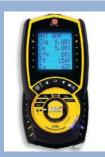
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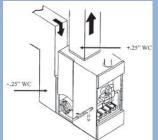
THE WEST'S LEADING MONTHLY NEWSMAGAZINE FOR THE AIR CONDITIONING, HEATING, REFRIGERATION, SHEET METAL AND VENTILATING INDUSTRIES



Editorial Focus

What's new? What's improved? Find out here as ICN takes a look at the latest offerings in Tools and Test Instruments.

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Technical Training

Jim Johnson takes a look at static pressure in duct systems in his latest column on Growing Green Technicians.

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Industry **Events**

More photos from last year's IHACI Trade Show.

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Industry News

Study: R-466A May Pose Compatibility Issue in Air Conditioning Units

Study by researchers at UC Davis also shows new refrigerant offers similar performance to R-410A.

Refrigerants used in vaporcompression air conditioners and heat pumps have been the subject of environmental regulations, requiring the need to develop alternative solutions with lower GWP. In general, there is a trade-off when choosing alternative refrigerants between safety, performance, and GWP.

The California Air Resources Board (CARB) has approved a new regulation requiring refrigerants used in all new stationary residential air conditioning systems to have a 100-year GWP value of 750 or less. For reference, the most common refrigerant currently used in unitary air conditioning equipment is R-410A, which has a 100-year GWP of 2,088.

A number of refrigerant solutions have been developed to meet the CARB GWP requirement, but the majority of these refrigerants have a low level of flammability (A2L). While there are strategies for mitigating the risk of using flammable refrigerants, finding a non-flammable solution presents the easiest path to market and would not require additional safety controls and updates to codes and standards.

In a new case study, the Western Cooling Efficiency Center (WCEC) at the University of California, Davis Energy and Efficiency Institute evaluated one refrigerant solution, R-466A, that meets the CARB GWP limit and is also non-flammable (A1). The 100-year GWP is 733 which is 65% lower than R-410A and is design compatible with R-410A equipment. A previous study by the UC Davis WCEC showed that the efficiency and capacity are similar to R-410A and would not impact the product design.

This project provided a direct comparison between a Trane package rooftop unit (RTU) operat-

Continued on Page 22

Product Spotlight

Danfoss Compressor Named Product of the Year

Company's Turbocor VTCA400 nabs top prize at 2022 AHR Expo in Las Vegas.

The Danfoss Turbocor VTCA400 compressor received the prestigious Product of the Year award at the 2022 AHR Expo in Las Vegas, Nevada. The panel of third-party ASHRAE member judges selected the winning product from this year's 10 AHR Expo Innovation Award winners. The VTCA400 had previously been named the winner in the cooling category.

The VTCA400 is the world's first oil-free, variable-speed, magnetic bearing centrifugal compressor utilizing a hybrid compression design that is optimized for use with low-GWP refrigerant R-1233zd. The 400 ton/1400 kW nominal capacity rating provides unparalleled performance for water-cooled chiller applications.

The patent-pending design uses a combination of mixed flow and radial impellers, enabling both high performance and a compact footprint. As a





(Above) Danfoss Company representatives accepting the Product of the Year award for the Turbocor VTCA400 Compressor (below, left).

result, the VTCA400 reduces footprint and weight by up to 50% compared to traditional designs, giving users the advantage of a more compact chiller design and more mechanical room space along with the ability to incorporate multiple compressors in a single chiller for built-in redundancy and improved part load performance.

The compressor's innovative oil-free, magnetic bearing compressor technology offers the benefits of efficiency, reduced maintenance, and simplified design through the elimination of the traditional oil management system. Oil-free, magnetic bearing

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2022

Training Classes

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Send a text directly to our product experts at the participating locations highlighted below. Monday – Friday, 7:00 a.m. – 4:00 p.m.

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*For disclaimer information please visit: https://www.trane.com/residential/en/products/indoor-air-quality/cleaneffects/

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CALIFORNIA

Trane Technologies Awards \$1M Gift to Project Scientist

Laguna Beach, Calif. – Project Scientist, a national non-profit that turns girls onto science, technology, engineering, and math, will receive a grant of \$1 million from Trane Technologies, payable over three years. The grant includes funding for Project Scientist to add a new mentoring program and expand internationally into Mexico.

Project Scientist offers a virtual after-school STEM Club and virtual summer STEM camps for girls ages 4-12 in three time zones. STEM Club this spring will explore machine learning, climate change in national parks, and the chemistry of medicine and pharmacology. Eighty-five percent of Project Scientist girls come from under-resourced communities and receive financial aid from Project Scientist to attend.

Trane Technologies' collaboration with Project Scientist will support nearly 800 girls between the ages of 4-12 each year of the three-year commitment. Trane Technologies employees will mentor girls and give them a behind-the-scenes look at STEM careers and work-places. Overall, Trane Technologies has pledged \$100 million and 500,000 volunteer hours to build sustainable futures for underrepresented populations.

Funding from Trane Technologies will help Project Scientist expand in the U.S. through a new virtual STEM leadership development program to empower girls ages 13-15 who want to pursue a STEM-focused education and career. Each girl experiences one-on-one mentoring with an accomplished STEM professional. Mentors help develop and guide girls via virtual conversations, resources, and college-preparedness projects.

Project Scientist will also launch its first international initiative, a virtual pilot program for girls ages 4-12 in Mexico, slated for Fall 2022. It will be held in Spanish to inspire girls to develop their STEM talents and help increase the pipe-

line of qualified, diverse people in STEM fields in Mexico. This will be Project Scientist's first program outside the United States. The programming will also be available to dual-language schools in the

These advancements are made possible by Trane Technologies, a long-time supporter of Project Scientist. "It's our honor to help expand Project Scientist's impact," said Steve Hagood, senior vice president and chief information officer for Trane Technologies.

"Children exposed to STEM education are not just learning new skills in problem-solving, computational thinking, and collaboration – they are absorbing the signals they see," added Hagood, who serves as Project Scientist's board chair. "That's why just a glimpse of people, especially women, in STEM careers can unlock new dreams for what they can be."

In both the after-school and summer program, Project Scientist-certified teachers lead girls divided by age in STEM learning and hands-on science. Each girl receives a STEM kit in the mail with all the supplies to conduct experiments at home. Girls also hear from STEM Superstars about their careers. Meeting these female role models allows girls to visualize themselves pursuing STEM degrees and becoming the next generation of STEM innovators.

A study on Project Scientist's first virtual summer program last year found that 87% of participants felt they could be themselves in the program, 88% felt it's okay to make mistakes, and 93% met someone in a career they admire at Project Scientist.

"Project Scientist is designed to show girls that a STEM career is attainable for any girl who wants one," says Founder and CEO Sandy Marshall. "We're incredibly grateful to Trane Technologies for making this program accessible for girls who couldn't join us without scholarship funding."

Project Scientist's programming is especially important now, as the organization works to help close the learning gap caused by COVID-19.

