facilitating a common technical language among designers, manufacturers, installers, operators, and authorities.

NTC 6572-2 is based on ANSI/IIAR-2. It addresses safety requirements for the design of closed-loop refrigeration systems using ammonia, including criteria for equipment, components, and installations.

NTC 6572-3 is based on ANSI/IIAR-3. It establishes safety requirements related to the components of ammonia refrigeration systems, contributing to their technically appropriate selection and application.

"For Colombia, it is so important to increase the availability of safety information for these systems," said Monroy. "We prioritize national standards over international standards so the main issue with adoption in Colombia was to translate IIAR international standards into standards that specifically apply to Colombia. We did that through the ICONTEC process."

Monroy said another important aspect of IIAR's chapter work with ICONTEC and the Colombian government was to help the government expand its own knowledge of the industrial refrigeration industry in Colombia.

"The availability of these national technical standards helps strengthen risk management, promote good engineering practices, and facilitate the incorporation of international criteria into new and existing projects," he said.

Max Duarte, IIAR International Committee Chair, said Colombia's new national norms represent "a very lengthy process that we have been working on with the local chapter which includes ACAIRE."

ACAIRE, the Asociación Colombiana de Acondicionamiento del Aire y de la Refrigeración, or the Colombian Association of Air Conditioning and Refrigeration was a partner in the effort to get the Colombian norms adopted.

"It's very important to promote the adoption of IIAR standards to promote the safe use of refrigerants for the industry as a whole," said Duarte.

Monroy added that industrial refrigeration plays a fundamental role in the Colombian economy, particularly in sectors such as food production, agribusiness, distribution centers, the pharmaceutical industry, and the cold chain.

In these applications, ensuring the safety, reliability, and efficiency of systems is essential to protect workers, facilities, and the continuity of operations in the country, he said.

Natural refrigerants are important in Colombia because of their lower climate impact, said Bolivar. "Ammonia, recognized for its zero ozone-depleting potential and virtually zero direct global warming potential, is a well-established alternative in industrial refrigeration. However, its toxicity and other hazards associated with its handling require rigorous design, installation, operation, and maintenance."

To continue that commitment to natural refrigerants, Yesenia Rector IIAR Vice President – Education, Outreach and Events, said IIAR's Colombia chapter will continue to advocate for and work on getting additional IIAR standards adopted as national norms in the country.

"This is not a once and done process. These adoptions take a lot of work in the background for years. Now there is more work to be done, but the work that has been done emphasizes Colombia's commitment to a safe, sustainable industry."

Monroy said ACAIRE, the IIAR-ACAIRE chapter and IIAR plan to continue in 2027 and 2028 with the adoption of other standards from the ANSI/IIAR family, starting with ANSI/IIAR-4.

"We prioritize national standards over international standards so the main issue with adoption in Colombia was to translate IIAR international standards into standards that specifically apply to Colombia. We did that through the ICONTEC process."



IIAR Project Will Create New CO2 Design Tool

A new IIAR research project will produce a web-based tool for accurate and cost-effective design of CO2 refrigeration systems during standstill conditions. The tool accomodates full system design information, calculate standstill pressure based on CO2 mass, volume and temperature, and incorporate a flexible user interface.

The tool will simplify and standardize calculations for CO2. "It will be faster and repeatable in determining the design pressures and vessel volume requirements for a CO2 refrigeration system," said Doug Scott, a member of the Research Committee and CO2 Handbook Committee.

Unlike ammonia and halocarbon systems, CO2 charge is a critical design element. To determine standstill pressure, the CO2 volume must be accurately calculated, and is a big benefit the tool will provide, said Scott.

"You can do all of this with refrigerant properties and a spreadsheet now, but it is very time consuming and laborious to iterate options, and it's easy to create errors," said Scott. "This tool will save time and provides a standardized approach. It's something an owner will be able to specify – requiring the IIAR tool be used creates a documented basis of design."

"Manufacturers that sell CO2 compressor systems often do not have control over the full system, such as evaporators and piping, so guesswork around refrigerant charge is not good for them either," said Scott. "This tool will assist with project coordination among participants and reduce finger pointing or needless oversizing. Like many safety aspects, agreeing on assumptions, using a standardized approach and documenting the outcome, that's the best we can do.

"This tool uses the concept of scenarios to consider events, from operating modes like pumpdown, to events such as power outages, to servicing and other "what if" conditions. Scenarios can be set up with defined system segments of the system examined – the high side, the low side, a smaller element, or the whole system," said Scott.

While much of the calculation solves "housekeeping details," he added that the real strength of the tool will be in its ability to make the design process more flexible, meeting reliability objectives in the most cost-effective fashion.

"The strength here is being able to iterate, like finding what size vessel you need quickly. This gives us a way to more easily do the many calculations needed to find the correct design of a system," said Scott.

Scott said the tool will include standard piping libraries and default equipment prototypes, as well as including a means for users to develop and use their own custom user libraries.

"If you have equipment that you use all the time, you'll be able to enter those model numbers and be able to drop down and choose them during the design process."

Bruce Nelson, a member of the CO2 Standards Committee, said the idea for the tool originated with Scott and has evolved from a simple calculation tool for designers, to a tool that can be used by the entire team.

"Consensus is going to be very useful tool for designers who are trying to correctly design their systems," said Nelson. "And IIAR is building a very useful set of tools to help them do that."

