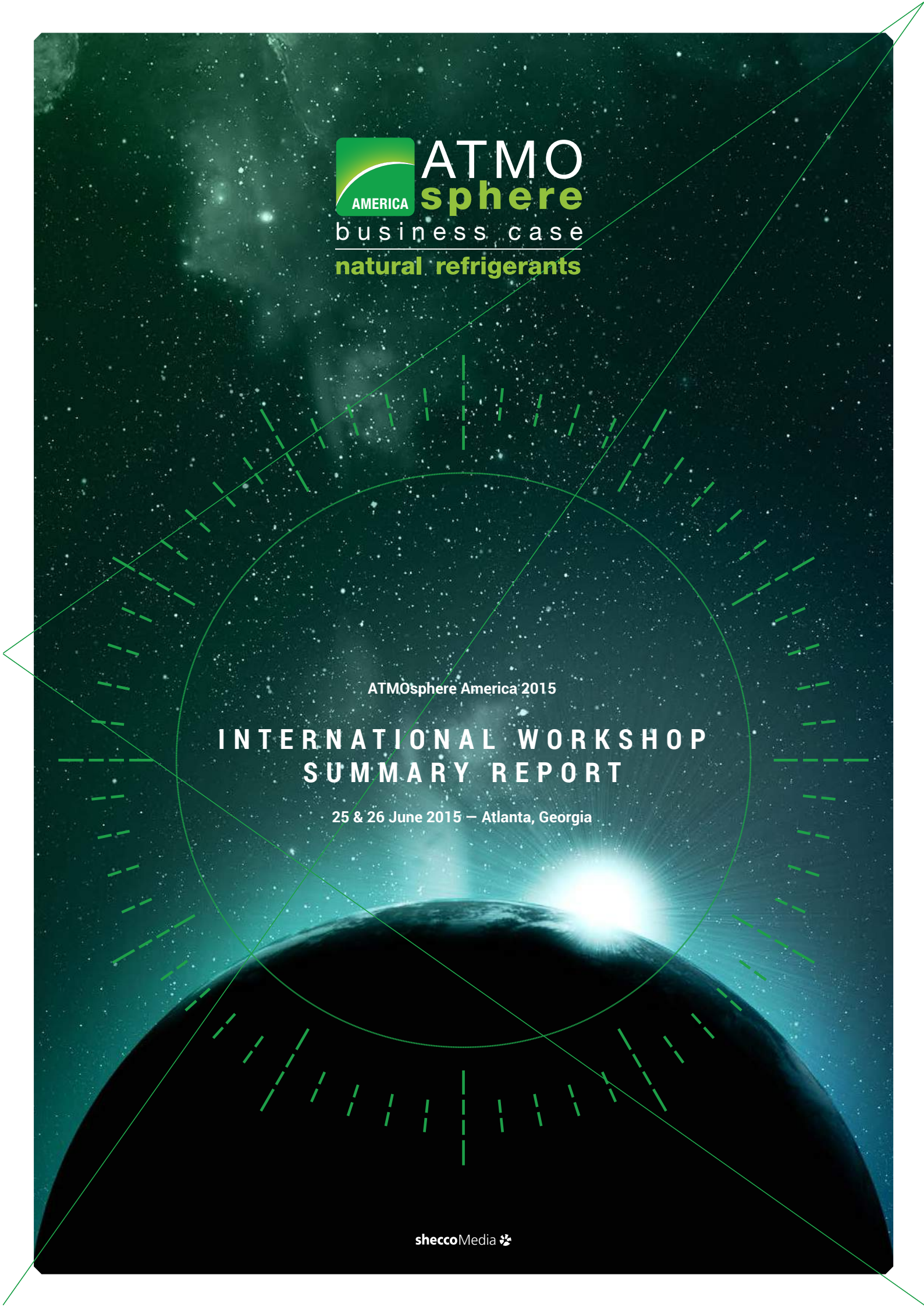
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ATMOsphere America 2015
INTERNATIONAL WORKSHOP
SUMMARY REPORT
25 & 26 June 2015 – Atlanta, Georgia
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ATMOsphere America 2015

Summary Report International Workshop
published by shecco®
www.atmo.org
http://publication.shecco.com

shecco America inc.
570 Seventh Avenue
New York, New York 10018
USA
www.shecco.com

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NUMBERS, NUMBERS, NUMBERS....

This ATMOsphere America was more about numbers than ever before - I don't just mean in terms of attendance (over 300 people / 140+ organisations) or presentations (more than 80), but also in terms of innovative projects launched, units shipped, solutions provided, installations completed – I mean the market growth.

So why does this matter?

Simply put, we are measuring progress. It demonstrates progress for natural-refrigerant-based technologies across several key sectors; natural refrigerants are accelerating. We are growing as an industry, and this is outstanding! And, to be frank, this is only just the beginning as natural refrigerants and the companies offering solutions based on these expand rapidly over the next two to three years.

Second, we are seeing competition among natural refrigerants themselves. In industrial applications there is huge innovation with low charge ammonia, CO_2/ammonia, and CO_2-only systems shaking up the traditional market. CO_2 and hydrocarbons in light commercial space are ready to capture the future market as EPA and DOE rulings and standards come into place. The use of CO_2 and hydrocarbons is also mounting in food retail, and not to forget low charge ammonia packaged units that will enter the commercial sector.

Again, this is only the beginning. The market is swiftly evolving, and I can't wait to see what the next year has in store for ATMOsphere America!

MARC CHASSEROT
CHAIRMAN, ATMOSPHERE AMERICA 2015
MANAGING DIRECTOR, SHECCO

ATMOsphere returned to America on 25 and 26 June 2015, in Atlanta, Georgia, making it the fourth – and biggest – ATMOsphere America conference. The event drew more than 300 participants and featured more than 65 international speakers from every facet of the HVAC&R industry, including government representatives, technology providers and end-users, who presented the latest trends in natural refrigerants in and around North America. The conference offered an exciting and varied array of coverage from light commercial, commercial and industrial refrigeration applications to heat pumps and energy incentives, and even highlighted some new applications for natural refrigerants.

The Market Opportunities Session and Food Retail Panel offered insights into HVAC&R market demand and best practices from end users such as McDonald's, The Coca Cola Company and Whole Foods Market. The Training Panel addressed what many view as the most significant barrier to the adoption of natural refrigerant technologies, while the New Applications Case Studies highlighted that natural refrigerants are more applicable than ever.

To complement the plethora of case studies and panel discussions, Platinum and Gold Sponsors Hillphoenix, Bitzer, Hussmann and Mayekawa organised site visits and a training session before and after ATMOsphere America. The day before the event kicked off, Hillphoenix offered a technology symposium, Bitzer organised two compressor seminars at its manufacturing campus near Atlanta, and Hussmann offered a tour of its new product display centre. Mayekawa hosted a post-event training session, which covered a natural refrigerant overview, different types of systems and steps toward success.

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Take a deep breath. Now blow — you're exhaling one of the most abundant natural resources on earth. And the key to Hillphoenix® Second Nature® CO_2 refrigeration systems. CO_2 is naturally occurring and that makes CO_2 refrigerant plentiful, available and inexpensive. CO_2 systems are environmentally friendly and cost less to install and maintain. But a CO_2 Second Nature system is only one of several refrigeration options available from Hillphoenix.

As the nation's leading refrigeration expert for the food retail industry, the company can design and build systems based on glycol, CO_2, ammonia or practically any other existing or future refrigerant. Hillphoenix introduced its first, sustainable refrigeration solution in the 1990s and today, enjoys a reputation among customers and peers alike as the industry's premier design and technology innovator. Tomorrow is already on the drawing boards and if today is any indication, it will take your breath away.

Hillphoenix
A DOVER COMPANY

Phone: 844-540-8803
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Benefits of CO_2

- *Significant HFC charge reduction with CO_2 Secondary & Cascade systems and 100% HFC elimination with CO_2 Booster systems.*
- *CO_2 offers improved compressor energy performance.*
- *Smaller diameters reduce copper pipe usage.*
- *Eliminates future refrigerant retrofits that interrupt sales floor activity.*
- *Much smaller carbon footprint.*
- *CO_2 is naturally occurring and delivers a GWP (Global Warming Potential) of almost 0.*
- *CO_2 refrigerant is abundantly available and inexpensive.*
- *Sustainable technology helps achieve GreenChill certification.*

CHAPTER 1
POLICY DEVELOPMENTS

As the North American regulatory environment continues to evolve and standards continue to change, one message rang clear during ATMOsphere America 2015: reducing greenhouse gas emissions is vital, and the HVAC&R industry has a key role to play in doing so. As other regions, particularly Europe, with its aggressive F-Gas Regulations, make headway in delisting high-GWP refrigerants, and nations like Japan restrict f-gases and incentivise the use of natural refrigerants, North American policymakers reflected on steps taken so far throughout North America to combat climate change caused by high-GWP refrigerants, including the approval of natural refrigerants for a variety of HVAC&R applications to replace high-GWP refrigerants. They also discussed what could be done to continue progress.

GERALD WOZNIAK

EPA

DOMESTIC APPROACHES TO HIGH-GWP HFCS

Gerald Wozniak, Environmental Engineer in the EPA's Stratospheric Protection Division, explained how, if left unchecked, HFC emissions could rise to around 20% of total carbon emissions by 2050. As a manager of the EPA's Significant New Alternatives Policy (SNAP) program, Wozniak highlighted the importance of reducing the use of HFCs domestically while transitioning to natural, sustainable alternatives.