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Continued on Page 6

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Continued from Page 4

U.S. CAD Launches Construction Cosmos

Irvine, Calif. – U.S. CAD, an AEC technology and consulting firm, and Autodesk Construction Specialized Partner announced it launched a new online resource, Construction Cosmos (www.uscad.com), aimed at helping construction organizations leverage technology by addressing issues that affect workflows, project teams, and data.

Construction Cosmos will empower construction professionals with practical information and new ideas to help them accelerate the use of technology in their operations by sharing knowledge, advice, and commentary through helpful and insightful webinars, blogs, articles,

ENERGYGUIDE

Topics will include Lean Construction, constructability, Building Information Modeling (BIM), sustainability, project lifecycle, prefabrication, reality capture, risk management, upskilling talent, data security, technology innovation and trends, economic conditions, and other complementary subjects.

"I am truly excited to be part of Construction Cosmos at U.S. CAD - an essential construction resource to finally shine a spotlight on the new era of construction during this time of unprecedented innovation and surge of new technologies," said Aaron Wagner, director of autodesk construction. U.S. CAD. "Construction Cosmos is rooted in a passion that I have to help individuals, teams, and businesses understand and adopt

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technology to thrive.

The resource is ideal for building construction stakeholders such as contractors, specialty contractors, owneroperators, company owners, designers, engineers, and project management, virtual design, and estimating resources.

U.S. CAD contributors and guest-contributors - including construction industry thought leaders, influencers, and professionals - will offer expert advice, best practices, and perspectives on key issues, industry trends, and research to leverage technology for better ways to design and build.

"Keeping up with technological innovations and best practices while a value-add can be a time-consuming burden, especially in today's fast-paced construction landscape. As a trusted technology partner to the construction industry, U.S. CAD aims to ease the burden felt by construction professionals to keep up and stay informed," said Nicholas Krey, director of construction business unit, U.S. CAD. "Construction Cosmos will be a place of actionable and trusted insights through thought leadership that will help provide guidance to industry professionals in our ever-changing environment."

COOLING & HEATING SYSTEMS

is ready for the NEW 2023 Efficiency Standards... are YOU?

Why the Change Every six years the Department of Energy (DOE) reanalyzes the effects of energy usage, sets minimum efficiency requirements and manages the testing standards by which those efficiencies are measured. For 2023, the DOE is increasing the minimum efficiencies for central air conditioners and heat pumps.

A New Normal is Coming for 2023 -SEER2, EER2 and HSPF2

In 2023, there will be new metrics and nomenclature -SEER2, EER2, and HSPF2. For now, we will continue to use the current terminology – SEER, EER and HSPF – to make ratings comparisons more apparent.

2023 (effective January 2023) Pre-2023 Test Procedure

Air Conditioner Ratings

Air conditioner minimum efficiencies will increase by 1.0 SEER in the North and South Regions with the new test procedure.

Split System Air Conditioners – 2023 Regional Standards						
		Region Southeast Region		Southwest Region		
System Type	New SEER	New SEER2	New SEER	New SEER2	New SEER	New SEER2
Split System ACs (AC < 45K Btu/h)	14.0 SEER	13.4 SEER2	15.0 SEER	14.3 SEER2	15.0 SEER and 12.2 EER*	14.3 SEER2 and 11.7 EER2**
Split System ACs (AC ≥ 45K Btu/h)	14.0 SEER	13.4 SEER2	14.5 SEER	13.8 SEER2	14.5 SEER and 11.7 EER*	13.8 SEER2 and 11.2 EER2**
					11.7 EER	11.2 EER2

AC built before January 1, 2023, can still be installed on or after

For the Southeast and Southwest Regions, any AC that does not meet the above requirements cannot be installed on or after January 1, 2023

NOTE: Any 14.0 SEER heat pump built before January 1, 2023, can still be installed on or after

Heat Pump Ratings

Heat pump minimum efficiencies will increase by 1.0 SEER and will require an 8.8 HSPF with the new test procedure.

Split System Heat Pump − 2023 National Standards				
System Type	National Efficiency Standard			
System Type	New SEER and HSPF	New SEER2 and HSPF2		
Split System HPs	15.0 SEER and 8.8 HSPF	14.3 SEER2 and 7.5 HSPF2		

[†] SEER, EER, and HSPF values shown are based on the current test procedure and are for reference only. Beginning January 2023, products must comply with the SEER2, EER2 and HSPF2 values developed using the 2023 test procedure.

Small Packaged Product Ratings

Small Packaged Products will not increase in minimum efficiency from 14.0 SEER and 8.0 HSPF, but will be required to comply with the new test procedure.

Packaged Systems – 2023 National Standards					
Sustan Tuna	National Efficiency Standard				
System Type	New SEER and HSPF	New SEER2 and HSPF2			
Packaged ACs, Heat Pumps, Gas Electrics and Dual-Fuel HPs	14.0 SEER and 8.0 HSPF	13.4 SEER2 and 6.7 HSPF2			



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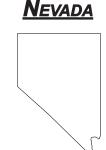
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AprilAire, Airthings Announce Partnership

Las Vegas, Nev. - AprilAire announced a strategic partnership with Airthings, a global technology company that produces indoor air quality monitors for radon and other dangerous airborne contaminants that impact overall health and wellness.

The partnership is rooted in addressing a common issue for homeowners everywhere: people spend more than 90% of their time indoors, but most are unaware of their home's indoor air quality. When they identify a problem, they typically do not have the knowledge and expertise to remedy the situa-

Continued on Page 8

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This program is funded by California utility customers and administered by Southern California Gas Company under the auspices of the California Public Utilities Commission. Program funds, including any funds utilized for rebates or incentives, will be allocated on a first-come, first-served basis until December 31, 2022 or until such funds are no longer available. This program may be modified or terminated without prior notice. The selection, purchase, and ownership of goods are the sole responsibility of customer. SoCalGas makes no warranty, whether express or implied, including the warranty of merchantability or fitness for a particular purpose, of goods selected by customer. Customers who choose to participate in this program not obligated to purchase any additional goods offered by manufacturer, vendor, service provider, or any other third party. Eligibility requirements apply; see the program conditions for details.



Continued from Page 6

tion effectively. The new AprilAire and Airthings partnership is an integration that combines detection, education, and mitigation to offer contractors an intelligent air quality solution tailored specifically to their customer's lifestyle and living environment.

The specializations offered by Airthings and AprilAire deliver an air quality combo to consumers and HVAC contractors that combines both monitoring and hands-on mitigation. In partnership, the brands will now provide consumers with a one-stop shop for radon and air quality monitoring with solutions to manage air

purity, humidity, fresh air supply, radon mitigation, and temperature.

"We are proud to partner with Airthings – a company whose purpose so closely aligns with our own of making homes healthy. Together, we will increase awareness of the impact the air we breathe in our homes has on our health and wellbeing and the availability of effective professional solutions to deliver healthy air" said Dale Philippi, president and CEO of AprilAire. "This alliance is a great example of synergy – when one plus one equals three and our customers realize more value. Working with Airthings, our network of healthy air experts will be better able to tailor solutions to address

homeowner concerns."