Meanwhile, IIAR President Gary Schrift said creating new member benefits like online tools is an important way that IIAR can support members.

"We have had this ongoing discussion, of IIAR creating and developing online tools to help end users and contractors conform and comply with our guidelines," said Schrift.

He added that IIAR's Board of Directors views software tools as something akin to the checklists the organization already produces for membership. "We asked, how best can our industry comply with our standards, which leads to safety, which leads to the idea of making it easy. Creating tools like this one feels like a pursuit that falls right into our mission."

IIAR is currently seeking proposals for the development of the tool and asks that qualified individuals or organizations interested in developing and implementing this design tool reach out directly to IIAR leadership.

"IIAR is currently seeking proposals for the development of the tool and asks that qualified individuals reach out directly to IIAR leadership."



iiar Remembers Adolfo Blásquez

Adolfo Blásquez, remembered by friends and colleagues as a driving force behind IIAR's expansion in Central and South America, passed away on September 30, 2026. Blásquez was the President of A. Blásquez E. Refrigeración Industrial, where he spent his career leading the company. He is survived by his wife, Veronica, sons Adolfo Jr. and Alejandro and daughters Veronica and Miriam.







Rowe Bansch, one of the founders of RVS, now EvapCo RVS, said Adolfo was a friend to many people in the industry, and credited his leadership as a major contributor to IIAR's presence in the region.

"Adolfo was actively promoting IIAR's standards in the development of chapters [in Mexico, Central and South America]," said Bansch. "IIAR standards have brought a lot of the safety and education aspects of what we developed at IIAR to other countries, and Adolfo was a big part of that. From a personal standpoint he was a great person to work with because he treated all his suppliers and customers as friends. He will be missed."

Blásquez was the former Chair of IIAR's International Committee and led IIAR as the Chairman of the Board of Directors from 2011-2012.

"The International Institute of All-Natural Refrigeration joins in the sorrow of the Blásquez González family on the passing of Adolfo Blásquez, who not only left a lasting legacy as Chairman of our Institute, but also played a fundamental role in the Latin America Project, which would not be possible without his invaluable support, leading to his recognition as Member of the Year in 2017," said Federico Alarcón López, IIAR's Latin America Program Manager.

"His gentle nature, kindness and humble leadership will be missed," said IIAR Vice President of Operations, Mike Chapman.

"Adolfo was a strong leader, a visionary, and was a fantastic human being," said Yesenia Rector, IIAR Vice President – Education, Outreach and Events. "Many of us would not be where we are today without Adolfo's contribution. The IIAR Chapters and Latin America program would not be where it is today if not for Adolfo."

Max Duarte, IIAR's International Committee Chair, remembers that Blásquez helped shape IIAR's strategy in Latin America. He started seven of the current eight Latin America chapters during his tenure.

"Adolfo really helped shape IIAR's strategy, he accepted the challenge to start promoting IIAR throughout Latin America as the International Committee Chair," said Duarte. "He supported Federico and Yesenia to travel throughout the region and start setting up all the chapters we have today."

Blásquez took the operation of Blásquez Refrigeration over from his brother in the early 90's when the North American Free Trade agreement opened the opportunity to develop supplier relationships outside of Mexico.

"From the Mexican side, Adolfo played a big role when Mexico opened up its economy," said Duarte. "Before Mexico opened up, companies had to work only with manufacturers in Mexico. When the border opened up to trade, Adolfo was one of the people who was instrumental in bringing companies like Frick, Vilter, and FES, into Mexico."

"He championed the free trade agreement with open arms, and he welcomed the opportunity to bring international manufacturers in industrial refrigeration into Mexico. There were ways that some companies were still working inside the old closed system even after NAFTA," said Duarte. "It is to Adolfo's credit that he was inviting competitors into Mexico. He was invested in opening the Mexican market up to international manufacturers, taking it from a closed economy to an open economy."

One of the reasons Blásquez was in a unique position in Mexico to make good on NAFTA promises may have been his earlier work in the U.S., said Duarte.

"It seems that Adolfo's earlier years in his career, which included spending time in the U.S. and working for U.S. companies, gave him a more worldly view. In his life he purposely cultivated relationships with important players across our industry."

Blásquez pursued those relationships for the betterment of the industrial refrigeration industry in Mexico and across Latin America, ultimately leading to IIAR's robust presence there.

"In Mexico, Adolfo helped the industry grow in ways it wouldn't have without people like him," said Duarte. "Where IIAR comes in, he decided he was going to follow IIAR standards way before anyone else did in the country. He saw the implementation of standards in Latin America as a way to improve the industry as a whole."

Today, every country that has an IIAR chapter in Latin America is working with the government in that country to promote IIAR standards, grow advocacy for the industry and deliver education.

"The membership of these chapters has grown exponentially," said Duarte. "You can see this in the number of seminars IIAR delivers in the region today. He planted the seed for all of these activities and now we're promoting the growth that he started."

Rector agreed that Blásquez will have a lasting impact on IIAR and Latin America. "Right now we have a truly global presence, especially in Latin America where our chapters have grown and are starting to accomplish the next phase of work that Adolfo envisioned."

"Several countries have implemented IIAR standards as national norms, that would not have happened without Adolfo's vision for creating these chapters," said Rector. "He was a force to be reckoned with and he will be missed."