> "There will be more delistings as well as approvals."
>
> **GERALD WOZNIAK,**
> **ENVIRONMENTAL ENGINEER,**
> EPA

ANTONIO BOUZA

DOE'S BUILDING TECHNOLOGIES OFFICE (BTO)

REFRIGERANT R&D

Antonio Bouza, Technology Business Manager with the Department of Energy (DOE) examined the BTO's goals for HVAC, water heating, and appliance R&D such as achieving 50% energy savings in buildings and accelerating the development of new technologies. Bouza made it clear that the DOE's preliminary target is to introduce technologies in the simplest application first, a tactic proven to have the highest probability of success. He also outlined some of DOE's ARRA (American Recovery & Reinvestment Act) projects including developing next-generation refrigeration lubricants for low GWP/ODP refrigeration and air conditioning, as well as energy-efficient commercial refrigeration with CO_2 and scroll expanders. Lastly, Bouza discussed the DOE's partnerships with HillPhoenix (Transcritical CO_2 Advansor System) and XERGY (Advanced Hybrid Water-Heater Using Electrochemical Compression).

GLENN GALLAGHER

CALIFORNIA AIR RESOURCES BOARD

REGULATION OF HIGH-GWP REFRIGERANTSHIGH-GWP HFCS

> "The measures are trying to complement, not conflict [EPA and DOE standards], but we will probably be a little more aggressive about our goals."
>
> **GLENN GALLAGHER,**
> **AIR POLLUTION SPECIALIST,**
> CALIFORNIA AIR RESOURCES BOARD

Glenn Gallagher, Air Pollution Specialist with the California Air Resources Board (CARB), discussed the curtailment of high-GWP refrigerants and how this will help achieve California's goal of reducing greenhouse gas (GHG) emissions to 1990 levels by 2020. Following this period, reductions of 40% by 2030, and 80% by 2050, are expected. Gallagher went on to outline the dominant sources of HFCs in California, and summarized the reduction measures proposed, including banning sales of "very-high GWP refrigerants" with GWPs of 2,500 or greater by 2020, limiting stationary refrigeration to refrigerants with under-150 GWP by 2021, and restricting stationary air conditioning to refrigerants with GWP of less than 750 by 2022.

RANDALL HASEMAN

UL

REFRIGERANTS AND UL STANDARDS

Randall Haseman, Principal Engineer, Underwriters Laboratories, examined the history of Underwriters Laboratories as well as the first meeting of the Flammable Refrigerant Joint Task Group, which culminated in the release of the "Recommendations Report" in 2014. Haseman outlined the current HVAC&R regulations in North America and the many revisions executed to meet certification needs in the market, including key changes to UL 484 pertaining to charge limits of flammable refrigerants.

KLARA SKACANOVA

DEPUTY MANAGER, MARKET DEVELOPMENT AT SHECCO

POLICY TRENDS FOR NATURAL REFRIGERANTS AN OVERVIEW IN EUROPE, JAPAN AND CHINA

Klara Skacanova, Deputy Manager, Market Development at shecco, , gave an overview of the different regulatory and market drivers for natural refrigerants across Europe, Japan and China. Skacanova outlined how Europe's aggressive regulatory stance covering various applications has helped delist high-GWP refrigerants, a move that is anticipated to drive down the average GWP of refrigerants from 2,000 in 2015 to 400 by 2030. Meanwhile, in Japan and China, f-gas restrictions, incentives for natural refrigerants through government support, and consumer awareness are helping shape a cleaner HVAC&R market.

CHAPTER 2
MARKET TRENDS

As climate change continues to gain traction on social and political agendas in North America, many companies are working to green their corporate image. A clear message - that the HVAC&R industry is quickly evolving and the time for future-proofing businesses is now - rang throughout ATMOsphere America 2015. Leading end users Delhaize, McDonald's, Los Angeles Cold Storage and Coca-Cola North America came together to identify what opportunities exist for natural refrigerants in the North American market based on their experiences with pilots and successful implementations. As pilots and trials prove successful, supermarkets are accepting CO_2-based systems as prototypes; hydrocarbons are becoming increasingly popular in the food service industry; and low-charge ammonia applications are gaining traction in industrial settings.

Moreover, the energy efficiencies achievable with natural refrigerants solutions can play an important role in reducing demand on utilities, which will be vital to mainstreaming these technologies.

There are more than 120 transcritical CO_2 supermarkets in operation in North America today, a number that is steadily growing. However, ATMOsphere America also revealed that, far from being a one-trick pony, transcritical CO_2 systems are finding their way into a number of industries, such as cold storage, winter sports and data storage. In addition, Dunwoody, Georgia, has become home to the southern-most CO_2 transcritical system, which is proving more efficient than even initially projected, and dispelling doubts about transcritical's effectiveness in warmer climates.

Overall, stakeholders across the board are eager to build confidence in natural refrigerant-based technologies, with training and product availability remaining major areas that need to be improved.

MARKET OPPORTUNITIES

HARRISON HORNING

DELHAIZE AMERICA

MARKET OPPORUNITIES

Harrison Horning, Director of Energy and Facilities, Delhaize (Hannaford Bros. division) outlined the principles that are driving Delhaize forward in its use of natural refrigerants and where the company sees potential. This potential was explored through some of Delhaize's pilot projects in light commercial, commercial and industrial refrigeration applications.

> "We need the suppliers to reduce the cost, that's true, but if the CFO is holding the purse strings, you'll have to wait for the cost to drop to zero. What I'm saying is there are two parts to that. The suppliers are doing their part, and we [retailers] need to do our part and invest when there is a return."

HARRISON HORNING,
DIRECTOR OF ENERGY AND FACILITIES,
DELHAIZE AMERICA

ROY BUCHERT

WORLDWILDE ENERGY DIRECTOR

MCDONALD'S

Buchert, Worldwide Eenergy Ddirector, McDonald's, discussed the huge growth potential for natural refrigerants in McDonald's restaurants and restaurants in general in the U.S. Using the example of McDonald's successful roll-out in Europe, Buchert explained the reasons pushing McDonald's to make the adjustments in America including sustainability, policy and environmental responsibility. Buchart updated the audience on the current availability of McDonald's equipment using hydrocarbons, with small refrigeration equipment (150 grams or less of R290) now on the market in the U.S.

JOHN S SCHERER

LOS ANGELES COLD STORAGE COMPANY

COLD STORAGE MARKET BUSINESS OPPORTUNITIES

John Scherer, Manager of Engineering for Los Angeles Cold Storage, explored the growth of low-charge ammonia systems in the industrial sector and how it can go a long way toward addressing the mega-trend of increasing demand for cold storage in the U.S. As R22 is phased out, Scherer expressed the expectation that the market will adopt low-charge ammonia as its long-term solution.

BRUCE KARAS

COCA-COLA NORTH AMERICA

REDUCING OUR IMPACT

Bruce Karas, Vice President of Environment and Sustainability for Coca-Cola North America, discussed the importance of Coca Cola's point-of-sales equipment. Karas described the equipment as one of the few chances the company has to speak directly to the consumer and show it cares about the environment. In addition, he discussed how the company is looking to improve environmental performance across its supply chain.

RON DOMITROVIC

ELECTRIC POWER RESEARCH INSTITUTE

MARKET OPPORTUNITIES

With EPRI (Electric Power Research Institute), Ron Domitrovic, Program Manager, advises utilities on new energy-efficient equipment. He spoke of the growing importance of natural refrigerants and natural refrigerant-based equipment in helping utilities reduce demand on their grids. Domitrovic noted that the commercial refrigeration sector is the first area of focus as its systems are among the larger users (and leakers) of refrigerants.

STATE OF THE INDUSTRY

NINA MASSON

SHECCO

STATE OF THE INDUSTRY – INTRODUCTION

Nina Masson, Deputy Managing Director at shecco and moderator of the session, gave insights into natural refrigerant trends in the food service industry and provided a detailed analysis of CO_2 transcritical (TC) stores in North America. With 120+ CO_2 TC stores in the U.S. and Canada today, Masson anticipated the further adoption of natural refrigerants in the coming years on the back of further market and regulatory changes. Emerging market trends such as low-charge NH_3 systems and more energy-efficient equipment were also discussed during her presentation.

SCOTT MARTIN

HILLPHOENIX

ADVANCES IN REFRIGERATION UTILIZING NATURAL REFRIGERANTS

Scott Martin, Director of Sustainable Technologies for the Refrigeration Systems Division at Hillphoenix, explained the applications in which the company utilises natural refrigerants and presented on how CO_2 systems have evolved in the North American market since 2006. In his presentation, Martin pointed out that CO^2 booster systems are rapidly spreading as viable technology in the region, with an expected annual growth of 120% year-on-year. To conclude, Martin also discussed the main challenges to overcome in the adoption of these systems, including energy efficiency in warmer climates, regulations and standards and training.

QUENTIN CROWE

HUSSMANN

BUILDING CONFIDENCE IN NATURAL REFRIGERANTS

Quentin Crowe, Product Manager at Hussmann, presented the company's path to developing and providing natural refrigerants-based technology for food retailers since 2012. Crowe also pointed out ways to make natural refrigerant options affordable by focusing on variables such as pressure control, safety, climate, design and technical and aftermarket support. Throughout 2015 Hussmann will continue to align case and coil products to support its CO_2 offering and will deliver its first transcritical store later this summer. In September 2014, Hussmann formed an alliance with Systemes LMP to work on CO_2 systems.