Airthings will integrate its flagship air quality monitor, View Plus, as a core component of the AprilAire partnership solution. View Plus launched in 2021 and it tracks seven air quality components, including particulate matter, CO2, and radon. AprilAire recently added Radon Mitigation Systems to its healthy air solutions portfolio to control radon, the leading cause of lung cancer for non-smokers. Equipped with hub functionality, View Plus will enable HVAC professionals to remotely monitor air quality in the homes they service while also providing full air quality visibility to the homeowners themselves. When problems arise, the professional receives automatic notifications and can take immediate mitigation actions. The newly formed alliance between AprilAire and Airthings will help consumers access information on their air quality with more clarity, enabling them to make informed decisions.

"Our new partnership with AprilAire helps consumers navigate complex decisions in a convenient way," said Oyvind Birkenes, CEO of Airthings. "Indoor air quality can be a real threat to our health and well-being, which is why proactive monitoring is essential. However, when problems arise, the next steps can seem daunting. By teaming up with AprilAire, our hope is that when people encounter indoor air quality issues, they'll turn to us to evaluate the situation, diagnose the problem, and develop recommendations and solutions to mitigate the situation if necessary - providing peace of mind to people everywhere."

Johnson Controls Executives Discuss Decarbonization

.

Las Vegas, Nev. – Johnson Controls, the global leader for smart, healthy and sustainable buildings, addressed some of the HVACR industry's most challenging issues during an executive panel discussion at the 2022 AHR Expo in Las Vegas. The most pressing issue discussed was decarbonization – an industry initiative to move away from energy systems that produce carbon dioxide and other greenhouse gas emissions to mitigate climate change.

Katie McGinty, vice president and chief sustainability and external relations officer, cited a global study to emphasize that most companies are making progress in pursuing their sustainability goals. The study, conducted in October

2021 by Forrester Consulting Group and commissioned by Johnson Controls, concluded that sustainability is now the top global business investment priority and that most companies see clear, competitive advantage from their sustainability focus and the goal of achieving net zero carbon emissions.

"Slashing carbon emissions from buildings is critical in tackling climate change, since they represent nearly 40% of all greenhouse gas emissions," McGinty told an audience of trade editors and other influencers. "There is no tackling climate change without substantial investment in buildings. We know that decarbonizing the built environment requires the digital transformation of buildings, including connected, energy-efficient HVAC equipment and controls."

The Forrester research also found that to accelerate decarbonization efforts, companies must align with stakeholder demands, collaborate with partners on transparent sustainability roadmaps and effectively measure the progress of sustainability initiatives.

To help meet current and future demands, Johnson Controls executives discussed how the company is leveraging leading-edge technology and its robust research and development pipeline to optimize its existing offerings. They include the company's OpenBlue suite of connected solutions and services as well as creating new offerings that meet, or exceed, customers' needs.

"We recently developed solutions such as OpenBlue Net Zero Buildings as a Service," McGinty said. "It's a one-stop shop for companies that want to achieve their net zero carbon and renewable energy goals. OpenBlue Net Zero Buildings includes turnkey access to successful building roadmaps, OpenBlue sustainability innovations, real-time performance dashboards and reporting that analyzes energy, water, materials and greenhouse gas emissions."

In addition to McGinty, the executives included Jeff Williams, president of Global Products, Michael Ellis, executive vice president, chief customer and digital officer, and Tyler Smith, executive director, healthy buildings, services and solutions. Jenny Stentz, vice president and general manager, HVAC and controls, North America, moderated the discussion.

Smith spoke about how critical indoor air quality is and will continue to be, especially in mitigating virus transmission as people go to school and work. "Building owners and operators have a responsibility to their occupants that they've prioritized their health and well-being and made the right investments in indoor air quality," said Smith. "To help with that, we developed a new offering, OpenBlue Indoor Air Quality as a

Service, to help them follow through on that commitment, answer the call and ensure that they're making investments in their buildings and people that are backed by science."

Samsung HVAC, Honeywell Collaborate to Provide Advanced Control Solutions

Las Vegas, Nev. – Samsung HVAC America announced at the 2022 AHR Expo that it is working with Honeywell to provide advanced control solutions.

The control solutions are expected to launch later this year and will be powered by the Niagara Framework® with an emphasis on design, advanced monitoring points and service capabilities, including a Niagara driver to communicate directly to Samsung heating and cooling equipment using the Honeywell CIPer Model 50 controller.

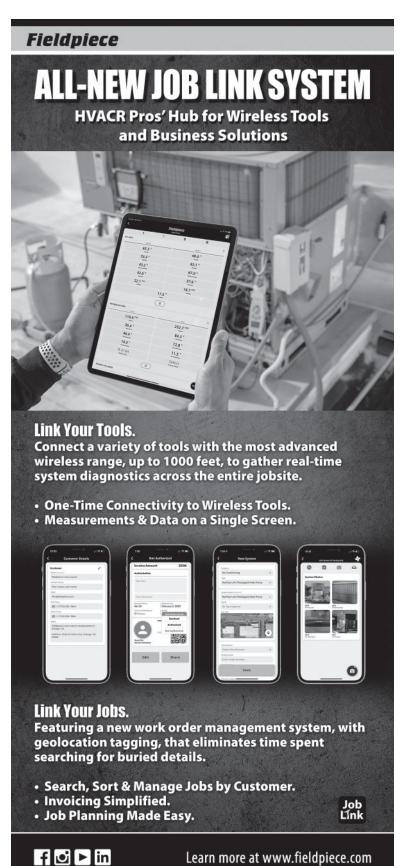
Notable features include the ability to wire direct to Samsung equipment without additional adapters and control and monitoring using PC, Mac, Android, or iOS in both standard and mobile web browser configurations. The CIPer Model 50 controller also allows for direct control of other non-Samsung devices on a project using direct communication (BACnet, Modbus, etc.), digital inputs/outputs, and analog inputs/outputs, and integral AI/ AO/DI/DO ports. Additional analog and digital inputs and outputs can be added with expansion hardware. Optional touchscreen HMIs and expansion modules are also available.

With variable refrigerant flow (VRF) sales growing dramatically year over year, especially small- to mid-sized projects, building control needs will continue to evolve. Samsung's new advanced control solutions provides full building integration for projects where it was not considered in the past, adding value for building owners and maintenance companies, and improving the overall occupant experience.

Learn more about Samsung HVAC America at www.samsunghvac.com.

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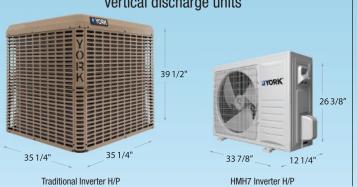
The YORK® HMH7 Heat Pump is designed to provide all the comfort and technology of a high efficiency unit at the cost of a base-tier vertical unit for residential customers. It's an ideal solution for homes that require a compact design and comes in several models and tonnages with flexible installation options and innovative features.



