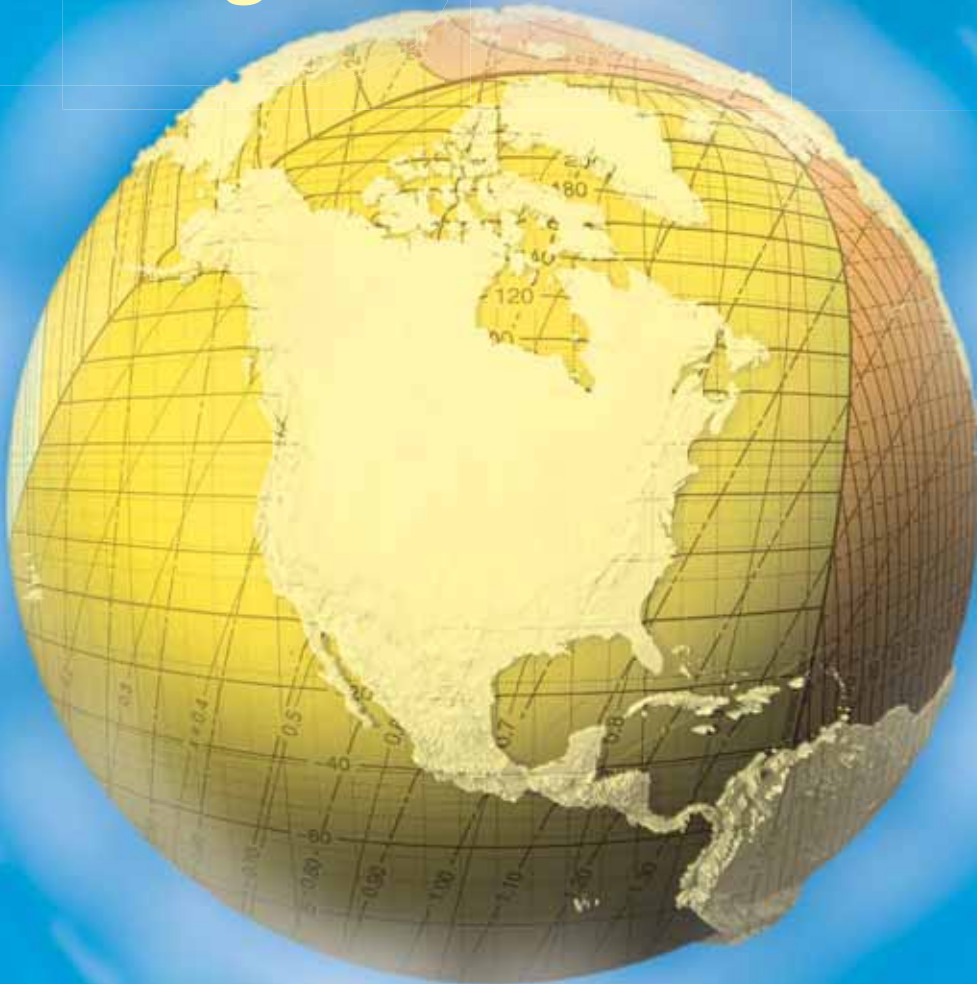
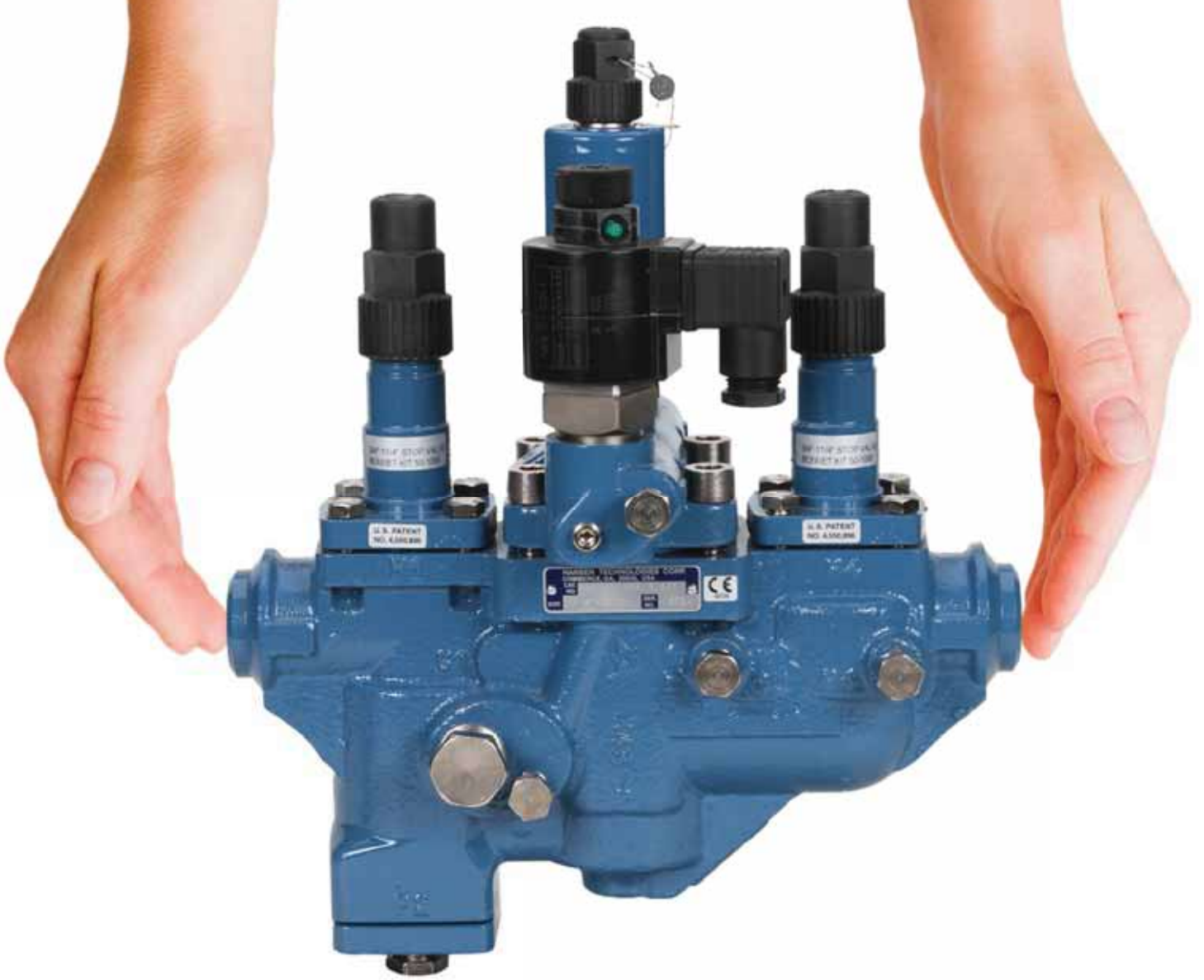


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### CONDENSER STAFF

Publisher  
**David Rule**

Editor-In-Chief  
**Andrea Fischer**

Creative Director  
**Bill Ellis**

Director of Sales  
**Eileen McKeown**

Technical Director  
**Eric Smith**

Contributing Writer  
**Rob Duca**

**International Institute of  
Ammonia Refrigeration**

1001 North Fairfax Street,  
Suite 503

Alexandria, VA 22314  
[www.iiar.org](http://www.iiar.org)

Phone: 703-312-4200  
Fax: 703-312-0065



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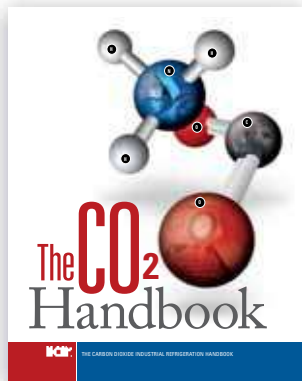
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## COMMITTEE update

# IIAR CO<sub>2</sub> Committee Releases Handbook

One of the primary missions of the International Institute of Ammonia Refrigeration is to offer constructive tools and education that will assist members. In July, IIAR's CO<sub>2</sub> Committee embarked on the comprehensive task of revising the CO<sub>2</sub> handbook that debuted four years ago. The new edition is scheduled to be released at IIAR's annual conference.

"This handbook will be invaluable to members and non-members alike. It provides a solid basis for individuals to become familiar with current practices," said Brian Marriott, co-author of the handbook and IIAR CO<sub>2</sub> Committee Chairman. "This revised issue puts a greater focus on transcritical applications. In addition, the original handbook did not reflect several important new pieces of data, and it was felt that it was time to update it."

CO<sub>2</sub> industrial refrigeration systems have experienced a renaissance in recent years, as the usage of halocarbon products such as freon have declined, thanks to regulatory pressures to address environmental concerns.

"There's been a switch back to natural refrigerants, which has put CO<sub>2</sub> back in the spotlight," said CO<sub>2</sub> Handbook Co-Author, Jeff Welch. "Our approach was not to make this revision into 'Refrigeration 101.' People reading this handbook understand industrial refrigeration. Its purpose is to show members what's different and how they can deal with it. It points out the unique requirements of CO<sub>2</sub> and provides a pathway to navigate through them."

The handbook is divided into four sections: data, design, equipment and post-installation. Chapters examine such topics as thermodynamic properties, safety, system types, system designs, evaporators, pressure boosting equipment, condensers, gas coolers and controls.

Among the major additions to the revised handbook is the inclusion of

complete thermodynamic property tables in both Inch-Pound and System International units. Other tables show various required pipe strengths as calculated per ASME Standard B 31.5 methodology.

A PH diagram produced by the National Institute of Standards and Technology (NIST) is also included, displaying how CO<sub>2</sub> behaves. It defines areas that are liquid, solid, vapor and supercritical. Originally produced by NIST in black-and-white, a graphic designer was brought in to add color, resulting in a more descriptive diagram.

"In this edition of the CO<sub>2</sub> handbook we're drilling down a little deeper to provide more system design detail," Welch said.

For example, there is a chapter on pipe strength that wasn't included previously. Tables show different pipes that are required for different designs, for both carbon steel and stainless steel. There is also a detailed chapter on system evacuation, where you place a vacuum on it to remove the moisture and impurities before you charge the system with CO<sub>2</sub>."

For those who have already installed CO<sub>2</sub> systems, the handbook

provides wide-ranging design information to help wade through issues and resolve problems. "Hopefully this handbook will give contractors and designers the needed resources," Welch said.

The IIAR has long been a proponent of all-natural refrigerants, he added. "We think that this update provides as much design information as we could compile from the industry, and it will be of great service to our members," he said. "Each chapter stands alone, and as more information becomes available we will include addendums. The handbook is a consolidation of the 2010 handbook, but with a great deal more new information added."

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# chairman's

BY BOB PORT

# MESSAGE

**T**he IAR 2014 Conference and Heavy Equipment Show in Nashville is just around the corner, and that means my term as Chairman is almost over.

Although the past year has flown by, we've reached many of our biggest objectives, and we expect to continue building on that success in 2014.

Our primary focus entering the year was the revision and rewrite of the *Carbon Dioxide Industrial Refrigera-*

tion Handbook because it establishes a comprehensive framework for all of our other standards. Prior to this update, IAR-2 was more closely focused on design standards for systems and equipment with some coverage of installation.

It has not previously covered all the aspects of safety, such as: the applications of systems; where ammonia equipment can be used; and how safety standards should be used in different applications.

The new IAR-2 includes updates relating to minimum safety requirements for equipment, design, and installation.

The development of this new document is one of the most important projects IAR has ever undertaken on behalf of the industry, and it will have

full Spanish language program, five Spanish language technical papers and two Spanish language workshops.

Overall, the IAR technical program will consist of eight technical papers, eight workshops, a research panel, an international panel and a closing forum discussing the characteristics and applications of small charge systems, which is one of this year's hottest topics.

There will also be 10 technomericals, or product display presentations, and we will have a special workshop presented by David M. Wulf, a director from the Department of Homeland Security, Infrastructure Security Compliance Division. Director Wulf will provide an insider's view of the DHS as it relates to the CFATS program and its impact on our industry.

One of my final goals before leaving office is to lay the foundation for a dialogue on the role of ammonia refrigeration regarding codes and standards as we turn toward the commercial world.

As I conclude my term as chairman, I'd like to urge all our members to become actively involved in the committees and leadership of IAR. The demands on our organization are greater than ever, and it has become evident to me that we need more and more committed people to help shoulder the load.

There has been tremendous growth over the past year, and my term, working with our staff and the many committed volunteers has been incredibly rewarding.

From a productivity perspective, it's clear to me that IAR member dues represent money well spent. Faced with two substantial projects during the past year with the release of the new CO<sub>2</sub> Handbook and the pending release of the new IAR-2 Standard, we rose to the challenge and exceeded expectations.

Neither of these objectives could have been reached without the focus and fortitude of you, our volunteer membership, and our headquarters staff. I offer a heart-felt thanks to everyone who played a part in IAR's success this year.

## The demands on our organization are greater than ever before. I'd like to urge all our members to become actively involved in the leadership of IAR.

tion Handbook (*the CO<sub>2</sub> Handbook*), and the completion and release of the IAR-2 standard.

Two years ago, we charged the IAR's CO<sub>2</sub> Committee with updating the handbook to reflect the most recent safety and operations standards. This was a massive undertaking which required the diligent work of two IAR members in particular: Jeff Welch and Brian Marriott. They worked as a team to complete this project on behalf of the industry and they deserve enormous credit for their efforts in completing it.

Meanwhile, the energy, effort and resources required to revise the IAR-2 standard, while in the middle of a leadership transition, to Dave Rule, our new president, was testament to the dedication of a wide variety of committee members, volunteers, consultants and our staff.

The release of this standard is essential to the ammonia refrigeration in-

dustry because it establishes a comprehensive framework for all of our other standards. Prior to this update, IAR-2 was more closely focused on design standards for systems and equipment with some coverage of installation.

It has not previously covered all the aspects of safety, such as: the applications of systems; where ammonia equipment can be used; and how safety standards should be used in different applications.

The new IAR-2 includes updates relating to minimum safety requirements for equipment, design, and installation.

The development of this new document is one of the most important projects IAR has ever undertaken on behalf of the industry, and it will have

significant code implications when it is completed.

This year has certainly been a full, exciting year, culminating with our annual conference, where we are proud to welcome astronaut Mike Mullane as our keynote speaker.

We have over 130 exhibitors participating in our exhibit hall this year, representing a more diversified cross-section of our industry and the largest exhibit floor ever. Many are unveiling new products, and there will be an impressive display of larger equipment.

Exclusive to this year's conference is a PSM/RMP training program and a free ammonia safety training program.

Over the past year, we have continued to strengthen our ties internationally, and those efforts are reflected at this year's conference, where we will welcome more international guests than ever before. Recognizing this, we will offer simultaneous translations for both the business meeting and the codes luncheon. We will also have a



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# president's

BY DAVE RULE

# MESSAGE

**T**he beginning of the year has been a busy time at IIAR headquarters as we prepare for our Heavy Equipment show in Nashville. As usual, we're looking forward to showcasing the best our industry has to offer. Our technical program will highlight some of the most important equipment and efficiency trends, and our exhibit hall floor will be crowded with new, cutting edge technologies.

But the real topic on everyone's mind – safety – is an old one. No matter how much we evolve and change, the same thing that drove us as an industry 100 years ago – to operate safely – still drives us today.

The IIAR Heavy Equipment show is the best place to showcase new systems, talk about our standards and vet new procedures, but the real exhibition floor for our industry is out in the real world. It's in the plants and facilities our members run every day with one of the safest records of any chemical industry in the United States, and increasingly, in the rest of the world.

Yet we can't ignore the fact that on average there is one ammonia release per week in some variety, somewhere in the United States. As an industry, we have a responsibility to drive down the number of even these marginal releases.

There may be a limit to how much influence we have over the way the public perceives our industry, but there is no limit on what we can do to increase safety every day, disproving any perception that our industry is unsafe.

As members of IIAR, it's our responsibility to reduce the number

of releases that occur. How do we accomplish that? First, we must continue to vigilantly enhance the design and quality of our systems. IIAR members have access to technical standards, educational guidelines and training materials, all of them focused on safety in some way.

And as an organization, we focus on developing engineering standards and working with building code bodies to make certain that ammonia refrigeration systems are appropriately designed, installed and maintained. Only through this process can we guarantee a safe environment for employees and for communities surrounding our facilities.

It's important to remember that regular monitoring of a refrigeration system is essential, and it's critical that we have established programs in place like those developed and offered by IIAR. A Process Safety Management program is required by law for any facility that operates with 10,000 pounds of refrigeration or more, and those below 10,000 pounds can turn to IIAR's ARM program to make sure they're following solid engineering practices.

The bottom line is, whether your facility is above or below 10,000 pounds of ammonia, these programs are essential, and no facility using ammonia should be without them.

We should also be continually improving our safety training. All employees should be made aware of the best engineering and operating procedures to follow to prevent an accident or respond appropriately if an incident occurs. That kind of training becomes the institutional knowledge of a facility, and to a large degree, informs regulatory agencies on behalf of the entire industry.

In fact, one of the best ways to demonstrate to regulatory inspectors, the media,

and the public that your system is safe and efficient is to be an IIAR member.

Our technical guidelines, training materials and safety standards provide the public with confidence that we're adhering to the highest possible principles when it comes to the use of natural refrigerants.

For that reason, we're always encouraging non-member companies to become members. IIAR membership gives everyone access to educational tools and other materials, ensures systems get designed and operated correctly, and encourages the implementation of PSM and RMP programs to maintain regulatory compliance.

Increased IIAR membership helps the Institute support its many programs, but that's not the primary benefit of a growing membership. The more members IIAR adds, the more the safety of our industry as a whole will increase.

Serving as an advocate for ammonia refrigeration by working with OSHA and EPA on members' behalf when issues arise is also an important part of our safety mission. We are actively collaborating with both agencies to develop education programs specifically targeted for their field inspectors. And we advise OSHA, EPA and other agencies in what we consider to be the standards, codes and guidelines that should be followed to produce the highest levels of safety.

By taking all of these steps to strengthen our relationships, build safe processes and increase our industry's participation in the work of this association, we can take safety to the next level. And that's an essential first step in addressing the sometimes uninformed public perception of our industry. Natural refrigerants are safe and effective now. And we have the track record, and membership, to prove it.

# IIAR Technical Program Highlights Industry Issues

The idea formed in Ron Worley's mind six years ago when he began auditing ammonia refrigeration systems at Nestlé, where he was a manager of refrigeration engineering before his retirement.

As he collected data, he discovered there was not a standardized tool to determine if there was adequate ventilation in the machinery room or if the systems met required codes and standards. With 60 facilities to audit, that presented a problem.

**In total, IIAR's 2014 technical program consists of eight technical papers, eight workshops, a research panel, an international panel and a closing forum which will highlight the characteristics and applications of small charge ammonia systems.**

So he invented the machinery room ventilation calculation tool, or MRVCT.

The MRVCT, introduced at this year's annual Conference and Heavy Duty Equipment Show in Nashville, is one of eight workshops or technical papers that cover a range of technical issues and innovations.

The MRVCT works by automatically providing calculations for data applicable to a specific code or standard. It will also determine if the ventilation system was in compliance with the codes or standards in effect at the time of installation – all the way back to the early 1990s – for all refrigerants.

"It will tell facilities what size ventilation systems they need, what parts

of the system are meeting code and what parts are not," Worley said.

The tool isn't intended to replace a registered professional engineer in determining the design of a ventilation system, but it is being used across the industry to supplement existing design protocols.

Meanwhile, another conference workshop will look at optimizing the applications of industrial heat pumps by examining how they provide sav-

ings, energy reduction, CO<sub>2</sub> emissions reduction and sustainability benefits to the end user.

"There is a lack of knowledge on how to even go about applying heat pumps," said Sam Gladis of Emerson Climate Technologies, who will run the workshop. "This is an educational opportunity based on our experience discovering what works under certain operating conditions."

Three options will be presented for optimizing the applications of industrial heat pumps, which involve: the base load strategy, the dedicated host compressor and the condenser unit.

The industrial heat pump reduces energy consumption and cost because the majority of what can be conserved is fossil fuel energy. At the same time,

the amount of water being used by outside condensers and chemicals is reduced because waste heat is no longer expelled into the atmosphere. It is instead converted by high pressure compressors into gas that is used to heat cold water normally serviced by boilers.

This year, IIAR technical program participants will also compare evaporative and air-cooled condensing for ammonia systems with a technical paper presented by Doug Scott, president of VaCom Technologies.

Scott's paper details a study that analyzed a medium-sized refrigeration facility on an hourly basis for one year, using a variety of climate conditions, electric rates and operating loads to assess the costs of evaporative versus air-cooling condensing.