MARC-ANDRÉ LESMERISES

CARNOT REFRIGERATION

CO_2 IS GOOD, NOT ONLY FOR SUPERMARKETS!

Marc-André Lesmerises, President of CARNOT Refrigeration, focused his presentation on CO_2 refrigeration systems for commercial, industrial and burgeoning applications such as data centres. CARNOT has also developed a new type of chiller, the Aquilon system.

DUSTAN ATKINSON

HEATCRAFT WORLDWIDE REFRIGERATION

AN INDUSTRY IN TRANSITION

Dustan Atkinson, Sales Manager, Supermarket Systems for Heatcraft, presented the company's project overview in North and South America, Europe, Asia and Australia, as well as future plans for natural refrigerant technology to meet customer demands. Technician skill level, local regulatory codes, sufficient component suppliers and cost reduction were discussed as the main challenges to the uptake of this technology.

MARK TOMOOKA

MAYEKAWA

TRENDING: #NATURAL, #EFFICIENT, #SAFE

Over 90% of Mayekawa's business involves natural refrigerants, providing innovative thermal solutions throughout the entire cold chain. Mark Tomooka, Director, Applied Technology Development, spoke of its latest projects including the installation of a CO_2 and low-charge test bench at a Tennessee facility, and an integrated "hot/cold" plant system designed for a customer who had traditionally installed freon systems. Tamooka pointed out education as the key to the successful adoption of natural refrigerant-based technology.

JOE SANCHEZ

BITZER US

CHANGING WITH THE TIMES

Founded in 1934, Bitzer designs, manufactures and commercialises refrigerant compressors and pressure vessels that can be used with natural refrigerants as well as ammonia compressor packages. In his presentation, Engineering Manager Joe Sanchez presented an overview of the different systems using CO_2 compressors and highlighted some of Bitzer's main projects in commercial and industrial applications in the U.S. While the industry is continually evolving, compressor manufacturers' goals remain the same: lower cost, greater efficiency, reliability, availability, and a wide range of low-noise products.

ANDRE PATENAUDE

EMERSON CLIMATE TECHNOLOGIES

RESPONSIBLE REFRIGERANT PLANNING FOR RETAIL ENTERPRISES

Andre Patenaude, Director of Marketing, Canada, Emerson Climate Technologies, explored the use of CO_2 in stores as chain sizes increase. He noted that even with the enlargement of store numbers, a reduction of CO_2 emissions is possible with CO_2 booster systems and by improving CO_2 booster architecture, resulting in impressive performances in warm ambient regions. Patenaude concluded by highlighting the key learnings of retail enterprises that apply responsible refrigerant planning.

TRAINING

JOE SANCHEZ

BITZER US

BITZER'S NATURAL REFRIGERANT TRAINING PROGRAMS

ATMOsphere America 2015, Joe Sanchez, Engineering Manager for Bitzer, explained its global training strategy designed to accommodate a wide variety of personnel from designers/engineers and technicians to sales staff and end users. Bitzer's hands-on training techniques, offered in Germany, Brazil, Australia and the U.S., are geared towards classes of 20, with instruction on how to use the company's CO_2 and ammonia compressors.

ARTHUR MILLER

RSES

HYDROCARBON REFRIGERANT TRAINING

RSES's training program is designed to equip manufacturers, service technicians and installers in proper working practices with flammable hydrocarbon refrigerants such as propane and isobutane, as well as HFCs. In his presentation, Arthur Miller, a Regional Director with RSES (Refrigeration Service Engineering Society), outlined how RSES developed its hydrocarbon training program in 2012 and continues to update it with the latest EPA SNAP regulations in the U.S.

> "Since 2012 we've trained approximately 1500 people as of June 2015 and demand and enquiries for RSES's training services have tripled since the regulations were introduced in March."

ARTHUR MILLER,
REGION 2 DIRECTOR,
RSES

JIM KALISH

STARK STATE COLLEGE

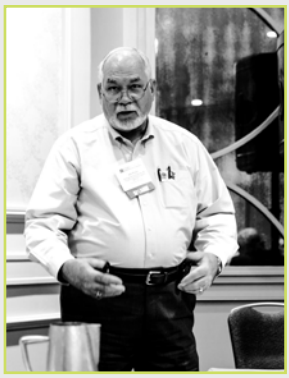
COLLEGE-COMPANY-COMMUNITY OUTREACH SERVICES FOR A BETTER ENVIRONMENT

James Kalish, Adjunct Instructor, Engineering Techniques, outlined the college's state-of-the-art CO_2 refrigeration curriculum, which functions to inform and train refrigeration professionals in the advantages of CO_2 systems and controls. Stark State has over 15,000 students, 520 of whom are directly involved in HVAC&R education. The college takes a neutral stance so as to not align itself with any particular OEM while teaching its SSC HVAC&R and environmental studies students advanced refrigeration techniques.

JIM PRICE

RETA

THE MISSION: TO ENHANCE THE PROFESSIONAL DEVELOPMENT OF INDUSTRIAL REFRIGERATION OPERATING ENGINEERS AND TECHNICIANS



The Refrigerating Engineers & Technicians Association was originally founded in 1910 and reincorporated under the RETA banner in 1963, yet the same mission exists - to enhance professional development of industrial refrigeration operating engineers and technicians. RETA's past president Jim Price presented its traditional training course principles and accompanying study material. He discussed RETA's multi-accredited interactive online training courses, which cover industrial refrigeration and ammonia, emergencies, and workplace safety.

> "As the refrigeration industry in the U.S. evolves towards more regulatory compliance requirements as well as increased use of natural refrigerants other than ammonia, for the training of technicians to work with new and innovative systems there would be a need to update not only the content of the training but also the delivery methods."
>
> **JIM PRICE,**
> **FORMER PRESIDENT,**
> RETA

RUSTY WALKER

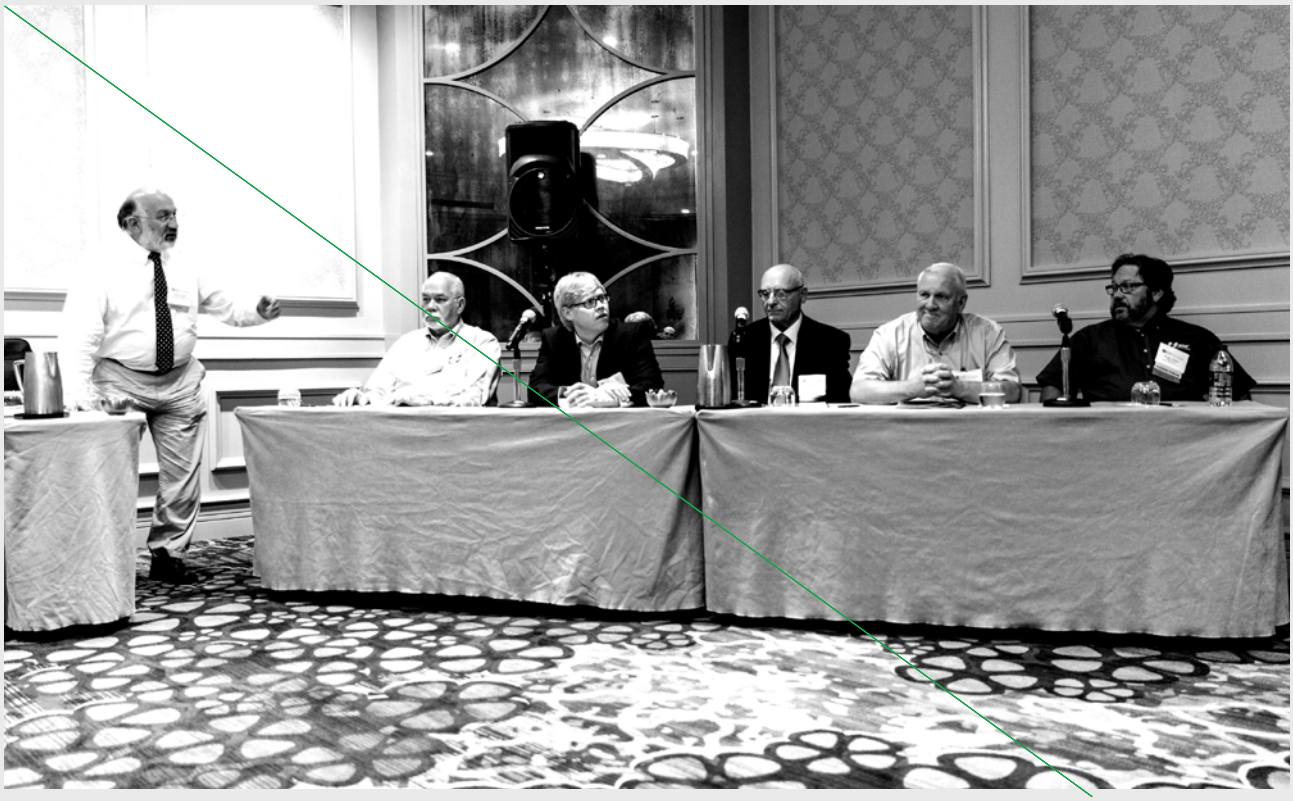
HILLPHOENIX

IS TRAINING REALLY NECESSARY?