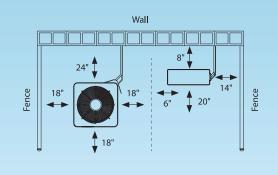
Model	Tons	SEER	HSPF	Height (Inches)	Width (Inches)	Depth (Inches)	Operating Weight (Lbs)	Sound Range (dBA) Low–High*
HMH72B241S	2	17.5	9.0	26 3/8	33 7/8	12 1/4	112	54–65
HMH72B361S	3	18.0	10.5	33	37 3/8	13 3/8	155	56–68
HMH72B481S	4	18.0	9.5	54 5/8	37 3/8	13 3/8	227	62–69
HMH72B601S	5	17.0	10.0	54 5/8	37 3/8	13 3/8	251	62–73

*High sound rated in accordance with AHRI Standard 270.

40% smaller footprint compared to traditional vertical discharge units



Traditional, Vertical Unit Minimum Clearances vs. HMH7 Minimum Clearances



HMH7 Horizontal Discharge **Heat Pumps**













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Continued from Page 8

NATIONAL



Carrier to Acquire Toshiba VRF, Light Commercial HVAC Business

Palm Beach Gardens, Fla. – Carrier Global Corporation signed a binding agreement to acquire Toshiba Corporation's ownership stake in Toshiba Carrier Corporation (TCC), a variable refrigerant flow (VRF) and light commercial HVAC joint venture with Carrier. The planned acquisition will strengthen Carrier's position in one of the fastest-growing HVAC segments, as well as scale its global VRF product platform.

Established in 1999, TCC designs and manufactures flexible, energy-efficient VRF and light commercial HVAC systems utilizing its own proprietary inverter technology, as well as commercial products, compressors, and heat pumps.

Carrier's acquisition will include all of TCC's advanced research and development centers and global manufacturing operations, and product pipeline.

"Carrier sees significant growth potential in the global VRF, light commercial, and heat pump segments and is excited by the opportunity to expand our business through this strategic acquisition. TCC's proven R&D expertise, strong global brand, and talented employees will be tremendous additions to Carrier's multi-brand channel strategy," said Dave Gitlin, chairman and CEO, Carrier. "We look forward to offering complementary, high-performance and sustainable solutions to our customers that will help them achieve their environmental goals."

"We are pleased that TCC employees will continue the growth and innovation journey of Toshiba's HVAC business as part of Carrier, benefiting from its unparalleled global reach, strong dealer network, and shared history of innovation," said Satoshi Tsunakawa, president and CEO, Toshiba. "This is a value-enhancing opportunity for investors,

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customers, and employees."

Today's announcement builds on Carrier's recent acquisition of Guangdong Giwee Group, a China-based manufacturer of HVAC products, offering a portfolio of products including VRF and light commercial air conditioners. Combined with Carrier's existing partnerships, the acquisition strengthens Carrier's portfolio of solutions with a broader range of highly efficient, all-electric products.

The acquisition is expected to close by the end of Q3, subject to customary closing conditions, including regulatory approvals. Upon closing, Toshiba will retain a 5% ownership stake in TCC, and Carrier will consolidate over \$2 billion in unconsolidated revenue.

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NATE Partners with Interplay to Launch New Web Training Platform

Arlington, Va. – North American Technician Excellence (NATE) is partnering exclusively with Interplay Learning to launch a new online training platform for HVACR technicians, NATE Training Academy.

NATE Training Academy is designed to provide technicians a way to train for NATE certification exams online at their own pace. The comprehensive online courses are all available on-demand and can be taken at any time. The interactive and immersive online courses powered by Interplay Learning's leading skilled trades training platform include "field-like" 3D and VR simulations, videos, and knowledge checks.

NATE Training Academy currently includes courses to prepare technicians for NATE's Certified HVAC Professional (CHP-5) certification exams. The CHP-5 is a NATE certification pathway where technicians can earn their NATE certification through a series of five 30-question exams, each on a different subject domain. NATE Training Academy's CHP-5 courses cover each exam subject area: HVAC Fundamentals, Electrical and Controls, Comfort and Airflow, Installation, and Service.

Courses on the first two CHP-5 exam subject areas, HVAC Fundamentals and Service, are currently available. Courses on the remaining CHP-5 exams will be released in the coming months, and all CHP-5 courses will be available by early June 2022.

NATE and Interplay Learning plan to continue adding courses to help technicians prepare for other certification exams. In the future, NATE Training Academy will introduce courses to prepare users for NATE's Low-GWP refrigerant certification.

NATE COO John Lanier explained the launch of the new online training platform is a part of an overall strategy change in the way NATE supports HVACR technicians. "In addition to certifying technicians and recognizing their excellence within the industry, we also want to help them get there, so we have shifted our model to create this training



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package for technicians."

"We're very excited for our partnership with Interplay Learning" said John Lanier. "Interplay is a recognized training provider that has registered its courses with NATE in the past. Many of our industry partners enjoy having their technicians and trainers use the training that Interplay creates, and we have received great feedback from technicians, contractors, and manufacturers that have used Interplay Learning's courses."

"The development of the new NATE Training Academy is a critical initiative that will actively address the shortage of skilled labor and help close the skills gap in the HVAC industry," said Doug Donovan, CEO of Interplay Learning. "Interplay's job-relevant virtual technical training directly aligns with NATE's goals and we're pleased to contribute to that effort. At Interplay, we work everyday to make better careers and better lives for our customers, and this partnership is directly in line with our mission."

Find more information at www.NATEX.org.

Daikin Applied Announces Two Acquisitions

Minneapolis, Minn. - Daikin Applied Americas announced it has made majority investments in two of its current equipment, services, and parts representatives: Detroit-based ThermalNetics, and TriState HVAC Equipment in Pennsylvania, which serves customers in Philadelphia and the surrounding tri-state area.

Our mission is to deliver innovative solutions and an exceptional customer experience," said Mike Schwartz, president and CEO of Daikin Applied. "That means solving today's challenges with speed and agility, and having a long-term roadmap to continue to support customers throughout the lifecycle of their equipment and buildings. With ThermalNetics and TriState as part of the Daikin Group, we have the people, technology, and structure to evolve with our customers."

In the heating and cooling business for 50 years, Thermal-Netics is an authorized Daikin Applied and VRV representative across eastern Michigan. ThermalNetics also services and

repairs a range of HVAC equipment. To bolster those capabilities, the regional Daikin Applied factory service team will join the firm to bring holistic support to customers.

"Aligning our teams allows us to better achieve our core focus of creating more comfortable and healthy indoor environments through innovative HVAC solutions," said ThermalNetics president Rick Sutkiewicz, who will continue to lead the business. "With the region's top engineering and technical talent under one flag, we can provide even greater coordination, responsiveness, and results."

