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October 2022

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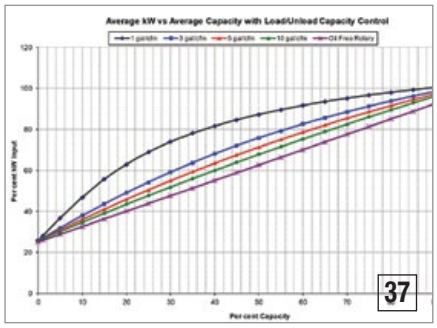
COOLING SYSTEM FEATURES

EVERY ISSUE



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FROM THE EDITOR

Best Practices 2023 EXPO & Conference Co-Locates with Process Expo

We are very pleased to announce the Best Practices 2023 EXPO & Conference will be co-located with Process Expo, in Chicago's McCormick Place, October 23-25, 2023.

Process Expo is a global food equipment and technology show, produced by Messe Frankfurt and by FPSA (Food Processing Suppliers Association).

This two-in-one event will offer the food and beverage industry access to full facility sourcing for all the equipment their plant needs – from on-site utilities like compressed air, vacuum, blower and cooling technologies, to food and beverage processing equipment and technology.

A goal of this partnership is to provide the food and beverage industry with industry-specific guidance on, as our show slogan says, how to run "Sustainable, Safe and Reliable On-Site Utilities."

Whether the topic is cooling water temperature, vacuum pressure, compressed air purity, or chiller and air compressor energy consumption, this event will help food and beverage plants significantly improve operations.

Further, we have announced the formation of a working group, whose goal will be the creation of a "Dairy Best Practices Guide for On-Site Utilities." Our focus industries will be cheese and yogurt manufacturing – with others under consideration.

I hope you enjoy this October 2022 Issue and would like to congratulate SPX Cooling Technologies for the 100-year anniversary of Marley – enjoy Bill Smith's write-up of their celebration!

Thank you for investing your time and efforts into ***Compressed Air and Chiller & Cooling Best Practices.***

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Compressed Air & Cooling Industry News

Kaishan USA Promotes Dave George to President

Kaishan USA, a leading worldwide manufacturer of industrial air compressors, announced that Dave George has been promoted from director of sales to president. In this new role, Dave will be responsible for Kaishan USA's day-to-day operations, and will continue to lead and drive Kaishan's sales team. Kaishan USA's current chief executive officer, Keith Schumacher, will remain in that position.

Dave has more than 30 years of experience in the field of compressed air systems. Prior to joining Kaishan in 2017, he held multiple sales roles at other compressed air systems manufacturers such as Ingersoll-Rand, Atlas Copco, Sullair and at a large distributor, Comairco Equipment.

"Dave is the right leader for Kaishan," said Keith Schumacher, chief executive officer. "Dave's extensive compressed air background and business development skills will help us strengthen channel partnerships, develop strategic alliances and expand our international sales presence. We believe his strong leadership experience will enable us to sustain our incredible growth for the foreseeable future."

"I am very excited to take on this new role," said Dave George. "Obviously, I believe Kaishan has a great business model and talented management team that uniquely positions us to grow rapidly. I look forward to working with

Dave George, President, Kaishan USA.

others at Kaishan to share my management and business experience to further develop the team for future growth. One major objective is to relate more of what our distributors and customers experience in the outside world back to the team inside the factory."

Dave received an MBA from California State University and a bachelor's degree in mechanical engineering from the New Jersey Institute of Technology. He is also an AIRMaster+ specialist, a designation reserved only for those individuals who thoroughly understand compressed air systems and related software. As of March 2019, the U.S. Department of Energy has regarded just over 300 people globally with this distinction.

About Kaishan USA

Kaishan USA engineers the highest quality rotary screw air compressors that enable us to build a better, more efficient future. We streamline our operations by taking direct ownership of 85% of our product content. This process enables us to vigorously control the cost and caliber of our equipment while improving its energy efficiency and safe use. Our solutions range from 5-600 horsepower and are used in a variety of industries. To learn more, please visit https://www.kaishanusa.com/.

CTI Launches Product & Material Certification Program

The Cooling Technology Institute announced the launch of the CTI Product and Material Certification Program, which complements its globally recognized and respected Thermal Certification Program for open and closed-circuit cooling towers. The CTI will now certify that the products and materials tested and analyzed will comply with the requirements of the relevant CTI and/or other industry standards specified for the specific program. This certification will offer important benefits to suppliers, heat rejection equipment manufacturers and end users that the products and materials meet the appropriate properties called for in the referenced standards.

The initial certification program will cover fiber-reinforced pultruded (FRP) structural materials for use in Cooling Towers. The program will certify that FRP structural materials from a specific manufacturer/supplier meet the material properties as identified in STD-137. CTI Standard 137 covers classification, materials of construction, tolerances, defects, workmanship, inspection and the physical, mechanical and design properties of glass fiber-reinforced pultruded structural shapes intended for use as construction items in cooling tower applications.

As part of this new FRP Material Certification Program, the CTI will also be offering strength testing of FRP samples pulled from existing cooling towers during inspections or from cooling towers under construction. The test

Compressed Air & Cooling Industry News

results will determine if the FRP samples meet the material properties of STD-137.

Parties interested in this new material certification program for FRP structural components should contact Virginia Manser, the CTI Administrator, at vmanser@cti.org or (281) 583-4087, to request an information packet and application. The application packet will contain complete details on the FRP Material certification program, audit procedure, and sample testing. All interested parties are strongly encouraged to apply.

For more information, visit www.cti.org.

Atlas Copco Acquires CAP

Atlas Copco has acquired the operating assets of Compressed Air Products, Inc. (CAP). CAP sells to a broad range of industrial customer segments. It also has a strong service business. CAP is located in Newnan, Georgia, south-west of Atlanta, and has 20 employees.

"CAP has a strong reputation in the Georgia market," said Vagner Rego, Business Area President Compressor Technique. "We have a long relationship with CAP as a distributor. This acquisition is in line with our strategy to get closer to our customers."

The purchase price is not disclosed. The acquired business will operationally become part of the Service division within the Compressor Technique Business Area.

About Atlas Copco Group

Great ideas accelerate innovation. At Atlas Copco we have been turning industrial ideas into business-critical benefits since 1873. By listening to our customers and knowing their needs, we deliver value and innovate with the future in mind. Our industrial ideas empower our customers to grow and drive society forward. This is how we create a better tomorrow. Atlas Copco is a global industrial group, founded in 1873 in Stockholm. In 2021 we had revenues of BSEK111 (BEUR 11) and at year end about 43 000 employees. For more information: www.atlascopcogroup.com.

SUTO iTEC Opens New Regional Headquarters in Michigan

SUTO iTEC is opening a new regional headquarters in Grand Rapids, MI., USA. In addition to its major operation in Germany and China, the Grand Rapids office expands SUTO iTEC's footprint to better support strong growth in the North American Market. "This decision allows us to get closer to our customers and partners," said Thomas Fischer, Founder and CEO. "We have the opportunity to further expand staffing and capabilities in our logistics, technical services and customer support departments."

Jan Hoetzel, the new Managing Director of SUTO iTEC Inc. in North America, said "I'm excited to continue the growth of SUTO iTEC. Our partners and customers really benefit from SUTO's international presence and customer orientated mindset. SUTO iTEC designs and manufactures all its own products in Germany and China, rethinking traditional methods and reaching new levels of time-efficient measurement. We are happy to bring SUTO iTEC's state of the art measurement and monitoring solutions for compressed air/gases directly to our North American customers, supported by outstanding customer service and support."

Jan Hoetzel, Managing Director, SUTO iTEC Inc. North America.

About SUTO iTEC

SUTO iTEC products play a vital role in applications of leading worldwide companies for the measurement and monitoring of compressed air and gas systems. Since our foundation in 2005, we offer our customers outstanding service and solutions and continue to innovate dependable measurement technology. With deep knowledge, large customer base and innovative R&D, SUTO has become the pioneer when it comes to a new level of time-efficient flow, consumption and air purity measurement and monitoring. For more information, visit https://www.suto-itec.com/.

Daikin Applied Names Jeff Drees as CEO

Daikin Industries, the world's number one air-conditioning company, announced Jeff Drees has been selected as the new chief executive officer and president of Daikin Applied Americas. Drees currently serves as executive vice president of sales, marketing and aftermarket at Daikin Applied, and will replace Mike Schwartz who retired at the end of August after 11 years leading the organization.