"Historically, most ammonia systems have used evaporative condensing," he said. "The advantage of air-cooling condensing is that it doesn't consume water or require water treatment. Water is becoming more expensive and sometimes isn't available. The intent [of the study] was to provide an accurate assessment of the energy use, including the costs and differences between the two methods of condensing. If you want to use air-cooled condensing, it's important to know the pros and cons."

The study reveals additional options for ammonia refrigeration systems. "While not comparing HFC and ammonia efficiencies, the result tells us that if you must use air-cooled systems, ammonia is still the best refrigerant," Scott said. "The conclusion was that from an operating cost standpoint, air-cooled is reasonably competitive in much of the country."

In addition to the papers and workshops that focus on system optimization, safety will also be a hot topic covered by IIAR's program.

Kim Snowden, of Snowden Engineering, will discuss options for ammonia refrigeration machinery exhaust treatment that can substantially reduce off-site consequences and aid emergency responders in the case of a liquid release.

Most ammonia refrigeration rooms vent directly into the atmosphere. That's in line with code regulations, but established protocol can leave emergency responders in a bind if there is a large liquid release. Snowden will present two options to reduce ammonia concentration before it discharges into the atmosphere.

One option involves a scrubber pipe, which is a dedicated piece of equipment that enables air from the engine room to discharge through the scrubber and disperse through water, removing much of the ammonia. However, large quantities of fresh water make-up are needed, and ammonia-tainted water from scrubbing must be addressed, making this technique expensive.

Snowden's less costly alternative is to use a condenser to dilute the ammonia. In this case, discharged air from the engine room mixes with fresh air so that the ammonia that is discharged is greatly diluted.

"The decision on which option to use depends on the proximity of the surrounding population," said Snowden. "If you have some flexibility, you'd go with the dilution method. It's a much cheaper approach and you won't have waste water to deal with afterward."

Conducting a Layers of Protection Analysis is a topic that will also be examined by Peter Jordan, president of MBD Risk Management Services. His technical paper discusses the layers of protection, or LOPA, in an ammonia refrigeration system. Jordan looks at high-risk scenarios for which large facilities can do a protection analysis.

"This technique takes certain scenarios and determines if a facility has proper protection," he said. "Probability and frequency estimates

determine how likely a scenario is to occur, how severe are the consequences, and does a facility have enough layers of protection to prevent it from occurring."

The paper will apply LOPA to five high-risk scenarios: A high discharge on the output of a compressor; high levels in a vessel that provide suction to a compressor; low levels of a vessel that provide suction to a pump; leaks in the engine room during transfer operations and leaks in a liquid pipe in a production area.

"I wouldn't encourage everyone to go out and do a LOPA," Jordan said. "This is only good for these high-risk scenarios."

In total, IIAR's 2014 technical program consists of eight technical papers, eight workshops, a research panel, an international panel and a closing forum which will highlight the characteristics and applications of small charge ammonia systems.

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# Astronauts Brave Spacewalk to Fix Ammonia Control Valve

The words ammonia and astronaut have been linked recently by more than their proximity in the encyclopedia. Last December, astronauts aboard the International Space Station embarked on a pair of dangerous spacewalks to replace a failed ammonia pump module outside the orbital laboratory.

It was the second time in three years that spacewalks were required for an ammonia-related issue. In 2010, astronauts replaced a depleted ammonia tank in a spacewalk that lasted nearly eight hours. Last year's project was completed in two spacewalks by NASA astronauts Rick Mastracchio and Mike Hopkins.

The space station's External Thermal Control System consists of two separate cooling loops – with a 600-pound ammonia charge – that work in tandem to transport heat away from electronic equipment and toward the radiators, where it then dissipates into space. The ammonia is circulated around each of the loops by the pump module.

Last year's failure occurred in the flow control valve inside the pump package of one of the loops. The flow valve controls the temperature of the ammonia in cooling loops by mixing cool ammonia that is exiting the radiators with warm ammonia that has bypassed the radiators. Without thermal controls protecting the computers and electronic systems, the temperature of the orbiting space station would fluctuate wildly, from 250 degrees on the sun-facing side to minus-250 on the dark side. Ammonia, with its high thermal capacity and wide range of operating temperatures, is the ideal refrigerant for such a volatile environment.

The failure of one of the two ammonia pump packages meant that several items of electronic equipment had to be shut down because one cooling loop is not sufficient to handle

The most difficult challenge was disconnecting the four ammonia lines from the failed pump module, which involved manually pulling a lever to close the bail and shutting a valve

to prevent ammonia loss into space via an open line, then pulling the jumpers away from their connecting ports. This exercise required significant physical strength and manipulation from the astronauts.

The 780-pound pump module was then removed from the space station as Mastracchio, riding on a robotic arm, pulled the bulky pump partly out of the space station's truss so Hopkins could install a robotic arm grapple fixture to its side. The new pump module was installed on a second spacewalk taken on Christmas Eve.

Although working with ammonia can be somewhat easier in space, where there is no fear of exposing nearby neighbors, there are still significant challenges. Mastracchio reported being surrounded by ammonia "snowflakes" as he clipped the four fluid lines into place onto the new pump. Although NASA said the ammonia was residual fluid and not another leak, some flakes did strike the astronauts' spacesuits, and there was fear the flakes might attach to the suits in solid form and then turn to vapor inside the space station, thus contaminating the

air lock. The spacewalkers took extra precautions to clean and brush their suits so that ammonia would not find its way back into the space station.

While working with ammonia may present significantly different challenges in space than on earth, safety, it seems, always comes down to the same thing: good engineering practices, and even better planning.



all of the space station's needs.

The pump module and valves are encapsulated in a box the size of a refrigerator, with hoses attached to the back of the module. Initially, astronauts attempted to adjust the electronics from inside the space station in hopes of resolving the issue, but they quickly realized that a spacewalk was necessary to replace the entire unit.

# NH Around the world

## 3



**A**mmonia refrigeration is emerging as a dominant market in many important world economies as governments move to re-energize the Montreal protocol to phase-down greenhouse gasses.

At the same time, cold chains are growing in areas of the world that are becoming the newest builders, users and designers of industrial refrigeration, underscoring the need for widely adopted safety standards.

Playing perhaps the most contentious roles in these new developments, are China and India, two countries at the center of the larger conversation about global warming and the industry-focused issue of safety.

Meanwhile, Australia, and European countries like Spain are on the brink of industry expansion as governments in both places force faster adoption of HFC-neutral technologies – like natural refrigerants – with new “F-gas” taxes.

That rapid expansion is likely to accelerate the use of new technologies, like low-charge, small package systems, and other innovative approaches to refrigeration that are already growing in the E.U.

While accelerated adoption of new technologies may be set to take place in Europe and Australia, the benefits could have wide-spread implications for the U.S. ammonia refrigeration industry, which has long been on the verge of expanding into new applications, such as supermarkets.

Expansion is also a theme for South and Central American countries which are looking to the International Institute of Ammonia Refrigeration to help them build the codes and standards needed to regulate a burgeoning cold chain infrastructure.

Nevertheless, multi-country environmental agreements intended to phase out halocarbons are driving many of the changes happening in the ammonia refrigeration industry around the world. Chief among

them, the Montreal Protocol has been controversial in the past decade, but with increasing support, is becoming a major force paving the way for the adoption of natural refrigerants.

Earlier this year, President Obama and Chinese President Xi agreed to provisions of the Protocol, saying the United States and China would work together and with other countries to use the expertise and institutions of the Montreal Protocol to phase down the consumption and production of hydrofluorocarbons, among other forms of multilateral cooperation.

At the same time, Indian representatives took a harder line, refusing to agree to a Montreal Protocol amendment which seeks to address the HFC issue. The country wants the issue to be dealt with by the Kyoto Protocol which falls under the United Nations Framework Convention on Climate Change. That approach requires only developed countries to phase out gases having global warming potential.

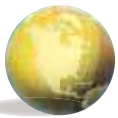
While China and India have different positions on their approach to HFC phase-out agreements like the Montreal protocol, both countries recognize that safety has become the biggest issue faced by their developing cold chains.

China continues to struggle with safety issues, especially regarding training and standards. And although the government has regulations in place, enforcement is sporadic.

India is also plagued by many of the same safety challenges, especially those resulting from an inability to adopt widespread training and standards at the regulatory level, as well as antiquated systems that don't meet the standards applied in the United States and Europe.

IIAR is currently collaborating with China and India to provide safety resources, through work with the China Association of Refrigeration, and the Indian Association of Ammonia Refrigeration.

IIAR past president Bruce Badger spoke in China last year and urged an increased emphasis on training



operators and senior management and on educating facilities about the economic benefits of following proper procedures.

He said that cooperation between the industry and the government is vital in order to improve safety.

For India, reaching a consensus on training has been difficult. But the formation of the AAR has led to significant progress. The association's members have spread across the country over the past 18 months, conducting training programs and providing education on the safe and efficient use of ammonia.

In both India and China, "Education from the workers on up to the owners is the key," said Badger. "And that is something we're starting to see in both places."

Meanwhile, in Europe the regulatory environment is pushing the faster adoption of natural refrigerants.

In Spain, a new tax on fluorinated greenhouse gases signaled that the country, like many others in Europe, is getting serious about outlawing all HFC's. The tax will apply to fluorinated gases or their mixtures with a global warming potential greater than 150 for up to a maximum of €100 per kilogram. The tax will be phased in gradually starting in January 2014 and 2015 to eventually reach a level corresponding to €20/tCO<sub>2</sub>eq in 2016.

In fact, the phase-out of synthetic refrigerants with a high global warming potential is being done on a local level all across Europe. Government programs that encourage the use of natural refrigerants include subsidies for supermarkets in Germany, tax exemptions in the Netherlands, and lower tax rates depending on contribution to global warming potential in Scandinavia, Switzerland and other countries.

In Australia, Prime Minister Tony Abbott published draft legislation to repeal the country's carbon tax, including the carbon component of the levy on synthetic greenhouse gases introduced by the preceding government.

After the levy was imposed in July, 2012, synthetic refrigerant prices skyrocketed by as much as 500 percent as manufacturers increased their prices more than the tax, creating a strong

incentive for facilities to switch to natural refrigerants.

The Australian Refrigeration Association responded to the potential tax repeal by presenting a list of issues to Australia's incoming prime minister, calling on the government to encourage rather than impede the industry to accept ammonia, and asking it to undertake a comprehensive training program and to educate the public on the benefits and feasibility of using natural refrigerants.

Meanwhile, in South America, countries like Chile and Brazil are facing regulatory changes of their own, while at the same time ramping up training programs to support a growing industry.

The biggest training news to come out of Chile during the past year is the development of the Good Practices Manual for Ammonia Refrigeration.

The Chilean Chamber of Refrigeration and Air Conditioning, in conjunction with the Ministry of Health, and with the support of the IAR and more than 36 volunteers from various sectors, said they have completed 95 percent of the manual.

In addition to the Good Practices Manual, a new occupational profile, "Ammonia Refrigeration Systems Operator," was also published in Chile last November.

The intent of both publications is to certify technicians and to implement pre-testing in order to evaluate competency.

Chile's Environment Ministry is creating training plans for technicians and is also scheduled this year to open a retail cold center that operates with CO<sub>2</sub> as a refrigerant, according to Peter Yufer, a member of the board of directors for the Chilean Chamber of Refrigeration and Air Conditioning.

Of special interest are plans by the Health Ministry to develop regulation for the use of ammonia refrigeration.

Meanwhile, Brazil, like many other countries, is in the process of eliminating HCFC-based refrigerants, with the consumption of R22 expected to begin falling by 2016.

The challenge facing Brazil is to gradually substitute R22 with alternatives, like natural refrigerants.

"There are many market product solutions including natural refrigerants. The sector will have to adjust to the technologies that best serve their business, while always evaluating the cost benefit in order to survive in the market," said Paulo Neulaender, ABRAVA's vice president for environment.

"We believe that natural refrigerants will provide a viable solution in a certain segment of the sector. They are an excellent option environmentally. The market will have to adjust to this because we're certain that natural refrigerants are here to stay."

Neulaender said Brazil is counting on IAR's support and partnership as a transition to natural refrigerants in that country continues. Adriano Castro Rocha, ABIAF president, echoed those sentiments, adding that the IAR's experience with natural refrigerants will help the country accelerate their use in the Brazilian marketplace.

"This could be achieved by way of agreements, technical visits, courses, manuals and standards, and by supporting the technological development of the cold storage industry," he said. "This contribution will be reflected not only in the upgrade of current installations, but also in the reduction of operational costs, and, consequently, current logistical costs in Brazil."

The requirements of the Montreal Protocol will result in the revision of the existing design and construction standards in Brazil, leading to opportunities for manufacturers and installers who must update systems to comply.

In Brazil, like many other countries these days, there is a "growing consciousness of environmental responsibility" among governments that see the economic benefits of ammonia and other natural refrigerants, said Rocha.

Nevertheless, while environmental agreements and regulations may be driving the industry in much of the world, economic incentives shouldn't be overlooked, he said. "Natural refrigerants tend to be more energy efficient; contributing to economic benefits worldwide in whatever market they're used. They just make sense."



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## ARF 2-Phase Flow Project Looks at Piping Configuration

What difference does the design of vertical piping arrangements have on two-phase ammonia flow? Can pressure drop in the suction riser be minimized or stabilized, leading to a significant decrease in power consumption at the compressor?

Jeff Welch, chairman of the research committee, says the project will allow designers to “really see behind the numbers, minimizing the guesswork.”

“If you watch the small things, those small things will contribute to much bigger gains in efficiency. That’s

minimum vapor velocity required to pull liquid up a pipe.

In contrast, the ARF 2-Phase Flow Project is examining the entrance configuration to the riser. Researchers are comparing elbow and Ptrap configurations to measure differences in pressure drop, hoping to more fully understand how different configurations affect fluid flow behavior.

This collaborative effort has allowed AFR to piggy-back on the larger ASHRAE project and to take advantage of an existing rig to conduct research. Without the ASHRAE project, the ARF 2-Phase Flow project could not have happened, said Bruce Nelson, a member of the research committee and the project’s monitoring subcommittee chairman.

“The information produced by this study will further our understanding of two-phase pressure drop and flow in risers, and should lead to better designs with this critical part of ammonia piping systems,” said Nelson.

A key aspect of the ARF project will assess how liquid is collected before being swept up the pipe.

“It’s easy to see that a Ptrap [at the bottom of the suction riser] will create pools of liquid, but it may not happen the same way with an elbow configuration,” Nelson said. “The ASHRAE handbook will always tell you to put a Ptrap at the bottom of the suction riser, but other engineers say that creates the risk of slug or plug liquid traveling up the riser.”

Slug or plug liquid traveling up the riser can lead to hydraulic shock, and, potentially, mechanical failure of pipes, valves and other components in the system, said Nelson.

A more detailed understanding of pressure drop is also significant for maximizing energy efficiency, especially at freezer temperatures. A large pressure drop in the suction riser forces the compressor to operate at a lower suction pressure, and therefore consumes more power. Obviously, the

The ARF 2-Phase Flow Project is examining the entrance configuration to the riser. Researchers are comparing elbow and Ptrap configurations to measure differences in pressure drop, hoping to more fully understand how different configurations affect fluid flow behavior.

Researchers hope to answer these questions and more with a project being conducted by the Ammonia Research Foundation, or ARF, in conjunction with ASHRAE RP-1327.

The goal: To take the configuration of piping systems from an art to a science.

what we’re doing here,” he said.

ARF has entered into an agreement with the Danish Technical Institute to test refrigerant flow using a rig that was previously built for a project DTI is conducting for ASHRAE. The ASHRAE project will determine the

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compressor must then work harder. Researchers are hoping to quantify how pressure drop in different configurations tax the compressor.

The project also allows researchers to visually monitor what is happening through a clear section in the pipe that matches the diameter of a steel pipe. Several tests are being conducted at low temperatures, with comparisons being made on pressure drop and fluid flow between the elbow and Ptrap configurations. There is a major risk of hydraulic shock during

a defrost, so researchers are observing flow patterns that could result in slug or plug liquid.

The ASHRAE project was first conceptualized nearly a decade ago. It required building a test rig, now located in Denmark, that could transfer a significant amount of ammonia vapor through a riser pipe. Researchers hope to discover the most efficient velocity required in order for ammonia vapor to sweep ammonia liquid up a pipe. This is important because a majority of the evaporators in the ammonia

refrigeration industry are mounted below headers, which are mounted on roofs requiring a riser in the piping. By discovering the most efficient velocity in these risers, systems can be designed more effectively.

“The exciting thing is that the gaps in our knowledge that will close [as a result of the ARF 2-Phase Flow project],” Nelson said. “It’s going to make our systems more energy efficient and safer, and that is directly related to our mission, which is to save energy and improve safety.”

## ARF Names Scholarship Recipients

Four students will be recognized as ARF scholarship recipients at the upcoming IAR Annual Conference and Heavy Equipment Show in Nashville, Tenn. The Ammonia Refrigeration Foundation, which supports research and education programs benefiting the industrial refrigeration industry, named Karlie Healy and Cody Eaton from the University of Wisconsin-Madison, Bryan Cius from Erie Community College and Mark Siemsen from Kansas State University as its 2014 scholarship recipients.

The goal of the ARF scholarship program is to encourage young engineers to pursue careers in industrial refrigeration and help develop new interests for natural refrigerants. Scholarship awardees complete an independent study on an industrial refrigeration-related project at the selected universities and colleges around the country.

In addition to supporting engineering education, the ARF scholarship aims to attract future graduates to industrial refrigeration engineering.

“The ARF scholarship program has been a key element of our educational efforts, with the goal of attracting talented young individuals to our industry,” said Tim Facius, ARF executive director. “The schools we have worked with have been carefully selected by our Education Committee for their thermal sciences programs,

and the students are selected based on their academic performance and interest in the thermal sciences.”

Karlie Healy will graduate in December with a degree in mechanical engineering and is hoping to work for a manufacturing company. She is interested in thermodynamics, fluid mechanics, mechanical systems and power generation. Last summer she interned at Boston Scientific and Caterpillar.

Cody Eaton is enrolled in the Thermal Energy Certificate Program at Wisconsin and has participated in related research in the solar energy lab and the Engine Research Center. He has completed internships as a machinery reliability engineer at Flint Hills Resources and as a project engineer at BE Aerospace.

Although Erie Community College’s program is aimed at residential and commercial applications, Bryan Cius displayed a passion for industrial refrigeration, choosing to take an elective course in that discipline and showing uncommon interest during a class trip to a large ice cream manufacturing facility.

“His interest in the subject material made him stand out,” said Marvin Tryon, project director for industrial technology at ECC. “It was above and beyond. He was not only the best student in the class, but the most interested.”

Mark Siemsen has been active in the mechanical engineering department throughout his four years at Kansas State. He interned at The Coleman Company in Wichita during the summer of 2013, and he has accepted an internship with Cessna Aircraft’s Pneumatic Systems division for the summer of 2014.

He has shown a special interest in the thermal area, and has worked closely with Don Fenton, professor of mechanical and nuclear engineering at Kansas State.

“Students like Mark are perfect for our industry because they can be effective engineers both for food processing companies and also refrigeration designers,” Fenton said. “All of our students have a solid background in controls and using computers to affect those controls. They can bring that to the refrigeration industry.”

All scholarship recipients will have the opportunity to visit an industrial refrigeration site in the vicinity of their school.

The Ammonia Refrigeration Foundation is a non-profit research and education foundation that was originally organized by members of the International Institute of Ammonia Refrigeration to promote educational and scientific projects related to industrial refrigeration and the use of ammonia and other natural refrigerants.



# 2014 – A Busy Year for OSHA Regulations

**iiar** government

## RELATIONS

BY LOWELL RANDEL, IIAR GOVERNMENT RELATIONS DIRECTOR

This year looks to be a busy one for the Occupational Safety and Health Administration. Two major initiatives pertaining to Process Safety Management and injury and illness recordkeeping are already under consideration by the agency and the long awaited proposed rule on Injury and Illness Prevention Programs appears to be on the horizon. Changes to these regulations could have a significant impact on the industrial refrigeration industry.

### PROCESS SAFETY MANAGEMENT – REQUEST FOR INFORMATION

In December 2013, OSHA published a Request for Information (RFI) regarding Process Safety Management (PSM) regulations. The RFI was generated as a part of the Obama Administration's efforts to implement Executive Order 13650 - Improving Chemical Facility Safety and Security. The Executive Order requires OSHA to publish, within 90 days, an RFI designed to identify issues related to modernization of its PSM standard and related standards necessary to meet the goal of preventing major chemical accidents. The Executive Order came in response to the accident last year in West, Texas and directs OSHA, the Department of Homeland Security, Environmental Protection Agency and other agencies to examine their regulations and propose ways to improve chemical safety and security.