IIAR Board of Directors Discuss Data, AI Projects

One of IIAR's most important ongoing events, the Board of Director's meeting, sets the agenda for the organization and offers committee chairs a chance to weigh in on behalf of IIAR's members.

The meeting helps IIAR determine the direction the organization should take on several issues — and was held most recently this year in October.

IIAR president Gary Schrift said one big initiative that was discussed this year was the addition of IIAR's first "AI task force." The task force grew out of an early discussion IIAR was having at the Board level regarding what information should and shouldn't be recorded for recordkeeping and what, if any, role AI should play in helping alleviate the burden of notetaking.

From there, the conversation broadened to a discussion of how IIAR should use AI in other association activities.

"This extends beyond just the Board of Directors. We're not only trying to figure out how to use AI in communications. We're hoping to develop a policy on how IIAR will use AI to create things like updates to our publications and new tools that will allow people to follow standards more easily," said Schrift.

He added that the use of AI involves more nuanced questions than just how or even where AI can be used. The questions that will be considered by the task force extend to the nuanced implications of using the technology in the first place.

"We're hoping to address those in our industry who use AI tools as well as how we might use AI to develop our own tools that provide access to IIAR standards and publications," said Schrift. "It was noted to our committee chairs that they should also consider a facility's use of AI when we are updating our standards."

Schrift said committee chairs might consider questions like, "Are AI devices in facilities monitoring for releases and how do those devices comply with our standards?"

"Right now we say we need to have sensors that alarm when concentrations hit a certain parts per million limit. But our standards don't take new AI technology into account."

The bigger question around AI, said Schrift, is "how do we accommodate a new technology that doesn't exist yet?"

This question was called out to committees as something they need to consider. The task force will then take the IIAR committee's answers into account as it defines IIAR's rules around how AI will be used to update standards and publications. "I think it will be helpful to have guidelines for that," said Schrift.

The second major discussion at the October Board meeting centered around IIAR's data project that is being conducted to support the "NH3 Overdue Regulation Modernization," or NORM, task force.

The task force is currently asking regulators to remove PSM/ RMP requirements that duplicate across agencies or defer to IIAR standards where the standards and regulations overlap. The first step in that effort, said Schrift, is to gather as much of the siloed data as possible to create a clearer picture of where regulation may be necessary.

To that end, the Board approved spending for a data project to support NORM. "The data has always been there in EPA and OSHA databases, but nothing has ever been done to unify it into a clearer picture of how our industry is regulated," said Schrift. "We're going to use this project to see where in those databases we can find common or additive information on citations or violations. The point is to gather all the data and try to tie these data points together in a way that gives us a bigger picture."

Schrift added that the NORM data project will be useful to IIAR members because it may reveal duplicative or unnecessary regulation in some places and overlooked safety hazards in others.

"For example, are there places in our industry where the amount of citations are extensive compared to the amount of actual releases," he said. "For example, where companies are getting fined for paperwork errors rather than acts of non-compliance related to their equipment."

"We want to spend money as an industry where there's the best value," he said. "For now, that means using this data project to see where the problems are [in the regulatory process], where education is needed and where things need to be updated."

Schrift, who also used the October Board meeting to announce his retirement at the end of 2027, said the projects add to the readiness he hopes he has left with the organization as IIAR's most recent leader. "I'm honored to have served as a leader of this organization and I know that thanks to the hard work of our staff and volunteer members, we'll be well prepared to meet the challenges ahead," he said.

IIAR Standards

When safety, compliance, and operational excellence matter, IIAR Standards are the must-have technical resource. IIAR Standards provide ANSI approved, authoritative guidance for the safe design, installation, startup, inspection, testing, maintenance, and operation of ammonia and other natural refrigerant systems.

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Help NRF/IIAR Research Relief Valves

Get a FREE Conference Registration!

IIAR and the Natural Refrigeration Foundation have initiated a research project on pressure relief valves that relieve back into refrigeration systems. We are in need of both liquid and vapor donor relief valves to conduct the research. If you know of internal relief valves that will be replaced as a matter of routine maintenance, we would like to have them for the project. We seek valves from all types of facilities and conditions, whether they are well maintained or not.

SOME EXAMPLES OF WHERE SUCH VALVES MAY BE LOCATED ARE:

- Ammonia Side of thermosyphon oil coolers, where vapor relief valves are often installed before the thermosyphon return shut-off valves, and sometimes installed at the bottom of the oil cooler to relieve liquid;
- Oil side of Thermosyphon Oil Coolers where the oil side is relieved back into compressors or oil separators;
- Oil pots that relieve into the vessel they serve;
- Remotely located heat exchangers where relief may be piped into suction lines.
- Intercoolers, economizer vessels, or intermediate-pressure vessels, where relief may be directed to a suction vessel or another location in the system maintained at a lower pressure;

In return for your effort, IIAR will provide free registration to the IIAR Annual Conference (an approximate $800 value) for one (1) person from the donor facility, and one (1) person from the contractor who completes the valve replacement (if a contractor is used). IIAR will pay for shipping the donor valves to our research contractor.

The research is being conducted because the industry has been challenged to determine an appropriate time interval for replacement of pressure relief valves with outlets that are piped back into the system. Unlike relief valves that discharge to atmosphere, valves that relieve back into the system are believed to be reliable for an indefinite period, because they are not subject to internal corrosion. With this research, we hope to provide support that such valves are either not subject to failure and require no routine replacement, or to determine an appropriate interval for their recertification or replacement using predictive analysis engineering methods. Without such backup, the industry may be susceptible to unnecessary expense and risk…so we need your help!