"This is an exciting time to be in the HVAC and building solutions industry," said Drees. "The work we do has a profound impact on the world at large, helping customers address issues such as reducing carbon emissions and improving indoor air quality. I'm honored to lead these

Compressed Air & Cooling Industry News

efforts and add to the significant growth the business has experienced over the last decade."

Daikin Applied designs and delivers innovative heating, ventilation and air-conditioning (HVAC) technology that not only offers superior comfort, but helps provide healthy, safe and sustainable environments. Its offerings include equipment, service, controls and systems integration for commercial and industrial facilities, encompassing the full customer lifecycle.

Drees joined Daikin Applied in 2020 and has helmed the organization's solutions transformation, expanding the portfolio of offerings and adding new capabilities through key acquisitions. He is a staunch advocate for customers, as well as Daikin's sales representatives and employees.

Jeff Drees, CEO, Daikin Applied.

"Jeff's leadership is critical to developing the strategy, plan and portfolio required to meet local and global challenges – air quality, decarbonization, digitalization," said Hirokazu Hirao, director of Daikin's Applied Solution Business Division, which includes Daikin Applied. "He is uniquely qualified to shape this organization to solve our customers' problems and help us attain the top position in North America."

Drees came to Daikin with experience in commercial engineering and operations. He held executive positions in private equity, as well as serving in significant business unit roles at Flowserve and Schneider Electric. He started his career in the United States Air Force, and holds a Bachelor of Science degree from Southern Illinois University and an MBA from Aurora University.

About Daikin Applied Americas

Daikin Applied designs and manufactures advanced commercial and industrial HVAC systems for customers around the world. The company's technology and services play a vital role in creating comfortable, efficient, and sustainable spaces to work and live – and in delivering quality air to workers, tenants and building owners. Daikin Applied solutions are sold through a global network of dedicated sales, service, and parts offices. For more information, visit www.daikinapplied.com.

OTC Opens New DIRECTAIR Manufacturing Facility

OTC Industrial Technologies, an industrial equipment service provider and distributor headquartered in Columbus, Ohio, announced the opening of a new manufacturing facility to support customer demand for its DIRECTAIR product. This facility, located outside of Cincinnati, OH, will increase capacity by

200%. To support customer demand, this is the second expansion in the last year, following the Kingman, AZ facility. A third location is set to open in Houston, TX early 2023.

In addition, this new facility will serve as Critical Rental Solutions' (CRS) second hub, further expanding OTC's rental offerings into the Midwest.

"This new location will allow OTC to serve our customers with compressed air needs. Both DIRECTAIR and CRS product offerings are in high demand as they provide significant value to our customers," said Adam Gibbs, President of Air Supply at OTC. "I am excited to open this new facility as it will allow us to further help our customers find success."

OTC Industrial Technologies opened a new manufacturing facility to support customer demand for its DIRECTAIR product.

About DIRECTAIR

DIRECTAIR is a solution for compressed air as a utility service. Since 1995, DIRECTAIR has offered a best-in-class service and has been a solution to increase company profitability. To date, DIRECTAIR has provided more than 13 million man-hours of accumulated operation and has provided over $250 million in energy savings and carbon footprint. With vital utilities such as water, electricity, and natural gas, DIRECTAIR provides peace of mind to its end consumers by supplying compressed air as a fourth utility. Currently, DIRECTAIR services more than 200 sites across the United States and counting. For more information, visit https://aircompressors.com/utility-services/directair/.

About OTC Industrial Technologies

Established in 1963, OTC Industrial Technologies (OTC), is one of the largest industrial distributors and service providers in the United States. OTC provides expert solutions for industrial motion control, factory automation, fluid power, pumping systems, spray finishing, power transmission, and compressed air systems. OTC operates a broad geographical footprint and delivers value to customers through its primary operating brands and divisions including OTP Industrial Solutions, AAP Automation, Air Technologies, Advanced Industrial Products, American Industrial Corporation, Buckeye Pumps, C&C Industrial Sales, Compressed Air Systems, Contrast Equipment, Crimson Electric, Critical Rental Solutions,

Compressed Air & Cooling Industry News

Diversified Pump, Filter and Coating Technology, Furey Filter and Pump, IDG Compressor, Industrial Process Equipment Group, Keller Electrical, Laron, Midway Industrial Supply, Ohlheiser, PK Controls, Pumps, Parts & Service (PP&S), PumpTek, PSI Engineering, Tape Industrial Sales, TP Pump, and Tri-Power MPT. For more information, visit https://otcindustrial.com.

Nano Completes Acquisition of Bireme Group

Bireme Group, a privately owned company located in Singapore that specializes in the sale, technical support and service of compressed air and gas purification and gas generation equipment has been acquired by nano-purification solutions.

"The acquisition of Bireme fits well with nano's geographic strategy, and Bireme's capabilities and approach to customers help us advance our Experience – Customer – Service philosophy," said David Peters, Group General Manager, nano-purification solutions. "Our growing customer base expects global support and this acquisition allows us to increase our direct presence and support to yet another region of the world. Utilizing Bireme's current Southeast Asia location, nano plans to add additional resources to expand our reach in the broader Asian region. Bireme has been a distributor of nano products for 10 years. We are happy to add a business to nano that has so many high-quality people within the organization and that has a similar culture for taking care of customers. We look forward to an exciting future in the region."

About nano-purification solutions

nano-purification solutions are headquartered in Charlotte, North Carolina with customer centers and production centers located in the United States, United Kingdom, Canada, Mexico, Germany, and now Singapore and Malaysia. For more information, visit www.n-psi.com.

Teledyne Acquires Majority Interest in NL Acoustics

Teledyne Technologies Incorporated announced that it has acquired a majority interest in Noiseless Acoustics Oy. NL Acoustics, located in Helsinki, Finland, designs and manufactures acoustics imaging instruments and predictive maintenance solutions. Terms of the transaction were not disclosed.

Pictured is the Bireme Group service staff.

NL Acoustics' camera products combined with advanced analytics provide easy-to-use advanced imaging and monitoring solutions. Users can detect critical problems and make intelligent maintenance decisions in multiple applications, such as electric power distribution, compressed air systems and factory condition monitoring.

Kai Saksela and Jonas Nyberg, who founded NL Acoustics in 2015, will retain a minority stake in the business and continue in their current executive leadership roles with the company.

"Having worked with NL Acoustics since 2019, we are delighted to strengthen our partnership with the company," said Rickard Lindvall, General Manager of Teledyne FLIR Solutions. "Collectively, Teledyne and NL Acoustics provide a wide range of condition monitoring and safety solutions, including acoustic imaging systems, optical gas leak detection cameras, and hazardous gas and flame detection instrumentation."

About Teledyne

Teledyne is a leading provider of sophisticated instrumentation, digital imaging products and software, aerospace and defense electronics, and engineered systems. Teledyne's operations are primarily located in the United States, Canada, the United Kingdom, and Western and Northern Europe. For more information, visit Teledyne's website at www.teledyne.com.

ABB to Acquire Siemens Low Voltage NEMA Motor Business

ABB announced it has signed an agreement to purchase Siemens' low voltage NEMA motor business. With manufacturing operations in Guadalajara, Mexico, this acquisition provides a well-regarded product portfolio, a longstanding North American customer base, and an experienced operations, sales, and management team. The business employs around 600 people and generated revenues of approximately $63 million in 2021. Financial terms of the transaction were not disclosed. The transaction is expected to close in the second quarter of 2023.

This transaction is part of the Motion business area's profitable growth strategy, and it will allow the NEMA motors division to enhance its product offering, expand its supply chain relationships, and improve support to its North American customer base. It also offers the opportunity to better support the customers in Mexico with local manufacturing and sales. ABB expects to benefit from identified synergies, and to use the R&D expertise, supply chain relationships, and market access to bring the combined portfolio to its full potential.

"This bolt-on acquisition creates strong value for ABB's NEMA motors division," said Tarak Mehta, President ABB Motion. "Investing in the business and opening up sales opportunities in North America and especially Mexico will allow this business to be margin accretive to the ABB Motion business within 24 months."

"We have long appreciated the quality and design of these motors," Jesse Henson, President of ABB's NEMA motors division, said. "Now that we have met the leadership team behind them, I am even more confident that together we can grow our combined businesses faster than

Compressed Air & Cooling Industry News

ABB expands its low voltage NEMA motor portfolio to further establish itself as a leader in that segment.

either of us could alone. We look forward to adding the Siemens low voltage NEMA motor portfolio to our existing offering of ABB and Baldor-Reliance® industrial electric motors."