Through the RFI, OSHA is requesting comments on possible revisions to the PSM standard. The PSM standard was originally promulgated in 1992 when OSHA was responding to a number of catastrophic releases of hazardous chemicals and set threshold quantities for specific substances to be regulated. For the industrial refrigeration industry, the most prevalent PSM chemical is ammonia and facilities

with more than 10,000 pounds of ammonia are subject to PSM regulations.

The RFI represents the first major effort to revise PSM regulations since their inception. The request lists 17 areas where OSHA is considering potential regulatory changes, many of which could impact the industrial refrigeration industry. The following are some of the proposed changes of particular interest to IIAR members:

- Revising the PSM Standard To Require Additional Management-System Elements
- Amending Paragraph (d) of the PSM Standard to Require Evaluation of Updates to Applicable recognized and generally accepted good engineering practices (RAGAGEP);
- Clarifying the PSM Standard by Adding a Definition for RAGAGEP
- Expanding the Scope of Paragraph (j) of the PSM Standard To Cover the Mechanical Integrity of Any Safety-Critical Equipment
- Clarifying Paragraph (l) of the PSM Standard With an Explicit Requirement That Employers Manage Organizational Changes
- Revising Paragraph (n) of the PSM Standard To Require Coordination of Emergency Planning With Local Emergency-Response Authorities
- Revising Paragraph (o) of the PSM Standard To Require Third-Party Compliance Audits

IIAR membership comprises thousands of PSM covered facilities across the nation so the above proposed changes to the standards are of great interest. The RFI is also important to IIAR because it specifically addresses RAGAGEP issues. IIAR is an ANSI accredited standards writ-

ing body whose standards are used as RAGAGEP by OSHA and other regulatory agencies. The RFI presents a good opportunity for IIAR to address the ways its standards are used by OSHA as RAGAGEP and overall RAGAGEP policies.

OSHA is seeking public comment on the RFI with a deadline of March 10, 2014. IIAR has developed a task force and is working with like-minded partners to develop formal comments in response to the RFI. IIAR members can review the RFI on the OSHA website at: [https://www.osha.gov/chemicalexecutiveorder/OSHA\\_PSM\\_RFI.pdf](https://www.osha.gov/chemicalexecutiveorder/OSHA_PSM_RFI.pdf). Members are encouraged to contact IIAR headquarters if they have any questions or comments about the RFI.

It is expected that the RFI will be the first step in a process for OSHA to go through the formal rulemaking procedure to revise PSM. Once OSHA has analyzed the public comments received from the RFI, the next step will likely be the publication of a proposed rule, followed ultimately by a final rule. Because PSM is a complicated and far reaching regulation, the formal process to change the rules will take some time. IIAR will continue to actively engage with OSHA as the process moves forward.

### ELECTRONIC RECORDKEEPING AND REPORTING PROPOSAL

In late 2013, OSHA published a proposed rule entitled "Improve Tracking of Workplace Injuries and Illnesses." OSHA's stated purpose of this rule-making is to improve workplace safety and health through the collection of useful, accessible, establishment specific injury and illness data to which

*continued on page 20*



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OSHA currently does not have direct, timely, and systematic access.

Currently, employers are compelled to report injury and illness data to OSHA under the following four circumstances:

- The injury or illness results in death or overnight hospitalization (for more than observation) of three or more employees.
- OSHA requests or subpoenas recordkeeping data during an enforcement inspection.
- Information is requested as a part of OSHA's Data Initiative Survey of industries with high injury and illness rates.
- The Bureau of Labor Statistics (BLS) requests data for its Survey of Occupational Injuries and Illnesses.

The proposed rule would add the following three new reporting requirements for employers:

- Employers with 250 or more employees and that are required to keep injury and illness records, must electronically submit these records to OSHA on a quarterly basis.
- Establishments with 20 or more employees and are in certain designated industries must electronically submit their OSHA annual summary (Form 300A) on an annual basis. *It is important to note that many IIAR end user industry codes are designated in the proposed rule.*
- Employers who receive specific notification from OSHA must electronically submit requested information from their Part 1904 injury and illness records.

According to the proposed rule, OSHA will use the electronic submissions to compile a database of timely, establishment-specific injuries and illnesses, and to identify workplaces where workers are at greater risk of illness and injury. Information submitted to the database would be publically accessible on-line. The public availability of the database is of great concern and would likely lead to serious unintended consequences.

Making the information publically accessible will likely result in underreporting of injuries and illnesses. Companies are likely to spend more time working on what should or should not be recorded, and less time working on proactive safety programs. There is also a privacy concern for employees. While names and other identifying information would be removed from the on-line database, enough information may be available to determine the identity of an employee, particularly by those with some connection to the company or individual. In addition, some employees may not want to "hurt" their company's rates and be hesitant to report injuries. Information in the public database can also lead to misrepresentation or misinterpretation by third parties, as injury and illness records provide minimal details about incidents and all of the circumstances involved.

There is also a concern that the new reporting requirement will lead to increased inspections and enforcement activity. Under the quarterly reporting timeframe, injuries and illnesses will be reported every three months. OSHA has a six month statute of limitations from the occurrence of an injury or illness. Therefore, all recordable injuries and illnesses will be in front of OSHA no more than three months after they occur.

IIAR will continue to monitor the status of the proposed regulatory change and keep members informed of any changes to the compliance requirements. A copy of the proposed rule and related information can be found on the OSHA website at: [https://www.osha.gov/recordkeeping/proposed\\_data\\_form.html](https://www.osha.gov/recordkeeping/proposed_data_form.html).

### INJURY AND ILLNESS PREVENTION PROGRAMS (I2P2)

Establishment of Injury and Illness Prevent Programs (I2P2) regulations remains a top priority for OSHA leadership. I2P2 has been on the OSHA regulatory agenda for over two years, but the agency has yet to publish a proposed rule. However, there are strong indications that 2014 will be the year that a proposed rule will finally be published. The agency's latest semi-

annual regulatory agenda states the goal of publishing a proposed rule for I2P2 by September 2014.

According to OSHA, Injury and Illness Prevention Programs are proactive processes that can substantially reduce the number and severity of workplace injuries and illnesses. These systematic programs are designed to allow employers and workers to collaborate on an ongoing basis to find and fix workplace hazards before workers are hurt or become ill.

- OSHA has identified the following five major elements of an effective I2P2 program:
- Management Leadership
- Worker Participation
- Hazard Identification and Assessment
- Hazard Prevention and Control
- Education and Training

OSHA sites the use of I2P2 type programs in a number of states as demonstrating the success of this proactive approach to preventing workplace injuries. According to OSHA, thirty-four states currently have some type of program initiatives for worker safety and health protection.

Many IIAR members already address these elements in their current safety programs, particularly those subject to PSM regulations. However, there are concerns about the costs and burdens that would be placed on employers if the new program goes into effect. Much like the General Duty Clause, it is feared that OSHA will use the I2P2 standard to cite employers for failing to address a hazard, even if there is not an established hazard specific standard. For example, some believe that I2P2 may be a way for OSHA to address ergonomics without advancing a rule on that specific topic.

Given the depth of concern being expressed by the business community, it is expected that the rulemaking process for I2P2 will be controversial and time consuming. IIAR will continue to engage with OSHA as the rulemaking process develops.



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## Industrial Refrigeration Conference & Heavy Equipment Show in Nashville, TN!

# WELCOME TO NASHVILLE AND THE 2014 IIAR INDUSTRIAL REFRIGERATION CONFERENCE & HEAVY EQUIPMENT SHOW.



It's time again for our industry's largest equipment show, and we're looking forward to our best event yet. I'd like to take this opportunity to welcome all attendees to the 2014 IIAR Industrial Refrigeration Conference & Heavy Equipment Show.

Whether you're a long time IIAR member, or joining us for the first time, Nashville is the place to be this year to see the latest equipment, products, services and technologies our industry has to offer.

The IIAR show draws ammonia refrigeration professionals from all across the United States, Canada and Mexico, and as far away as South America, Europe, Australia, and Asia.

It has become a truly global gathering of key decision-makers in our industry and this year will be no exception. In fact, we're expecting our highest attendance and exhibition level yet, a truly exciting milestone!

This year, the conference will also feature an exclusive event, the PSM and RMP Workshop, where PSM and RMP experts will give their unique insight on strategies for implementing process safety management and risk management plans. The workshop will focus on PSM/ RMP-covered processes and outline how to avoid common pitfalls while performing the best and most effective audits.

Meanwhile, IIAR attendees are invited to participate in the Ammonia Safety Training Day, presented by the Ammonia Safety Training Institute. The half-day workshop is designed to strengthen relationships among industry, public safety and the regulatory community.

Beyond our unique special events this year, we're again looking forward to a strong, informative technical program that is focused on practical information that will help the industry continue to advance.

I want to thank the companies who provide the important financial support for IIAR through their participation at this conference, and our members who are always ready to make the important contribution of their time.

I'd like to especially thank every paper author, workshop presenter and panel participant who has developed the presentations that provide insight for everyone who attends this conference. And, a special thank you to the companies for encouraging and supporting this essential volunteer work.

Welcome to Nashville, and I hope you enjoy this year's Industrial Refrigeration Conference & Heavy Equipment Show.

Best regards,

**Tom Leighty**  
2014 Conference Chair



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Exhibit Hall Lunch - Monday, March 24



Continental Breakfast - Monday, March 24



Registration Maps



Afternoon Break - Monday, March 24



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Morning Break - Tuesday, March 25



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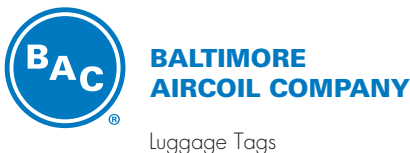
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Continental Breakfast - Wednesday, March 26

## AMMONIA SAFETY TRAINING PROGRAM • Sunday, March 23 • 8:00 AM – 12:00 PM

Presented by the Ammonia Safety Training Institute (ASTI) in collaboration with IIAR exclusively for the 2014 IIAR Industrial Refrigeration Conference & Heavy Equipment Show.

This half day educational program is designed to strengthen relationships among industry professionals, public safety officials, and the regulatory community by creating a stronger level of positive awareness and network engagement concerning ammonia safety. The intended audience for the Ammonia Safety Training program includes but is not limited to end-users and facility personnel who create policy for and respond to ammonia releases and accidents, first responders, and emergency personnel. Anyone interested in ammonia safety with regard to Industrial Refrigeration may attend.

With an emphasis on ammonia safety and regulatory compliance pertaining to emergency response, this program has been designed to feed in to the afternoon IIAR PSM/RMP program.

The Ammonia Safety Training Program covers the following topics:

- Understanding the link between an Emergency Action Plan and Emergency Response Plan
- Linking your process hazard analysis to the strategy for engaging emergency preparedness planning
- Using PSM and RMP prevention, mitigation, and preparedness measures during pre-emergency, incidental control, and emergency response
- Emergency actions during the first 30 minutes - discovery and initial response
- Most effective PPE choices that match the emergency plan strategic expectations
- Evaluating hazards of ammonia before engaging action
- Crisis communications and recovery activities



&



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**Date:** Sunday March 23, 2014  
**Time:** 8:00am – 12:00pm  
**Location:** Renaissance Nashville Convention Center  
Room 205/206 – Broadway Ballroom  
**Fee:** FREE – Registration is required



**2014 IIAR PSM/RMP PROGRAM • Sunday, March 23, 2014 • 1:00 PM – 5:00 PM**

Exclusive to the 2014 IIAR Conference, this educational program examines IIAR’s model *Process Safety Management and Risk Management Program Guidelines* and presents strategies for implementing it in your facilities. In addition, this program will discuss how to best conduct effective audits for regulatory compliance. The program concludes with a discussion of PSM/RMP typical program weaknesses that are consistently arising as a result of regulatory inspections as part of OSHA’s National Emphasis Program.

The IIAR PSM/RMP Program will help you:

- Prepare for regulatory visits
- Conduct effective audits
- Avoid common pitfalls that lead to non-compliance issues during NEP and other Inspections
- Significantly enhance the safety of your ammonia-covered processes.

**Are You In Compliance 100%?**

Introduction to OSHA’s PSM and EPA’s RMP Rules and Who Must Comply	Jet C Stiffler, Process Compliance, Inc.
Where do we begin? Basics of a Risk Management Plan	Peter Thomas, Resource Compliance Inc.
IIAR To the Rescue: Effectively using IIAR <i>Process Safety Management and Risk Management Program Guidelines</i>	Peter Jordan, MBD Risk Management Services, Inc.
<b>30 Minute Break</b>	
Challenges facing the Ammonia Refrigeration Industry: Audit Guidance	Doug Reindl, Industrial Refrigeration Consortium University of Wisconsin-Madison
Conclusion: Next Steps and Takeaways	Jet C Stiffler, Process Compliance, Inc.
<b>Question and Answer</b>	

**Date:** Sunday, March 23, 2014  
**Time:** 1:00pm – 5:00pm  
**Location:** Renaissance Nashville Convention Center  
 Room 205/206 – Broadway Ballroom  
**Fee:** \$250.00

Each attendee will receive a coupon for a 20% discount off the member price of the *IIAR Process Safety Management and Risk Management Program Guidelines* to be redeemed at the IIAR Bookstore located at the entrance of the Exhibit Hall. This coupon must be redeemed at the conference.

# PROGRAM SCHEDULE

## IIAR 2014 INDUSTRIAL REFRIGERATION CONFERENCE & HEAVY EQUIPMENT SHOW

### Saturday, March 22

8:00 AM	Registration Open (ends at 5:00 PM)	CC - First Floor Lobby
8:00 AM	Exhibitor Setup (ends at 5:00 PM)	CC - Exhibit Hall Center/ West - First Floor
12:00 PM	Board Luncheon and Meeting — <i>Invitation Only</i> (ends at 5:00 PM)	RH - Belmont 1 and Belmont 2/3

### Sunday, March 23

7:00 AM	IIAR Committee Meetings (ends at 12:00 PM)	CC - See Committee Breakout Section
8:00 AM	Registration Open (ends at 5:00 PM)	CC - First Floor Lobby
8:00 AM	Exhibitor Setup (ends at 5:00 PM)	CC - Exhibit Hall Center/ West - First Floor
8:00 AM	FREE Ammonia Safety Training Program — <i>Separate Registration Required</i> (ends at 12:00 PM)	CC - 205/206 - Broadway Ballroom
1:00 PM	The IIAR PSM/ RMP Training Program — <i>Separate Paid Registration Required</i> (ends at 5:00 PM)	CC - 205/206 - Broadway Ballroom
1:00 PM	International Committee (ends at 4:00 PM)	CC - 204
4:00 PM	Latin America Committee (ends at 5:00 PM)	CC - 204
5:30 PM	First Timer's Reception (ends at 6:00 PM)	RH - Music City Ballroom
6:00 PM	Chairman's Reception (ends at 7:00 PM) — <i>Sponsored by Republic Refrigeration</i>	RH - Grand Ballroom

### Monday, March 24

7:00 AM	Registration Open (ends at 5:00 PM)	CC - First Floor Lobby
7:00 AM	Continental Breakfast — <i>Sponsored by Summit Refrigeration Group</i>	CC - 200 Level Foyer
7:30 AM	IIAR Business Meeting	CC - 205/206 - Broadway Ballroom
8:00 AM	Key Note Speaker — Astronaut Mike Mullane	CC - 205/206 - Broadway Ballroom
9:00 AM	Country Line Dancing Class — Spouse/Guest — <i>Separate Registration Required</i> (ends at 10:00 AM)	RH - Belmont 2/3
9:15 AM	Exhibit Hall Opens	CC - Exhibit Hall Center/ West - First Floor
9:30 AM	Technomercial #1 — Vilter Manufacturing LLC: Total Cost of Compressor Ownership	CC - Exhibit Hall - Back of Hall
10:00 AM	Break Exhibit Hall — <i>Sponsored by Parker Hannifin</i>	CC - Exhibit Hall Center/ West - First Floor
10:30 AM	Technomercial #2 — EVAPCO, Inc. : EVAPCO's new SST-A Series Evaporators — Featuring AHRI Certified Performance and More!	CC - Exhibit Hall - Back of Hall
11:15 AM	Technomercial #3 — FRICK by Johnson Controls: Condensing Options and the Drivers Influencing Them	CC - Exhibit Hall - Back of Hall
12:00 PM	Lunch Exhibit Hall — <i>Sponsored by EVAPCO, Inc.</i>	CC - Exhibit Hall Center/ West - First Floor
12:30 PM	Technomercial #4 — Colmac Coil: Colmac A+Series™ Evaporators for CO <sub>2</sub> Refrigeration	CC - Exhibit Hall - Back of Hall

1:15 PM	Technomercial #4 — Colmac Coil: Low Charge DX Ammonia Case Studies	CC - Exhibit Hall - Back of Hall
1:45 PM	Exhibit Hall Closes	CC - Exhibit Hall Center/ West - First Floor
2:00 PM	Green Door Gourmet Farm Tour — Spouse/ Guest — <i>Separate Paid Registration Required — Space is limited</i> — (ends at 4:00 PM) — <b>Meet in Renaissance lobby at 1:30 PM for bus transfer</b>	River Road, Nashville, TN
2:00 PM	TP #1 — Comparison of Various Methods of Mitigating Over Pressure Induced Release Events Involving Ammonia Refrigeration Using Quantitative Risk Analysis (QRA)	CC - 103/104
	TP #8 — Refrigerant Charge Reduction: Strategies and Results in Building Ultra Low Charged Ammonia Systems	CC - 108/109
	WS #1 — Machinery Room Ventilation Analysis Tool	CC - 209/210
	SP #1 — Consideraciones en la selección de válvulas de seguridad para sistemas de refrigeración industrial	CC - 208
2:45 PM	TP #2 — Ammonia Refrigeration System Pressure Relief Vent Design Evaluation	CC - 103/104
	TP #7 — Chemical Vapor Protective Clothing While Working in Atmospheres of Less Than 15,000 PPM of Ammonia Vapor	CC - 108/109
	WS #2 — Optimized Design Strategies for Industrial Heat Pump Applications	CC - 209/210
	SP #2 — Reduciendo la carga de amoníaco en sistemas de refrigeración industrial utilizando expansión directa	CC - 208
3:30 PM	Break in Foyer — <i>Sponsored by MR Braz &amp; Associates</i>	CC - First Floor Lobby
4:00 PM	TP #3 — Layers of Protection Analysis in Ammonia Refrigeration Systems	CC - 103/104
	TP #6 — Modeling of Releases from Ammonia Refrigeration Pressure Relief Valves Using Dispersion Modeling Software	CC - 108/109
	WS #3 — Ammonia Charge Reduction and Revamping of Refrigeration System Installed for Dairy in India	CC - 209/210
	SP #3 — Aplicación de válvulas de servicio y de control en sistemas usando amoníaco como refrigerante	CC - 208
4:45 PM	TP #4 — Comparing Evaporative and Air-Cooled Condensing for Ammonia Systems	CC - 103/104
	TP #5 — Ammonia Refrigeration Machinery Exhaust Treatment	CC - 108/109
	WS #4 — Welding Procedures for Ammonia Refrigeration Systems	CC - 209/210
	SP #4 — Deshielo por gas caliente en sistemas de refrigeración sin alterar la presión de evaporación	CC - 208
6:00 PM	Reception — <i>Sponsored by GEA</i>	RH - Grand Ballroom Foyer
6:30 PM	Banquet (ends at 10:00 PM) — <i>Sponsored by GEA</i>	RH - Grand Ballroom