Trainer for Hillphoenix's Learning Center since its inception nine years ago, Rusty Walker outlined some of the challenges facing contractor training, including myths and misconceptions regarding safety, system pressure, and transcritical CO_2 vs. subcritical CO_2 systems. Walker also touched on the future outlook for training the next generation of engineers and technicians, including online opportunities, YouTube, and trade schools.

> "We're a greying, maturing industry and we're not getting young technicians in the field anymore. Hands on, hands on, and more hands on. Contractors are vigil learners and we have to enable them to get their hands on the equipment."

RUSTY WALKER,
TRAINER,
HILLPHOENIX'S LEARNING CENTER



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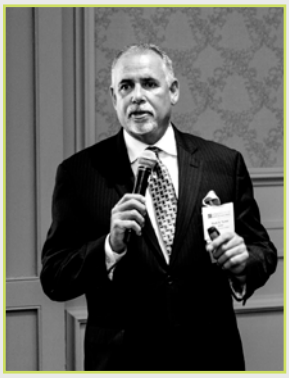


MARK TURNER

STELLAR

THREE THINGS YOU SHOULD KNOW ABOUT THE CHANGING REFRIGERATION CLIMATE

Mark Turner, National Director of Sales for Stellar, analysed the refrigeration climate along with projections for the future and how non-compliance to global warming measures can have devastating impacts on the atmosphere and water levels. Turner also touched on new technologies developed to adapt to the changing landscape and how to choose the best solutions, including distributed refrigeration with low-charge rooftop systems, CO_2/NH_3 cascade systems, and low-charge packaged chillers.

JOSE MERGULHAO

CIMCO REFRIGERATION

THE CONTRACTORS' PERSPECTIVE

Jose Mergulhao, Vice President of CIMCO Refrigeration's U.S. Operations, explained the company's role in the industry, which is to provide design/build, construction/ installation, training, service and maintenance expertise. Mergulhao detailed some of the obstacles to the adoption of green solutions, particularly ammonia regulations, as well as market trends in the U.S., including packaged systems, mini compressors, control systems and transcritical CO_2.

ROB ARTHUR

CTA ARCHITECTS ENGINEERS

NATURAL REFRIGERANT TECHNOLOGIES - DESIGN CONSULTANTS' PERSPECTIVE

In one of two presentations, Rob Arthur, Senior Mechanical Engineer for CTA Architects Engineers, offered a design consultant's perspective on CTA's global business involving natural refrigerants. The firm's 400+ employees have completed projects installing cascade (CO_2/ammonia) and CO_2 transcritical systems for chains like Albertsons, Whole Foods, Target, Walmart, and more. Arthur compared and contrasted the life cycle, cost and regulatory burden placed on natural refrigerants as compared to HFCs, outlining a strong business case for innovative green systems.

> "We do need to state the endgame and figure out how to get there, instead of taking several little steps towards lowering GWP a bit."
>
> **ROB ARTHUR,**
> **SENIOR MECHANICAL ENGINEER,**
> CTA ARCHITECTS ENGINEERS

RUSTY WALKER

HILLPHOENIX

THINGS TO CONSIDER WHEN INSTALLING A CO_2 DX REFRIGERATION SYSTEM

Hillphoenix trainer Rusty Walker asserted that the more "hands-on" the training, the better prepared installers will be. In his presentation Walker extolled the benefits of installing DX CO_2 systems, including lower installation costs due to smaller copper tubes, and electronic expansion valves eliminating the need for superheat settings. Walker urged technicians to attend certified courses and familiarise themselves with CO_2 systems and related components before doing installations.

CHAPTER 3
COMMERCIAL REFRIGERATION

Leading end users, component and system manufacturers and engineering companies used ATMOsphere America as a platform to introduce latest technology advancements and share performance results for natural refrigerant technologies already installed across North America.

Following major trends in Europe and Japan, CO_2 transcritical technology is heading south in the North American market as well, with the southern most installation in Dunwoody, Georgia, having outperformed projected results. System integration is also a key trend in commercial refrigeration, especially in convenience stores. Hydrocarbons also received notable mention in commercial refrigeration, as companies take advantage of SNAP approvals for hydrocarbons in certain applications, particularly in food service, and more recently, in larger supermarket applications.

FOOD RETAIL PANEL DISCUSSION

MICHAEL GARRY

ACCELERATE AMERICA

PROGRESS AND PROSPECTS FOR NATURAL REFRIGERANTS

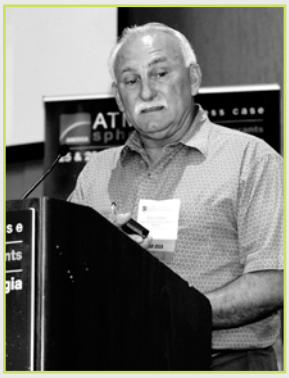
Michael Garry, Editor, Accelerate America, explored the progress and prospects for natural refrigerants by presenting the various CO_2 and cascade/secondary CO_2 installations for 2015 in the United States and Canada. He named many of the natural refrigerant food retailers in both as well.

HARRISON HORNING

DELHAIZE AMERICA

EXPERIENCES WITH NATURAL REFRIGERANTS

Harrison Horning, director of energy & facilities for Delhaize America (Hannaford) provided a summary of the retailer's experience with CO_2 since 2008. The company started with several CO_2 hybrid stores and in 2013 moved to a transcritical CO_2 model in Turner, Maine. Two other transcritical pilot stores are under construction in Berwick, Maine and Southport, North Carolina.



GARY COOPER

LOWE'S MARKETS

IS R290 THE END GAME OR JUST A PROOF OF CONCEPT?

A 34,000–square-foot (10,360m^2) Lowe's Market has been testing R290 (propane) for self-contained cases in terms of performance, safety, serviceability and total cost of installation. Gary Cooper, Director of Refrigeration at Lowe's Markets, described a glycol-loop design specifically implemented to evaluate propane (170 ounces/4,820 grams total charge) in 35 condensing units, across 88 freezer doors, Among the main advantages of the system were energy reductions beyond expectations, extended compressor life and straightforward installation. The cons included fixed capacity due to the design of the system and higher fixture costs.

> "Going forward, there are enough reasons to pursue this."
>
> **GARY COOPER,**
> **DIRECTOR OF REFRIGERATION,**
> LOWE'S MARKETS

> "Safety, given the small charge, is really more of a perception than it is a problem - there's more flammable stuff in any grocery store."
>
> **GARY COOPER,**
> **DIRECTOR OF REFRIGERATION,**
> LOWE'S MARKETS

TRISTAM COFFIN

WHOLE FOODS MARKET

WHOLE FOODS' WORLD OF NATURAL REFRIGERANTS

Tristam Coffin, Sustainable Facilities Coordinator at Whole Foods, outlined the company's commitment to natural refrigerants by describing their 14 natural refrigerant stores and refrigeration designs, with San Jose, California (transcritical CO_2) located the furthest south. Whole Foods holds the title for the first synthetic refrigerant-free supermarket in the U.S. (in Brooklyn, New York), in addition to three GreenChill Platinum Certifications. Coffin noted that prices of CO_2 systems were quickly dropping but pointed out the increasing need for better training in installation and maintenance.

> "There's no silver bullet with natural refrigerant systems; we're looking at a variety of designs in different climate zones and building types."
>
> **TRISTAM COFFIN,**
> **SUSTAINABLE FACILITIES COORDINATOR,**
> WHOLE FOODS MARKET

KEN WELTER

BALTIC TRAIL ENGINEERING

THE PATH TO TRANSCRITICAL - TC OR NOT TC: THAT IS THE QUESTION

Kenneth Welter, Senior Manager of Engineering at Baltic Trail Engineering, presented on a trial CO_2 transcritical installation at a Giant store located in Springfield, Virginia. Although it was too early to comment on energy performance, Welter observed initial benefits such as easier piping installation compared to HFC loop piping, faster and less expensive discharge gas piping, and better quality compressor rack construction. Baltic Trail Engineering works with supermarkets to provide innovative refrigeration system solutions, as well as refrigeration and HVAC service management.

COMMERCIAL REFRIGERATION CASE STUDIES

JEFF NEWEL

HILLPHOENIX

COMPARING CALCULATED ENERGY CONSUMPTION AND ACTUAL ENERGY RESULTS OF A CO_2 BOOSTER SYSTEM

Jeff Newel, Director of Research and Development at Hillphoenix, presented the company's installation of an Advansor CO_2 booster refrigeration system in a warm climate - a Sprouts Farmers Market store in Dunwoody, Georgia. Both the efficiency and cost gains were explained, presenting clear proof that transcritical CO2 systems can operate efficiently in the South.

> "Going forward, a fully integrated control system with the ability to see the operation of all components is extremely important."
>
> **TOM WOLGAMOT,**
> **PRINCIPAL,**
> DC ENGINEERING

TOM WOLGAMOT, DC ENGINEERING

TRISTAM COFFIN, WHOLE FOODS MARKET

A CASE STUDY OF THE CO2 SYSTEMS IN WHOLE FOODS MARKET'S NORTHERN CALIFORNIA REGION

Tom Wolgamot, Principal at DC Engineering, and Tristam Coffin Sustainable Facilities Coordinator Whole Foods Market, described the company's CO_2 systems in the Northern California region. These installations were compared in terms of system cost, installation cost and energy usage. The case study also looked at the lessons learned in the development of the CO_2 stores.