The global NEMA motor industry, roughly $2.7 billion in size, comprises industrial electric motors primarily used within North America. NEMA motors are essential components used to run equipment in industries such as food and beverage, oil and gas, mining & aggregate, and water & wastewater and in applications like those which move air, liquids, and units.

About ABB

ABB is a leading global technology company that energizes the transformation of society and industry

to achieve a more productive, sustainable future. By connecting software to its electrification, robotics, automation and motion portfolio, ABB pushes the boundaries of technology to drive performance to new levels. With a history of excellence stretching back more than 130 years, ABB's success is driven by about 105,000 talented employees in over 100 countries. www.abb.com.

Asahi/America Introduces New Field Service Technician

Asahi/America, Inc., the leader in thermoplastic fluid flow technology, is pleased to announce the addition of Brad Doughty to the technical field service team. Brad will assist customers with training and installing Asahi/America's single and double wall piping systems through thermofusion processes. This includes properly training customers how to use Asahi/America's available welding equipment with the company's piping products. He will cover all regions throughout the US.

Brad comes to Asahi/America with almost 30 years of experience in the polyethylene (PE) industry. His experience ranges from making PE tanks and connections to providing field service for PE-related products across the US. Brad's addition to the field service department will help the growing need for thermoplastic piping installation and field training assistance. Brad is based out of Louisiana and can be reached via email at bdoughty@asahi-america.com.

Brad Doughty, Field Service Technician, Asahi/America, Inc.

About Asahi

Asahi/America is the premier manufacturer and supplier of thermoplastic fluid flow and air handling solutions for industrial, environmental, high purity and commercial applications. Asahi's piping systems, valves and actuators have been installed with confidence for over 40 years in a variety of industries including water and wastewater treatment, oil and gas, water parks and aquariums, landfills, semiconductor and pharmaceutical manufacturing, and chemical processing.

The company maintains fabrication, machine and assembly shops in its Massachusetts headquarters, as well as an extensive custom fabrication department in Louisiana. The Asahi/America staff is here to support you through every step of your project, offering engineering support, on-site consultation, supervision and training. From concept to completion, we're Your Experts in Plastics™.

For more information about Asahi/America products and services, please contact us: 655 Andover St. Lawrence, MA 01843; 800-343-3618; asahi@asahi-america.com; www.asahi-america.com.

DOE Better Plants Partners Get Serious About Compressed Air Systems

By Robert Lung, BGS, with contributions from: Ed Willhite, Schneider Electric; Stephen Tankersley, Ring Containers; Marco Gonzalez, Waupaca Foundry; and Darwin Jaeger, Plastics Engineering Company.

Waupaca Foundry Employee Finding Compressed Air Leaks

Optimizing and improving energy efficiency in compressed air systems has long been an important priority for the manufacturers in the U.S. DOE's Better Plants program. Since the program began offering In Plant trainings in 2011, the compressed air training has been the most frequently requested training off all the industrial system trainings. In addition, many compressed air system energy-saving opportunities have been uncovered during the energy Treasure Hunt trainings that are offered through the program. These opportunities have been shared and implemented by many Better Plants partners and were a key element for many that met the program goal as of 2019.

In the past five years the Better Plants program has offered annual awards for significant energy-saving projects and best practices. Termed the "Better Project and Better Practice Awards," this initiative recognizes partners for implementing projects save large amounts of energy as well as for implementing best practices and managerial improvements that facilitate the partners' ability to reach their sustainability goals. Partners having significant energy-saving projects receive

a "Better Project" award and partners that demonstrate important best practices are awarded "Better Practice" awards.

In 2022, four Better Project/Practice applications were related to compressed air system optimization – more than any single other system this year. The four partners are: Schneider Electric, Waupaca Foundry, RING Containers and Plastics Engineering Company (PLENCO).

Schneider Electric

In the case of Schneider Electric, traditional measures for detecting compressed air leaks were insufficient for finding all the leaks that the company's energy management team wanted to uncover. In addition, some internal stakeholders were skeptical that leaks were a significant source of cost savings. The energy management team worked with a third party to evaluate advanced, acoustical imaging technology that could show the location and magnitude of compressed air leaks anywhere within a manufacturing plant.

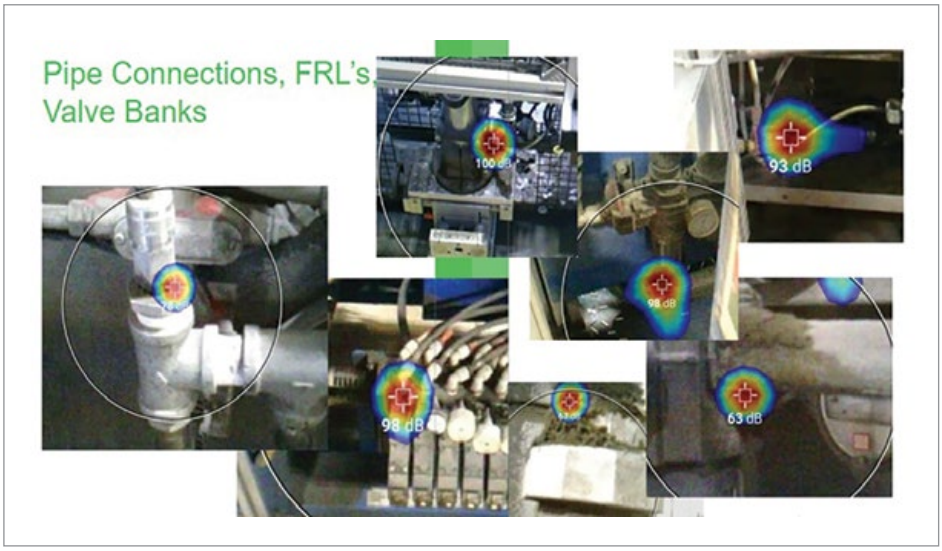
The demonstration showed that it was very easy to locate leaks quickly and accurately, often in places that are hard to access. The energy management team was then able to procure the device and train more than 40 employees how to use it. In a few weeks, the company's employees found more than 250 compressed air leaks across six plants, resulting in $60,000 in compressed air energy cost savings. Because the technology can measure losses in any environment that generates acoustic signals, the company plans to use the technology to locate leaks within other industrial gases, steam systems and even pump cavitation.

Waupaca Foundry

Waupaca Foundry implemented a system-level project that included supply-side upgrades and demand reductions to improve their Waupaca, WI, plant's compressed air performance. One important feature that led to the project was a Compressed Air In-Plant training offered through the Better Plants program that yielded several improvement opportunities that Waupaca implemented.

DOE Better Plants Partners Get Serious About Compressed Air Systems

Marco Gonzalez, Corporate Energy Manager at Waupaca Foundry said "Energy represents our third largest expense, with a direct impact on our environmental footprint and business bottom-line. Having the opportunity to have a DOE In-plant training allowed us to provide our employees base knowledge to effectively monitor and manage our energy consumption, as well as to identify opportunities for improvement in our daily operations. Training enhances our energy skills and raises awareness, promoting engagement and a new energy efficiency culture across the company."



Sample of Identified Compressed Air Leaks

Waupaca's compressed air system project included the following measures by category:

1. Compressed Air – Supply Side
   - Replaced two legacy trim water-cooled compressors with one new VFD air-cooled unit.

- Installed a Master Control System and pressure/flow controller.
- Optimized the piping configuration in the compressor rooms.
- Offset natural gas usage during the winter by recovering waste heat from the compressors.

2. Compressed Air – Demand Side

- Reduced overall plant pressure to the lowest level that ensured reliable production.
- Implemented end-usage reduction projects; e.g., leak repair.
- Tuned up large end-users through demand-side management strategies.

3. Compressed Air – Best Practices

- Improved the plant's air-leak management program.

The compressed air optimization project not only saved energy, but also improved system reliability to meet foundry operational needs. The total project costs amounted to $325,000. With combined reductions of approximately 1,100,000 kWh of electricity, 6,750 MMBTU of Natural Gas, and 13 million gallons of water the total cost savings were $185,000 per year, yielding a simple payback of only 1.24 years. This project was also eligible for energy rebates from the state energy efficiency program, which paid the equivalent of 28% of the project cost.