# PROGRAM SCHEDULE

THE RENAISSANCE NASHVILLE HOTEL & CONVENTION CENTER • MARCH 23–26, 2014

## Tuesday, March 25

7:00 AM	Registration Open (ends at 5:00 PM)	CC - First Floor Lobby
7:30 AM	Exhibit Hall Opens	CC - Exhibit Hall Center/ West - First Floor
7:30 AM	Continental Breakfast in Exhibit Hall — <i>Sponsored by Farley's S.R.P., Inc.</i>	CC - Exhibit Hall Center/ West - First Floor
8:00 AM	Technomercial #6 - Bitzer : BITZER Ammonia Packages	CC - Exhibit Hall - Back of Hall
8:45 AM	Technomercial #7 - Polyguard Products, Inc.: Pipe Coatings that Reduce the Risk of CUI	CC - Exhibit Hall - Back of Hall
9:00 AM	Finance Committee (ends at 10:00 AM)	CC - 110/111
9:30 AM	Technomercial #8 — Process Compliance Inc.: Got Compliance? Are You Ready For An Audit?	CC - Exhibit Hall - Back of Hall
10:00 AM	Country Music Hall of Fame Tour — Spouse/ Guest — <i>Separate Paid Registration Required (ends at 12:00 PM)</i>	Meet in Renaissance Hotel Lobby at 9:40 AM to walk to CMHF
10:00 AM	Break in Exhibit Hall — <i>Sponsored by Howden Compressors LLC</i>	CC - Exhibit Hall Center/ West - First Floor
10:30 AM	Technomercial #9 - MYCOM (Mayekawa USA): Ammonia Reinvented	CC - Exhibit Hall - Back of Hall
11:00 AM	Exhibit Hall Closes	CC - Exhibit Hall Center/ West - First Floor
11:00 AM	Exhibitor Advisory Committee (ends at 12:00 PM)	CC - 110/111
11:15 AM	TP #5 — Ammonia Refrigeration Machinery Exhaust Treatment	CC - 103/104
	TP #4 — Comparing Evaporative and Air-Cooled Condensing for Ammonia Systems	CC - 108/109
	WS #5 — The OSHA Chemical NEP: How to Minimize Your Risk	CC - 209/210
	SP #5 — Una visión general de la aplicación de CO <sub>2</sub> en supermercados en Brasil	CC - 208
12:15 PM	Code and Regulatory Update Lunch (ends at 1:30 PM)— <i>Sponsored by Vilter</i>	CC - 204/206 - Broadway Ballroom
1:45 PM	TP #6 — Modeling of Releases from Ammonia Refrigeration Pressure Relief Valves Using Dispersion Modeling Software	CC - 103/104
	TP #3 — Layers of Protection Analysis in Ammonia Refrigeration Systems	CC - 108/109
	WS #6 — Pre-startup Safety Reviews	CC - 209/210
	SW #1 — Procedimientos de instalación de tuberías y procedimientos de soldaduras para sistemas de refrigeración usando amoníaco como refrigerante	CC - 208
2:00 PM	Board Meeting (ends at 3:30 PM)— <i>Invitation Only</i>	RH - Belmont 2/3
2:30 PM	TP #7 — Chemical Vapor Protective Clothing While Working in Atmospheres of Less Than 15,000 PPM of Ammonia Vapor	CC - 103/104

	TP #2 — Ammonia Refrigeration System Pressure Relief Vent Design Evaluation	CC - 108/109
	WS #7 — Practical Considerations for Condenser Selection and Performance	CC - 209/210
	SW #2 — Aplicación de cambiadores de calor de microcanales a sistemas de amoníaco compactos	CC - 208
3:15 PM	TP #8 — Refrigerant Charge Reduction: Strategies and Results in Building Ultra Low Charged Ammonia Systems	CC - 103/104
	TP #1 — Comparison of Various Methods of Mitigating Over Pressure Induced Release Events Involving Ammonia Refrigeration Using Quantitative Risk Analysis (QRA)	CC - 108/109
	WS #8 — Department of Homeland Security — An Insider's Review of CFATS	CC - 209/210
3:30 PM	Exhibit Hall Opens	CC - Exhibit Hall Center/ West - First Floor
4:00 PM	Break in Exhibit Hall — <i>Sponsored by Colmac Coil</i>	CC - Exhibit Hall Center/ West - First Floor
4:30 PM	Technomercial #10 — HCR Inc. (Division of Jamison Door Company): Evaluation of Horizontal Recirculatory Air Curtain Efficiencies — Cooler to Conditioned Spaces	CC - Exhibit Hall - Back of Hall
6:00 PM	Exhibitors Reception (ends at 7:00 PM)	CC - Exhibit Hall Center/ West - First Floor
7:00 PM	Exhibit Hall Closes	CC - Exhibit Hall Center/ West - First Floor

## Wednesday, March 26

7:00 AM	Registration Open (ends at 10:00 AM)	CC - First Floor Lobby
7:00 AM	CO <sub>2</sub> Committee (ends at 9:00 AM)	CC - 208
7:00 AM	ARF Board Meeting (ends at 8:45 AM) — <i>Invitation Only</i>	CC - 102
7:30 AM	Exhibit Hall Opens	CC - Exhibit Hall Center/ West - First Floor
7:30 AM	Continental Breakfast — Exhibit Hall — <i>Sponsored by MYCOM (Mayekawa USA)</i>	CC - Exhibit Hall Center/ West - First Floor
9:30 AM	Exhibit Hall Closes	CC - Exhibit Hall Center/ West - First Floor
9:00 AM	Panel 1 — Research Panel: CO <sub>2</sub> , the Next Best Thing Since Natural Gas for Heating Water; ARF Update; ASHRAE Update	CC - 103/104
9:00 AM	Panel 2 — International Panel: Global View of Industrial Refrigeration	CC - 108/109
10:30 AM	Break in Foyer — <i>Sponsored by Airgas</i>	CC - First Floor Lobby
11:00 AM	Closing Forum — Characteristics and Applications of Small Charge Systems	CC - 108/109
12:30 PM	Conference Adjourns	

TP = Technical Paper    WS = Workshop  
 SP = Spanish Language Paper    SW = Spanish Language Workshop  
 RH = Renaissance Hotel    CC = Renaissance Nashville Convention Center

# TECHNICAL PROGRAM

## 2014 TECH PAPER SCHEDULE

### Technical Paper #1

Comparison of Various Methods of Mitigating Over Pressure Induced Release Events Involving Ammonia Refrigeration Using Quantitative Risk Analysis (QRA)

Monday, March 24 | 2:00 PM | Room 103/104  
Tuesday, March 25 | 3:15 PM | Room 108/109

### Technical Paper #2

Ammonia Refrigeration System Pressure Relief Vent Design Evaluation

Monday, March 24 | 2:45 PM | Room 103/104  
Tuesday, March 25 | 2:30 PM | Room 108/109

### Technical Paper #3

Layers of Protection Analysis in Ammonia Refrigeration Systems

Monday, March 24 | 4:00 PM | Room 103/104  
Tuesday, March 25 | 1:45 PM | Room 108/109

### Technical Paper #4

Comparing Evaporative and Air-Cooled Condensing for Ammonia Systems

Monday, March 24 | 4:45 PM | Room 103/104  
Tuesday, March 25 | 11:15 AM | Room 108/109

### Technical Paper #5

Ammonia Refrigeration Machinery Exhaust Treatment

Monday, March 24 | 4:45 PM | Room 108/109  
Tuesday, March 25 | 11:15 AM | Room 103/104

### Technical Paper #6

Modeling of Releases from Ammonia Refrigeration Pressure Relief Valves Using Dispersion Modeling Software

Monday, March 24 | 4:00 PM | Room 108/109  
Tuesday, March 25 | 1:45 PM | Room 103/104

### Technical Paper #7

Chemical Vapor Protective Clothing While Working in Atmospheres of Less Than 15,000 PPM of Ammonia Vapor

Monday, March 24 | 2:45 PM | Room 108/109  
Tuesday, March 25 | 2:30 PM | Room 103/104

### Technical Paper #8

Refrigerant Charge Reduction: Strategies and Results in Building Ultra Low Charged Ammonia Systems

Monday, March 24 | 2:00 PM | Room 108/109  
Tuesday, March 25 | 3:15 PM | Room 103/104

*All Technical Paper sessions take place in the Convention Center*

## 2014 PROGRAMA EN ESPAÑOL

### Trabajo técnico #1

Consideraciones en la selección de válvulas de seguridad para sistemas de refrigeración industrial

Monday, March 24 | 2:00 PM

### Trabajo técnico #2

Reduciendo la carga de amoníaco en sistemas de refrigeración industrial utilizando expansión directa

Monday, March 24 | 2:45 PM

### Trabajo técnico #3

Aplicación de válvulas de servicio y de control en sistemas usando amoníaco como refrigerante

Monday, March 24 | 4:00 PM

### Trabajo técnico #4

Deshielo por gas caliente en sistemas de refrigeración sin alterar la presión de evaporación

Monday, March 24 | 4:45 PM

### Trabajo técnico #5

Una visión general de la aplicación de CO<sub>2</sub> en supermercados en Brasil

Tuesday, March 25 | 11:15 AM

### Taller #1

Procedimientos de instalación de tuberías y procedimientos de soldaduras para sistemas de refrigeración usando amoníaco como refrigerante

Tuesday, March 25 | 1:45 PM

### Taller #2

Aplicación de cambiadores de calor de microcanales a sistemas de amoníaco compactos

Tuesday, March 25 | 2:30 PM

*All Spanish language sessions take place in Room 208 of the Convention Center*

# WORKSHOPS **PANELS** FORUMS

## 2014 WORKSHOP SCHEDULE

### Workshop #1

Machinery Room Ventilation Analysis Tool

Monday, March 24 | 2:00 PM

### Workshop #2

Optimized Design Strategies for Industrial Heat Pump Applications

Monday, March 24 | 2:45 PM

### Workshop #3

Ammonia Charge Reduction and Revamping of Refrigeration System Installed for Dairy in India

Monday, March 24 | 4:00 PM

### Workshop #4

Welding Procedures for Ammonia Systems

Monday, March 24 | 4:45 PM

### Workshop #5

The OSHA Chemical NEP: How to Minimize Your Risk

Tuesday, March 25 | 11:15 AM

### Workshop #6

Pre-startup Safety Reviews

Tuesday, March 25 | 1:45 PM

### Workshop #7

Practical Considerations for Condenser Selection and Performance

Tuesday, March 25 | 2:30 PM

### Workshop #8

Department of Homeland Security—An Insider's Review of CFATS

Tuesday, March 25 | 3:15 PM

*All Workshop sessions take place in Room 209/210 of the Convention Center*

## 2014 PANELS & FORUMS

### Panel #1

Research Panel: CO<sub>2</sub>, the Next Best Thing Since Natural Gas for Heating Water; ARF Update; ASHRAE Update

Wednesday, March 26 | 9:00 AM | Room 103/104

### Panel #2

International Panel: Global View of Industrial Refrigeration

Wednesday, March 26 | 9:00 AM | Room 108/109

### Closing Forum

Characteristics and Applications of Small Charge Systems

Wednesday, March 26 | 11:00 AM | Room 108/109

*All Panel sessions and the Closing Forum take place in the Convention Center*

### Technomercial #1

**Vilter Manufacturing LLC:** *Total Cost of Compressor Ownership*

Monday, March 24 | 9:30 AM

### Technomercial #2

**EVAPCO, Inc.:** *EVAPCO's new SST-A Series Evaporators – Featuring AHRI Certified Performance and More!*

Monday, March 24 10:30 AM

### Technomercial #3

**FRICK by Johnson Controls:** *Condensing Options and the Drivers Influencing Them*

Monday, March 24 | 11:15 AM

### Technomercial #4

**Colmac Coil:** *Low Charge DX Ammonia Case Studies*

Monday, March 24 | 12:30 PM

### Technomercial #5

**Parker Hannifin:** *Engineering Your Success through Real Solutions*

Monday, March 24 | 1:15 PM

### Technomercial #6

**BITZER:** *BITZER Ammonia Packages*

Tuesday, March 25 8:00 AM

### Technomercial #7

**Polyguard Products, Inc.:** *Pipe Coatings that Reduce the Risk of CUI*

Tuesday, March 25 | 8:45 AM

### Technomercial #8

**Process Compliance Inc.:** *Got Compliance? Are You Ready For An Audit?*

Tuesday, March 25 9:30 AM

### Technomercial #9

**MYCOM (Mayekawa USA):** *Ammonia Reinvented*

Tuesday, March 25 10:30 AM

### Technomercial #10

**HCR Inc. (Division of Jamison Door Company):** *Evaluation of Horizontal Recirculatory Air Curtain Efficiencies – Cooler to Conditioned Spaces*

Tuesday, March 25 4:30 PM

*All Technomercial sessions take place in Convention Center at the back of the Exhibit Hall*



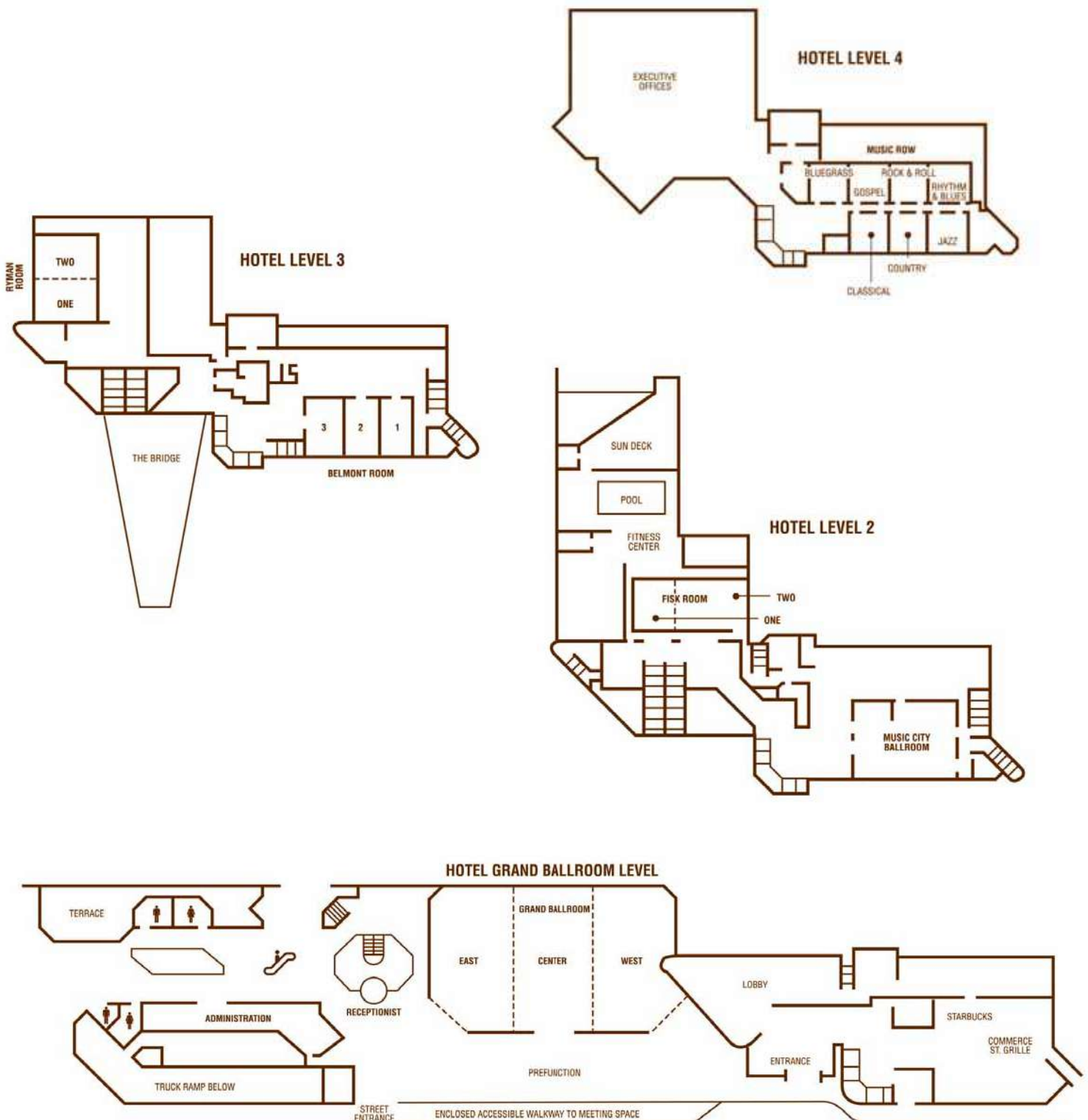
## 2014 COMMITTEE MEETING SCHEDULE

Committee Name	Day	Time	Location
Ammonia Foundation	Wednesday	7:00 AM – 8:45 AM	Room 201
CO <sub>2</sub>	Wednesday	7:00 AM – 9:00 AM	Room 208
Code*	Sunday	8:00 AM – 12:00 PM	Room 108/109 and 110/111
Education	Sunday	8:00 AM – 12:00 PM	Room 209/210
Exhibitor Advisory	Tuesday	11:00 AM – 12:00 PM	Room 110/111
Finance Committee	Tuesday	9:00 AM – 10:00 AM	Room 110/111
Government Relations	Sunday	8:00 AM – 12:00 PM	Room 203
International	Sunday	1:00 PM – 4:00 PM	Room 204
Latin American	Sunday	4:00 PM – 5:00 PM	Room 204
Marketing	Sunday	9:00 AM – 11:00 AM	Room 213/214
Piping	Sunday	8:00 AM – 12:00 PM	Room 211/212
Research	Sunday	8:00 AM – 12:00 PM	Room 208
Safety	Sunday	7:00 AM – 11:00 AM	Room 103/104
Standards*	Sunday	8:00 AM – 12:00 PM	Room 108/109

\*The Standards Committee and the Code Committee will have a joint meeting in Room 108/109 from 8:00 AM to 9:00 AM

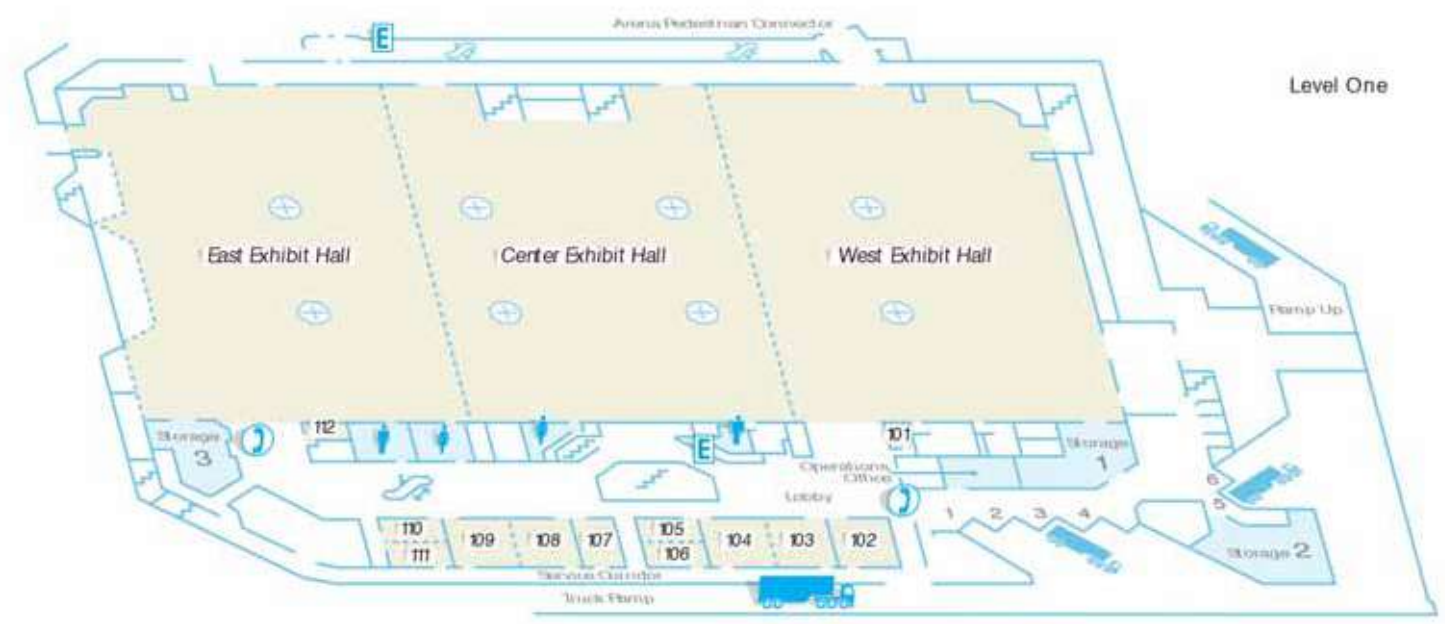
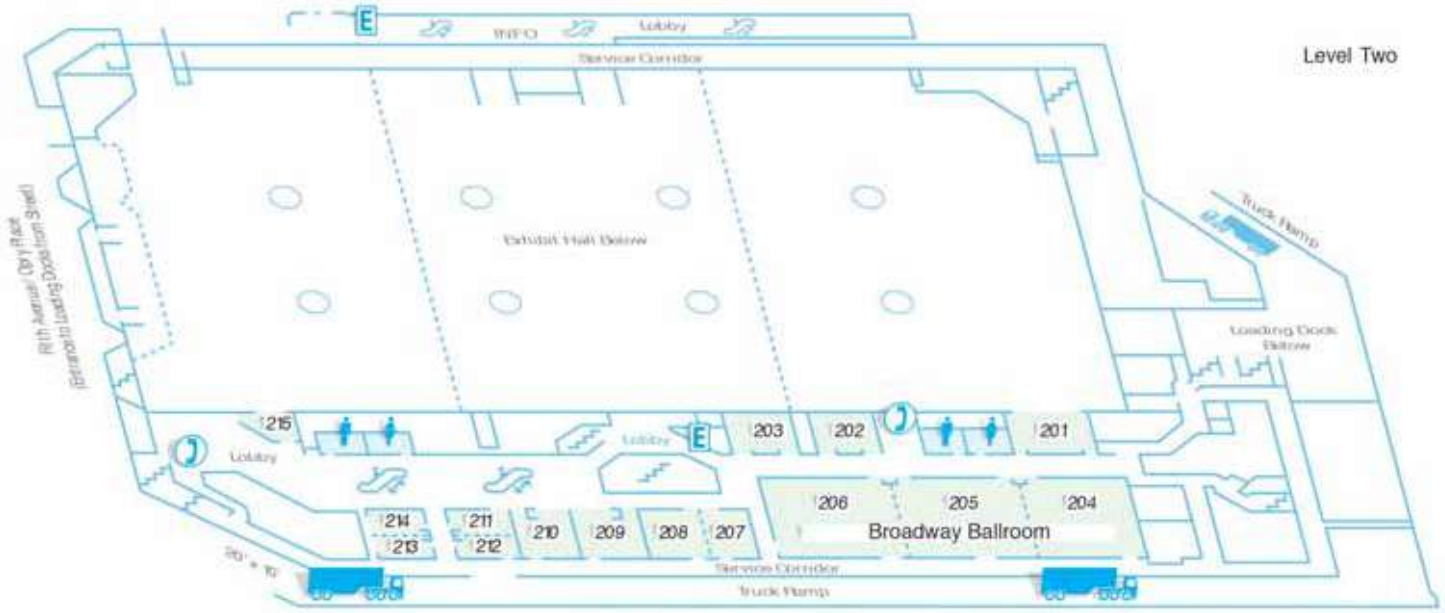
*All Committee meetings take place in the Convention Center*