If you would like to participate, please contact Matt Chojnacki, matt_chojnacki@iiar.org or Eric Smith, eric.smith@iiar.org.

White Paper

IIAR 2026 Natural Refrigeration Conference
& Heavy Equipment Expo

March 15 – 18, 2026
San Antonio, Texas

ACKNOWLEDGEMENT

The success of the IIAR Natural Refrigeration Conference is due to the quality of the technical papers and white papers in this volume and the labor of its authors. IIAR expresses its deep appreciation to the authors, reviewers, and editors for their contributions to the ammonia refrigeration industry.

ABOUT THIS VOLUME

The views expressed in this white paper are those of the author(s), not the International Institute of All-Natural Refrigeration. They are not official positions of the Institute and are not officially endorsed.

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White Paper

Evaporators: Why Material Matters

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Abstract

The selection of materials in finned evaporator construction plays a critical role in determining the performance, durability, and overall efficiency of refrigeration systems. This white paper examines the importance of selecting the appropriate material for the construction of finned heat exchangers based on the specific operating conditions and requirements of each application, with particular emphasis on systems exposed to aggressive or corrosive substances. This paper highlights the consequences of inappropriate material selection, including premature failure, increased maintenance costs, and compromised food safety, through a technical and theoretical analysis supported by real-world case studies. The paper also outlines best practices and key considerations related to material compatibility, corrosion resistance, and regulatory compliance. By examining both successful and problematic installations, this paper aims to guide engineers, facility managers, and procurement specialists in making informed decisions when designing evaporators for commercial and industrial refrigeration systems.

Introduction

Selecting an appropriate evaporator for a given application not only involves the selection of an optimal design but also the careful selection of suitable materials that can ensure the long-term performance and durability of the equipment.

In refrigeration and air conditioning technology, corrosion and corrosion protection are key considerations, particularly for heat exchangers and evaporators. A clear understanding of the mechanisms and causes of corrosion is critical for material selection, especially since evaporators are employed across a wide range of applications and environments that have a corrosive effect on metal.

Material Importance

A variety of substances can have a detrimental impact on metals, the most important of which are carbon dioxide, ammonia, nitrogen oxide, hydrocarbons, sulfur compounds, fluorides, chlorides, carbon monoxide, and their reaction products.

Corrosive environments are not limited to industrial emissions; natural conditions can also significantly affect material durability. For example, coastal regions are exposed to high concentrations of airborne chlorides, which can cause pitting corrosion, particularly on aluminum surfaces. Without adequate protective coatings, heat exchangers operating in such environments may suffer irreversible damage over time. Other environmental factors, such as heat, humidity, and airborne contaminants, can further accelerate corrosion. Effective corrosion protection thus begins with the careful selection of the appropriate materials that can preserve the functionality of the heat exchanger.

Materials used in heat exchangers are exposed to demanding operating conditions on both internal and external surfaces. Internally, refrigerants impose chemical, thermal,

and pressure-related stresses on tubes and profiles. Externally, the surrounding air—which often contains corrosive agents—exposes the equipment to additional environmental challenges. Through careful, application-specific material selection, heat exchangers can be designed to reliably withstand these stresses while meeting performance and durability requirements under most operating conditions.

Material Recommendations

Figure 1 presents an exploded view of a typical air-cooled finned evaporator, illustrating its principal components and the materials that are most commonly used in standard construction. Each component is exposed to different mechanical loads, thermal conditions, and environmental stresses, all of which directly influence material selection. Components such as the heat exchanger coil, casing panels, fan plates, service doors, and drain trays are typically manufactured from aluminum alloys, galvanized steel, or stainless steel. The choice of material depends on their proximity to moisture, cleaning chemicals, food products, and condensate accumulation.

This overview provides a reference framework for understanding how material selection varies across evaporator components based on mechanical requirements, corrosion exposure, hygiene considerations, and maintenance practices. Ultimately, application-specific requirements will dictate the choice of material for each component.