Plastics Engineering Company

Plastics Engineering Company (PLENCO) is a manufacturer of phenolic resins and compounds that require compressed air for multiple processes. The largest end-uses are the grinding and compounding processes that are both served by a common header. The company found that this section of the plant had a

DOE Better Plants Partners Get Serious About Compressed Air Systems

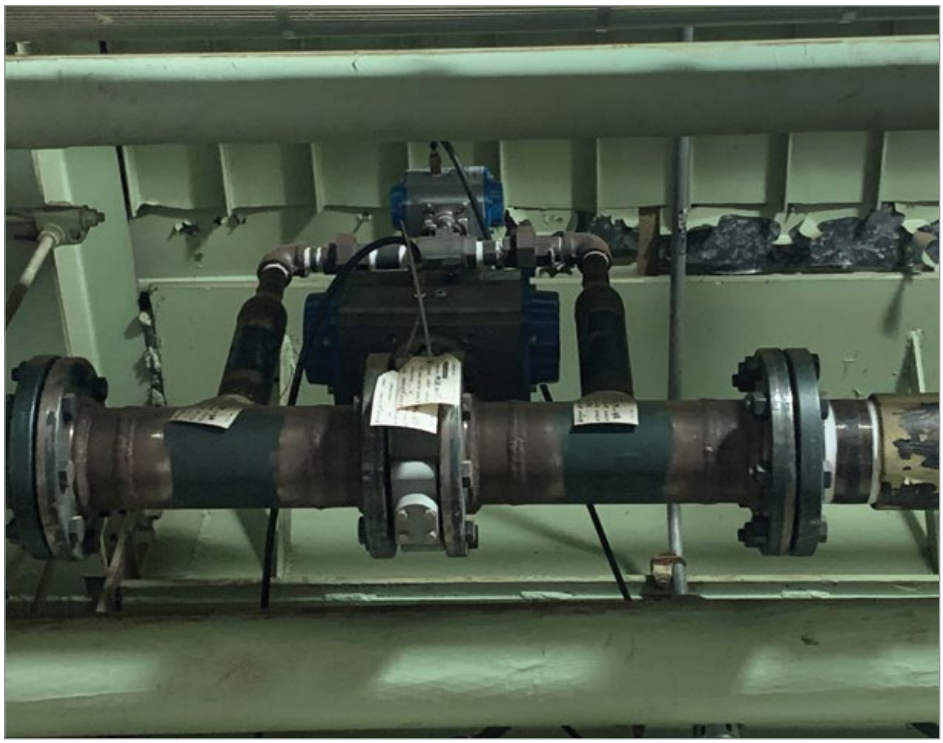
serious leak load, and it dedicated one of the maintenance mechanics to fix compressed air leaks on that line. However, the plant found that after several weeks the leakage volume during off-production hours in that part of the plant was still greater than half of the compressed air load during production. PLENCO's engineering team decided to isolate compressed air to this part of the plant during off-production hours.

After installing an isolation valve on the header serving that part of the plant, the company found they were able to reduce compressed air losses by 62%. The company's engineering team then decided to apply isolation valves to other areas. This decision further reduced compressed air demand to the point where the company was able to justify replacing an old, oversized air compressor with a new, smaller unit that can start and stop automatically as needed by system demand. The isolation valves served to reduce compressed air energy consumption and helped the system operate more efficiently, which in turn, lowered both electrical demand and consumption.

Based on the implementation of isolation valves and reduced consumption from the smaller air compressor, total energy savings amounted to 406,000 kWh per year and annual compressed air energy cost savings of $35,000 per year and resulted in a simple payback of about 1.5 years.

RING Container Technology

RING Container Technology operates 17 plastic bottle/container plants in the U.S. using either High Density Polyethylene (HDPE) or Polyethylene Terephthalate (PET) plastic resin to produce their respective bottles and containers. RING joined the DOE Better Plants



A Compressed Air Isolation Valve

program in July 2021 with a commitment to improve energy intensity by 20% over 10 years.

Compressed air is used in all the company's plants and is often the single largest energy end use within them. As a result, compressed air energy-saving measures are often replicable across the company and offer significant positive impacts. One area of focus is with compressed air leaks since they are "the best low hanging fruit to focus on and they always keep popping up and waste energy" according to Stephen Tankersley, Project Manager at RING.

In RING's case, the company leveraged several internal and outside resources, including an IAC assessment, to uncover more than 1,900 CFM worth of air leaks that were wasting approximately 1.5 Million kWh per year. The company then implemented a corporate-wide leak repair campaign that yielded compressed air energy cost savings of $138,000 per year. In addition, RING set up a regular leak detection/repair program that includes one large annual campaign along with daily leak checks by plant staffs. One additional benefit, from the compressed air leak repairs, is that the personnel in the plants are more aware of compressed air leaks and the losses associated with them, even the small ones. This has led to a more proactive culture of finding and fixing compressed air leaks. BP

To learn more about the U.S. DOE Better Plants program visit https://betterbuildingssolutioncenter.energy.gov/better-plants

To read similar ***Compressed Air Best Practices*** articles, visit https://www.airbestpractices.com/

For expert presentations, visit our Webinar Archive Section dedicated to ***Air Compressor Technology*** at https://www.airbestpractices.com/magazine/webinars

What is CFM in Compressed Air? How Much Do I Have? How Much Do I Need?

By Hank van Ormer, Technical Director, AP Energy

Do the questions in the title seem like simple questions? There are many things that confuse the issue including air compressor condition, controls as applied, interconnecting pipe size and configuration and effective storage.

All of these have been covered in many technical compressed air papers and articles. The topic many don't use or understand is how to calculate the actual value of these initial questions at the operating sites and conditions.

CFM is the flow rate of compressed air in cubic feet per minute – but there are many variations on CFM – and these must be considered to clarify the issue.

Consider: Has anyone ever said to you, "We have plenty of compressed air except during the summer and especially with high humidity."

OR

"Ten years ago, we had plenty of compressed air. Now, after installing a chiller system and some pumps, it gets pretty hot in the compressor room, and we are often short of air. All the compressors seem to be running fine." In this case, when investigating the room ambient "pressure" was almost 1.5psia lower than the outside psia (pounds per square inch ambient) – which is known as "Negative Room Pressure".

These tales could go on and on, but let's get your thoughts into the "common sense mode".

There are two CFM values we want to identify – the OEM's test data for CFM and reconcile that to an equivalent volume at the operating site conditions.

Most OEM's (Original Equipment Manufacturer) use specific accepted standard

ATMOSPHERIC PRESSURE AND BAROMETER READINGS AT DIFFERENT ALTITUDES

Altitude above sea level, ft	Atmospheric pressure, psi	Barometer reading, in. Hg	Altitude above sea level, ft	Atmospheric pressure, psi	Barometer reading, in. Hg
0	14.69	29.92	7,500	11.12	22.65
500	14.42	29.38	8,000	10.91	22.22
1,000	14.16	28.86	8,500	10.70	21.80
1,500	13.91	28.33	9,000	10.50	21.38
2,000	13.66	27.82	9,500	10.30	20.98
2,500	13.41	27.31	10,000	10.10	20.58
3,000	13.16	26.81	10,500	9.90	20.18
3,500	12.92	26.32	11,000	9.71	19.75
4,000	12.68	25.84	11,500	9.52	19.40
4,500	12.45	25.36	12,000	9.34	19.03
5,000	12.22	24.89	12,500	9.15	18.65
5,500	11.99	24.43	13,000	8.97	18.29
6,000	11.77	23.98	13,500	8.80	17.93
6,500	11.55	23.53	14,000	8.62	17.57
7,000	11.33	23.09	14,500	8.45	17.22
			15,000	8.28	16.88

Table 1

conditions. In most of North America and many other countries, the CAGI (Compressed Air & Gas Institute) standard is used. There are other standard conditions, which can mathematically be reconciled to another standard. It is very important to know what standard operating conditions the air compressor manufacturer used. The standard operating CAGI conditions are:

- **Inlet Pressure** to the air compressor inlet (14.5 psia)
- **Ambient Temperature** of the inlet air (68°F)
  - We use absolute Fahrenheit in the calculation which adds + 460 to 68°F to equal 528 **Rankine.** (If you use Celsius there is a different constant).
- **Relative humidity** – 0% RH

Anything that negatively affects the inlet air pressure, temperature, and relative humidity at the actual site operating conditions will affect the amount of actual available air volume (CFM) to use.

Inlet Pressure, Inlet Temperature and Relative Humidity

Inlet Pressure: The standard altitude chart (Table 1) psia is not a feasible fixed value, it goes up and down with climate changes.

Inlet Temperature: Remember High School Physics – hot air weighs less (lower pressure psia) than colder air. When the air is hotter (summer) the temperature goes up and you have less available weight of air per CFM to do the work.

Lower inlet pressure will always have a negative effect on the actual delivered compressed air to the system. Ambient temperature has a direct effect on the reconciliation – hot air weighs less and this modifies the inlet psia relative to the standard.