## IAR 2014 INDUSTRIAL REFRIGERATION CONFERENCE & HEAVY EQUIPMENT SHOW



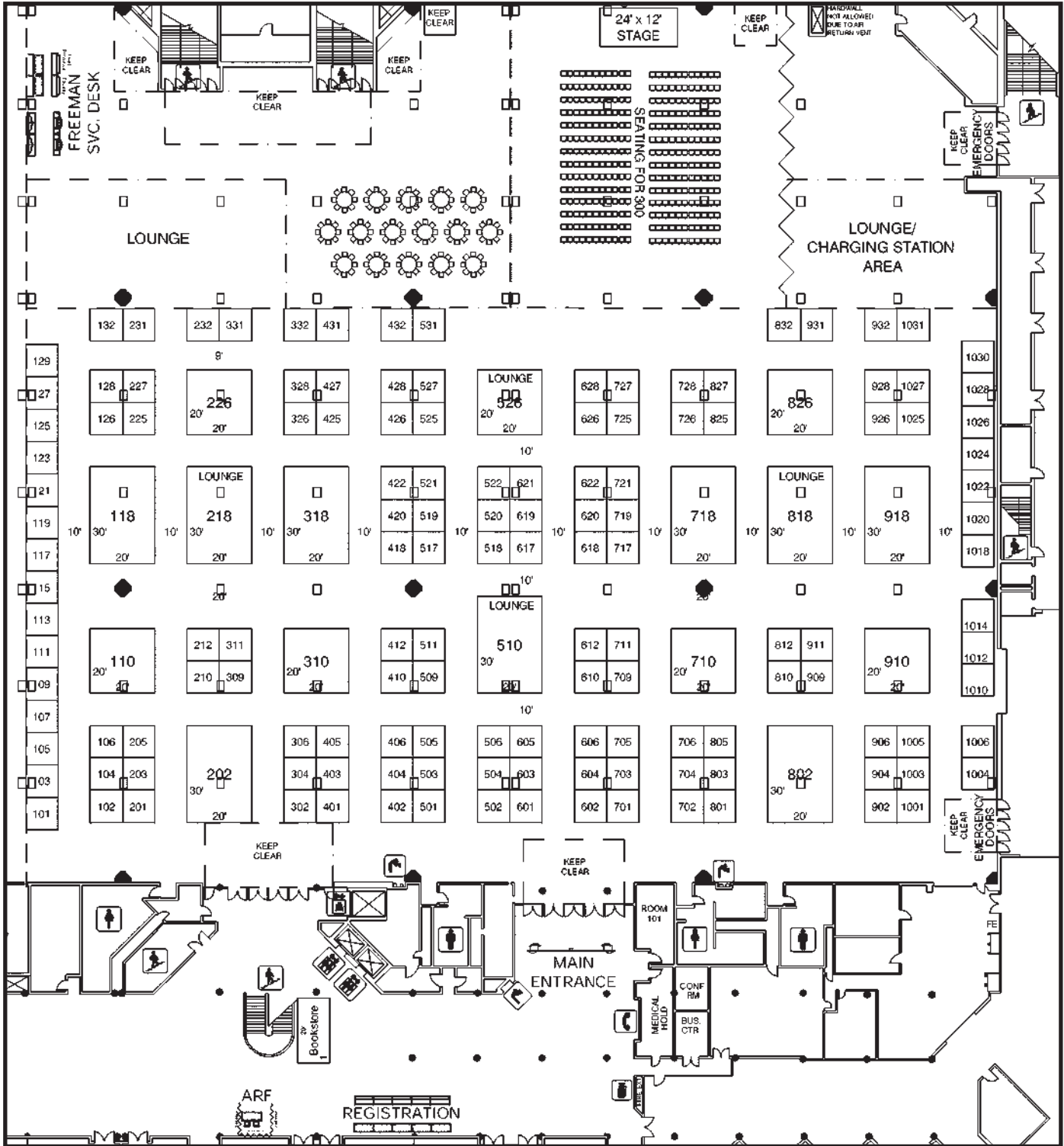
# CONVENTION CENTER MAP

THE RENAISSANCE NASHVILLE HOTEL & CONVENTION CENTER • MARCH 23–26, 2014



# EXHIBIT HALL FLOORPLAN

IAR 2014 INDUSTRIAL REFRIGERATION CONFERENCE & HEAVY EQUIPMENT SHOW



# EXHIBITOR LISTING

THE RENAISSANCE NASHVILLE HOTEL & CONVENTION CENTER • MARCH 23–26, 2014

## **A. Blasquez E.**

### **Refrigeración Industrial**

#### **S.A. de C.V. . . . . . Booth #926**

A. Blasquez E. Refrigeración (ABE) is the largest ammonia refrigeration contractor company in Latin America, specializing in refrigeration systems for breweries, beverages, food and cold storage industries. ABE - your refrigeration partner in Mexico.

#### **AAIM Controls . . . . . Booth #705**

From starters and drives to PLC systems and microprocessor designs, AAIM Controls has the expertise for all your automation requirements with over 90 years of combined refrigeration controls experience.

#### **Acuren . . . . . Booth #601**

Acuren's industry-leading mechanical integrity services for ammonia refrigeration systems include; Corrosion Under Insulation Scanning (CUI), Computerized Radiography (CR), API Tank and Vessel Inspections, and our exclusive inspection data management system, DMAPS.

#### **AIR . . . . . Booth #412**

AIR is your premier industrial refrigeration contractor; a division of Corval Group, Inc. AIR has been providing design/build engineering and installation, customized packaging skids, superior quality shop fabrication, parts and field service technicians across the U.S. and International markets since 1978.

#### **Airfoil Impellers . . . . . Booth #812**

Cast aluminum fan blades, machine room exhaust fans, product cooler fans, blast freezer fans, and general ventilation fans.

#### **Airgas . . . . . Booth #401, 403**

Airgas Specialty Products offers anhydrous ammonia, pump-outs, field service, safety video, safety training, and Cold Flow Sampler (for determining water in ammonia).

#### **Alfa Laval . . . . . Booth #1001**

Manufacturer and supplier of semi-welded plate heat exchangers, gasketed heat exchangers and 100% stainless steel fusion-bonded heat exchangers for applications as condensers, evaporators, oil coolers, and economizers.

#### **Analytical Technology, Inc. . . . . Booth #1005**

ATI designs and manufactures a complete line of ammonia gas detectors both fixed and portable and additionally gas detectors for 32 other toxic and combustible gases.

#### **APSM . . . . . Booth #425**

APSM provides PSM software and services for effective compliance management.

#### **Armstrong International . . . Booth #126, 128**

Armstrong provides intelligent system solutions that improve utility performance, lower energy consumption, and reduce environmental emissions while providing an "enjoyable experience"

#### **Ashworth Brothers . . . . . Booth #1018**

Ashworth is the world's largest manufacturer of conveyer belting and offers 24-7-365 nationwide service on every brand of spiral freezer including self-stacking. Emergency repairs, reconfiguration, relocation, refurbishments, upgrades, and preventative maintenance programs.

#### **ASTI . . . . . Booth #928**

ASTI was established in 1991, in recognition of the long standing need for training in the safe handling of ammonia, a chemical used widely throughout many areas of industry and agriculture. ASTI offers training in accordance with OSHA Standard 1910.120(q) - emergency response to hazardous substance releases.

#### **Bacharach Inc. . . . . Booth #727**

Fixed, continuous monitors for the detection of gases including ammonia, CO, CO<sub>2</sub>, CFCs, HFCs, CH<sub>4</sub>, and more featuring multiple alarm, sensor and relay configurations. From one to 64 points, the units are ideal for chillers, walk-in freezers, public spaces, physical plants in commercial and industrial applications.

#### **Baltimore Aircoil . . . . Booth #310**

BAC is a worldwide manufacturer of heat transfer and ice thermal storage products. BAC's products include evaporative condensers, cooling towers, closed circuit cooling towers, ice thermal storage systems and equipment controls.

#### **BITZER . . . . . Booth #202**

BITZER introduces its new Modular Ammonia Compressor Package featuring BITZER's "Ammonia Components Solution" with on or multiple BITZER 85 Series Screw Compressors and Variable Speed Drive for maximum performance and energy efficiency.

#### **Bonar Engineering & Construction Co . . . Booth #227**

BONAR provides single-source responsibility for all facets of design and construction - all under one roof. In the past 30 years, BONAR has completed thousands of projects in 36 states and eight countries. That's why BONAR is the most trusted name in engineering, construction, and refrigeration. Expertise. Stability. Peace of mind. The choice is simple. BONAR - the design/build specialist.

#### **Calibration Technologies . . . . . Booth #422**

Calibration Technologies is a manufacturer of gas detection equipment, specializing in Ammonia. CTI's engineers and technicians have over 30 years of experience in system design, sales, and field service. Calibration Technologies provides detection for NH<sub>3</sub>, CO<sub>2</sub>, CO, H<sub>2</sub>S, H<sub>2</sub>, O<sub>2</sub>, CH<sub>4</sub>, R22 and more in a variety of industries including cold storage, food processing, sea vessels, chemical plants, and many others.

## IAR 2014 INDUSTRIAL REFRIGERATION CONFERENCE & HEAVY EQUIPMENT SHOW

### **CAMCO Lubricants** . . . Booth #410

Nationally known for both the CAMCO 717 series ammonia refrigeration oil and for high-quality food-grade lubes for all air compressors, gear, hydraulic, vacuum, and grease applications.

### **Century Refrigeration, a division of RAE Corporation** . . . . Booth #119, 121

Century Refrigeration is the leader in Comdustrial™ Refrigeration Systems: The ideal balance of commercial and industrial refrigeration markets. We offer flexibility in design surrounded by durability in construction

### **Chester-Jensen** . . . . . Booth #109

ChesterJensen manufactures air agitated ice builders, instant chillers, plate heat exchangers and other heat transfer equipment.

### **CIMCO Refrigeration Inc.** . . . . . Booth #617, 619

CIMCO Refrigeration specializes in the engineering, design, manufacture, installation, and service of industrial, process cooling, and recreational refrigeration systems. With key locations across North America and around the world, we provide unique cooling solutions to meet our client's needs.

### **Colmac Coil Manufacturing, Inc.** . . . . . Booth #618, 620, 622

From its newly opened second factory in Illinois, Colmac is supplying its Aircoil™ and custom aluminum, stainless, and galvanized steel evaporators to Midwest and Eastern markets.

### **Concepts and Designs, Inc.** . . . . . Booth #1003

Concepts and Designs is a premier supplier of dehumidification systems for humidity and condensation control. Dehumidification provides a permanent solution to avoid contamination hazards in compliance with USDA, zero tolerance.

### **Cool Air Incorporated** . . . . . Booth #406

For over 30 years, Cool Air Incorporated has provided quality ammonia leak detection systems and equipment. Please review our new website @ [www.coolairinc.com](http://www.coolairinc.com) for all of our product line and calibration videos.

### **Cornell Pump Company** . . . . . Booth #501

Cornell Pump presents the latest innovations in refrigerant pumps including their new high-pressure, low-speed 2.5 CBH. Cornell also manufactures high quality glycol and chiller pumps.

### **Cyrus Shank Company** . . . . . Booth #701

The Cyrus Shank Company manufactures and sells industry-leading relief valves and other products for the refrigeration industry such as relief valves, shut-off valves, bolted bonnet shut-off valves, flanged valves, expansion valves, needlepoint valves, check valves, three-way valves, line valves, purge valves, manifolds, brass valves, etc.

### **Danfoss** . . . . . Booth #702, 704

Danfoss' complete line of refrigeration valves and electronic controllers includes assembled valve stations in one shared housing and weld-in motorized, solenoid and control valves designed to 754 psig.

### **Delta Tee International, Inc.** . . . . . Booth #518

Delta Tee manufactures heat exchangers, pressure vessels and systems, complete capabilities in designing and manufacturing shell and tube heat exchangers for refrigeration, air conditioning, chem-process, food and other applications.

### **Draeger Safety, Inc.** . . . . . Booth #621

Draeger offers a full line of fire and gas detection equipment for the ammonia industry. The Draeger Sensor is the foundation for success in the ammonia industry market. With our new advanced product line, Draeger is ready for your gas detection needs

### **DualTemp Companies, Inc.** . . . . . Booth #725

Providers in the finest of design, construction, installation, service, and supplies for the industrial refrigeration market. Dual-Temp also provides equipment, training, and supplies to meet all your safety requirements.

### **Dyplast Products** . . . . Booth # 105

Dyplast Products, LLC is a premier manufacturer of ISO-CL® poly iso rigid insulation foams used as mechanical pipe insulation in the refrigeration market.

### **EcoClear LLC** . . . . . Booth #711

EcoClear, a GPM company, is an environmental cleaning company specializing in HVAC and facilities cleaning that promotes surface hygiene protection of energy savings of commercial, manufacturing and processing facilities.

### **Enceptia** . . . . . Booth #932

Enceptia is an Autodesk partner that provides solutions for the design, fabrication, and construction industries. We specialize in software, training and consulting solutions for process piping spooling, fabrication and installation.

### **EVAPCO, Inc.** . . . . . Booth #918

EVAPCO is a worldwide leader in the design and manufacture of industrial refrigeration system components. A broad line of ammonia air unit evaporators, critical process air systems, evaporative condensers, water treatment systems,

# EXHIBITOR LISTING

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packaged recirculators, pressure vessels, hydro-cooling coils, and ice builders can shipped from one of 17 manufacturing facilities in 9 countries around the world. With an on-going commitment to Research and Development, EVAPCO provides the most advanced products in the industry - Tomorrow's Technology... Available Today!

## **Extol of Ohio** . . . . . Booth #428

Extol fabricates and distributes STYROFOAM™, isocyanurate, cellular glass, perlite, and phenolic insulation for piping equipment. Complete valve system, contoured heads, fittings, PVC, aluminum, vapor, and weather barrier caulks and coatings. Extol also provides specification assistance. Extol offers materials for refrigeration chilled water, steam, and process systems.

## **ezpanel.us** . . . . . Booth #405

ezpanel engineers custom control panels, and utilizes a patented (APE™) online configuration technology which allows configuration, pricing and generation of submittals in a matter of minutes.

## **Farley's S.R.P.,**

## **Inc.** . . . . . Booth # 113,115

Our Mission: To support and provide the highest quality of parts, equipment and service while offering very competitive prices. All delivered efficiently by friendly, qualified personnel with "Farley's personal touch service guarantee" Providing "Getability" Since 1978.

## **freiye-RSC Engineered**

## **Solutions** . . . . . Booth #911

freiye Engineered Solutions, is an organization with 50 plus years of experience in the industry. RSC has been providing services in the industry for 50 plus years, also. The combination of the two companies through a merger has dramatically strengthened and enhanced the services to the Food Process, Food Distribution and Pharmaceutical Industries. We offer key strengths to the industry for Refrigeration, Insulated Panels, HVAC, Mechanical, Plumbing, Electrical, Engineering and Service. The result is a comprehensive offering of professional services to our clients. The merger of freiye and RSC creates expanded capability and improves our ability to enhance delivery of products and services nationwide.

## **FRICK by Johnson**

## **Controls** . . . . . Booth #318

Full line of refrigeration equipment for most applications. Rotary Screw Compressor Packages and Packaged Chillers with VSD, Condensers, Evaporators, AcuAir Hygienic Air Handlers, Vessels, Heat Exchangers, Controls, and Replacement Parts.

## **Gamma Graphics**

## **Services** . . . . . Booth #810

Gamma Graphics provides non-destructive testing (NDT) services on ammonia refrigeration piping. We are able to identify corrosion on wet or saturated insulation without having to cut holes or breach the vapor barrier on piping in any way. We also provide conventional ultrasonic inspection services on ammonia vessels.

## **Garden City Ammonia Program**

## **(G.C.A.P)** . . . . . Booth #311

Garden City Ammonia Program, known as GCAP, has been providing

education for the industrial ammonia refrigeration & boiler operator for efficiency, safety, and compliance is nine years old. Our Ammonia Boot Camp, National Emphasis Program, and the New Process Safety Management Training are the newest in the industry. Our private technical school has CO<sub>2</sub>, Ammonia, and Boiler equipment for hands-on training.

## **Garden City Community**

## **College (GCCC)** . . . . . Booth #302

Ammonia Refrigeration, Boiler, PSM/RMP, Adv RETA Prep, "Hands-On" Ammonia Refrigeration training since 1996, 4 1/2 Day Format-Earn College Credit-Degree Opportunities Conforms to OSHA & EPA regulations.

## **GEA Refrigeration North**

## **America, Inc.** . . . . . Booth #718

An innovative leader in industrial refrigeration, GEA's precision-engineered products include screw and piston compressors, controls, packages & systems, chillers, freezing systems, and ice systems. Parts, service, preventive & predictive maintenance, compressor rebuilds, and training.

## **GEA PHE Systems** . . . Booth #718

GEA PHE Systems- manufacturer of FlatPlate® heat exchangers perfect for ammonia refrigeration applications with flow rate up to 1,645 tons. Products meet ASME/CRN requirements, manufactured in York, PA.

## **GF Piping Systems** . . Booth #404

COOL-FIT® ABS Plus is complete pre-insulated plastic piping system for glycol and secondary cooling piping systems. It is UV resistant, vapor-tight, and 100% water-tight and requires minimum installation time.