TriState HVAC Equipment is a multi-manufacturer representative in the Philadelphia market. It delivers technology and support to organizations across the eastern portion of Pennsylvania, as well as southern New Jersey. The firm has represented Daikin and its predecessor for over 30 years, now selling applied and VRV solutions, and handled equipment startup and service since the late 90s.

"As we've continued to grow so have the demands on our customers," said Tony Greener, managing partner at TriState HVAC Equipment. "Digital connectivity, IAQ, ecological stewardship - these are all pressing needs and concerns. The close connection and collaboration with Daikin further fuel our ability to innovate and meet these and future needs."

Greener and co-managing partner Joe Callahan will remain and run

EPA Adds R-1233zd(E) to **SNAP Program**

Washington, D.C. - The Environmental Protection Agency (EPA) recently announced that it had listed low-GWP refrigerant, R-1233zd(E), as an acceptable substitute refrigerant in its Significant New Alternatives Policy (SNAP) program.

EPA finds R-1233zd(E) acceptable in cold storage warehouses (new equipment only), ice skating rinks (new equipment only), and industrial process air conditioning (new equipment only) end uses because it does not pose greater overall environmental and human health risk than other available substitutes in the same end-uses.

For ice skating rinks and industrial process air conditioning, R-1233zd(E)'s GWP of about 3.7 is comparable to or lower than that of other acceptable substitutes for new equipment such as ammonia absorption, CO2, R-450A, R-513A, and R-507A, with GWPs ranging from zero to 3,990.

Flammability and toxicity risks are comparable to or lower than flammability and toxicity risks of other available substitutes in the same end uses. Toxicity risks can be minimized by use consistent with the ASHRAE 15 and other industry standards, recommendations in the manufacturer's SDS, and other safety precautions common in the refrigeration and air conditioning industry.

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REBATES UP TO \$6,600* PER UNIT FOR CALIFORNIA CONTRACTORS



TECH Clean California rewards contractors for recommending and installing heat pumps in California homes. When you install a Mitsubishi Electric heat pump HVAC system in your eligible customers' homes, you can earn up to \$6,600 in incentives for each unit.

TECH is designed specifically to help contractors keep up with the market and policy shift towards new technologies. With over \$120 million in funding, TECH Clean California can:

- · Offset installation costs with incentives paid directly to you
- Offer the chance for bonus incentives and a free heat pump water heater
- Provide you with technical and sales training from manufacturers and world-class instructors

As a participating Contractor, you'll also receive:

Contractor Organization \$5,000 bonus incentive

- Attend a TECH provided training + install 5 HP HVAC systems or
- Install 15 HP HVAC systems

Technician Bonus Incentive

- Earn a \$100 gift card/day of TECH provided training attended



Single Family HVAC Incentives

Baseline Heat Pump HVAC Incentives

Equipment Type	Minimum Efficiency Requirements	Incentive / Unit
Package, split, mini/multi-split	Title 24 code minimum	\$3,000

Enhanced Heat Pump HVAC Incentives — Efficiency

Equipment Type	Size Category	Tier	Seasonal/Part-Load Cooling Efficiency	HSPF	Incentive / Unit
Package, split, mini/multi-split			Title 24 code minimum		\$3,000
	< 5.4 tons	1	16.0 SEER	9.0	\$3,900
		2	18.0 SEER	9.7	\$4,800

Enhanced Heat Pump HVAC Incentives — Quality Installation

Quality Installation Measure	Qualifier	Incentive
Manual J Completed	Provide calculations	\$600
Duct sealing/replacement and testing	5% total leakage or less	\$600
Field Measured Performance (based on ASHRAE 221-2020)	Heating System Performance Ratio (HSPr) and Cooling System Performance Ratio (CSPr) = 80% or better	\$600

Incentives for Heat Pump HVAC Systems Serving Individual Apartments

Burniana Ourana Harat Oranna	System	Туре		
Previous Space Heat Source	Description AHRI Test Standard		Incentive / Equipment	
Non-heat pump systems	Split or rooftop heat pump (ducted or ductless)	210/240	\$2,000	
All except PTHPs	PTHP, SPVHP, or unitary through the wall/ceiling heat pump	310/380, 390	\$500 (single or two-stage compressor) \$1,000 (variable capacity/inverter-driven)	

Incentives for Heat Pump HVAC Systems Serving Multiple Apartments

Previous Space Heat Source System Type		Incentive / Apartment Served
Non-heat pump systems	HP HVAC equipment serving multiple apartments	\$1,000



*Learn about available incentives and sign up at: https://energy-solution.com/tech-incentives

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Tools & Test Instruments

Fieldpiece Instruments
JL3KM2



The revolutionary new JL3KM2 Job Link® System Manometer probes from **Fieldpiece Instruments** give HVACR prosthe freedom to work the way they want to – unrestricted by hoses, so technicians get readings from optimal locations on every

system, every time.

Short hose length keeps things neat, and independent sensors allow for direct placement on test ports. Measure between zones without snaking a hose past the door. Dial in gas pressure of a furnace. Optimize total external static pressure of equipment. Pinpoint duct leaks and restrictions. Increase comfort and do more.

Unlike traditional dual port manometers, Fieldpiece's revolutionary untethered design lets contractors place each probe independently in exact locations, to see up to 8 reliable pressure readings at once – all fed directly into the Fieldpiece Job Link app for maximum convenience.

Measure and view real-time re-

turn static, supply static, and total external static pressure all at once from up to 1000 feet away. Get single, dual or multiport measurements with the freedom to work the way technicians like, from anywhere on the job site. They now have the versatility they've always needed.

More information: www.field-piece.com.

Hilti Group Nuron

Hilti Group, an innovator of tools, technology, software and services to the commercial construction industry, announces the launch of a new innovation that provides customers with a fully-connected experience like never



before: Nuron, a more-powerful 22V cordless battery platform.

Nuron introduces state-of-the-art technologies to reinvent how construction professionals work daily on jobsites, tackle health and safety challenges, and manage their businesses, giving them the power and confidence of being safer, smarter, and more efficient. Connectivity is at the core of the platform, making it part of every tool, battery, and charger now and well into the future. With the unveil-

ing of Nuron, the brand affirms its commitment to innovation and strengthens its legacy as a leading provider of productivity solutions.

Nuron is a single 22V battery platform that enables cordless tools on all kinds of jobs, from light-duty drilling to heavy-duty concrete breaking. Launching with more than 60 tools, the battery platform enables heavy-duty applications that were once restricted to corded, gas-powered or higher voltage battery systems. And, all the battery packs and chargers work interchangeably under a single ecosystem to help reduce complexity for tool cribs and cost for business. Gone are the days when jackhammers, angle grinders, and large combi-hammers had to be corded.

The redesigned battery interface ensures higher performance and longer operating times by allowing a significantly higher power transfer, helping customers meet tight deadlines.