Relative humidity will not directly affect the inlet pressure. The water vapor that comes in with the inlet air will be removed from the delivered air in the after cooler and dryer and this will reduce the volume of available, usable air before it gets to the system. To calculate this effect, we go to Saturation Pressure Table, which gives a value in psia to adjust for this removal of water vapors as available air. Hot air holds more water vapor, in vapor form, than cold air. The saturation pressure, at the ambient temperature, is multiplied by the relative humidity (RH%) to give the net result of actual inlet pressure in psia to the air compressor.

Reconciling Standard Conditions to Operating Site Conditions

There are often things that all air compressor OEM's may or may not include in their published numbers. For example most technical people, in the compressed air arena, use a 0.3 psia reduction for a clean inlet air filter. The true number will only be available by measurement and you can assume the loss at site will be higher with older inlet filters. When gathering applicable data, remember to measure the pressure below 14.5psia. You will need a vacuum gauge and when possible, try to measure in or at the inlet valve.

Some key terminology before we show a proper path for converting acfm to scfm.

What is CFM in Compressed Air? How Much Do I Have? How Much Do I Need?

Summary Converting ACFM to SCFM

$$scfm = acfm \times \frac{Pa-(PP \times RH)}{Ps} \times \frac{Ts}{Ta}$$

Where:

- Acfm = delivered air measured at stated ambient conditions
- Pa =The ambient pressure
- PP = the saturation pressure or partial pressure of moisture at Ta (from steam tables in psia) – see table properties of water
- RH = The relative humidity expressed as a fraction
- Ts = the standard absolute temperature (degrees Rankine)
- Ps = The standard pressure (14.5 psia)
- Ta = the ambient absolute temperature (degrees Rankine)

Ambient Site Conditions

- 1,050 ACFM delivered at stated ambient conditions
- 14.42psia measured inlet psia
- 90°F ambient inlet temperature + 460 = 550° Rankine
- 0.6981 saturation (partial pressure) at 90° – Water/Steam Table
- 60% RH

Temperature Deg. F	Saturation Pressure psia
70	0.3629
80	0.5068
90	**0.6981**
100	0.9492

(Taken from table 2)

- ICFM – Inlet air volume depending on the type of air compressor. This value may or may not equal delivered air.
- ACFM – Ambient air volume in this context is the same as ICFM. This is not relevant in this discussion.
- ACFM/FAD – Actual CFM delivered at the air compressor discharge at inlet conditions. These are basically interchangeable in this instance.
- SCFM – The volume of the flow of compressed air in cubic feet/minute – reconciled back to a specific set of "standard conditions". This is a very critical step, in proper equipment selection and application, because the air consuming equipment rate their products demand in SCFM. When planning, be sure you have identified the proper converting standards to the compressed air using equipment. Once that is done, you then only must reconcile the standard conditions to the operating site conditions.

PROPERTIES OF WATER

Temperature Deg. F	Saturation Pressure Psia	Temperature Deg. F	Saturation Pressure Psia
32	0.0886	200	11.526
40	0.1216	210	14.123
50	0.1780	212	14.696
60	0.2561	220	17.186
70	0.3629	240	24.968
80	0.5068	260	35.427
90	0.6981	280	49.200
100	0.9492	300	67.005
110	1.2750	350	134.604
120	1.6927	400	247.259
130	2.2230	450	422.55
140	2.8892	500	680.86
150	3.7184	550	1045.43
160	4.7414	600	1543.2
170	5.9926	650	2208.4
180	7.5110	700	3094.3
190	9.340		

Table 2

Elevation (FT)	1,000 FT	2,000 FT	3,000 FT	4,000 FT	5'000 FT	6,000 FT	7,000 FT	9,000 FT	10,000 FT
Multiplier	1.000	1.065	1.100	1.138	1.174	1.213	1.255	1.298	1.391

Table 3: Altitude Correction Factors (vs. sea level). Example: Most air powered tools and equipment have the compressed air consumption rated at SCFM. Normally this would be at sea level and CAGI standard conditions unless otherwise stated. Under these conditions 600scfm at sea level will require a compressed air supply of about 753 scfm at 7000 feet elevation (Flagstaff, AZ). (600 x 1.255 = 753).

Impact of Altitude on the Operation of Air Powered Equipment

Table 3 will give some idea of what impact the lighter/lower pressures of higher (than sea level) altitude air will have on most compressed air powered equipment. These numbers are calculated to compare the sea level demand in weight of compressed air per CFM. The multiplier shown identifies what is required to deliver the same weight per CFM of compressed air, at the altitude, as at sea level.

Example: Convert 1,050 ACFM to SCFM

$$\text{Scfm} = \frac{\text{acfm x Pa}-(\text{PP x RH})}{(\text{Ps})\ 14.5\ \text{psia}} \text{ x } \frac{\text{Ts}}{\text{Ta}}$$

$$\frac{1050\text{acfm x } (14.2-(0.698)}{14.5} \text{ x } \frac{68°\text{F}+460}{90°\text{F}+460}$$

$$\text{Scfm} = \frac{1050\text{acfm x } 13.78}{14.5} \text{ x}$$

$$\frac{528° \text{ Rankin}}{550° \text{ Rankin}} = \textbf{958.7scfm}$$

The air compressor that produces 1050 acfm actually delivers 958.7 scfm at the site operating conditions.

Final Note on Converting ACFM to SCFM: Calculate the operating site conditions scfm value for 100 scfm. The resultant answer will represent a multiplier for any future acfm to scfm conversion under the same conditions.

For Example:

$$\frac{100\ \text{acfm x } 13.78}{14.5} \text{ x } \frac{528\ °\ \text{R}}{550°\ \text{R}} =$$

91.2 = .912% multiplier

Tips on Measuring Operating Site Conditions

Standard Inlet Conditions	Operating Site Inlet Conditions
Inlet press. 14.5 psia	14.42 psia
Inlet temp. 68°F	90°F
RH % 0	60

It is best to measure the actual inlet PSIA below the inlet filter at full load with a vacuum gauge. I personally prefer a high-quality digital gauge. Be sure the gauge has the range to cover the expected volume. If this is not feasible, use the vacuum gauge in the surrounding area at the inlet. Equipment operating rooms may have negative pressure. Check for negative pressure by also using your gauge to check outside of the room.

Measure the temperature at the inlet valve. If you don't have an RH meter, check the morning weather data or? Lastly, compare the standard data to the measured data and convert ACFM into SCFM. BP

For more information contact Hank van Ormer, Technical Director, or Don van Ormer, Senior Auditor, AP Energy (formerly Air Power USA) at tel: 740.862.4112, Visit https://apenergy.com

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Hiran de Mel
Senior Project Manager and Principal Technologist, Jacobs

Nick McCall, P.E.
Technical Manager, Woodard & Curran

Ron Marshall
Chief Auditor, Marshall Compressed Air Consulting

JAN 20

Air Compressor Component Function, Troubleshooting & Maintenance

Presenter Loran Circle, Senior Consultant, Circle Training & Consulting – *Sponsored by BEKO Technologies*

Thursday, January 20, 2022 – 2:00PM EST

FEB 17

Compressed Air Piping System Sizing & Design

Presenter Tim Dugan, P.E., President and Principal Engineer, Compression Engineering Corporation – *Sponsored by Trace Analytics and Unipipe*

Thursday, February 17, 2022 – 2:00PM EST

MAR 10

On-site Nitrogen Generation Replacing Bulk Liquid Nitrogen

Presenter Antonio Mayne P.E., Utilities Optimization Engineer, Molson Coors Beverage Company – Toronto Brewery – *Sponsored by Atlas Copco*

Thursday, March 10, 2022 – 2:00PM EST

MAR 24

How to Hunt for Vacuum Leaks: Is it Worthwhile?

Presenter Ron Marshall, Chief Auditor, Marshall Compressed Air Consulting – *Sponsored by Best Practices 2022 EXPO & Conference*

Thursday, March 24, 2022 – 2:00PM EST

APR 28

Air Compressor Cooling, Water- or Air-Cooled?