## IIAR 2014 INDUSTRIAL REFRIGERATION CONFERENCE & HEAVY EQUIPMENT SHOW

- GfG Instrumentation** . . . . . Booth #825  
GfG Instrumentation develops and manufactures portable gas detectors, fixed systems, and respiratory airline monitors; protection from combustibles, oxygen hazards, and toxic gases.
- H.A. Phillips & Co.** . . . Booth #212  
Phillips manufactures liquid level controls, valves, Level Eye sightglasses, injectors, ASME pressure vessels, gas-powered and pumped recirculation systems, PHE chillers, the Anhydrator system cleaner and PUR air purger. Phillips is the distributor for Danfoss IR products for the US and Canada.
- Hansen Technologies** . . . . . Booth #710  
Hansen Technologies offers innovative industrial refrigeration solutions to meet your application needs, including: multi-valve stations, control, shut-off, pressure-relief and solenoid valves, regulators, pumps, auto-purgers, level controls and safety detection systems.
- Hantemp** . . . . . Booth #1026  
Stainless steel long-neck, two and three way ball valves with optional control motors and lock-out tag-out features. Also stainless steel level controls for ammonia and other liquids.
- HCR Inc. (Division of Jamison Door Company)** . . . Booth #1012, 1014  
HCR/Jamison Door will feature HCR Air Door Technology and BMP Rollup Door.
- Hench Control, Inc.** . . . Booth #904  
Hench Control is a manufacturer and service provider of modular energy management systems for industrial refrigeration which quantifiably cut energy cost, improve profitability, and significantly reduce the CO<sub>2</sub> footprint for the environment.
- Henry Technologies** . . . . . Booth #326  
Heat Exchangers, Condensers, Chillers, Pressure Vessels & HVAC/Refrigeration Components. Henry Technologies Ltd. takes pride in providing high quality HEX / PV to our global partners in industrial and commercial applications. Customer Satisfaction, Quality Designs, Product Quality and On Time Deliveries are our primary goals. Let Henry Technologies Ltd. be a partner to your future successes.
- Hermetic Pumps** . . . . . Booth #709  
Hermetic Pumps has over 40 years experience in handling refrigerants in canned motor pumps and has over 50,000 units installed. Hermetic is the only manufacturer that offers a canned motor pump specifically designed for refrigerants.
- HillPHOENIX** . . . Booth #201, 203  
HillPHOENIX specializes in the design and manufacturing of halocarbon, carbon dioxide transcritical and secondary refrigeration systems for commercial warehousing and industrial refrigeration applications.
- Honeywell Analytics, Inc.** . . . . . Booth #801, 803  
Honeywell Analytics manufactures the industry's most complete range of monitoring instrumentation for ammonia and other refrigerant gases. We offer fixed-install units (Manning), portable services, controllers, service/support second to none.
- Howden Compressors** . . . . . Booth #826  
Howden Compressors offers the most complete range of screw compressors available in the world for virtually any compressor application- refrigeration to gas reliquification, gas compression or cryogenics, and more.
- Howe Corporation** . . . Booth #906  
How Corporation Manufactures quality flake ice and industrial refrigeration equipment including pump out compressors, vessels and heat exchangers. We feature our ice flakers for use with ammonia, CO<sub>2</sub>, and other refrigerants.
- Industrial Consultants, LLC** . . . . . Booth #505  
Industrial Consultants- your compliance connection for OSHA and EPA related training and services including HAZMAT, refrigeration, PSM/RMP, lockout/tagout, confined space, and incident command.
- Industrial Refrigeration Technical College** . . . Booth #511  
Industrial Refrigeration Technical College (IRTC) training lab features VFD compressors, Quantum, G-Force micro's, VFD condenser, VFD evaporators, hygienic unit, liquid recirculation, thermosyphon oil cooling, plate chiller, autopurger, and PLC controls.
- Industrial Service & Fabricators, Inc.** . . . . Booth #503  
Industrial Service & Fabricators custom designs and fabricates pressure vessels, tanks, and liquid recirculator assemblies. Products include recirculators, receiver intercoolers, accumulators, surge drums, and oil pots.
- Innovative Refrigeration Systems** . . . . . Booth #509  
Innovative Refrigeration Systems specializes in customized turnkey industrial refrigeration systems. We design and build computer-controlled ammonia refrigeration, large tonnage Freon systems, and large CO<sub>2</sub> systems for the cold storage and food process markets.



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## **Insul-Therm Intl.**

**Inc.** . . . . . Booth #117

Insul-Therm International is a leader in the fabrication and distribution of insulation products for refrigeration and process systems. Our product offerings include TRYMER™, STYROFOAM™, SARAN™, Foamglas, Mylar, and many other lines.

## **Integrated Circuit Systems,**

**Inc.** . . . . . Booth #210

ICS is a system integrator working primarily in the industrial refrigeration sector.

## **INTERSTATE Chemical**

**Company Inc.** . . . . . Booth #1004

INTERSTATE Chemical Company is a manufacturer of INTERCOOL industrial heat transfer fluids. These fluids include ethylene glycol, propylene glycol, ethanol and INTERCOOL BIOGREEN made from totally renewable resources.

**ISEL, Inc.** . . . . . Booth #304

For more than 20 years, International Specialty Engineered Lubricants (ISEL) has been manufacturing fluids for the ammonia refrigeration industry, including compressor lubricants, liquid transfer pump fluids and rust-prevention gels.

**ISN** . . . . . Booth #1022

ISNetwork is a global online contractor management system for over 270 owner clients and 50,000 contractors/suppliers, connecting corporations with safe reliable contractors.

**Isotherm, Inc.** . . . Booth #719, 721

We provide turnkey solutions in engineering, specifications, control code development, graphical interface, operation evaluation, and UL listed control panels.

## **ITW Insulation**

**Systems** . . . . . Booth #726

ITW Insulation Systems supplies TRYMER™ polyisocyanurate pipe insulation and XPS pipe insulation billets, former products of Dow Chemical Company. Additionally, ITW specializes in aluminum and stainless steel jacketing, sheets, and elbows.

**JANX** . . . . . Booth #832

JANX is a nationwide non-destructive testing and mechanical integrity service company offering a variety of erosion/corrosion detection solutions per API-653-510-570.

**JAX Refrigeration** . . . Booth #106

JAX Refrigeration, Inc. specializes in the engineering, design, installation, service, and parts of industrial refrigeration process & mechanical systems. At JAX "every system is a custom system"

## **Kathabar Dehumidification**

**Systems** . . . . . Booth #827

Kathabar Dehumidification Systems, Inc. (KDS) is the most diverse dehumidification company in the world-offering five (5) liquid desiccants and the silica gel desiccant wheel. Liquid desiccants reduce energy usage up to fifty percent by eliminating frost/ice buildup on evaporator coils thus eliminating the defrost cycle completely. Kathabar designs and manufactures liquid desiccant and dry desiccant systems for a wide range of applications for industrial, commercial, institutional, and green/LEED facilities.

## **Kuhlman**

**Incorporated** . . . . . Booth #1010

Kuhlman Incorporated: with offices in Wisconsin Illinois and Kentucky provides a quality team of engineering, project management, sales, service and education to provide our customers with economical and efficient solutions to support all of their refrigeration needs. (Established in 1957) Charter member IIR

**Lanham Insulation** . . Booth #520

For More than 30 years, Lanham Insulation has provided unparalleled quality and reliability in mechanical insulation services. From inception, our expertise and pursuit of excellence have earned us the trust and confidence of our customers. The Lanham team of industry-leading insulation professionals focuses exclusively on the complete success of each project, to ensure the highest levels of safety, quality, and efficiency. Our fundamental mission is to deliver complete satisfaction with superior quality and value.

## **Lanier Technical**

**College** . . . . . Booth #101

The Ammonia Refrigeration Program at Lanier Technical College in Oakwood Georgia is dedicated to providing the ammonia refrigeration industry with the best, state-of-the-art, hands-on, live system training in ammonia refrigeration system operation, maintenance, and support

## **Logic Technologies,**

**Inc.** . . . . . Booth #1025

Logic Technologies, the industry's foremost leader in factory automation and computer controls, provides turnkey, state-of-the-art automation systems for ammonia formulization and production, and is setting the standard for today's automation.

**Logix** . . . . . Booth #522

Logix Refrigeration Energy Management Systems provide energy-efficient operation of refrigeration equipment with documented savings up to 40%. No other refrigeration energy management system is easier to use or more capable.

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### **LUDECA, Inc.** . . . . . Booth #306

LUDECA, Inc., leading provider for Preventive, Predictive, and Corrective Maintenance Solutions including Laser Coupling Shaft Alignment and Belt Alignment tools; vibration analysis and balancing equipment; software, services, and training.

### **M&M Refrigeration** . . Booth #102

M&M Refrigeration manufactures both reciprocating and rotary screw compressor packages, packaged refrigeration systems, pressure vessels, and microprocessor control systems.

### **Marking Services, Inc.** . . . . . Booth #506

Marking Services is your partner for ammonia refrigeration pipe labels, valve tags and signage materials and services. In addition to the manufacture of identification products, we provide turnkey services for material installation and P&ID updates/creation.

### **MIRO Industries, Inc.** . . . . . Booth #104

MIRO Industries, Inc. provides solutions for supporting rooftop pipe, conduit, duct and walkway systems that prevent damage to the roof membrane.

### **MRBraz & Associates, PLLC** . . . . . Booth #517

Industrial Refrigeration engineering for cold storage and food processing facilities. Our design approach is environmentally friendly and promotes energy efficiencies with highest center of safety to operate.

### **Multi-Wing America** . . . . . Booth #1024

High efficiency low noise fan blades, diameters from 7 inches to 9 feet.

### **MYCOM (Mayekawa USA)** . . . Booth #118

The MYCOM TRUE Touch compressor control panel complements the industry leading efficiency of Mycom compressors and superior package design by offering features such as a user friendly touch screen interface, remote panel monitoring, and a USB interface.

### **NIKKISO Pumps America** . . . . . Booth #125

Canned motor seal-less pumps for ammonia refrigeration.

### **Noble Americas Energy Solutions** . . . . . Booth #232

Noble is one of the top Industrial Energy Retailers in the US. World class in Risk & Portfolio Management, Product Structuring & Regulatory Affairs, Noble is the best choice for your energy needs.

### **Nomaco Insulation** . . . . . Booth #626, 628

Cryoflex insulation addresses the key concerns of the industrial refrigeration industry with exceptionally low water absorption and vapor permeability rates, Cryoflex acts as a second vapor barrier that helps prevent moisture penetration.

### **North Star Ice Equipment Corporation** . . . . . Booth #1020

The world leader in industrial ice equipment for over 60 years, North Star Ice Equipment manufactures premium, high capacity industrial flake ice makers and automatic ice storage and delivery equipment for a wide variety of applications. Products include stainless steel and carbon steel flake ice makers ranging in capacity from 5 to 58 tons per day, and storage systems ranging from 21 to 280 tons per unit.

### **Omega Thermo Products, LLC** . . . . . Booth #432

Heat exchangers/evaporators, including falling film chillers, ice machines, cooling tables/conveyor, cooling jackets, and specialized cooling/cryogenic equipment.

### **Owens Corning** . . . . . Booth #703

From a leader in Fiberglas™ Pipe Insulation comes the new Owens Corning FOAMULAR® extruded polystyrene (XPS) fabrication billets. You now have a choice for your XPS pipe insulation requirements. Benefits include exceptional thermal efficiency, long service life, reduced overall installation costs and manufactured in the USA. All of this brought to you by the same trusted company you can count on for FOAMULAR® cold storage floor applications.

### **Parker Hannifin** . . . . . Booth #610, 612

Parker's Refrigerating Specialty Division manufactures one of the most complete lines in industrial refrigeration; including state of the art flow control valves, safety relief, service and expansion valves and system solutions

### **Paul Mueller** . . . Booth #519, 521

Paul Mueller will feature their falling film chiller, semi-welded plate and frame heat exchanger, brazed plate heat exchanger and heat recovery equipment.

### **PermaTherm** . . . . . Booth #431

PermaTherm is a premier manufacturer of pipe insulation, serving the ammonia refrigeration and cold chain industry for over 20 years. As a leading design manufacturer and supplier of rigid pipe insulation, PermaTherm has developed a complete pipe insulation system for the ammonia refrigeration industry with

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millions of linear feet of trouble-free pipe installed throughout the country. The PermaTherm pipe insulation system provides superior thermal performance and environmental attributes, while yielding tremendous savings at every phase of your project!

## **Petrochem Insulation** . . . . . Booth #418

Petrochem is a single source specialty contractor, providing mechanical insulation, metal structures, scaffolding, fireproofing, painting & coatings, heat tracing and lead and asbestos abatement services nationwide from eleven regional offices. We're a certified MBE company.

## **Phoenix Air Systems** . . Booth #107

Phoenix Air Systems is an experienced designer and manufacturer of critical process air management products. The company's extensive product line includes: hygienic air handlers, desiccant dehumidification products, energy recovery units, make-up air handlers, penthouse refrigeration units, and related accessories. Phoenix Air Systems specializes in critical process air management for the food industry, but the company also has experience in a variety of industrial applications.

## **Polyguard Products, Inc.** . . . Booth #525, 527

RG2400™ Corrosion Gel ZeroPerm™, Vapor Barrier, AlumaGuard™ Weather Barrier, ZeroPerm™ Ultra Vapor and Weather Barrier Membrane, RG2400™ CSA Structural Steel Corrosion Protection.

## **Process Compliance, Inc.** . . . . Booth #111

PCI specializes in compliance services for OSHA 1910.119 Process Safety Management and EPA 40 CFR Part 68. Five-year mechanical integrity, PHA, RMP, training, ultra-sonic thickness testing, and total PSM management.

## **Professional Rebuild Optimal Service, LLC (The PROS company)** . . . . . Booth #402

PROurbish (rebuild) screw compressors and gear boxes. All brands, makes, and models.

## **PSRG Inc.** . . . . . Booth #129

PSRG is a premier provider of PSM/RMP expertise to help the NH<sub>3</sub> refrigeration industry improve safety & reliability, ensure compliance and enhance overall business performance. We perform Audits, PHAs, M.I./B-109 Inspections, Training, and more.

## **Quote Express** . . . . . Booth #232

QuoteExpress CAD – BIM – Estimating software is designed for refrigeration contractors to automate the preconstruction process. Our Cloud enabled solution is the fastest, most accurate way to produce precise accurate data. Call 800-813-7020 for more information.

## **Refrigeration Valves & Systems Corp. (RVS)** . . . . . Booth #918

RVS is a preferred supplier of innovative industrial refrigeration products including factory assembled, packaged recirculation systems and ASME pressure vessels of all types and sizes. RVS, a subsidiary of EVAPCO, is committed to providing superior technical support and the highest quality products with fast, on-time shipments to meet your construction schedule.

## **Regal** . . . . . Booth #226

Regal is a leading manufacturer of electric motors, mechanical and electrical motion controls and power generation products. For 30+ years, its Leesport, PA facility (formerly RAM Motors) has served the refrigeration industry with purpose built designs.

## **Republic Refrigeration** . . . . . Booth #602, 604, 606

Industrial refrigeration system design, modular packaged refrigeration systems, equipment skids, Process Safety Management and Risk Management Services, pipe installation, refrigeration controls, control and power wiring, parts, service quality, integrity, and performance. We do it right the first time!

## **RETA** . . . . . Booth #1027

RETA exists to enhance the professional development of industrial refrigeration system operators and technicians through training and education events focused on safe and efficient operation.

## **Schneider Electric** . . . Booth #910

Schneider Electric manufactures industrial refrigeration solutions including AC motors, variable speed drivers, and system controls specifically designed for the industrial refrigeration market focused on control and energy efficiencies.

## **SCS Tracer Environmental** . . . . . Booth #805

Environmental engineering and consulting services focusing on PSM & RMP compliance for ammonia refrigerated facilities. Consulting services include PSM & RMP development, Compliance Audits, Mechanical Integrity Inspections, Operator Training, OSHA/EPA Inspection Assistance, Facility Energy Audits, and overall consulting.

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### **SGS Refrigeration**

**Inc.** . . . . . Booth #603, 605  
SGS Refrigeration Inc. manufactures the full line of Industrial Unit Coolers and Evaporators, Product Coolers, Special Cooling Coils under the SGS/Krack brand. On display in their booth will be a PC Product Cooler unit with one cast aluminum fan, a stainless steel tube/aluminum fin coil, optional stainless steel housing, and optional tube style hot gas insulated drain pan. Along with the unit, several tube/fin material examples will be displayed.

### **Shambaugh & Son,**

**L.P.** . . . . . Booth #328  
Shambaugh's Design-Build Refrigeration Division provides Low Temperature Ammonia Refrigeration systems, Fluid Process, Storage Systems, Preventative Maintenance and Emergency Ammonia Refrigeration Service and Spare Parts sales to clients throughout the U.S.

### **SHECCO** . . . . . Booth #1030

Shecco is a market development company for natural refrigerants. Activities include ammonia21.com, ATMOSphere America and market research.

### **Sinteco Americana**

**Inc.** . . . . . Booth #127  
Sinteco manufactures special air handling installation for food industry processes. Sinteco Hygiene® AHUs - stainless steel or polyester, Textile air distribution ducts Aertex® and s.s. AERMET®, and clean rooms special products & design.

### **SmartWatt Energy** . . Booth #902

SmartWatt Energy works with clients throughout the United States to design and install multi-measure energy-efficiency projects. Clients look to SmartWatt to provide large-scale savings through turnkey energy auditing, engineering, project management and installed services.

### **Stellar** . . . . . Booth #502

Stellar is a fully integrated firm focused on design, engineering, construction, and mechanical services worldwide. In addition to its Jacksonville, Florida headquarters, Stellar maintains more than 20 strategic technical support and refrigeration parts locations throughout the United States. For almost 25 years, Stellar has been the leader in designing, fabricating, installing and maintaining industry best ammonia refrigeration systems. Stellar also provides expert compressor rebuilding and remanufacturing services, safety compliance and PSM programs, condensation control, mechanical integrity, thermal services, automation and replacement parts.

### **Summit Industrial**

#### **Products** . . . . . Booth #123

Summit Industrial Products manufactures ammonia compressor lubricants using various base fluids: from NSF-certified H1 PAOs to Alkylbenzene (AB), AB/PAO, Polyglycol and API Group II fluids. Summit Products deliver value and cost benefits like thermal efficiency, increased reliability, reduced oil carryover, extended oil drains, and cleaner lubricating systems. NH<sub>3</sub>/CO<sub>2</sub> cascade systems? Bring 'em on! For lubricant-related technical expertise and used oil analysis support, let's talk.

### **Summit Refrigeration**

#### **Group** . . . . . Booth #717

Summit Refrigeration Group is a full service, customer oriented, design/build industrial refrigeration contracting company specializing in food processing plants, multi-temperature distribution centers and specialized process cooling. Summit provides services and contracting for customers nationwide.

### **Tanner Industries, Inc.** . . Booth #420

Full service anhydrous ammonia distributor for ammonia refrigeration. Acknowledged for product quality and service dating back to 1890. Storage tanks pump-out services and safety training. Member NACD.

### **TechCold**

#### **International** . . . . . Booth #225

TechCold International is on the cutting edge of energy saving industrial refrigeration control technology, with a proven track record of delivering control solutions for over 10 years on a global scale. By adopting an open infrastructure, non-proprietary approach to industrial refrigeration controls, TechCold International offers cost-effective solutions helping organizations reduce energy consumption and increase profitability.

### **Teikoku USA Inc.** . . . . Booth #426

Teikoku is the world's largest manufacturer of seal-less, canned motor pumps, and the leading supplier of pumps to the refrigeration industry. Our highly reliable and easy to maintain pumps are perfect for pumping ammonia.

### **Temprite** . . . . . Booth #332

Temprite specializes in energy-efficient coalescent and conventional oil separators and refrigerant oil management products, including oil level controls and oil reservoirs, for all refrigerants including ammonia and CO<sub>2</sub> (R744).

### **Texoma Industrial**

#### **Insulation, Inc.** . . . . . Booth #531

Serving the commercial and industrial insulation market since 1992.

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**TH. Witt** . . . . . Booth #504

TH. WITT Kaltemaschinenfabrik GmbH is a family owned company that has been dedicated to industrial refrigeration since 1896. We offer refrigeration contractors a reliable partnership with system solutions using high quality components, such as refrigerant pumps (with couple or hermetic canned motor), high side float regulators (a simple, mechanical and safe way to expand liquid refrigerant without need of high pressure receivers) and automatic oil return systems (a unique and simply operated design). For the European market we also produce entire pressure vessel units and therefore we are also a competent partner for solutions such as oil return, maximum level switch or pump protection. Our components are produced in Aachen, Germany, and exported all over the world.

**Thermal Seal Duct Systems** . . . . . Booth #331  
Refrigeration Duct work.

**Therma-Stor LLC** . . . . . Booth #1028  
Therma-Stor LLC manufactures heat reclaim (desuperheating) water heaters. Therma-Stor's harness waste heat ad utilize it to heat water.

**thermofin GmbH** . . . . . Booth #427  
thermofin® produces finned heat exchangers for an application in refrigeration and air-conditioning industry in commercial and industrial projects that fit for all kinds of refrigerants (HFC, NH<sub>3</sub>, CO<sub>2</sub>, glycol etc.).

**Tyco Fire Protection Products** . . . . . Booth #728  
Tyco Fire Protection Products produces fire protection solutions for refrigerated and non-refrigerated storage facilities as well as other types of commercial, industrial, institutional, and residential applications.

**VaCom Technologies** . . . . . Booth #103

Focused on energy efficiency technologies for industrial refrigeration, VaCom Technologies provides integrated control solutions and system integration, combined with our trademark EnergyDashboard™ application, to enable enterprise-level performance monitoring and achieve reliable operation

**Vahterus Oy** . . . . . Booth #205  
As the inventors of Plate & Shell Heat Exchanger (PSHE) technology, with an installed base of >35,000 exchangers, Vahterus PSHE have many benefits for advanced refrigeration applications.

**Vilter** . . . . . Booth #802  
Vilter manufactures industrial refrigeration reciprocating compressors, single screw compressors, and twin screw compressors. The Vilter single screw's low life-cycle costs and high reliability are backed by an exclusive 15-year bearing warranty.

**Vogt Ice, LLC** . . . . . Booth #1006  
Vogt Ice manufactures Ice Makers, Ice Storage, Ice Delivery Systems, and Plate Water Chillers. The company is out of Louisville Kentucky, we have been manufacturing for more than 70 years.