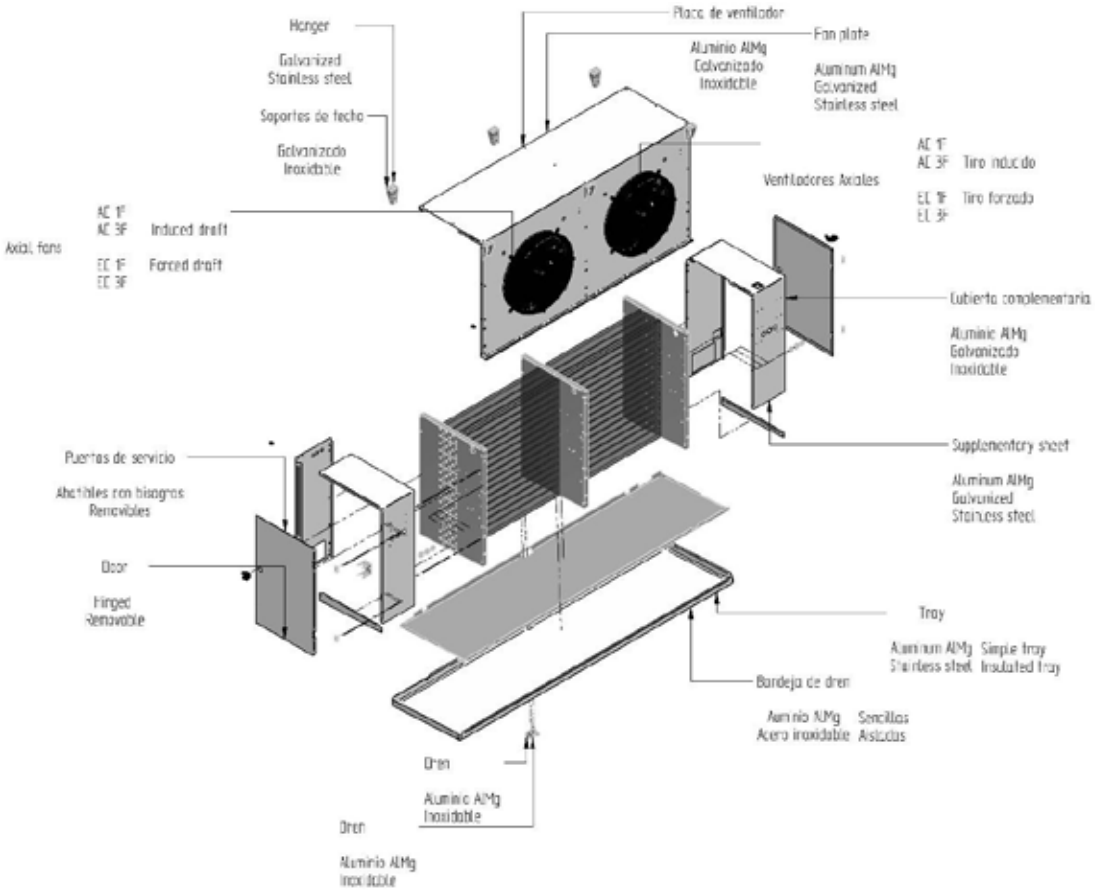

Figure 1. Finned heat exchanger parts and standard materials

If no aggressive or corrosive components are expected in the operating environment and the heat exchangers are not subjected to frequent cleaning with aggressive agents, established standard material combinations can be used without compromising performance or service life. Typical applications where standard materials may be considered include cold rooms for dry or packaged products, such as distribution centers, or storage facilities for pre-packaged perishable or frozen goods. In these installations, the ambient air is generally clean, characterized by low concentrations of corrosive agents, and cleaning routines are usually infrequent and carried out using neutral detergents. Under these conditions, evaporator components

manufactured with standard material combinations (see Table 1) offer reliable performance, long service life, and technically and economically efficient solutions.

Standard			
Fluid	**Tube**	**Fin**	**Casing/Tray***
NH_3	Stainless Steel 304 Aluminum	Aluminum	Aluminum/Galv Steel
Glycol	Copper	Aluminum	Aluminum/Galv Steel
HFC	Copper	Aluminum	Aluminum/Galv Steel
CO_2	Copper	Aluminum	Aluminum/Galv Steel

*Casing material includes the fan panels, pan plate, motor guards, and doors. The tray material includes the drain.

Table 1. Recommended materials for finned heat exchangers operating in non-corrosive environments.

In applications characterized by aggressive ambient conditions, the materials described in Table 2 should be carefully considered. Such environments, which are common in food processing, storage, and fermentation facilities, often contain corrosive agents such as moisture, salt, and organic acids. To ensure long-term durability and reliable performance, the appropriate selection of tube, fin, and casing materials is essential.

Recommendations for applications with aggressive ambient conditions				
Application	**Expected conditions**	**Tube**	**Fin/Coating**	**Casing/Tray***
Ripening rooms	Mostly ethylene, which results in copper corrosion	Stainless Steel 304	Epoxy	Aluminum/ Galv Steel
Wet fish	High humidity and salt exposure	Stainless Steel 304	Epoxy	Aluminum/ Galv Steel
Cold room for smoked foods	Smoke particles, oily residues, salt	Stainless Steel 304	Epoxy/AlMg	Stainless Steel 304
Salting room	High salinity, which is very corrosive	Stainless Steel 316	Stainless Steel 316/Coating	Stainless Steel 316
Meat processing room	Blood residues, cleaning chemicals	Stainless Steel 304	Epoxy	Stainless Steel 304
Offal room	Organic acids, cleaning agents	Stainless Steel 316	Epoxy	Stainless Steel 316
Pre-cooling room half carcasses	High humidity, moderate organic exposure	Stainless Steel 304	Epoxy/AlMg	Stainless Steel 304
Wine cellars	High humidity, acidic environment	Stainless Steel 304	Epoxy	Stainless Steel 304

*Casing materials include the fan panels, pan plate, motor guards, and doors. The tray material includes the drain.

Table 2. Material recommendations for applications with aggressive ambient conditions.

It is important to note that the recommended material combinations do not prevent the long-term degradation of heat exchangers operating in aggressive environments; rather, they serve to slow the progression of corrosion-related damage.