Nuron brings intelligence to the core of the platform all tools generate data which is then stored on the Nuron batteries and sent securely to the cloud during every charge without any operator interaction. The data collected includes information such as tool usage, tool utilization, charging location and battery state-ofhealth. This information can then be used to alert individuals if action is needed immediately or can be accessed on-demand as required and is available on mobile and desktop via Hilti's ON!Track software platform. Together with services like Hilti Fleet Management tool data can be used to reduce downtime and optimize tool cribs to boost customer productivity.

More information: www.

Marsh Instruments New Website

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For more than 150 years, **Marsh Instruments** has been the standard of accuracy, synonymous with the design, manufacture, and supply of the highest-quality pressure gauges, thermometers, and accessories. The company's portfolio includes the most comprehensive gauge lines in the world, trusted in countless applications where accuracy, dependability, and

Continued on Page 16



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2-PART SERIES

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ON-DEMAND

ITsAboutQ.net - Online Training Program - Technician Education & Certification

hvacredu.net/sdgetraining/

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D&R International - Commercial Heat Pump Water Heating Online Education

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Tools & Test Instruments

Continued from Page 14

durability are essential.

History matters in the manufacture of critical products for industry, but when a website begins to look historical, that's another matter. So Marsh Instruments is proud to unveil its brand-new website, completely updated for the 21st Century.

The newly redesigned site offers bold graphics and intuitive navigation to help customers find exactly the information they need. Easyaccess direct links help visitors find distributors in their area or request a quote for their projects. There is also a resources tab for downloading literature and other product specifications.

It is a worthy showcase for Marsh's highest-quality pressure

gauges, thermometers, diaphragm seals, and thermowells, serving diverse industries such as oil and gas, utilities, automotive, chemical/petrochem, pulp and paper, HVAC/refrigeration, power gen, and more.

More information: https://marshgauges.com/.



Innovative Products of America Blow-Guns

Innovative Products of America® (IPA®), a USA manufac-

turer since 1996, is proud to expand its specialty blow-gun line to include tools for HVAC maintenance. The Air Comb® Filter and Radiator Cleaners and 3-PC Specialty Blow-Gun Assortment offer multiple options for cleaning filters, radiators, condensers, fans, registers, grilles, ducts, vents, and other hard-to-reach applications found in HVAC systems.

Technicians can thoroughly clean air filters, radiators, and AC condensers using the Air Comb®'s 90°, multi-port airflow design with focused, high-pressure output with five times the air volume. Available in four sizes - 12" (#8050), 24" (#8051), 36" (#8052) and 48" (#8053) – the Air Comb® safely cleans without tearing or punching holes in filters.

The 3-Pc. Specialty Blow-Gun Assortment (#8055) provides innovative and versatile solutions for specialty cleaning applications. The Air Bender® (#8056) can reach around obstacles at a 90° angle with a focused, high-pressure output - a very intuitive and safe design that allows the blow-back to be away from your face. The Air-Scraper (#8057) has a stainless-steel shaft and a hardened scraper tip that can remove and blow away stuck-on debris using high air pressure with scouring action. The BlowBack[™] (#8058) cleans debris from the bottom of a blind hole or vent with 360° plus front airflow. All three are available separately or combined in the #8055 3-Pc. Specialty Blow-Gun Assortment.

More information: www.ipatools.



NAVAC A2L Compatible Tools

NAVAC offers a complete line of tools compatible with A2L refrigerants, which are being phased in as part of greener industry initiatives.

Since legacy HFC refrigerants such as R-410A will still be used on a scaled-down basis for the next decade or more, NAVAC's portfolio of HVAC/R tools are designed to handle both newer and older refrigerants. Industry groups as well as manufacturers like NAVAC have been spreading the word about the



pending phasedown, and developing solutions to ensure a seamless transition to more eco-friendly refrigerants.

A2L refrigerants have lower toxicity and flammability than their predecessors. Refrigerants in this class include R32, which offers a lower global warming potential (GWP) than legacy products like R-410A. To soften the transition, NAVAC's series of A2L-compatible tools includes a broad array of its offerings.

For example, a wide range of NAVAC vacuum pumps are A2L-compatible, including the NP4DLM & NP2DLM Cordless Vacuum Pumps, part of the company's BreakFree Series™ of cordless HVAC/R solutions. The NP4DLM features a high-performance lithium battery capable of up to one hour of continuous running time. The NP2DLM is a compact, lightweight unit suitable for residential HVAC systems up to 5 tons with high-speed evacuation hoses.

Another option is NAVAC's cost-effective NP7DP2 Vacuum Pump, whose dual-stage design delivers an ultimate vacuum down to 15 microns. The unit's integrated cylinder structure, coupled with forced oil circulation, assures high performance and reliability. The company's popular NRP8Di and NRP6Di units - the market's first smart vacuum pumps – also are A2L-compatible. Featuring a digital control interface, the units offer unsurpassed intuitiveness with features such as task reminder, extended evacuation for improved vacuum, and precision vacuum measurement technology with display.

NAVAC's A2L-compatible inventory also comprises several recovery units. This includes the NRDD Recovery Unit, recently substantiated as the market's fastest twin-cylinder recovery unit per UL certification data. Exemplifying NAVAC's overall mission of making technicians' jobs simpler and more efficient, the NRDD Recovery Unit features a brushless DC motor that allows it to provide substantial power in a compact size and weight of just 25 pounds. This DC technology also provides better starting performance under

low voltage conditions. The NRDD's twin-cylinder compressor and oversized condenser with two rows of microchannel coils offer exceptionally efficient vapor recovery.

NAVAC's NRDC4M Recovery Unit – which, as the world's first DC inverter 4-cylinder recovery unit, is the fastest and most powerful machine of its kind on the market – also is A2L-compatible. Operating up to 40% faster than 2-cylinder units, the NRDC4M utilizes an efficient brushless DC motor and ultra-effective condenser with an oversized microchannel coil and three cooling fans.

Finally, many of NAVAC's tools are also refrigerant-agnostic, including the digital N2D4H Manifold Gauge, a high-precision unit with Class 0.4 accuracy. The analog N2A4A Manifold Gauge, which effectively measures the pressure of various gases and liquids used in HVAC systems, also can handle R-32 refrigerant, and features an "impact-resistant" design with a molded protective shell and rubber covering for shock absorption.

More information: www. navacglobal.com.

Tru Tech Tools C161

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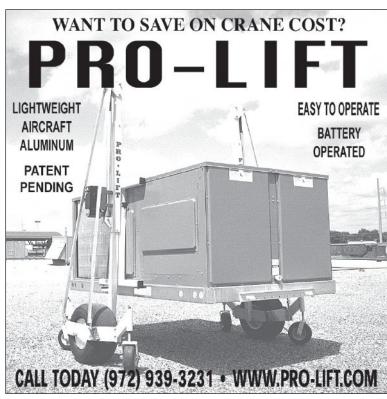


Tru Tech Tools' C161 with EOS Technology eliminates the cost and downtime of replacing the CO sensor. The C161 offers direct CO2 measurement and features a 30-second startup time.