**Wagner-Meinert, LLC** . . . . . Booth # 706  
WAGNER-MEINERT, LLC is committed to exceeding expectations by providing complete customer satisfaction through uncompromised integrity and excellence in engineering, installation, service and training in refrigeration, food process and mechanical integrity.

**WEG Electric Corp.** . . . . . Booth #132, 231

WEG Electric Corp. is a leading global supplier of motors, drives, controls, generators, and transformers with a focus on quality, technology, R&D,, performance, and customer service.

**Westermeyer Industries, Inc.** . . . . . Booth # 909  
Manufactures components for the industrial and commercial refrigeration industry. Supplying products such as: Oil Separators, Accumulators, receivers, oil pots, Shell and tube heat exchangers, and level detection devices.

**WingFAN** . . . . . Booth# 309  
Modular axial fans.

**Zero Zone, Inc.** . . . . . Booth#110  
Zero Zone designs and manufactures quality custom industrial refrigeration solutions: chillers, Freon and CO<sub>2</sub> based systems, liquid overfeed and related equipment for cold storage, food processing, pharma, and other applications.



SANDIEGO2015

**iir** INDUSTRIAL REFRIGERATION  
CONFERENCE & EXHIBITION



Hilton San Diego Bayfront San Diego, CA March 22-25, 2015



## KEYNOTE SPEAKER • ASTRONAUT MIKE MULLANE

Colonel Mullane was born September 10, 1945 in Wichita Falls, Texas but spent much of his youth in Albuquerque, New Mexico, where he currently resides. He was a child of the space race and in the late 1950's embarked on his own rocket experiments in the deserts near his home. Upon his graduation from West Point in 1967, he was commissioned in the United States Air Force.

As a Weapon Systems Operator aboard RF-4C Phantom aircraft, he completed 134 combat missions in Vietnam. He holds a Master's of Science Degree in Aeronautical Engineering from the Air Force Institute of Technology and is also a graduate of the Air Force Flight Test Engineer School at Edwards Air Force Base, California.

Mullane was selected as a Mission Specialist in 1978 in the first group of Space Shuttle Astronauts. He completed three space missions aboard the Shuttles *Discovery* (STS-41D) and *Atlantis* (STS-27 & 36) before retiring from NASA and the Air Force in 1990.

Mullane has been inducted into the International Space Hall of Fame and is the recipient of many awards, including the Air Force Distinguished Flying Cross, Legion of Merit and the NASA Space Flight Medal.

Since his retirement from NASA, Colonel Mullane has written an award-winning children's book, *Liftoff! An Astronaut's Dream*, and a popular space-fact book, *Do Your Ears Pop In Space?* His memoir, *Riding Rockets: The Outrageous Tales of a Space Shuttle Astronaut*, has been reviewed in the *New York Times* and on the Daily Show with Jon Stewart. It has also been featured on Barnes and Noble's 2010 recommended summer reading list.

Mullane has held a lifelong passion for mountain climbing. Since age 60 he has summited Africa's highest peak, Mt. Kilimanjaro; the glaciated peak of Mt. Rainier; and thirty-three of Colorado's highest peaks.

Colonel Mullane has established himself as an acclaimed professional speaker on the topics of teamwork, leadership and safety. He has educated, entertained, inspired and thrilled tens of thousands of people from every walk of business and government with his incredibly unique programs.

Mike and Donna Mullane recently celebrated their 45th anniversary. The couple have three children and six grandchildren.

**Monday, March 24 • 8:00 AM**

Convention Center Room 205/206 – Broadway Ballroom



# Final Changes to the 2015 International Codes

**iiar** code advocacy

## UPDATE

BY JEFFREY M. SHAPIRO, P.E., FSFPE

The 2015 editions of the International codes, including the International Mechanical Code (IMC) and the International Fire Code (IFC), have been completed and will be published later this year. A number of changes to these codes are of interest to IIAR members. However, it's also important to mention several proposed changes that would have negatively impacted the ammonia refrigeration industry but are not included in the 2015 codes because IIAR successfully opposed them.

### APPROVED PROPOSALS

Below are the significant changes affecting ammonia refrigeration that were approved for inclusion in the 2015 IMC and IFC. All of these are considered as positive by IIAR. The changes are shown in "legislative format," meaning text shown as underlined is being added and text shown with a strike-out overlay is being deleted.

**Proposal M184-12** (clarifies 30 air changes per hour as the required ventilation rate for ammonia systems):

#### 1106.3 Ammonia room ventilation.

Ventilation systems in ammonia machinery rooms shall be operated continuously at the emergency ventilation rate specified in determined in accordance with Section 1105.6.3.2.

#### Exceptions:

1. Machinery rooms equipped with a vapor detector that will automatically start the ventilation system at the emergency ventilation rate specified in determined in accordance with Section 1105.6.3.2, and that will actuate an alarm at a detection level not to exceed 1,000 ppm; or
2. Machinery rooms conforming to the Class 1, Division 2, *hazardous location* classification requirements of NFPA 70.

**Proposal F77-13** (permits tamper-resistant covers, such as plastic cover boxes, in lieu of break-glass style covers for ventilation system and equipment shutdown emergency controls, which is already allowed by IFC Section 606.9.1):

**606.9.2 (also IMC 1106.5.2) Ventilation system.** A clearly identified switch of the break-glass type or with an approved tamper resistant cover shall provide on-only control of the *machinery room* ventilation fans.

**Proposal F78-13** (establishes that emergency pressure control systems, EPCS, are only required for refrigeration systems that are permanently installed, as opposed to those that are portable or temporary):

**606.10 Emergency pressure control system.** Permanently installed refrigeration systems containing more than 6.6 pounds (3 kg) of flammable, toxic or highly toxic refrigerant or ammonia shall be provided with an emergency pressure control system in accordance with Sections 606.10.1 and 606.10.2.

**Proposal F79-13** (restructures provisions for termination of overpressure relief piping for clarity and allows use of internal venting of overpressure from one part of a system to another as an alternative to atmospheric discharge options in this section because 606.12 will now only apply to systems that are designed to discharge to atmosphere):

**606.12 Discharge and termination of pressure relief devices and purge systems.** Pressure relief devices, fusible plugs and purge systems discharging to the atmosphere from for refrigeration systems containing more than 6.6 pounds (3 kg) of flammable, toxic or highly toxic

refrigerants or ammonia shall be provided with an approved discharge system as required by comply with Sections ~~606.12.1~~ 606.12.2, ~~606.12.2~~ 606.12.3 and ~~606.12.3~~ 606.12.4.

**606.12.1 Fusible plugs and rupture members.** Discharge piping and devices connected to the discharge side of a fusible plug or rupture member shall have provisions to prevent plugging the pipe in the event of the fusible plug or rupture member functions.

**606.12.1 606.12.2 Flammable refrigerants.** Systems containing more than 6.6 pounds (3 kg) of flammable refrigerants having a density equal to or greater than the density of air shall discharge vapor to the atmosphere only through an *approved* treatment system in accordance with Section ~~606.12.5~~ 606.12.6. Systems containing more than 6.6 pounds (3 kg) of flammable refrigerants having a density less than the density of air shall be permitted to discharge vapor to the atmosphere provided that the point of discharge is located outside of the structure at not less than 15 feet (4572 mm) above the adjoining grade level and not less than 20 feet (6096 mm) from any window, ventilation opening or *exit*.

**606.12.2 606.12.3 Toxic and highly toxic refrigerants.** Systems containing more than 6.6 pounds (3 kg) of toxic or highly toxic refrigerants shall discharge vapor to the atmosphere only through an *approved* treatment system in accordance with Section ~~606.12.4~~ 606.12.5 or a flaring system in accordance with Section ~~606.12.5~~ 606.12.6.

**606.12.3 606.12.4 Ammonia refrigerant.** Systems containing more than 6.6 pounds (3 kg) of ammonia refrigerant

*continued on page 48*



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shall discharge vapor to the atmosphere through an *approved* treatment system in accordance with Section 606.12.4 ~~606.12.5~~, a flaring system in accordance with Section 606.12.5 ~~606.12.6~~, or through an *approved* ammonia diffusion system in accordance with Section 606.12.6 ~~606.12.7~~, or by other *approved* means.

#### Exceptions:

1. Ammonia/water absorption systems containing less than 22 pounds (10 kg) of ammonia and for which the ammonia circuit is located entirely outdoors.
2. When the fire code official determines, on review of an engineering analysis prepared in accordance with Section 104.7.2, that a fire, health or environmental hazard would not result from discharging ammonia directly to the atmosphere.

**Proposal F80-13** (adopts IAR 2, IAR 7 and ASHRAE 15 as a mandatory referenced standard in the IFC):

**606.12.1 (new) Standards.** Refrigeration systems and the buildings in which such systems are installed shall be in accordance with ASHRAE 15.

**606.12.1.1 Ammonia Refrigeration.** Refrigeration systems using ammonia refrigerant and the buildings in which such systems are installed shall comply with IAR-2 for system design and installation and IAR-7 for operating procedures

#### Chapter 80 (mandatory reference standards):

[ASHRAE 15-2013](#)

[IAR-2-2014](#)

[IAR-7-2013](#)

**Proposal F81-13** (places “discharge to atmosphere” on a par with other permissible methods of emergency pressure relief venting, rather than having water tanks or other treatment systems serve as the default requirement for relief vent discharge, with atmospheric release shown as a subordinate second exception):

#### 606.12.3 Ammonia refrigerant.

Systems containing more than 6.6 pounds (3 kg) of ammonia refrigerant shall discharge vapor to the atmosphere in accordance with one of the following methods: through an approved treatment system in accordance with Section 606.12.4, a flaring system in accordance with Section 606.12.5, or through an approved ammonia diffusion system in accordance with Section 606.12.6, or by other approved means.

**Exceptions:** 1. Ammonia/water absorption systems containing less than 22 pounds (10 kg) of ammonia and for which the ammonia circuit is located entirely outdoors.

1.2 Directly to atmosphere ~~When~~ the fire code official determines, on review of an engineering analysis prepared in accordance with Section 104.7.2, that a fire, health or environmental hazard would not result from atmospheric discharge of ammonia directly to the atmosphere

2. Through an *approved* treatment system in accordance with Section 606.12.4

3. Through a flaring system in accordance with Section 606.12.5

4. Through an *approved* ammonia diffusion system in accordance with Section 606.12.6

5. By other *approved* means.

#### REJECTED PROPOSALS

IAR’s advocacy work in the model code arena involves more than just submitting and supporting proposals that would benefit the ammonia refrigeration industry. Opposing proposals that are unnecessary or that unfairly burden ammonia refrigeration is an equally important part of what we do. With this in mind, the following is a summary of proposals to the 2015 International codes that were opposed by IAR and were rejected:

#### Proposal ADM34-13 (disapproved) –

This was a proposal submitted by a California fire service group to add a

special fire code permit requirement, applicable every time a refrigeration system regulated by the fire code, which includes all ammonia systems, is installed or modified. Although the proposal was well intentioned, with the stated purpose of wanting the special permit to give fire officials a means to ensure that their regulations are being enforced, IAR opposed the change because mechanical code permits should already provide for this through internal coordination among fire and mechanical code enforcing agencies. If the mechanical code enforcing agency isn’t cooperating with the fire code enforcing agency to ensure that all applicable code requirements are being enforced, this indicates an administrative failure in the jurisdiction that shouldn’t be solved by requiring the installer or service company to get duplicate permits. Based on IAR’s opposition, the proposal was disapproved at ICC’s final action hearing.

#### Proposal F51-13 (disapproved) –

This proposal was submitted by a California fire service group to add a requirement for constructions documents (plans, calculations, etc.) to be submitted to the fire code official for review and approval prior to installation or modification of any building system regulated by IFC Chapter 6, including all ammonia refrigeration systems. Like ADM34, this proposal may have been well intentioned, but it too would have added an unnecessary administrative burden on installers and service companies to submit duplicate plans and await approval of the fire code official prior to commencing work. Using a code requirement as a means of addressing a jurisdiction’s internal failure to coordinate enforcement is not appropriate from IAR’s perspective, and based on IAR’s opposition, the proposal was disapproved by ICC’s Fire Code Development Committee.

**Proposal F76-13 (disapproved) –** This proposal was similar to others in

recent years that added a requirement to secure refrigerant access ports that are located outdoors with locking, tamper-resistant caps or an equivalent security method. The intent of these requirements is to inhibit refrigerant “huffing,” by individuals seeking intoxication. This has never been an issue with ammonia systems for obvious reasons, but IIAR didn’t previously oppose the requirement because ammonia refrigeration system access ports are typically secured to be only be accessible to authorized personnel. Nevertheless, IIAR opposed this particular change because it added a requirement for alarms to be provided on hatches and doors leading to controlled areas with refrigerant access ports. While this might have been appropriate for some situations, it is clearly unnecessary at facilities with ammonia refrigeration systems. Based on opposition by IIAR and Target Corporation, the proposal was disap-

proved at ICC’s final action hearing.

**Proposal F179-13 (disapproved)** – This proposal by the alarm industry would have created a new category of alarm systems in the International Fire Code called “emergency alarms.” The intent was to gather all alarm requirements, other than those that are fire or security related, from various sections of the IFC and govern this equipment with standardized administrative and technical requirements. IIAR had several concerns with this proposal. Most notable was a requirement mandating that emergency alarm control units be listed by a testing laboratory or approved by the fire code official, who might insist on a UL or similar listing as a condition of approval. Currently, ammonia leak detection systems, which may be integrated with a programmable logic controller, are not listed, and the proposal did not specify a standard on which such listings

would be based. Currently, no specific standard exists for this purpose.

IIAR’s continued success in advocating the ammonia refrigeration industry’s interest is largely attributed to the many dedicated member volunteers who serve on the IIAR Code Committee and IIAR Standards Committee and assist in identifying and formulating positions on code proposals of interest to the ammonia refrigeration industry. IIAR members are indebted to these individuals for the work they do on the industry’s behalf.

Look for a report on the outcome of many changes of interest in the Uniform Mechanical Code and the NFPA Fire Code 2015 editions in an upcoming *Condenser* column. Final hearings for these documents are still several months away, but preliminary results indicate more good news is headed IIAR’s way.

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# Know Your Incident Timelines

BY KEM RUSSELL

Like a good science fiction plot, any ammonia-related incident has two parallel timelines. Making sure you're aware of both of them, even before anything happens, can make the difference between public relations and operational horror story, and a good outcome.

Take one incident where the lack of awareness by facility staff led to a lot more chaos than should have been expected. It was a normal work shift when several employees coming into a process area smelled a very strong, irritating odor.

Several of them knew that the refrigeration department had just a short time earlier been working on the refrigeration system in the area. But they didn't know, or remember, who to call about the strong smell. Panicking, more than one of them called 911 as they all rapidly exited the area to the outside.

Almost fifteen to twenty minutes later, someone finally remembered to call the facility safety manager, who quickly drove to the site. When he got there, he found several ambulances, fire department engines, police and sheriff department cruisers, and, of course, the media. As the safety manager approached the scene, he also noticed what appeared to be several employees lying on the ground, some seemingly convulsing. In the safety manager's words, "It was chaos!"

In this particular event, the employees did not remember who was supposed to be called, and what the facility emergency plan was. The safety manager quickly contacted the refrigeration department and began investigating the incident.

It was soon learned that this was not an ammonia release, or even any other kind of release. What the employees had smelled turned out to be a cleaning agent used for sanitation of the process equipment in the area.

Nevertheless, the damage was already done. In a very short time, news of this incident quickly spread through the media. One regulatory agency called the safety manager asking why they had not reported this serious ammonia release. From the quick inves-

tigation the safety manager was able to explain there was "not an ammonia release."

A lesson learned from this event is there are two timelines that should always be considered. One is a timeline that should begin well in advance of any incident. The other timeline begins at the moment of the event. And both are very important to always keep in mind.

The "before event" timeline is concerned with what might be done to prepare employees for any type of incident. This means companies should train all employees on several things, which can include: the emergency plan (action or response); what specific actions should be taken when an event occurs (these may vary depending on the emergency); what the chain of command is and who should be notified within a company; how to properly evacuate all areas in a facility; where a pre-determined gathering point is outside of the facility; what areas within the facility could be used for shelter-in-place; how to identify a chemical; how to perform basic first-aid; and who should talk to the media. Training drills that prepare employees to better respond when an event occurs are essential to the "before event" timeline.

The event described above would have likely unfolded much differently, with less of an impact to the company, if "before event" training had established a reflexive employee response. At the least, employees would not have made several separate 911 calls indicating that there was a large emergency.

In this case, the correct facility personnel would have been contacted, and the facility would have been exited in a safe and organized manner. In the end, the panic experienced by some of the employees was not from a physical effect of a chemical, but a psychological effect that caused "panic attack" symptoms, including minor convulsions.

Meanwhile, the second timeline begins the moment the event occurs. In this scenario, several actions should



## LESSON

## LEARNED?

take place during a very short time period. To illustrate this timeline let's look at another event of an ammonia release occurring outside of a refrigerated facility and examine some of the approximate times that events occur as the incident unfolds.

In this case, a 150-psig relief valve on a surge drum released. The estimated wind speed was approximately 7 mph, which was normal for the area. But in these few minutes, two minutes to be exact, the wind carried the ammonia over 1000 feet, which was well past the facility property line.

During the first couple of minutes, the ammonia could be smelled outside of the facility property line. There was no plan in place to determine how to rapidly notify or alert the public of what to do if an ammonia release occurred. In this event, it was actually someone outside the facility property that called 911. The 911 dispatcher quickly notified responders, which in this case included members of the fire department and police department.

Once the call arrived at the fire department, the responding fire company engine quickly prepared, left the station, and in about seven minutes was on site at the facility. A police unit arrived shortly after that. Once the fire department arrived, it took a few more minutes for the engine captain to determine what the event was,

*continued on page 52*

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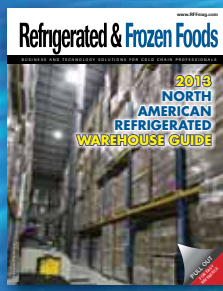
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the status of the facility employees (they were all accounted for and safe), and where to set up exclusion areas.

With the identification and confirmation that this was an ammonia release, the fire captain radioed fire dispatch to request the hazmat team to respond. It would be over another 30 minutes before the hazmat team arrived.

State Patrol (in this particular state, the designated incident commander for hazmat events) was also contacted by the fire department to coordinate what was happening. The local ambulance service also sent an aid unit, which arrived a few minutes after the fire engine.

In the follow-up to the ammonia release, it was stated by the office of emergency management that whoever owns the chemical is responsible for notifications, including alerting the public of the emergency. This was not new information, but the lesson learned was potentially how little time was available to accomplish the notification of the people and businesses around the facility or in the potentially affected area.

As was found in this event, the ammonia smell went over 1,000 feet in the first few minutes of the release, which meant there was not sufficient time to make phone calls to all potentially affected offsite people or businesses. The proper response would have required a plan to have been developed and coordinated with local agencies on how to rapidly notify the surrounding area. This plan would also involve informing and educating the surrounding population prior to future events.

Another lesson learned was that since this particular facility had an "emergency action plan" and would rely on outside emergency responders, the length of time it would take to have the properly trained and equipped hazmat responders on the scene was well past the first 30 minutes of the event.

Analysis of the event timeline turned out to be an eye-opener for facility personnel, illustrating the importance of close coordination with

local emergency responders and possibly a local refrigeration contractor to improve the means and methods of dealing with an ammonia release in a timely, safe, and effective manner.

These two events illustrate lessons that can be learned to improve some of the actions and responses to emergencies. The first event shows the importance of doing proper training in a timeline well in advance of an incident, and that properly trained people should both be able to safely evacuate and be able to communicate to the right people, agencies, and media.

The second incident shows the importance of developing an emergency plan that takes into account the rapid timeline of actions that should occur during an ammonia event. Also the importance of coordinating with local responders in developing an overall action or response plan that will provide the most effective, efficient, and timely actions.

Have you considered the timelines before and during an emergency at your facility?

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# Don't Forget the Paperwork

It seems relatively simple: If the emergency contact for your facility changes, you must submit a corrected Risk Management Plan to the EPA within one month if your facility is covered by EPA's Risk Management Program Rule (40 CFR Part 68). Yet facilities often neglect to do this, many because they're unaware it's necessary, according to Peter Jordan, Senior Principle Engineer at MBD Risk Management Services.

"The EPA has said that this is one of the most commonly deficient items they find," Jordan says.

EPA regulations also require that facilities submit an updated RMP every five years, or within six months of a change which requires an updated process hazard analysis. These straightforward tasks can save facilities unexpected fines.

Having updated Process Safety Management and Risk Management Programs are among the most important factors that lead to a good outcome when OSHA and EPA inspectors come knocking on your door. It may seem like only paperwork, but failure to follow these steps can lead to big citations.