> "Overall our experience with natural refrigerants has been extremely positive."
>
> **TRISTAM COFFIN**
> **SUSTAINABLE FACILITIES COORDINATOR**
> WHOLE FOODS MARKET

ROB ARTHUR

CTA ARCHITECTS ENGINEERS

US DEFENSE COMMISSARY AGENCY PROJECT, AMMONIA/CO_2 CASCADE REFRIGERATION SYSTEM, FROM DESIGN THROUGH COMPLETION

Rob Arthur, Mechanical Engineer with CTA Architects Engineers, examined an ammonia/CO_2 cascade refrigeration system, from design through completion, used by the Defense Commissary Agency (DeCA). The project was analysed for efficiency and energy use. Arthur concluded with an assessment of the future of ammonia/CO_2 systems and their broader application.

KLASS VISSER

KAV CONSULTING

A DESKTOP STUDY INTO THE ENERGY EFFICIENCY AND ENVIRONMENTAL BENEFITS OF CO_2 REFRIGERATION IN USA SUPERMARKETS

Klaas Visser, owner of KAV Consulting, gave an in-depth analysis of the energy efficiency and environmental benefits of using CO_2 refrigeration in U.S. supermarkets. Extensive data, including the effect of heat reclaim, was used to reason for increased usage of CO_2 refrigeration systems via a comparison with an R404-refrigerated store.

REGGIE O'DONOGHUE

EMERSON CLIMATE TECHNOLOGIES

THE ADVANTAGES OF USING ELECTRONIC CONTROLS IN CO_2 BOOSTER SYSTEMS

Reggie O'Donoghue, Director of Marketing & Product Management for Emerson, spoke on the virtues of CO_2 transcritical booster systems and the advantages that electronic controls in a CO_2 booster system can bring. O'Donoghue identified the benefits by comparing the electronic controls for a booster system to mechanical controls in terms of managing gas cooler transition and the maintenance of flash tank pressure.

TOMMASO FERRARESE

CAREL INDUSTRIES

NEW ALTERNATIVES FOR NATURAL REFRIGERANTS IN US MARKET - DC COMPRESSOR WATERLOOP SYSTEM

Tommaso Ferrarese, Thermodynamic Engineer for CAREL Industries, examined DC waterloop systems in commercial refrigeration as a new frontier for natural refrigerant technology. The presentation included the energy efficiency of CO_2 systems and explained how all the components of a DC compressor waterloop system can facilitate efficiency. Ferrarese concluded with factory-tested units and how they improve the ease of installation, flexibility, and energy efficiency.

TECHNOMMERCIAL

CAREL RETAIL SYSTEM FOR CO_2 CONVENIENCE STORE

CAREL presented its solutions for convenience store applications, in which integration of refrigeration, air conditioning, lighting and energy management are key

WIELAND PRESENTS K65 HIGH-STRENGTH COPPER ALLOY

Wieland presented their K65 high-strength copper alloy tubing, which is designed for high pressure AC&R applications, especially those that use CO_2 as a refrigerant. After K65's success in Europe, Wieland is now in the process of commercialising this tubing in the United States in anticipation of the acceleration of CO_2 use in the commercial refrigeration market. K65 is available in "straight-length," which is used for pipe work in supermarkets or compressor racks with larger diameters. It is also available as a level-on coil that is used for heat exchanger processes such as gas coolers. K65 is currently awaiting UL207 certification but Wieland anticipates this will be finalised by September 2015.

CHAPTER 4
LIGHT COMMERCIAL REFRIGERATION

Particularly driven by retailer commitments to procure environmentally friendly marketing equipment, the use of natural refrigerants in light commercial refrigeration applications is becoming increasingly popular in the North American market. Power consumption comparisons with equipment using HFCs make a strong business case for the adoption of natural refrigerants in this space. A shift to convenience-type stores is also driving the market for self-contained plug-in units.

FOOD SERVICE PANEL

ROY BUCHERT

MCDONALD'S

THE MCDONALD'S YOU DON'T KNOW

> "Natural refrigerants make business sense, and it is the right thing to do for the environment."

ROY BUCHERT,
GLOBAL ENERGY DIRECTOR,
MCDONALD'S

Roy Buchert, McDonald's Global Energy Director, examined the market opportunities for natural refrigerants, highlighting that using natural refrigerants is not only the right thing to do for the environment, but also makes long-term business sense. McDonald's transition plan began in 2010 with small refrigeration units using R290; the company is now testing medium refrigeration systems before transitioning to natural refrigerant technology in larger HVAC&R applications.

PAIGE DUNN

RED BULL

HYDROCARBON COOLERS - EFFICIENCIES FOR RETAIL SPACES

> "We're really excited with what we've been able to do with hydrocarbons. When the private sector and the government team up, we can get really great results."

PAIGE DUNN,
CSR AND SUSTAINABILITY PROJECT LEAD,
RED BULL NORTH AMERICA

Paige Dunn, Redbull's CSR & Sustainability Project Lead, outlined the company's commitment to phasing out HFCs and its accomplishments in doing so, highlighting the increased efficiencies achieved using its R600a-based ECO Coolers.

PAUL CAMERA

STARBUCKS

TESTING AND IMPLEMENTATION OF NATURAL REFRIGERANTS IN STARBUCKS RETAIL STORES

Paul Camera, Director, Global Research and Development, Starbucks outlined the four components of the retailer's comprehensive environmental approach: achieving LEED building standards in new stores; recycling and reducing waste; water and energy conservation; and addressing climate change through strategies at origin. This includes Starbucks' R&D strategy to test multiple suppliers of hydrocarbon cabinet technology to phase out end-of-life HFC units. Camera said the EPA's recent ruling on natural refrigerants enabled Starbuck to pursue this.

CHARLIE HON

TRUE MANUFACTURING

HYDROCARBONS - ADVANTAGES AND OBSTACLES

Charlie Hon, Engineering Manager for True Manufacturing, discussed the company's journey with hydrocarbon refrigerants. It started with collaborative educational efforts with industry suppliers and training organisations, continued with developing training on the safe use and servicing of hydrocarbon refrigerants, and is moving forward with a phase out of HFCs.

LIGHT COMMERCIAL PANEL

ANTOINE AZAR

THE COCA-COLA COMPANY

R744 FOR LIGHT COMMERCIAL APPLICATIONS

Antoine Azar, Global Program Director for The Coca-Cola Company, described the company's involvement with Refrigerants, Naturally! (of which he is chairman). As part of that group, The Coca Cola Company is working toward its goal of procuring 100% HFC-free commercial stand-alone units based on CO_2 refrigerant. Azar discussed the company's progress and the proven performance of its CO_2 units.

> "We are reaching an inflection point in our HFC-free global system adoption. We are at the phase where [CO_2] is the technology that fits our portfolio of equipment."
>
> **ANTOINE AZAR,**
> **GLOBAL PROGRAM DIRECTOR,**
> THE COCA-COLA COMPANY

> "I am confident that CO_2 is the future, for our applications at least. CO_2 is the only technology that has the safety, coverage, performance and cost we are looking for. We made the right bet."
>
> **ANTOINE AZAR,**
> **GLOBAL PROGRAM DIRECTOR,**
> THE COCA-COLA COMPANY

BRUCE KARAS

COCA-COLA NORTH AMERICA

LIGHT COMMERCIAL APPLICATIONS

Bruce Karas, Vice President of Environment and Sustainability for Coca-Cola North America discussed The Coca-Cola Company's sustainability mission and its quest to build the necessary supply chain to deliver HFC-free coolers and vendors. Karas remarked that the industry should work to educate regulators about the supply chain in order to fully achieve HFC-free goals.

> "Regulators need to be aware of the virtues of natural refrigerants but also the implementation, something that regulators sometimes aren't aware of."
>
> **BRUCE KARAS,**
> **VICE PRESIDENT OF ENVIRONMENT AND SUSTAINABILITY,**
> COCA-COLA NORTH AMERICA

MIKE WEISSER

SANDENVENDO AMERICA

AN INTRODUCTION TO CO2 REFRIGERATION IN FOOD AND BEVERAGE MARKETING EQUIPMENT

Mike Weisser, Vice President of Sales and Marketing for SandenVendo America, spoke about the company's current application of natural refrigerants for Coca-Cola and Dr Pepper Snapple, including a power consumption comparison with R134a systems, and its plans to implement larger systems for application in convenience stores.

> "There's a big opportunity for natural refrigerants, particularly CO_2, to play a role in this market."
>
> **MIKE WEISSER,**
> **VICE PRESIDENT OF SALES AND MARKETING,**
> SANDENVENDO AMERICA

MARCO GIULIETTI

ISA

TODAY IS POSSIBLE

For ISA, "design means harmonising man and machine," said Marco Giulietti, CEO, who presented the company's product range, including both hydrocarbon and CO_2 systems for light commercial and supermarket applications.

JUNYA (JOE) ICHIKAWA

SANDEN ENVIRONMENTAL PRODUCTS CORP.

IN PARTNERSHIP WITH NATURE

Joe Ichikawa, President of SANDEN Environmental Products Corp., explained the company's commitment to sustainable growth. Ichikawa highlighted the range of CO_2 compressors the company offers.