The products features EOS technology, high-altitude compensation, water trap indication, and six-line display so contractors can see all readings on one screen. The product is NOx filtered and features eight preprogrammed fuels, an IR printer port, low flow detection, auto-purge at shutdown, protective rubber boot with magnet, 30 memory positions, and a 1-year limited warranty.

More information: www. trutechtools.com.





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Troubleshooting

A Heat Pump with a Starting Problem

By Jim Johnson Contributing Editor

In this month's trouble-shooting situation, a customer has called to say that while their heat pump "seems to be operating," the temperature in the house is not comfortable. When you arrive, you find that while the thermostat is properly set, the indoor temperature is uncomfortable. You also confirm that the indoor air handler is operating, and that a proper air filter is in place, and it is clean.

Investigating further, you find that the outdoor fan motor is operating. And after removing the access panel, you find the compressor is hot to the touch and off on its internal overload.

When you check the wiring relative to the diagram and legend information provided (See Figures One and Two) you find that the optional crankcase heater and switch system, and pressure and discharge temperature switches are installed on this equipment. Regarding the compressor starting method employed on this piece of equipment, you note that the potential relay and start capacitor are not used, and that a start thermistor is used.

Your visual inspection also shows that connected to the blue and yellow wires from the common and hermetic connections on the dual capacitor is the charred, melted plastic remains of a device.

Your two-part troubleshoot-

Answer to Last Month's Troubleshooting

The installation error was the use of a suction line that was too small. In a proper installation, the maximum temperature drop between the evaporator outlet and compressor should be 3-degrees. In our situation, the temperature drop was excessive and the compressor was running at a higher-than-normal temperature, indicating an insufficient volume of refrigerant vapor to the compressor.

> The winner of last month's Troubleshooting is: Steven Pugliese San Diego, CA

ing question:

- 1. Which component has failed?
- 2. What procedures do you follow to ensure the proper operation of this equipment?

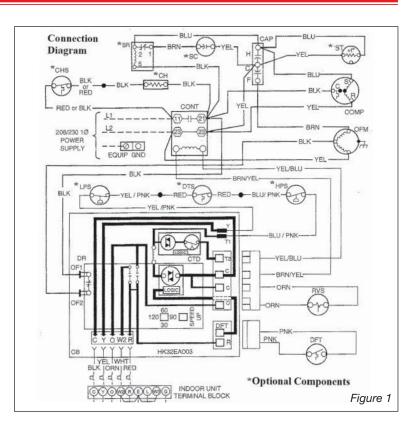
If you believe you have the correct answer to one of Jim Johnson's Troubleshooting Problems, please submit it by email to Jim Johnson at icntroubleshooting@techtrainassoc.com or by U.S. Mail to: Technical Training Associates, PO Box 2259, Green Valley, AZ 85622-2259.

In your email subject line please include "Troubleshooting Answer" and indicate which month the question you are responding to was published.

Correct answers will be entered into a drawing and will be eligible to receive a copy of Jim Johnson's

FACTORY POWER WIRING
FACTORY POWER WIRING
FIELD POWER WIRING
FACTORY CONTROL WIRING
FACTORY CONTROL WIRING
FIELD CONTROL WIRING
CONDUCTOR ON CIRCUIT BOARD
COMPONENT CONNECTION
1/4 - INCH QUICK CONNECT TERMINALS
FIELD SPLICE
JUNCTION
PLUG RECEPTACLE
AUXR
AUXILLARY HEAT RELAY
CAP CAPACITOR (DUAL RUN)
'CH CRANKCASE HEATER
'CHS CRANKCASE HEATER
COMP COMPRESSOR
CTD COMPRESSOR TIME DELAY
CONT CONTACTOR
CB CIRCUIT BOARD
DFT DEFROST THERMOSTAT
DR DEFROST RELAY AND CIRCUITRY
'DTS DISCHARGE TEMPERATURE SWITCH
'LPS LOW PRESSURE SWITCH
'LPS LOW PRESSURE SWITCH
OFM OUTDOOR FAN MOTOR
RVS REVERSING VALVE SOLENOID REVS
'SC START CAPACITOR
'SR START THERMISTOR
FIGURE 2

video "Evaluating Refrigeration Systems: Troubleshooting & Identifying Problems."





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Pacific Gas and Electric Company is pleased to offer the following HVAC/R training courses specifically designed to advance the skills of HVAC/R professionals.

MARCH 2022

IHACI Webinar
NATE HVAC/R Support Training
Instructors: Mitch Bailey / Jeff Painter
Wed., March 2 - Part 1
Thurs., March 3 - Part 2
Wed., March 9 - Part 3
Thurs., March 10 - Part 4

APRIL 2022

IHACI Webinar
Electrical Module
Instructors: Mitch Bailey / Jeff Painter
Wed., April 6 – Part 1
Thurs., April 7 – Part 2
Wed., April 13 – Part 3
Thurs., April 14 – Part 4

MAY 2022

IHACI Webinar
AC/HP Refrigeration Module
(Four-Night Class)
Instructors: Mitch Bailey / Jeff Painter
Wed., May 25 - Part 1
Thurs., May 26 - Part 2

JUNE 2022

IHACI Webinar
AC/HP Refrigeration Module
(Four-Night Class, continued from May)
Instructors: Mitch Bailey / Jeff Painter
Wed., June 1 – Part 3
Thurs... June 2 – Part 4

All classes are currently scheduled as Webinars held 6:00 pm to 8:00 pm. Webinars are FREE of charge and online registration is required.



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Technical Training

Growing Green Technicians Part 149: Static Pressure in **HVAC Duct Systems**

By Jim Johnson Contributing Editor

Static pressure in a duct system is not only related to CFM (Cubic Feet Per Minute), nor simply FPM (Feet Per Minute). A simple definition of the concept of static pressure is that it is a result of the transport of air in cubic feet per minute and feet per minute through a confined space. And, as the illustration representing a supply air in a duct in Figure One shows, another element of the above definition is that it is a pressure that is exerted equally on all sides within the duct assembly.

A simple way to understand static pressure in a supply duct is to consider the idea of blowing up a balloon. If you were to inflate it to, say, 50% of its total maximum possible size, there would be a given pressure against the entire inner surface of the balloon. If you inflated the balloon another 5%, the flexibility of the balloon material would allow an increase in size with the static pressure against the inner surface remaining essentially the same.

In standard sheet metal ductwork, since it is not made of a flexible material, the addition of more air in a small percentage would not expand the size of the duct, but instead, the static pressure against the inner surface would increase. In a perfect world of HVACR supply air flow, if a properly designed and installed duct system was found to be operating at lower-than-normal

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technology also incurs no performance degradation or mechanical

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Continued from Page 1

static pressure, and if the addition of 5% more air was the answer to accomplishing the correct static pressure, the air handling segment of the equipment would be able to perform as designed, in perfect balance with the refrigeration

The unfortunate truth, though, is that encountering a system that is perfect can be a rare occurrence. When all the factors that can affect the performance of a system are considered, such as possible improper sizing of the equipment, variables in the building design and construction that result in a change to duct routing plans, errors in installation, lack of maintenance, and remodeling that may have occurred in a structure, technicians need to understand that all possible situations must be considered when responding to a customer's request for service.