When considering non-traditional materials for evaporator construction, such as 316L stainless steel, epoxy-coated aluminum fins, or other polymer-based coatings, both the performance benefits and potential disadvantages must be carefully evaluated. Polymer coatings are typically applied over the entire coil assembly, including

tubes, fins, and headers, to minimize the risk of aggressive substances coming into direct contact with the base material. When evaluating non-traditional materials for evaporator construction, the following factors should be considered:

- **Heat Transfer Properties.** Stainless steels offer superior corrosion resistance compared to standard galvanized or aluminum fin-and-tube designs; however, they generally exhibit lower thermal conductivity, which can lead to reduced heat transfer efficiencies unless compensated by increased surface area, which in turn results in larger and more expensive heat exchangers. In contrast, aluminum and copper alloys offer significantly higher thermal conductivity but may require protective coatings when used in highly corrosive environments.
- **Cost Considerations.** It is well-known that 316L stainless steel is 30–50% more expensive than 304L stainless steel and considerably more costly than aluminum or copper. This premium is primarily associated with the molybdenum content in 316L, which enhances its resistance to pitting and corrosion in chloride-rich or otherwise aggressive operating environments. In contrast, 304L stainless steel is generally suitable for use in clean or mildly corrosive conditions but may experience premature corrosion when exposed to salts, cleaning chemicals, or elevated humidity levels. Alternative options include coatings that can offer corrosion resistance at a fraction of the cost of stainless steel construction; however, these solutions may have shorter service lives and typically require periodic inspection, maintenance, and potential recoating.

Although non-traditional materials can significantly improve durability in aggressive environments, they do not always provide the optimal balance between cost, heat transfer efficiency, and maintenance requirements. In many applications, a targeted coating or treatment strategy can provide adequate corrosion protection while maintaining higher thermal efficiency and lower upfront costs.

Coatings

Polymer-based coatings are widely used in finned heat exchangers to protect metallic components—such as tubes, fins, and headers—from corrosion, chemical attack, and environmental degradation. These coatings function as both physical and chemical barriers between the base metal (typically aluminum, copper, or steel) and aggressive operating conditions.

Coatings represent an effective alternative in environments characterized by high humidity, chlorides, acids, or alkaline cleaning agents. By limiting direct metal exposure, coatings can significantly reduce pitting, galvanic corrosion, and material loss, thus allowing the use of aluminum or carbon steel in applications that might otherwise require higher-cost stainless steels. However, polymer coatings introduce an additional thermal resistance layer that can slightly reduce heat transfer efficiency, which may necessitate an increase in the heat transfer surface area to maintain capacity. Furthermore, coatings can degrade over time, especially under aggressive chemical exposure. Improper application can lead to pinholes or poor adhesion, potentially accelerating localized corrosion.

Common types of polymer coatings used in finned heat exchangers include the following:

- **Epoxy coatings.** Provide strong adhesion and good chemical resistance and are commonly used in moderately aggressive environments.
- **Polyurethane (PU) coatings.** Offer good flexibility, impact resistance, and tolerance to thermal cycling.
- **Phenolic coatings.** Highly resistant to chemicals and moisture; often used in food processing facilities or industrial cold rooms with aggressive cleaning regimes.
- **Fluoropolymer coatings.** Excellent resistance to corrosion, chemicals, and fouling, but associated with higher costs. Typically used in highly corrosive or

Cleaning

To prevent corrosion and maximize the service life of heat exchangers, regular cleaning should be incorporated into routine maintenance programs. This is particularly important in food-processing facilities, where the use of cleaning agents is essential. However, under certain conditions, these may have corrosive effects comparable to aggressive ambient atmospheres, which are often influenced by the refrigerated goods themselves.

The pH value of the cleaning agent is a key parameter that determines the effectiveness of the agent with respect to certain substances as well as their compatibility with materials. As a general rule, the acidic agents ($pH < 7$) are typically used to remove mineral residues, such as scale and rust. Neutral agents ($pH \approx 7$) are commonly used as multi-purpose cleaners and often serve as disinfectants. Alkaline cleaners ($pH > 7$) are effective at dissolving organic contaminants, including grease, oils, and proteins.

To minimize the risk of material degradation during cleaning, the following practices should be observed:

- Prior to cleaning, the compatibility of the cleaning agent with the materials used in the heat exchanger coil should be verified. This information is typically provided by the manufacturer of the cleaning agent.
- Cleaning agents should be applied strictly in accordance with the dilution ratios prescribed by the manufacturer.
- After the removal of contaminants, all cleaning agents must be thoroughly rinsed from the unit using clean water to ensure that no residues of the cleaning agent remain.

Material Compatibility Case Studies

Corrosion by Sulfites

In this case study, an evaporator constructed with copper tubes, epoxy-coated fins, and a galvanized casing was installed in a grape cold storage room. However, within a few weeks of operation, significant corrosion was observed on the fins, frame, and drain pan, ultimately leading to the development of visible holes as a result of prolonged exposure. Further inspection also revealed damage to several rivets as well as certain sections of the coil tubing (see Figure 2 in the Annexes).

An investigation determined that the corrosion was caused by elevated sulfite concentrations in the cold room atmosphere, a condition worsened by the lack of ventilation (Figure 3), which allowed these compounds to accumulate. Sulfites are commonly used in grape storage to inhibit yeast and fungal growth as well as to control fermentation; sulfite compounds were detected in the condensate collected in the evaporator. Sulfites are often released into the storage environment in the form of sulfur dioxide (SO_2) gas or as residue from treated packaging materials. Over time, these compounds interact with moisture in the air, resulting in the formation of corrosive condensate that can severely degrade metal components.