Presenter Tom Taranto, Owner, Data Power Services – *Sponsored by Kaeser Compressors*

Thursday, April 28, 2022 – 2:00PM EST

Bert J. Wesley
Sr. Principal Industrial Plant Engineering Practice Leader, Woodard & Curran

Antonio Mayne, P.E.
Utilities Optimization Engineer, Molson Coors Beverage Company

MAY 12

IIot Solutions for Multiple and Multi-brand Compressors Remote Monitoring

Presenter Tim Dugan, P.E., President and Principal Engineer, Compression Engineering Corporation – *Sponsored by Kaishan*

Thursday, May 12, 2022 – 2:00PM EST

MAY 19

ASME PTC 13 Wire-to-Air Performance Test Code for Blower Systems Part 1

Presenters Julie Gass, Lead Mechanical Process Engineer, Black & Veatch, Fred Constantino, S&C Project Engineering Advisor, ASME and Andrew Balberg, President, Lone Star Blower and Compressor – *Sponsored by Lone Star Blower & Compressor*

Thursday, May 19, 2022 – 2:00PM EST

JUN 09

Sizing and Maintaining Compressed Air Systems

Presenter Loran Circle, Senior Consultant, Circle Training & Consulting – *Sponsored by Kaishan*

Thursday, June 9, 2022 – 2:00PM EST

JUN 23

Compressed Air System Design for Lowest kW/100scfm

Presenter Tom Taranto, Owner, Data Power Services – *Sponsored by VPInstruments and BEKO Technologies*

Thursday, June 23, 2022 – 2:00PM EST

JUL 21

Applications for Adiabatic Cooling Technology

Presenter Bert J. Wesley, Sr. Principal Industrial Plant Engineering Practice Leader, Woodard & Curran – *Sponsored by Evapco*

Thursday, July 21, 2022 – 2:00PM EST

JUL 28

ASME PTC 13 Wire-to-Air Performance Test Code for Blower Systems Part 2

Presenters Hiran de Mel, Senior Project Manager and Principal Technologist, Jacobs and Lloyd Slezak, Consulting Engineer (ret), Brown and Caldwell – *Sponsored by Howden*

Thursday, July 28, 2022 – 2:00PM EST

AUG 18

VFD Vacuum Pumps Do's and Don'ts

Presenter Ron Marshall, Chief Auditor, Marshall Compressed Air Consulting – *Sponsored by Busch Vacuum Solutions*

Thursday, August 18, 2022 – 2:00PM EST

AUG 25

Avoiding Production Downtime: Realtime Compressed Air Quality Monitoring and Audits

Presenter: Francisco Lara, Manager, Airtec Global LLC – *Sponsored by SUTO-iTEC*

Thursday, August 25, 2022 – 2:00PM EST

SEP 15

Using CAGI Data Sheets for Optimal Efficiency

Presenter Ron Marshall, Chief Auditor, Marshall Compressed Air Consulting – *Sponsored by Kaishan*

Thursday, September 15, 2022 – 2:00PM EST

OCT 20

How to Determine the Ideal Physical Location of a Cooling Tower

Presenter Nick McCall, P.E., Technical Manager, Woodard & Curran – *Sponsored by SPX Cooling Technologies, Inc.*

Thursday, October 20, 2022 – 2:00PM EST

OCT 27

Compressed Air: What You Don't Know Can Hurt You

Presenter Ron Marshall, Chief Auditor, Marshall Compressed Air Consulting – *Sponsored by VPInstruments and Kaeser Compressors*

Thursday, October 27, 2022 – 2:00PM EST

NOV 10

ASME PTC 13 Wire-to-Air Performance Test Code for Blower Systems Part 3

Presenters John Conover, Consultant, Mark Addison, Senior Engineer, Artesian Water Company, and Fred Constantino, S&C Project Engineering Advisor, ASME – *Sponsored by APG-Neuros*

Thursday, November 10, 2022 – 2:00PM EST

DEC 08

Compressed Air: Reliable Source for Nitrogen Generation

Presenter Loran Circle, Senior Consultant, Circle Training & Consulting – *Sponsored by Rogers Machinery and Parker*

Thursday, December 8, 2022 – 2:00PM EST

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SPX Cooling Technologies Celebrates the Marley Centennial

By Bill Smith, Chiller & Cooling Best Practices Magazine

Chiller & Cooling Best Practices Magazine interviewed Glenn Brenneke, Vice President of Engineering and R&D, SPX Cooling Technologies, to discuss the Marley 100-year anniversary.

MARLEY 100 YEAR ANNIVERSARY ESTABLISHED 1922

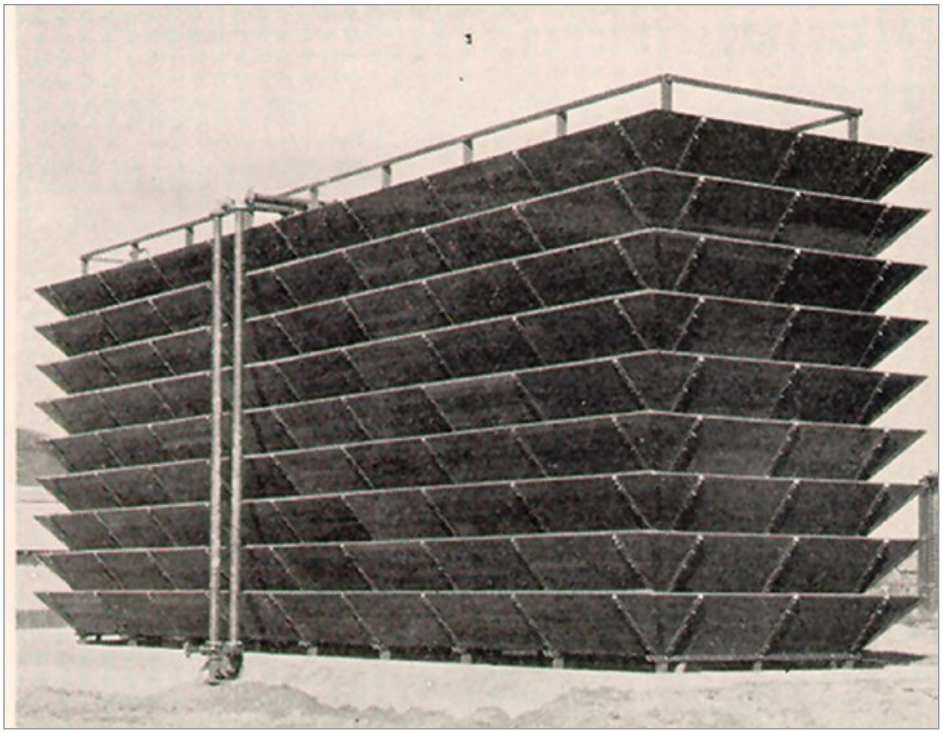
Good morning. Please describe your role with SPX Cooling Technologies.

I've been with SPX Cooling/Marley for 31 years. I'm the Vice President of Engineering and R&D for the global business, based at our global headquarters in Overland Park, Kansas. Working on the development of our products and technology for 3 decades means I've been involved in about one third of the company's history!

Can you tell us about the company's founding and evolution?

It all started with two young engineers and manufacturer's representatives named L. T. Mart and Chester Smiley, who founded Power Plant Equipment Company in Kansas City in 1922. L. T. Mart, a mechanical engineer, was considered the inventor of the group. Together, Mart and Smiley developed and patented new spray nozzles and spray pond inventions, so innovation has been a core of the business from the beginning. When Mart and Smiley needed an original name for the business, they combined elements of their last names, and the Marley brand was born in 1924.

Glenn Brenneke, Vice President of Engineering and R&D, SPX Cooling Technologies.



An early version of an atmospheric deck cooling tower, circa 1930.

In 1928, Smiley continued his role as a manufacturer's representative, while Mart retained the patents and all products carrying the Marley name, then incorporated the business as The Marley Company.

How has Marley continued to innovate its products?

Following the first patents around spray nozzles, the development of the crossflow cooling tower in the 1930s was very significant. Today, our primary Marley NC Cooling Tower line is designed in a crossflow configuration. This evolution in the layout of the heat exchanger to the fan really drives efficiency and ease of access.

Next, the Marley Aquatower® was an early factory-assembled crossflow cooling tower introduced by Marley in the 1940s. Today, factory assembly is a major part of our business. Factory assembly allows for ease of installation and the ability to package and ship the product whether it be an industrial or HVAC application.

In the 1970s, we had an invention relative to plume abatement. Plume abatement is a technology used to reduce the visible plume discharged from a cooling tower. This parallel path wet/dry tower was a significant development to reduce plume at the time. Plume abatement technology is frequently specified for airport installations. Certainly, if plume is interrupting the view of a runway, it's not a good thing. It's pure water vapor, but that vapor can cause a cloud obstructing views. Plume abatement technology improves safety and also helps to make the tower and discharge less noticeable.