> "We are confident that more people will start choosing natural refrigerants in the next five years – two or three times what we have at this point."
>
> **ANDRÉS MARTÍNEZ-NEGRETE,**
> **TECHNICAL AND PRODUCT DEVELOPMENT MANAGER,**
> IMBERA COOLING

ANDRÉS MARTÍNEZ-NEGRETE

IMBERA

SUCCESS IN CO_2 COOLER DEVELOPMENT

Andrés Martínez-Negrete, Technical and Product Development Manager of Imbera Cooling, discussed misconceptions regarding the use of natural refrigerants The company has worked to dispel these misconceptions through the creation and optimisation of highly efficient, low-noise CO_2 solutions for light commercial applications.

PAUL BEVINGTON

CARTER GROUP

INTEGRATED CO_2 CONVENIENCE REFRIGERATION INSTALLATION

Paul Bevington, Business Development Manager, Carter Group, examined integrated transcritical CO_2 refrigeration systems and why the technology is the best solution for refrigeration systems. The presentation included a description of an "integrated solution" and how the refrigeration plant is maximised. Bevington concluded with various case studies from North America and Europe in order to demonstrate how CO_2 offers a viable, economic, and efficient solution for all store formats.

ANDREW MARTIN

SECOP

HOW TO GAIN MAXIMUM EFFICIENCY IN PLUG-IN CABINETS BY USING NATURAL REFRIGERANTS

Andrew Martin, Sales Representative with Secop, examined how to gain maximum efficiency in plug-in cabinets by using natural refrigerants and outlined the cumulative market as well as a project overview. The presentation compared R290 to other refrigerants in terms of efficiency and cost analysis. Martin concluded with future plans for market penetration and prices for inverter electronics.

TECHNOMERCIAL

BLUPURA PRESENTS R290 AND R600 NATURAL REFRIGERANTS IN DRINKING WATER COOLERS AND FOUNTAINS

Italian firm Blupura has made waves in Europe with its R290- and R600a-cooled water (both still and sparkling) coolers and fountains, and the company is now bringing this technology to North America, in addition to other markets. The company produces only climate-friendly water coolers using natural refrigerants to serve a range of end users, from the hospitality industry, to offices, to public dispensers. The community water dispensers save citizens money and assure quality while reducing waste and protecting the environment.

AHT COOLING SYSTEMS PRESENTS ENVIRONMENTAL ASPECTS OF FOOD REFRIGERATION

AHT has been working with R290 since its first cooperation with a hydrocarbons compressor manufacturer in 1994-1995. By 2004, AHT already had more than 10,000 cabinets in the field, a number that is now increasing by around 50,000 every year. The key features of an AHT R290 cabinet are the fully hermetic system with less than 150g of environmentally friendly refrigerant; that it is fully tested at the factory for safety and leakage; and that it provides silent operation in a maintenance-free refrigeration system. AHT's units feature a total equivalent of warming impact (TEWI) of nearly zero as well as reduced energy consumption.


Coca-Cola
Coca-Cola

EMBRACO PRESENTS HIGHLY EFFICIENT HYDROCARBON SOLUTIONS

Embraco presented a technomercial highlighting the role HVAC&R plays in the current state of the environment. According to the technomercial, natural refrigerants offer an efficient and cost saving way to reduce environmental impact. The technomercial featured several compressors of embraco's range for commercial refrigeration plug-in units, emphasising low noise and vibration, a broader range, and significant energy consumption reductions.

SANDEN PRESENTS CO_2 PRODUCTS

Sanden presented in a technomercial its range of CO_2 products.

CHAPTER 5
INDUSTRIAL REFRIGERATION

While natural refrigerants (ammonia in particular) have been applied in industrial refrigeration for decades, the industry has undergone major developments in recent years. ATMOsphere America saw the innovators of the North American industrial refrigeration industry come together to discuss the future, highlighting a closing “application gap” between commercial and industrial applications, the advantages and expansion of opportunities low-charge ammonia systems can provide, and the necessity of collaboration among all parties involved in an installation in order to meet the challenges facing the industry and ensure an installation’s success.

LOW-CHARGE AMMONIA PANEL

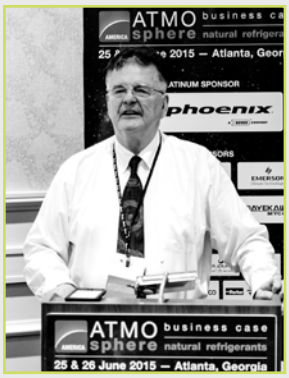
PEGA HRNJAK

UNIVERSITY OF ILLINOIS

WHAT SHOULD LOW CHARGE DO FOR AMMONIA?

Pega Hrnjak, Professor at the University of Illinois and President of CTS, moderated the Low-Charge Ammonia Panel and made a presentation about what the new technology could mean for the ammonia industry. Hrnjak noted that the technology has the potential to open new business opportunities where ammonia is not currently adopted in non-industrial applications.

> "The future for refrigerated warehouses is the packaged system."
>
> **GERARD VON DOHLEN,**
> **PRESIDENT,**
> PORT NEWARK REFRIGERATED WAREHOUSE



GERARD VON DOHLEN

PORT NEWARK REFRIGERATED WAREHOUSE

THE BUSINESS MODEL

Gerard Von Dohlen, President at Newark Refrigerated Warehouse, made a presentation on the business model for packaged ammonia systems vs. site-specific designed systems. He analysed various factors including cost per unit, maintenance, leakage, ease of installation, and more. Von Dohlen stressed that end users, contractors and designers must adjust to change and new technologies or risk going out of business.

JOHN S. SCHERER

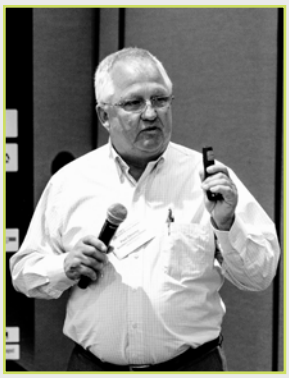
LOS ANGELES COLD STORAGE

NXTCOLD'S ULTRA-LOW AMMONIA CHARGE TECHNOLOGY

John Scherer, Manager of Engineering at Los Angeles Cold Storage, made a presentation on behalf of NXTCOLD, highlighting the state of the industry. With a graph he demonstrated the number of U.S. cold storage facilities by size, indicating that since 2011 the larger facilities are becoming more numerous. He also urged the industry to embrace change and take advantage of it. NXTCOLD's self-contained refrigeration system provides 50 tons of refrigeration with 25 pounds (11.3 kg) of ammonia.

> "The main thing is to meet with regulators and educate them."

JOHN SCHERER,
MANAGER OF ENGINEERING,
LOS ANGELES COLD STORAGE



PAUL DELANEY

SOUTHERN CALIFORNIA EDISON

DO LOW- CHARGE AMMONIA SYSTEMS SAVE ENERGY?

Paul Delaney, Senior Engineer at Southern California Edison, focused his presentation on energy savings achieved by low-charge ammonia refrigeration systems. Southern California Edison is one of the country's largest electric utilities, servicing nearly 14 million residents. Delaney examined the benefits of low-charge ammonia, estimating the efficiency gain is 5%-10% in California for industrial and large refrigerated warehouses using ammonia. Lower installation costs, higher productivity and environmental improvements were among the other benefits.

> "We're working with manufacturers, inventors and customers to look at the new technology and how it can help you with your business. We're trying to improve the adoption curve for new technology."

PAUL DELANEY,
SENIOR ENGINEER,
SOUTHERN CALIFORNIA EDISON

KURT LIEBENDORFER

EVAPCO

HOW TO SAFELY RIDE THE WAVE

Kurt Liebendorfer, Vice President at Evapco, presented on how to handle the new developments in ammonia refrigeration, including understanding regulatory compliance, R&D testing, and reliable and repeatable manufacturing. Lower-charge ammonia systems essentially mean lower risk, and packaged products can make code compliance easier and less costly. The Evapcold low-charge units undergo rigorous testing; an example was given of a 25 TR test unit, which operated at full and part loads in Evapco's Environmental Test Lab "D" while being put through -34°C to 37.8°C ambient temperatures. Evapco offers 250 low-charge models, which are all in compliance with major U.S. codes.

> "There is a wave coming for low-charge ammonia packaged solutions in the next 18 to 24 months."

KURT LIEBENDORFER,
VICE PRESIDENT,
EVAPCO

INDUSTRIAL REFRIGERATION CASE STUDIES

BENOIT RODIER

CIMCO REFRIGERATION

NEW DEVELOPMENT IN NATURAL REFRIGERANT EQUIPMENT

Benoit Rodier, Director of Business Development at CIMCO Refrigeration, explained the company's technology evolution and how it partnered with Mayekawa USA (MYCOM) to introduce the NewTon product to the North American market. The compressor includes an NH_3/CO_2 brine solution and is set to alleviate problems pertaining to large NH_3 plants in the U.S., where operators and contractors to install and maintain the systems can be difficult to find. Many NewTon systems have been installed in Japan, where the phase out of R22 has been accelerated; something Rodier would like to see in the U.S.