"You should have a clear description of who is responsible for managing the programs at your facilities," Jordan says. "Many facilities never update their organizational charts. It's one of those trivial things that you should never be cited for, but it's a common issue."

The need to report organizational changes in a timely manner, or in a more serious circumstance, to report an ammonia release to all necessary agencies, is often misunderstood. In 2012, an organic food company processing facility was fined for not notifying all required agencies about an ammonia release. Although the EPA said the company did report the ammonia release to the state's department of environmental protection, it did not immediately report it, as required, to the state's emergency management agency and to the county's emergency services office.

Not reporting the ammonia release to all required agencies violated the Emergency Planning and Community Right-to-Know Act. According to the EPA's web site, the act: "*Mandates that facilities immediately notify state and local emergency response officials of significant releases of hazardous chemicals, and to provide follow-up reports on response actions and public health effects. This information ensures that state and local officials have timely and complete information to respond to chemical emergencies.*"

Making certain your PSM and Risk Management Programs are current includes updating the maximum intended ammonia inventory whenever a change occurs which could affect the inventory. Regulations also require that the pressure release design and design basis be updated whenever there are changes in the system. According to Jordan, OSHA has been finding cases where these items were never properly documented and/or have not been updated when necessary.

It's important to note that the management of change, or MOC, and pre-start up safety review, or PSSR, procedures must be followed prior to implementing any changes in the system if the facility is covered by PSM and Risk Management Program regulations.

Four presenters will address these points during a seminar at this year's IIAR conference in Nashville. The educational program will examine IIAR's Process Safety Management and Risk Management Program Guidelines and focus on strategies for its implementation. In addition, this seminar will discuss how to conduct effective audits for regulatory compliance. The seminar will conclude on a discussion of typical PSM and Risk Management Program weaknesses that are consistently arising as a result of regulatory inspections conducted as part of OSHA's National Emphasis Program.

Issues related to Recognized and Generally Accepted Good Engineer-



ing Practices (RAGAGEP) will also be highlighted during the seminar. "RAGAGEP is one item inspectors thoroughly examine when conducting compliance audits," Jordan says. For example, inspectors have issued citations for failure to provide and maintain proper emergency exits, failure to provide adequate protection from forklifts, and failure to properly design pressure relief systems.

The lack of preventative maintenance often leads to citations. The tests and inspections conducted as part of the preventive maintenance program must follow RAGAGEP. In addition, procedures should be written to describe in detail how these tests and inspections will be conducted. Facilities must also be able to document that personnel have been adequately trained on the procedures.

The IIAR established a task force in 2010 to update the IIAR Process Safety Management and Risk Management Program guidelines with the goal to publish a complete rewrite of the existing guidelines. The guidelines were revised to reflect OSHA and EPA clarifications, along with current PSM and Risk Management Program practices. The first section of each of the new guidelines describes the purpose of that section and contains a list of regulatory requirements and clarifications. The second section contains a "fill-in-the-blank" element with "tips" for implementation.

The bottom line: It doesn't require the imminent threat of danger or a fault in your system for your facility to be cited. Sometimes, it just comes down to the paperwork.





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# Building Efficiency Beyond the Machinery Room

Building an energy-efficient machinery room can make a big difference in energy savings. But how much of a difference is largely dependent on what takes place outside of the room, where influences throughout the facility play a significant role in energy usage.

By paying attention to details, maintaining regular communication between the machinery room and the production floor, and using common sense, facilities can improve energy efficiency in the machinery room by as much as 50 percent in five simple steps.

## STEP 1: CLOSE THE DOORS

Closing the exit and dock doors to prevent outside air infiltration from occurring seems like a fairly obvious step. But it's remarkable how many facilities fail to monitor this basic activity. It's not uncommon to see facilities that have many dock doors, with several of them open in the heat of the summer, which translates into a greater load on

the system. That forces compressors to work harder to meet the load, and contributes to a serious energy waste.

Employees sometimes leave doors open because the doors don't function quickly enough and it's easier to leave a door open when moving product. Whether it's an employee overriding controls, or a general lax approach to door policies, this issue should be addressed to ensure efficient system operation.

In these situations, a facility might consider installing faster-acting doors. In other cases, while closing the doors would be more effective, backing up trucks so that fewer doors remain open would help solve the problem.

Bottom line: The prevention of air infiltration is critical in reducing the load and can provide an energy savings of up to 50 percent.

## STEP 2: MONITOR COMPRESSORS

Monitoring the sequencing and control of compressors is another method



to increase energy efficiency in the machinery room. The goal should be to have compressors operating loaded to 100 percent and only one machine at a reduced "variable" load. A popular philosophy of leaving compressors on "hot stand-by" to meet an unanticipated lineup start in a plant can also drain energy. It's similar to leaving a car running in case a sudden departure is needed. It just doesn't make sense from an energy standpoint. To prevent this, effective communication between the machinery room and the production floor is critical.

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The functional description of the refrigeration system can also be programmed to keep all compressors fully loaded, with one variable machine. Once the variable compressor drops below 20 percent, it should be shut down to save energy. Even if the facility is not properly wired or programmed to allow this recommended compressor sequencing, the cost of making this modification will be quickly recouped in energy savings.

### STEP 3: ACCOMMODATE OUTSIDE TEMPERATURES

Many facilities aren't aware of the energy benefit that can be gained from floating head pressure control utilizing a wet bulb approach. Plants often fail to make changes in system head pressure to accommodate cooler outside temperatures or drier outside air. As the wet bulb temperature fluctuates, the system head pressure can be reduced, which in turn will lower the energy used in the equipment room. Many older systems run at a constant high side head pressure regardless of changes in the outside temperature. By using the wet bulb approach to control head pressure, the correlation between system operating pressure and wet bulb can be held to a narrow pres-

sure differential. This will significantly reduce the energy consumption for the machinery room compressors when the outside temperature drops or the outside air is dryer than normal.

Changes in the system and operating schedules in response to weather conditions also apply to defrosting strategy. Facilities in colder climates don't require the same level of defrosting on evaporator coils in winter, when there is less moisture in the air to infiltrate the facility and affect the coils. Yet many plants keep the same defrosting schedule year-round, running identical defrost frequencies in January and July. Defrosting several times a day in cold weather does not make sense when only two defrost periods a day are needed to allow efficient evaporator performance. A visual inspection of the evaporator coils will reveal when defrosting is necessary and provide energy savings at the machinery room. Logging these observations and conditions will make it easier to predict and adjust defrost schemes.

### STEP 4: SLOW DOWN THE FANS

Another way to reduce energy consumption in the machinery room is by slowing down fans to reduce air flow through the evaporators and condensers. Fans

draw considerable amperage each time they turn on from a dead-start. By keeping the motor running, and varying the speed based on the air required, energy savings can be earned. Variable frequency and, or, two-speed fan controls on the evaporators and condensers will result in significant reductions in amperage requirements and provide for a balanced system. This also reduces heat input to the refrigerated room that would otherwise need to be removed by the compressors. These control methods will result in smoother overall system operation and energy savings at the equipment room compressors.

### STEP 5: DON'T FORGET THE LIGHTS

Finally, changing from halogen and high-powered lights to LED or low-emission light bulbs could provide as much as a 40 percent energy savings.

In the end, building or modifying a machinery room to operate at maximum energy efficiency doesn't require costly changes, time-consuming manpower or even innovative approaches to energy usage. The biggest energy savings can be had as a result of attention to detail, maintaining a constant level of communication with personnel and applying common sense.

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# Brazil Faces Challenges, Opportunities, with HCFC Phase Out



Brazil will host the 2016 Olympics and the World Cup this year, two high-profile events that will draw the attention of the rest of the world. And within our industry, several factors are making the country worth watching as it takes an increasingly central role in the international growth of natural refrigerants.

Size is one factor: it is the fifth largest country in terms of area and has the world's fifth largest population. It also has the seventh largest economy, which is notable for several sectors depending on refrigeration. Brazil ranks number three in agricultural

cent from improper repair. Da Silva concludes that the majority of blame for these system failures lies with the operators and owners as well as negligent maintenance routines. He cites the lack of skilled ammonia refrigeration technicians, insufficient employee training and ammonia training courses, and the absence of programs for process safety management, risk management and emergency response as underlying causes for incidents described in his study. Among the other direct causes of the ammonia incidents he describes are faulty design or fabrication (13 percent), safety valve issues

## Brazil's ammonia refrigeration industry currently faces two related challenges: safety, and the lack of qualified ammonia refrigeration operators and technicians.

exports worldwide and is the leading global supplier of beef, chicken, orange juice and soy. It also has a thriving and diverse industrial sector, second only to that of the U.S. in the western hemisphere.

Brazilian industry benefited from substantial investment in new equipment and technologies since the Real Plan brought stability to Brazil's currency in 1994, paving the way for impressive economic growth in the ensuing years. However, industries like industrial refrigeration face significant challenges in Brazil, along with important opportunities.

Brazil's ammonia refrigeration industry currently faces two related challenges: safety, and the lack of qualified ammonia refrigeration operators and technicians. A study by Alessandro da Silva of 38 ammonia incidents in refrigeration facilities in Brazil that occurred between 2010 and 2013 illustrates the relationship between these two problems.

About 55 percent of the incidents resulted from operator error or poor maintenance and another 10.5 per-

cent (10.5 percent) and improper installation (3 percent). Da Silva classifies the remaining incidents (8 percent) as unknown or under investigation.

Another challenge is the limited amount of technical information and knowledge for industrial refrigeration in Brazil. One limiting factor is language: Brazil is the only Portuguese speaking country in Latin America and a small percentage of the population speaks English. Until recently there were few materials specific to ammonia refrigeration available in Portuguese. Brazil has one safety standard for refrigeration; however, it does not specifically address ammonia refrigeration systems. In the last decade, the Brazilian government has begun to remedy the scarcity of published technical guidance. Following an ammonia accident affecting 127 workers including two fatalities at a shrimp processing plant in the city of Natal in northeastern Brazil in 2003, the department of worker health and safety published a general introduction to ammonia refrigeration technology

for safety inspectors to facilitate better interaction with the industry.

Then, in 2009, Brazil's environment ministry published three more detailed reference guides for the industry, including: Design Recommendations for the Safe Operation of Ammonia Refrigeration Systems; Recommendations for Commissioning and Start-up for Ammonia Refrigeration Systems; and Recommendations for Operation and Maintenance of Ammonia Refrigeration Systems.

The three guides, available for download at the publications page of [www.protocolodemontreal.org.br](http://www.protocolodemontreal.org.br), reference IAR standards and bulletins as well as other international and Brazilian standards.

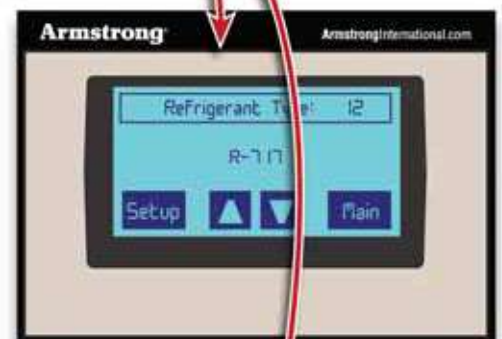
In fact, parts of the guides rely heavily on IAR content. In the design guide, the section on machinery room design is based primarily on IAR Bulletin 112. The chapter on machinery room ventilation draws heavily on Bulletin 111 and the design recommendations for future modifications are largely based on Bulletin 107. In the second guide, there is a chapter on start-up based on Bulletin 110 and another chapter containing safe operating criteria is based on Bulletin 109. Among the twelve sources mentioned in the third guide on operations and maintenance are four IAR bulletins, the *Ammonia Data Book* and three IAR technical papers.

In the second half of 2013, the ABNT's (the Brazilian Association of Technical Standards) industrial refrigeration studies commission began laying out Brazil's first ammonia refrigeration standard. The standard will be based on existing international publications including ANSI/IAR-2. The group work-

*continued on page 60*

# Refrigerant Loss Calculator

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ing on this standard includes academics, design engineers, consultants, end users and equipment manufacturers.

The growing amount of technical information and knowledge specific to ammonia and other natural refrigerants should help create new opportunities for natural refrigerant use in Brazil by increasing the safety of current applications and should lead to a growing acceptance, awareness and use of these technologies.

As a signatory of the Montreal Protocol, Brazil participated in the CFC phase out and is now in the early stages of implementing an HCFC elimination program. Brazil committed to freeze its HCFC consumption at 2009/2010 levels in 2013 and completely eliminate the importation, production and sale of HCFCs by 2040.

However, according to Leonilton Tomaz Cleto, the refrigeration consultant who worked with the government to develop the three ammonia refrigeration guidelines mentioned above, this HCFC phase out program

will not necessarily translate any time soon into significant gains for natural refrigerants in Brazil. In his view, Brazil lacks the political will to provide the incentives needed for a big shift towards natural refrigerants. Therefore, Tomaz believes, refrigerants with zero ODP but with a high GWP (like R-134a and R410a) may become the main beneficiaries of the HCFC phase out program during the coming years.

On the other hand, there are indications of natural refrigerant use gaining ground despite the absence of big incentives from Brazil's government. One example is the growing use and recognition of CO<sub>2</sub> in commercial refrigeration, especially supermarket applications. A technical paper to be presented in Spanish by Alessandro da Silva at IIAR's upcoming Industrial Refrigeration Conference and Heavy Equipment Show in Nashville describes 40 such systems in operation throughout Brazil.

According to Fabricio Franco of MRbraz & Associates, Brazil needs to focus on at least four objectives to effec-

tively manage the opportunities presented by the HCFC phase out, including:

1. Identify low GWP substitutes for HCFC-22, including HC-290 (Propane), HC-600A (Isobutane) and HFC-32, all flammable;
2. Revise international standards like IEC 60335-2-40 and ISSO 5419 to include flammable refrigerants;
3. Train technicians to handle equipment containing flammable refrigerants; and
4. Prohibit the importation of equipment containing HCFC-22.

Of course, IIAR is eager to do what it can in Brazil to help push the balance in favor of natural refrigerants like ammonia and CO<sub>2</sub>. IIAR has provided technical information for the committee developing Brazil's ammonia refrigeration standard. In addition, IIAR is discussing potential cooperation with ABRAVA, Brazil's leading HVAC-R association, ABIAF -Brazil's cold storage industry association, and Brazil's ASHRAE chapter.







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# IIAR Responds to Media Coverage

Two days after publishing a news story which many in the industrial refrigeration industry felt overstated the potential hazards of ammonia to the public, Pennsylvania-based newspaper, the Times Tribune, ran a follow-up news story presenting the industry in a more positive light.

Dave Rule, president of the International Institute of Ammonia Refrigeration, said in an interview with the Tribune for the follow-up story, that industrial plants all over the U.S. prefer ammonia for many reasons, not least of which is the proven safety record of the industry.

The first story published by the Tribune failed to give information on the industry's safety record or safety resources, and instead focused on outlining worst-case-scenario plans on file at the EPA. The story emphasized that eight facilities that use large amounts of anhydrous ammonia in one region of Pennsylvania could put 46,238 people at risk in a worst case scenario situation.

The Tribune's follow up article downplayed the likelihood of worst case scenario incidents, and incorporated perspective on safety from the industrial refrigeration industry, including comment from facility general managers and IIAR.

IIAR's Rule outlined the industry's safety standards, pointing out that they cover every part of the life cycle of a facility, including design, operation and maintenance, personnel training and decommissioning guidelines. He also emphasized the environmental benefits of ammonia refrigeration and the industry's critical role in the nation's cold chain.

"Part of the reason we have such a strong and safe cold chain in the United States is because we're able to keep food refrigerated from field to table," he said. The Tribune article can be found archived online at the newspaper's website.

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from the technical

## DIRECTOR

BY ERIC SMITH, P.E., LEED AP, IAR VICE PRESIDENT AND TECHNICAL DIRECTOR

**W**hen the tragedy involving the explosions of ammonium nitrate occurred at the West, Texas, fertilizer facility last year, much of the national conversation turned to how industries can work to better protect workers and

when the conclusion often seems pre-determined. In this case, OSHA is requesting industry feedback before rules changes are drafted. It is a unique opportunity to help guide our destiny. When the RFI was issued, IAR initially responded by notifying members with an email alert which included a link to the RFI and a request for feedback. Next IAR developed a

a concise and powerful response to the RFI. The deliverable will be a detailed letter to OSHA describing our concerns and listing the contributors and co-signers.

Generally speaking, the IAR believes that the existing regulations are very comprehensive and quite effective. There are far fewer instances of ammonia refrigeration accidents than there were before PSM and RMP were implemented in the mid 1990's. People are much more aware of the possible severe consequences of poor maintenance and procedures. The regulations have been responsible for the development of a multitude of associations, programs, schools, materials and businesses dedicated to making our industry safer...and they have worked. IAR has served to provide educational information, guidelines and standards tailored specifically to our industry. Unfortunately there are too many companies and individuals who are not members or are generally not aware of the need for compliance with existing regulations and the realities of poor maintenance and operating procedures.

We also recognize that some industries are not held to such rigorous standards when handling ammonia. For example, accidents in transferring or transporting ammonia used in the agricultural industry can occur too often. When these accidents occur, any industry using ammonia is tainted by the bad publicity. We continue to encourage OSHA to place more emphasis on identifying those facilities and industries that are grossly negligent and to develop methods that will provide funds for more education and training purposes. A re-direction of focus and resources could lead to a better

### The Obama Administration has issued an Executive Order to improve chemical facility safety and security. The order directs OSHA, the Department of Homeland Security, the EPA and other agencies to examine their regulations and propose ways to improve safety.

the public at large. The loss of life and property was unfathomable to many, and public outcry has demanded a response. As a result, the Obama Administration has issued an Executive Order to improve chemical facility safety and security. The order directs OSHA, the Department of Homeland Security, the EPA and other agencies to examine their regulations and propose ways to improve safety. As a result, OSHA has issued a Request for Information (RFI) to solicit feedback from various industries on regulatory change proposals that could impact the ammonia refrigeration industry.

The IAR welcomes the opportunity to weigh in on these proposals. Often rules changes are instigated by agencies and the only opportunity to comment on them is during official public review comment periods,

task force of talented members who are intimately familiar with ammonia refrigeration and PSM and RMP regulations and who represent highly recognizable companies and associations. Among this group are individuals representing facilities used in cold storage, distribution, meat and poultry production, and prepared foods production. Also participating are representatives of the Ammonia Safety Training Institute (ASTI), Refrigeration Engineers and Technicians Association (RETA), IAR Board of Directors, and IAR Standards, Safety and Code Committee members. This group has been reviewing the RFI line by line and has begun returning their comments. We have also engaged other associations such as the American Meat Industry, the Global Cold Chain Alliance and others to develop

*continued on page 64*





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safety record for all facilities that use ammonia. An example might be to use money levied from fines toward the education of technicians and inspectors. Another concept is to use some resources for identifying facilities and industries which are not attempting to

of this is a periodic independent inspection of equipment. Another point with which we agree is the requirement to coordinate emergency planning with local emergency response authorities. For most facilities, this is already a requirement per the EPA's Risk Management

review a facility against IIAR standards rather than reference those which are not applicable; for example American Petroleum Institute (API) standards. A common set of standards that are recognized by both regulators and industry would provide more consistency and greater safety in ammonia facilities.

## We agree that the PSM standard should define recognized and generally accepted good engineering practices.

follow generally accepted safety standards and regulatory compliance.

We acknowledge that many of the ideas presented in the OSHA RFI are worthy of consideration. Many are actually actions that our industry already implements and are reflected in the IIAR PSM/RMP guidelines. An example

Program, and compliance might not impose any additional new measures. We agree that the PSM standard should define recognized and generally accepted good engineering practices (RAGAGEP) and that these should be periodically reviewed for applicability. This is a great opportunity to reinforce the position that regulators should

As with any written set of standards, regulations or rules, the language of the intent can be the greatest barrier to implementing good ideas rather than imposing unreasonable expectations. While our industry may agree that a concept is worthy, we must be careful to consider what is written and how it will affect our industry. We shall continue to engage with OSHA and other agencies and work diligently to monitor and influence the crafting of any new language in the regulations. We ask that you support these efforts by encouraging IIAR membership and participation to anyone in the industry that benefits from our work.

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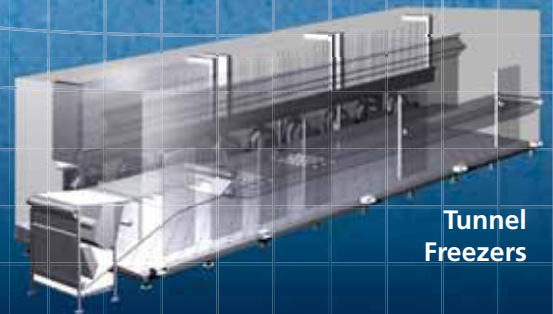
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