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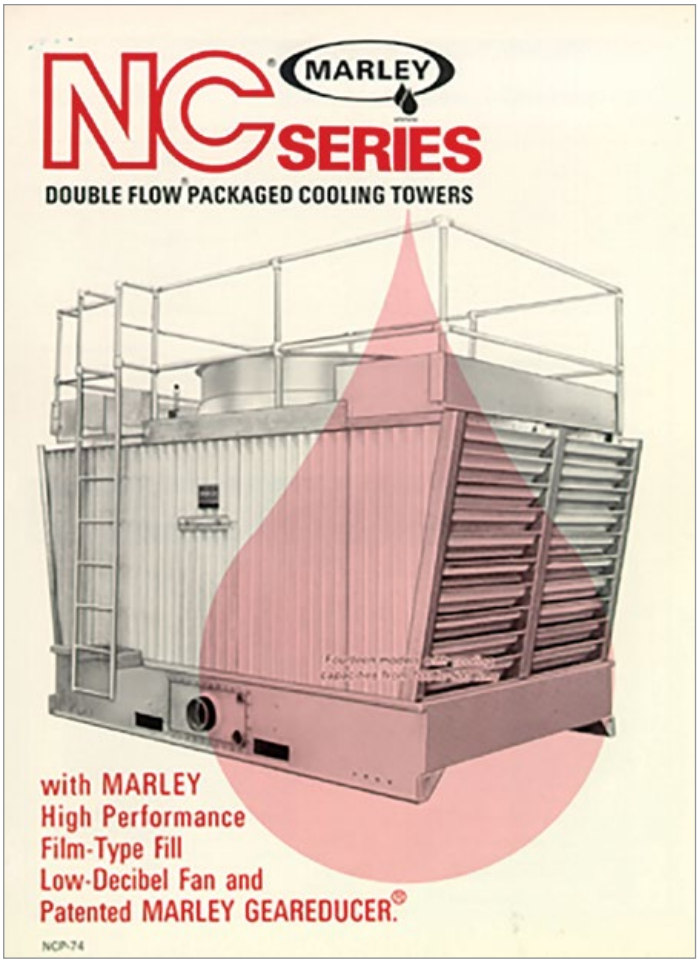
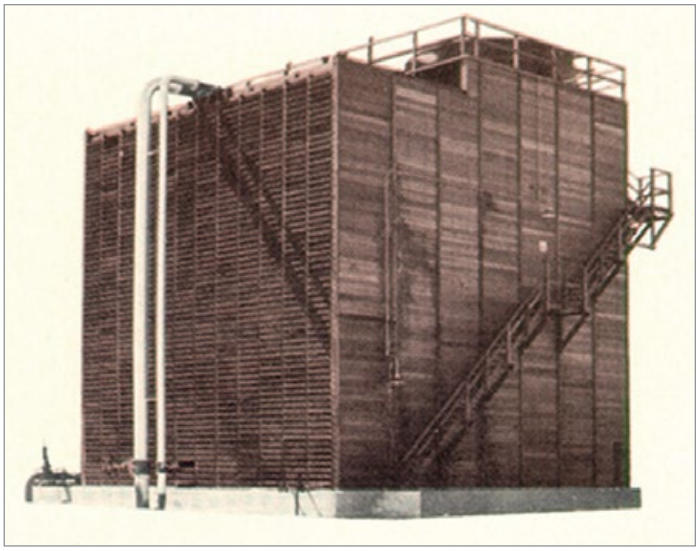


A Marley NC Series cooling tower flyer, circa 1968.



An early image of a Marley single flow cooling tower.

Another innovative product is the Marley MH Element™ Fluid Cooler for industrial and HVAC closed-loop applications. By keeping the process fluid in a clean closed loop, and combining the functions of a cooling tower and heat exchanger into one system, the MH Fluid Cooler provides significant operational and maintenance benefits. With its hybrid arrangement of evaporative fill media and prime surface coils, the MH Fluid Cooler offers significantly improved performance over conventional non-hybrid systems.

A more recent development is the Marley NCWD Crossflow Cooling Tower, designed to abate plume at lower temperatures with the same amount of humidity. The NCWD also offers up to 20% water savings over conventional towers when the coil section is employed.

Our most recent launch is the Marley DT Fluid Cooler with the patented Aero-X™ coil technology. The Aero-X coil is a streamlined coil that is very aerodynamic with low pressure drop and high heat transfer capabilities. Today, SPX Cooling Technologies holds over 200 U.S. patents for evaporative cooling systems and components.

Can you tell me more about the emergence of factory-assembled products?

When we introduced the Aquatower in the 1940s, they were mostly small, low-capacity units for the demands of the time. As industrialization increased throughout the country back then, there were small heat loads (whether it be punch presses, or injection molding process) that required rejection of heat. Over time, heat loads got larger, so Marley products grew with them to meet the needs of industry.

Today our factory-assembled products are very flexible. We offer a wide range of capacities from the smallest to largest, allowing customers to select a tower that fits their needs. When we develop a new product line, it has multiple models with different sizes and power combinations allowing customers to address their unique heat loads.

How were the earliest cooling tower models constructed and applied?

Our first units were field-erected products. Initial cooling equipment started as spray ponds, then cooling towers evolved to save space. At the time, cooling towers were large units constructed of wood,

serving large industrial applications like power plants and refineries. Materials have evolved through the years and today, you will still see both mechanical draft and natural draft field-erected cooling towers for power and industrial applications with very large duties and heat rejection requirements. A large power plant can be in the hundreds of thousands of GPM in the recirculating water stream.

Since SPX Corporation acquired the Marley brand in 2001, how has the company grown?

First, SPX has brought opportunities to grow the business through acquisition. From the get-go there were a number of acquisitions made. Initially in the 2000s, growth was primarily focused on power industries. Today, as markets evolve, we have more focus on HVAC and refrigeration. We see an opportunity in those markets for sustained growth. As temperatures rise, people around the world need comfort cooling to survive, and we will continue to focus on these needs. Also, with a growing population of people who want access to fresh and processed foods, refrigeration will continue to be a sustainable market for us.

In the last five years, SPX has begun to enter these markets through the acquisitions of SGS Refrigeration and Cincinnati Fan. We now have our Recold brand, focused on commercial refrigeration, and our SGS brand, focused on industrial refrigeration. The most recent acquisition of Cincinnati Fan has grown our SPX Air Movement products portfolio to now include Cincinnati Fan, Strobic Air and Daniels fans, providing a means to enter the industrial ventilation business and grow within the HVAC market.

How are engineers and facility managers able to monitor the performance of their units?

One thing we're rolling out now is our CoolBoost Opti FC Control Panel, a new control technology for our fluid cooler product line. It offers an

SPX Cooling Technologies Celebrates the Marley Centennial

ability to have various modes of operation to optimize the system. With many fluid coolers, you can operate in evaporative mode or dry mode. In dry mode, you can shut off the recirculating water stream and still have optimal performance. It allows these various operating modes to balance or enhance what the customer is after. If they're after premium efficiency they will operate in evaporative mode. If they want to save some water during cooler ambient conditions, they can shut the water stream off and still provide cooling in dry mode.

SPX Cooling project managers at the Marley Centennial Celebration.

Long-time Marley & SPX Cooling Employee, Kent Martens (retired), with regional sales manager, Tony Ring, at the Marley 100-year celebration event (right to left).

We look to provide the necessary instruments to connect into building management systems from a control standpoint. We recognize the importance of being able to control the equipment and optimize systems. Cooling towers usually fit into a bigger system, and they're usually not the only piece of equipment in the system, so there's many different approaches to controls. We aim to provide the appropriate sensors and data points into those systems so the building/plant operating system can gather that data and control the equipment appropriately.

Are you seeing more demand for advanced controls, sensors and free cooling capabilities?

The short answer is yes. We've had great discussions relative to operation of systems with our engineers advisory council, an industry group we formed a few years ago. With the sophistication enabled through control systems, facility managers are able to operate systems in a much more complex way than they were 10 years ago. Customers are looking at it less as a single design point and more on an annual basis since a cooling tower operates in environments that fluctuate throughout the year. There is however, some debate about the best way to approach control system design. We may want to provide more sophisticated controls on our systems, but often times it's

just one piece of equipment in a bigger system, and they're looking at it more at the system level. If every individual piece of equipment in the system had its own controls, it would be difficult to manage. Certainly, we can meet the needs of customers wanting sophisticated control at the cooling tower level, while some just want certain data points fed into their building management system so they can control fan speeds accordingly. We feel we can accommodate many different design approaches with our controls products.

With advanced controls and sensors, facility managers are able to utilize free cooling in colder months. With evaporative cooling technology, users can achieve desired fluid temperatures without mechanical cooling when ambient air temperatures fall to a certain degree. Since a cooling tower's power consumption is relatively low compared to a chiller, it's very important that users identify when free cooling can be utilized for their facility.