The drain pan was identified as the most severely affected component, as it remained in direct contact with the sulfate-laden condensate (Figure 4). The corrective measures included replacing the damaged evaporator components with corrosion-resistant materials better suited to sulfite-rich environments, enhancing ventilation in the cold room to reduce the buildup of sulfur compounds, and implementing a structured inspection and preventive maintenance program to identify early signs of corrosion and prevent recurrence.

Corrosion by Chlorine and Poor Maintenance

Repeated instances of evaporator corrosion were observed in a vegetable processing facility that handled products such as lettuce and green peppers. The corrosion primarily affected tubes and casings constructed from 304L stainless steel, in contrast to other equipment in the facility constructed from 316L stainless steel. After an extended period of operation, the evaporators exhibited severe corrosion within the coil, affecting both tubing and casing materials. Numerous coil leaks were identified during inspection (Figure 5).

The root cause of the corrosion was traced to the daily use of chlorine-based cleaning and sanitizing agents throughout the facility. These chemicals entered the evaporators and were deposited on coil surfaces (Figure 6). It should be noted that some facilities use drain pan tablets to sanitize drain pans in air units. These chlorine-rich tablets continuously release chemicals throughout the day, leading to significant corrosion.

This issue was aggravated by the lack of a proper maintenance program. The internal surfaces of the evaporators were not regularly cleaned, leading to the accumulation of chlorine residues and the subsequent corrosion. Furthermore, incoming produce is rinsed in 12% chlorine solution tanks as part of a conveyor-based pre-wash system, contributing to elevated airborne chlorine levels within the cold room. Although the facility is cleaned daily, the absence of a Clean-In-Place (CIP) system or regular internal cleaning procedures prevented the effective removal of chemical residues within the evaporators.

Conclusion

This paper demonstrates that the appropriate selection of materials for the design and construction of finned heat exchangers is a critical factor in ensuring reliable performance, durability, and safety in refrigeration systems. The case studies

presented in this paper illustrate that inappropriate material selection, particularly when combined with inadequate maintenance practices, can significantly accelerate corrosion and structural degradation, ultimately leading to evaporator failure. Furthermore, the analysis highlights how cleaning procedures and the chemical composition of cleaning agents can adversely interact with unsuitable materials, thereby further compromising the integrity of the equipment.

These findings emphasize that material selection should be treated as a generic decision or based solely on cost. Instead, it must be grounded in a thorough understanding of the atmosphere, operating conditions, hygiene requirements, and maintenance protocols of the intended application. Consequently, effective communication between the system design engineer or contractor and the heat exchanger manufacturer is essential in determining whether the components will be exposed to a corrosive environment; based on this assessment, an appropriate material should be selected. By selecting evaporator materials based on the environmental and chemical exposures associated with the intended application, system reliability can be improved, maintenance costs reduced, and premature equipment failures effectively prevented.

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Annexes



Figure 2. Corrosion on unit casings.



Figure 3. Location of the evaporator in the cold room.



Figure 4. Corrosion damage observed in the drain tray.