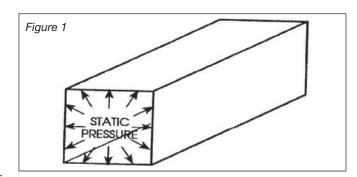
And, to confirm whether some or all the factors mentioned above are having an effect on the operation of HVACR equipment, temperature checks, such as those we mentioned in the previous segment in this series are necessary, static pressure evaluation procedures are a logical next step in evaluating system performance.

Regarding the air flow measurements related to static pressure, we need to consider the fact that they are accomplished based on what is a fine scale, water column inches. And, to appreciate how precise the measurements of static pressure in a duct system are, also consider that the water column

times over the 18-year history of the Innovation Awards program, including multiple Product of the Year recognitions – most recently in 2020 for the CO2 Adaptive Liquid Management solution. This year's award ceremony was held on January 31 during the 2022 AHR Expo.

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inch scale is a fine scale of measurement in the same way that another scale, that of the measurement of

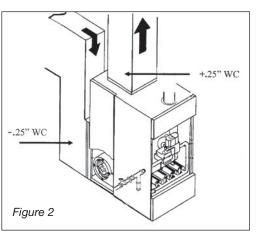
1 Atmosphere = 29.92 in. hg.

While the above refers to vacuum and a negative pressure only, the process of static pressure measurements involves both the measurement of positive and negative pressures. When comparing static pressure to PSI we find the following:

1 PSI = 27.679904842545 WC

1 in. WC = 0.036127291827354 PSI

And, to take this a step further, consider that manufacturer's recommendations regarding static pressure measurements in duct systems are listed in fractions of a water column inch. Measurements such as this are accomplished with a digital manometer that can provide the accurate readings that are necessary for precise air flow system evaluation.



As an example, the illustration in Figure Two shows a typical type of residential equipment with the static pressure measurements being accomplished in both the return and supply segments of the air handling system. The measurements shown here, in both a positive and negative, relate to the concept of TESP (Total External Static Pressure) which we'll discuss further in the next segment in this series.



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Mon., May 9 - Part 3

Tues., May 10 - Part 4

Air Distribution Module

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Thurs., May 5 - Part 2

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Thurs., May 12 - Part 2

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(Four-Night Class) Instructors: Mike Griffin / John Dalton

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Thurs., June 9 – Part 4

SEPTEMBER

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(Four-Night Class) Instructors: Mike Griffin / John Dalton

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Wed., Sept. 28 – Part 3

Thurs., Sept. 29 - Part 4

OCTOBER

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(Four-Night Class) Instructors: Mike Griffin / John Dalton

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Wed., Oct. 26 – Part 3

Thurs., Oct. 27 - Part 4

NOVEMBER

System Diagnostics Module

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Wed., Nov. 9 - Part 1

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Thurs., Nov. 17 - Part 4

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MARCH

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Thurs., March 24 - Part 2

APRIL

Air Distribution Module

(Four-Night Class) Instructors: Mike Griffin/ John Dalton

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Thurs., April 21 - Part 2

Wed., April 27 - Part 3 Thurs., April 28 - Part 4

MAY

System Diagnostics Module

(Four-Night Class) Instructors: Mitch Bailey / TBA

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Thurs., May 12 - Part 2

Wed., May 18 - Part 3

Thurs., May 19 – Part 4

June **Electrical Module**

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Wed., June 8 – Part 2

Tues., June 14 - Part 3 Wed., June 15 - Part 4

SEPTEMBER

System Performance Module

(Four-Night Class) Instructors: Mitch Bailey / TBA

Tues., Sept. 13 – Part 1

Wed., Sept. 14 - Part 2

Tues., Sept. 20 - Part 3

Wed., Sept. 21 – Part 4

OCTOBER

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(Two-Night Class) Instructors: Mitch Bailey / TBA

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Thurs., Oct. 20 - Part 4

NOVEMBER NATE AC/HP Refrigeration &

Air Distribution Training (Two-Night Class) Instructors: Mitch Bailey / TBA

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Thurs., Nov. 3 - Part 2

Wed., Nov. 9 - Part 3

Thurs., Nov. 10 - Part 4

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JUNE

AC/HP Refrigeration Module

(Four-Night Class) Instructors: Mitch Bailey / TBA

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Thurs., June 2 – Part 4

Air Distribution Module

(Four-Night Class) Instructors: Mitch Bailey / TBA

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Thurs., June 30 - Part 4

AUGUST

System Diagnostics Module

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<u>SEPTEMBER</u>

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Thurs., Sept. 8 - Part 4

OCTOBER

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NOVEMBER

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Wed., June 22 - Part 3

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Olimpia Splendid USA (from left): Sergio Carobba, Olimpia Splendid model, Diego Stefani and Dimitri Kontakos.

R-466A Study Continued from Page 1

ing with R-466A and with R-410A. R-466A is a blend of R-32, R-125 and R-13I1 (CF3I), and the use of R-13I1 refrigerant in the blend presents some material compatibility challenges with certain existing materials used in air conditioning equipment. These concerns include the reaction of R-13I1 with zinc, which causes the molecule to break

down. The standard Trane RTU used in the project was determined to have acceptable materials of construction in the compressor and heat exchangers. As a result, Trane Technologies developed a materials compatibility additive package to improve the compatibility of R-13I1 with system materials.

The system used in the case study was a production packaged Trane Technologies (Foundation Series) R-410A RTU, where R-410A was reclaimed and replaced with R-466A. The additive package

was added to the oil, and the unit was shipped from the factory to the field site. (Note: this was an engineered retrofit and it would not be appropriate for all R-410A unit designs.)

According to the results of the test, the capacity between R-410A and R-466A were within the margin of error of the measurements. R-466A appeared to deliver slightly higher capacity than R-410A as outdoor temperatures increased. Total power draw showed a similar profile as capacity, with an increase

in power consumption with increasing outdoor air temperatures. The COP for R-466A and R-410A showed very similar performance between the two refrigerants across all outdoor air temperature conditions.

The report concluded that as a replacement for R-410A, R-466A was very successful in showing similar capacity and COP across a wide range of outdoor air conditions. From an installation and maintenance perspective, the system was no different from a

typical R-410A rooftop package unit, with the exception of an additive package to the oil and simple exchange of refrigerant. Assuming the compatibility issues with certain metals can be mitigated through the use of alternative materials and appropriate additives, the report stated that R-466A represents a viable alternative to R-410A that achieves comparable performance with significantly lower GWP.

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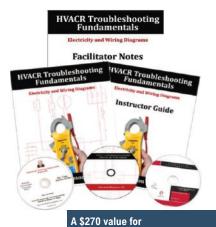
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