JOE SANCHEZ

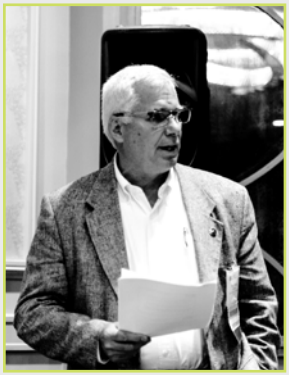
BITZER US

AN INDUSTROMMERCIAL CO_2 SYSTEM

Joe Sanchez, Engineering Manager for Bitzer US, explained the term "industrommercial" and the growing sense that technology for both commercial and industrial sectors are overlapping more and more, closing the "application gap." Sanchez compared commercial (supermarket) and industrial (cold storage/blast freezing) in traditional load sizes (commercial, 10-150 tons; industrial, 50-1,000 tons); piping (copper vs. steel); and refrigerant (H(C)FCs vs. ammonia. Sanchez argued that CO_2 will play a big role in closing the gap and providing another natural refrigerant option for the industrial sector because unlike ammonia, CO_2 does not require open-drive compressors.

> "Exchanging information and technologies between commercial and industrial will ensure natural refrigerant success."
>
> **JOE SANCHEZ,**
> **ENGINEERING MANAGER**
> FOR BITZER US

TECHNOMERCIAL



TERRY L. CHAPP, DANFOSS INDUSTRIAL

JEREMY OLBERDING, COLMAC COIL MANUFACTURING

AMMONIA DX LOW CHARGE SYSTEM PROVES SUSTAINABILITY

In their joint presentation, Terry Chapp, National Business Development Manager for Danfoss, and Jeremy Olberding, Vice President of Sales for Colmac Coil, explained the factors behind the resurgence of ammonia DX systems including its low-GWP/zero ODP, lower power consumption and operating costs. The pair cited a case study at 403,000-square-foot (122,830m^2) Joliet Cold Storage in Illinois, which has a total refrigeration load of 1,007 TR. Advanced DX ammonia systems allow industrial refrigeration systems charges as large as 1,800 TR with a system charge of under 10,000 lbs (4,540kg), offering a value-added alternative to HFC commercial systems.

STELLAR PRESENTS THE ADVANTAGES OF PACKAGED EQUIPMENT

Stellar presented a technomercial emphasising the advantages of packaged ammonia equipment. The nature of the systems contribute to cost savings; less on-site labour lowers construction costs, and the systems save space because all refrigeration components are incorporated into a single unit, requiring a smaller machine room.

CHAPTER 6
HEAT PUMPS

CO_2 heat pumps are gaining traction in the North American market as manufacturers bring their successes and knowledge of best practices from other markets like Japan. Mayekawa presented its experience with commercial application of hot water heat pumps, showing promising energy performance, while Sanden reported on its project with residential split-type CO_2 heat pump water heaters across the northwest region of the United States, with the help of utilities, government and university resources.

TROY DAVIS

MAYEKAWA USA MYCOM

WATER SOURCE CO_2 HOT WATER HEAT PUMPS - LESSONS LEARNED FROM COMMERCIAL INSTALLATIONS

Troy Davis, Energy Manager with Mayekawa USA MYCOM, examined various lessons learned from commercial installations of water-source CO_2 hot water heat pumps. The presentation included Mayekawa's own CO_2 heat pump technology that achieves energy conservation and a reduction of CO_2 emissions. While Davis outlined the economic results of existing and new hot water system projects, he also explained the design phases of existing and new hot water system integration. The presentation concluded with Mayakawa USA's mission to conserve ecology, energy, and environment.

JOHN MILES

SANDEN INTERNATIONAL USA

RESIDENTIAL CO_2 HEAT PUMP WATER HEATERS IN COLD CLIMATE FIELD TESTS

John Miles, General Manager, Eco Products, Sanden International USA, examined three different field tests done at various cold-climate sites across the northwest U.S. in collaboration with a consortium of utilities, government, and university resources. The tests were conducted to demonstrate the efficiency and performance of the residential, split-type CO_2 units, based on the Japanese Eco Cute water heater product line. The presentation included energy monitoring and analysis along with observations and operation of the installation across three tests, including challenges faced using a split heat pump and water tank system.

CHAPTER 7
NEW APPLICATIONS

The HVAC&R industry is in a period of evolution in which environmentally friendly refrigerants are in high demand and natural refrigerants are being tested and applied in several new applications. ATMOsphere America 2015 saw innovations such as the first transcritical CO_2 system for server rooms, hydrocarbons efficiently cooling ultra-low temperature freezers for medical and chemical industries, supermarkets deploying NH_3/CO_2 cascade refrigeration systems and even the use of magnetic cooling in refrigerated cabinets.

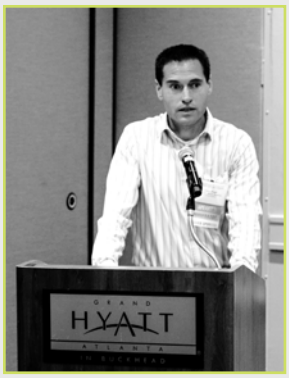
MARC-ANDRÉ LESMERISES

CARNOT REFRIGERATION

FIRST CO_2 TRANSCRITICAL SYSTEM FOR SERVER ROOMS AT TELECOMMUNICATION PROVIDER BELL CANADA

Marc-André Lesmerises, CEO of CARNOT Refrigeration, focused on the company's new all-CO_2 Aquilon system at Bell Canada, promoting its energy efficiency and environmental impact. The program involved transforming the refrigeration system in the server rooms, using an Ottawa site for the first installation. Following impressive results, Carnot expects more projects with Bell Canada to be done in the future.

> "We see a lower energy consumption than what you see with comparable units on the market."
>
> **MARC-ANDRÉ LESMERISES, CEO,** CARNOT REFRIGERATION

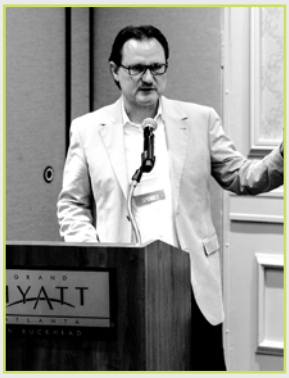


JOHN PRALL, EMBRACO NORTH AMERICA

AND RICHARD H. BAIR, THERMO FISHER SCIENTIFIC

THE FIRST HYDROCARBON VARIABLE-SPEED ULT FREEZER

John Prall, Commercial Ttechnical Support Engineer for Embraco North America, and Richard Bair, Systems Engineering Manager for Thermo Fisher Scientific's Laboratory Products Cold Storage Business Unit, jointly detailed the first hydrocarbon variable-speed ULT freezer for the medical and chemical industries. It uses Embraco's 'Fullmotion' compressor, which intuitively meets peak and off-peak demand. Embraco designs its systems to reduce the hydrocarbon charge.



VINCENT DELECOURT

COOLTECH APPLICATIONS

FIRST INTEGRATIONS OF INDUSTRIALIZED MAGNETIC COOLING DEVICES INTO REFRIGERATED CABINETS

Vincent Delecourt, Director of Sales and Marketing at Cooltech Applications, examined magnetic cooling as a revolutionary technology and its use in industrialised devices. Magnetic cooling's first applications were in the commercial refrigeration market, equipping refrigerated cabinets with the new system. While the product launch has not yet been finalised, Cooltech Applications and its partners are continuing to optimise the cabinets, testing different heat exchanger types and architectures.

YORAM SHABTAY

HEAT TRANSFER TECHNOLOGIES LLC

NEW COPPER-TUBE TECHNOLOGIES FOR CO_2 HEAT EXCHANGERS

Yoram Shabtay, President, Heat Transfer Technologies; Jian Yu from Super Radiator Coils and Nigel Cotton from International Copper Association, explored new copper tubing technology used for CO_2 gas coolers and evaporators in applications varying in size from small refrigeration systems for vending machines to large industrial cooling systems. The presentation included the performance, industrial application, and practicality of the heat exchangers in a large-scale, North American setting, while also investigating new engineering for high-strength tube alloys.