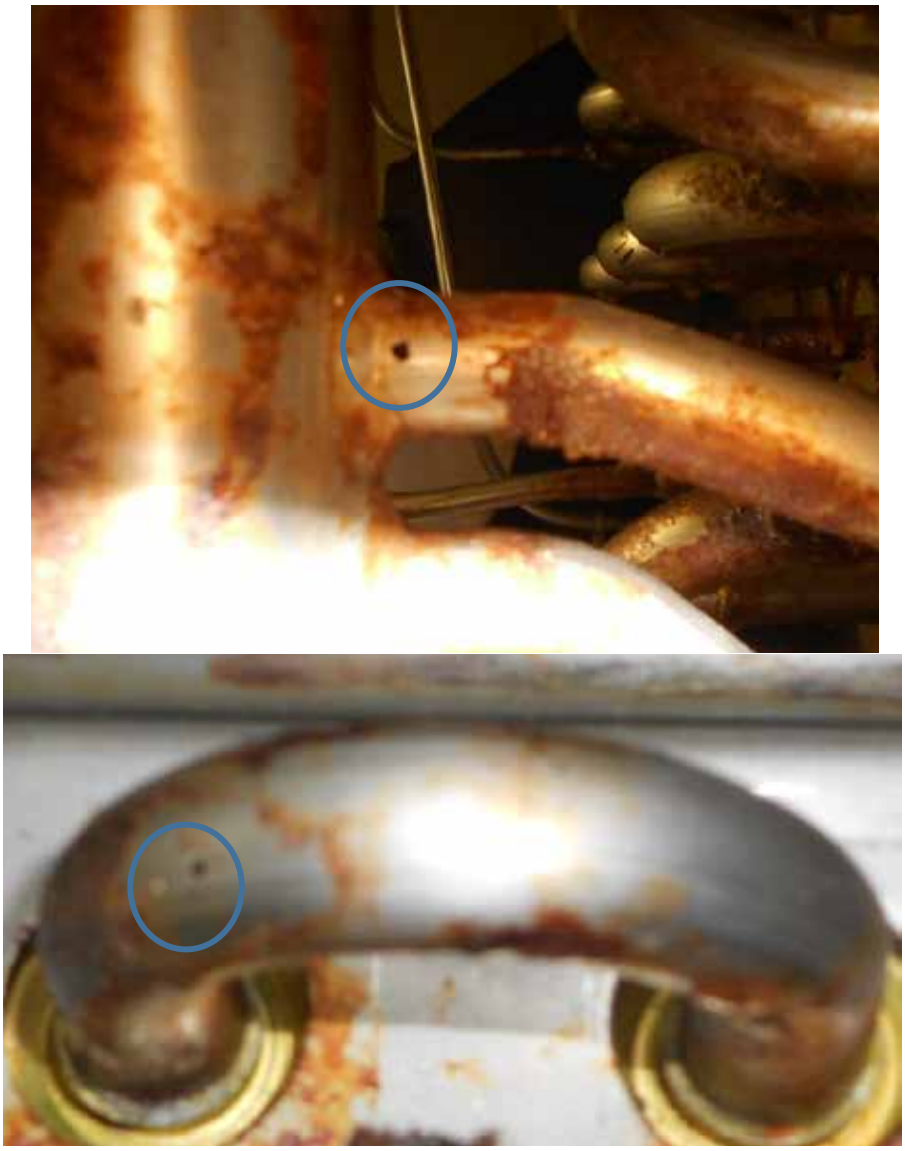

Figure 5. Typical hole in a 304L stainless steel coil tube caused by chemical attack.



Figure 6. Corrosion observed on the drain tray surface.

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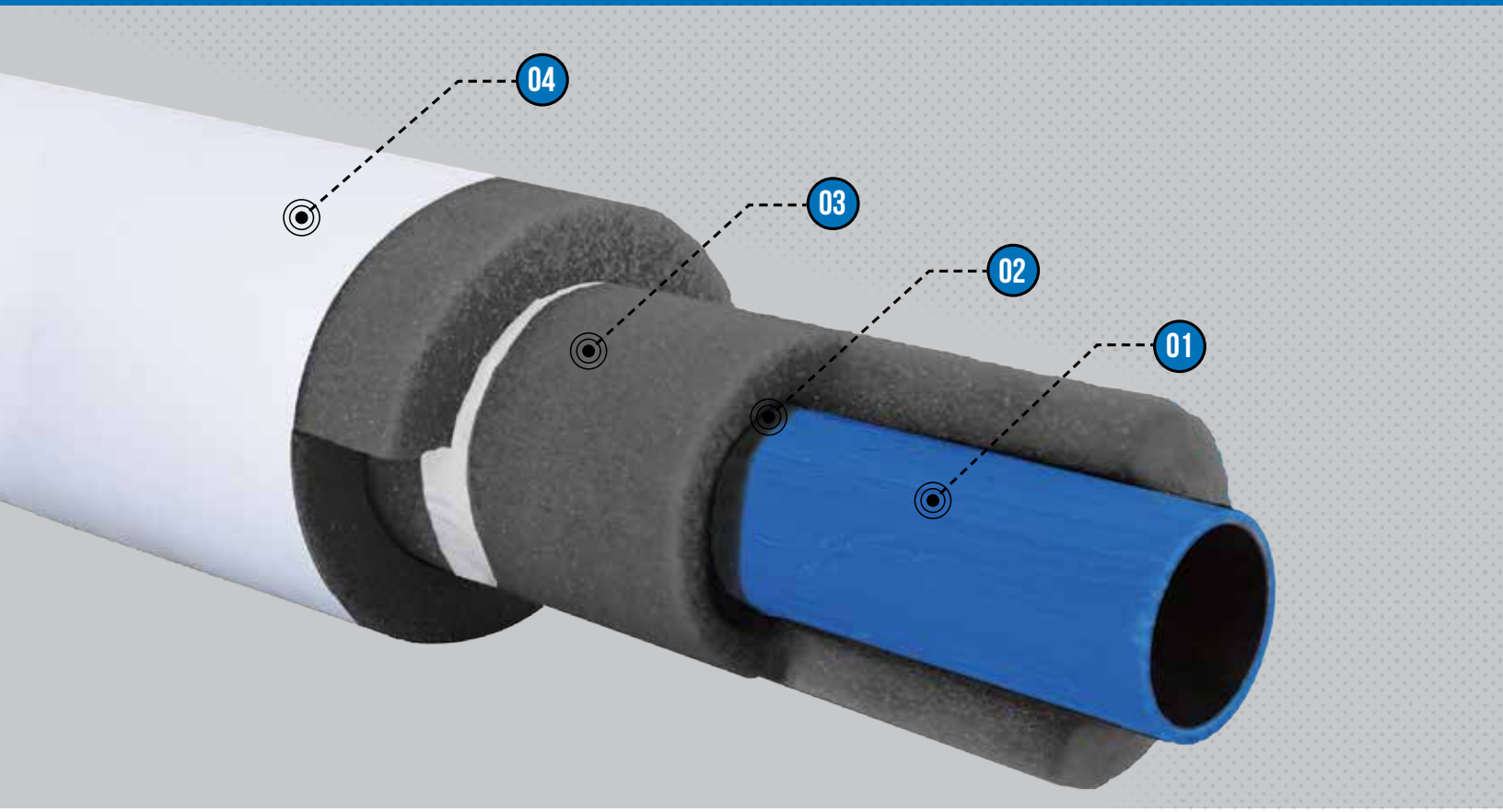

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