MICHAEL DUGGAN,

RLS

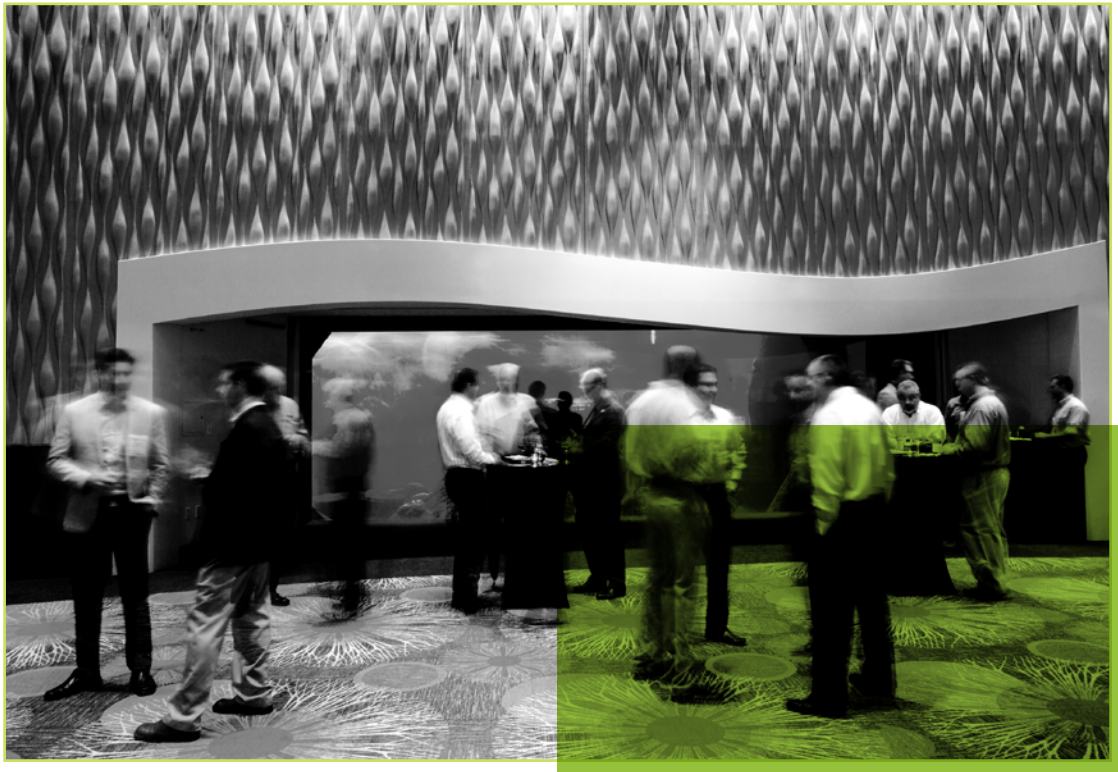
BRAZE-FREE REFRIGERATION FITTINGS AND CONNECTIONS

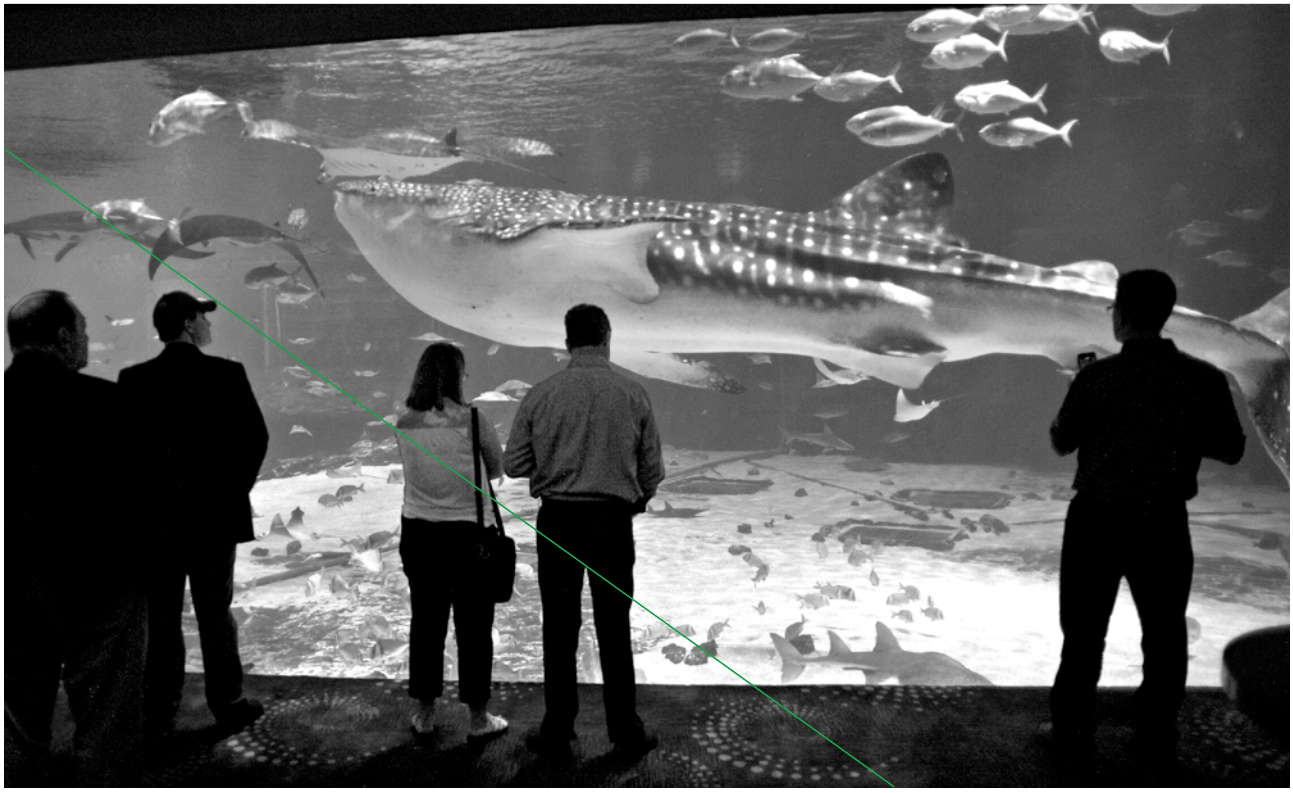
Michael Duggan, President and General Manager, RLS, reviewed braze-free press fittings and their enhancements in regard to the adoption of natural refrigerants. Brazing is often a challenge and concern for manufacturing and repairs in the field. The presentation examined testing and examples of the products, as well as plans for product adjacency with versions for additional metal systems.

> We have had phenomenal feedback – 25,000 connections joined without failure to date.
>
> **MICHAEL DUGGAN,**
> **PRESIDENT AND GENERAL MANAGER,**
> RLS

RECEPTION AT THE GEORGIA AQUARIUM

ATMOsphere America officially kicked off on 25 June and was followed by a dinner reception at the Georgia Aquarium, sponsored by Hillphoenix. Surrounded by graceful beluga whales, manta rays and even sharks, guests enjoyed a relaxed meal prepared by award winning chefs “under the sea.” Eduardo Navarro, Vice President & General Manager of Systems Division, Hillphoenix, offered some warm words praising the ATMOsphere America conference, stating that the nature of the event, which encourages discourse and innovative solutions that are environmentally responsible, is an ideal way to grow business and the industry, and that the event serves as a catalyst for change.





GLOSSARY

AC — AIR CONDITIONING OR ALTERNATIVE CURRENT

BTO — BUILDING TECHNOLOGIES OFFICE

CARB — CALIFORNIA AIR RESOURCES BOARD

CDU — CONDENSING UNIT

CO_2 — CARBON DIOXIDE

CTS — CREATIVE THERMAL SERVICES

CVS — CONVENIENCE STORE

DECA — DEFENSE COMMISSARY AGENCY

DOE — DEPARTMENT OF ENERGY

EPA — ENVIRONMENTAL PROTECTION AGENCY

EPRI — ELECTRIC POWER RESEARCH INSTITUTE

EU — EUROPEAN UNION

FREON — HALOCARBON REFRIGERANTS

GHG — GREENHOUSE GAS

GWP — GLOBAL WARMING POTENTIAL

H2O — CHEMICAL NAME FOR WATER

HC — HYDROCARBONS

HCFC — HYDROCHLOROFLUOROCARBON

HFC — HYDROFLUOROCARBON

HP — HORSE POWER

HT — HIGH TEMPERATURE

HVAC&R — HEATING, VENTILATION, AIR CONDITIONING & REFRIGERATION

LEED — LEADERSHIP IN ENERGY & ENVIRONMENTAL DESIGN

LT — LOW TEMPERATURE

MT — MEDIUM TEMPERATURE

NH_3 — AMMONIA

NR — NATURAL REFRIGERANT

ODP — OZONE DEPLETION POTENTIAL

OEM — ORGINIAL EQUIPMENT MANUFACTURER

R&D — RESEARCH & DEVELOPMENT

R134A — R–NUMBERING IDENTIFICATION FOR HFC TETRAFLUOROETHANE

R22 — R–NUMBERING IDENTIFICATION FOR HFC CHLORODIFLUOROMETHANE

R290 — R–NUMBERING IDENTIFICATION FOR PROPANE

R718 — REFRIGERANT NUMBER FOR WATER

R600A — R–NUMBERING IDENTIFICATION FOR ISOBUTANE

R744 — R–NUMBERING IDENTIFICATION FOR CARBON DIOXIDE

R717 — R–NUMBERING IDENTIFICATION FOR AMMONIA

RETA — REFRIGERATED ENGINEERS & TECHNICIANS ASSOCIATION

RSES — REFRIGERATION SERVICE ENGINEERS SOCIETY

SNAP (EPA) — SIGNIFICANT NEW ALTERNATIVES POLICY PROGRAM

TC — TRANSCRITICAL

UL — UNDERWRITERS' LABORATORIES

ULT — ULTRA LOW TEMPERATURE

PRESENTATION LIST

MARC CHASSEROT – SHECCO
WELCOME SPEECH & INTRODUCTION
http://www.atmo.org/media.presentation.php?id=678

GERALD WOZNIAK – SNAP, U.S. ENVIRONMENTAL PROTECTION AGENCY
EPA REGULATORY UPDATE. DOMESTIC APPROACHES TO ADDRESS HIGH-GWP HFCS
http://www.atmo.org/media.presentation.php?id=643

ANTONIO M. BOUZA – U.S. DEPARTMENT OF ENERGY
DOE'S BUILDING TECHNOLOGIES OFFICE: REFRIGERANT R&D
http://www.atmo.org/media.presentation.php?id=644

GLENN GALLAGHER – CALIFORNIA AIR RESOURCES BOARD (CARB)
REGULATION OF HIGH-GWP REFRIGERANTS
http://www.atmo.org/media.presentation.php?id=645

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