Does SPX participate with the Cooling Technologies Institute (CTI) Thermal Performance Certification program?

Yes, and since the CTI Certification program started in the 1990s, it has become an industry norm. CTI has enabled the industry to ensure products are meeting performance levels, and has provided standards on how to test and maintain that performance. CTI offers thermal performance certifications for multiple cooling tower designs and models. This enables us to provide third-party tested and verified information to customers.

We recommend specifying engineers and facility managers request CTI Thermal Performance Certification when picking a tower. This ensures they're getting a product that meets the heat load conditions prescribed for their tower.

How is the CTI Thermal Performance Certification program evolving?

One of the areas CTI is exploring is adding sound certification. As industry and applications get closer to population,

SPX Cooling Technologies Celebrates the Marley Centennial

noise becomes a bigger problem. Ensuring noise levels are managed and certified is an important aspect, and noise is one of the things CTI is working to add. It's making progress, and we will see this evolve in the coming years.

In the interim, SPX Cooling has done independent certification of cooling tower sound levels to help bring that forward. We've also been instrumental in encouraging CTI to have an industry-wide certification program for noise levels. Noise is something that can affect not only our direct customers, but the neighbors of those customers as well. Ensuring you have highly efficient equipment is important. Ensuring you manage water use is important, and noise is another important factor we are cognizant of. You want to manage it. You want quiet equipment.

Do you test at both partial loads and full loads?

Yes, we test our products at a wide range of application conditions including variation in load. Right now, the test standard calls for a design condition. We have selection software available for customers called CoolSpec, where users can utilize and run different conditions within their application. It's a great tool. We recently updated our product selection software with significant enhancements, making it easier for new users to run the program. With a series of support screens, CoolSpec helps engineers select the type of application and solution they need with regards to efficiency, water consumption, space, noise and other factors We wanted to make it easier for consulting engineers and specifiers to use, whether or not they're experienced with our type of equipment.

Aaron Todd, Product Development Lead, Controls (right), shows attendees the benefits of the CoolBoost Opti FC Control Panel during the Marley Tour of the Century Road Show.

Do SPX Cooling products carry other third-party certifications?

Yes, our products are Eurovent certified, another performance-based certification. Eurovent is a European certification agency partnering with CTI. We also offer products that are Factory Mutual (FM) Approved. Many industrial companies are insured by FM Global, which has a certification for fire prevention, recently broadened to also cover wind loads, storm resistance and more. Our products are certainly OSHA compliant, and we maintain thorough understanding of compliance requirements as they relate to access ladders, platforms, guard rails, tie-off locations, etc. We ensure components are easily and safely accessible for anyone servicing our products.

How is SPX Cooling celebrating its 100-year anniversary?

In May, our team did a great job organizing the Marley Centennial Celebration near our world headquarters in Overland Park. During a weeklong series of events we held our sales conference, centennial dinner and awards ceremony, annual charity golf tournament and plant and R&D center tours., Of course, Kansas City barbeque was included in the program!

You don't stay in business for 100 years without having great partners. These last couple years made it difficult to get people together, so we took this opportunity to celebrate not only this tremendous milestone, but our partners and reps as well. One of the reps that stood out to me was Midwest Machinery, which has been a rep for 99 years. We're grateful to have partners that have

worked with us since the beginning. Marley reps are very knowledgeable individuals and dedicated businesses that have been important components of our success for a sustained time, so we wanted to recognize them. We also recognized our suppliers – important suppliers that have been with us for decades. Our suppliers have done a remarkable job, especially with recent COVID and supply chain challenges, so I'm glad we were able to recognize them as well. These relationships bring a lot of opportunity to grow both our business and theirs. We wouldn't be the company we are today without the partners that we have.

We're also conducting our Marley Tour of the Century Road Show, touring our products across 50 locations in 33 states. The road show began in April and concludes November 2022. BP

About SPX Cooling Technologies, Inc.

SPX Cooling Technologies, Inc. is a leading global manufacturer of cooling towers, evaporative fluid coolers, evaporative condensers, industrial evaporators and air movement systems. Since 1922, the company's cooling and air handling systems, components, and technical services have supported applications in HVAC, refrigeration and industrial process cooling. For more information, visit www.spxcooling.com.

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The Magazine for Safety, Quality & Reliability in Energy-Efficient Compressed Air Systems

Compressed Air Best Practices® is part of a family of magazines dedicated to **Safe, Quality and Reliable Systems Powering Automation.** The U.S. Department of Energy estimates compressed air represents 30% of industrial energy use. Each issue features expert articles on how to conduct **Best Practice System Assessments** to reduce energy consumption while enhancing **Quality, Safety and Reliability.**

"We have had supply-side compressed air audits performed, within the last three years at around forty percent of our plants. Generally, we are looking for a ten to fifteen percent energy savings from most of the projects we identify and execute."

— Daniel K. Pemberton, Corporate Project Engineer, Berry Global

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A Case for Using Compressed Air Flow Meters

By Ron Marshall, Marshall Compressed Air Consulting

To accurately assess compressed air systems, it is best to gather as much information as possible, for as long as practical so a clear picture of the operation of the system can be formed. The basic equipment needed includes pressure and amp/power data loggers, but in the past decade some excellent advances in instrumentation design has made very affordable flow meters available. These devices make compressed air auditing much more accurate, especially for systems using air compressors running in inlet modulation, or variable displacement, where it becomes quite difficult to calculate flow from the power input. This article discusses using flow meters for an example compressed air assessment.

Background

Creating a baseline of a compressed air system, basically capturing some "as found" readings as in Figure 1, gives an auditor a reference from which he can work to improve the system being audited.

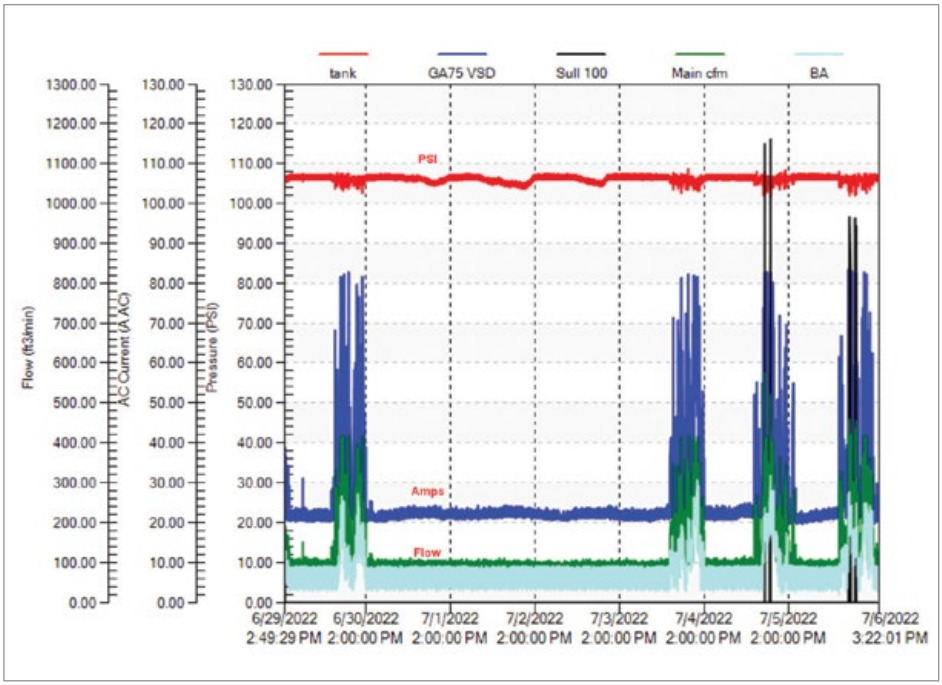
We can see from simple visual analysis of Figure 1 the pressure is adequate, but is the system efficient and can something be done to improve it? To find the answer to this question we must measure the system power and energy, and then calculate or measure

A Case for Using Compressed Air Flow Meters

how much air is produced for a given amount of electrical input. Very often the calculations and measurements will yield a parameter called Specific Power, stated in kW per unit output (we commonly use kW per 100 cfm in North America, but we can use any applicable units, or even cfm per horsepower).

This is where flow meters come in, it is quite easy to measure amps, then calculate power and energy, but it takes some complex calculations, and detailed understanding of compressor operations to convert this same power measurement into flow. Figure 2 shows the theoretical flow versus power characteristics of 5 different air compressor control modes. We can see that the modulation mode with no blowdown and VSD modes are the only curves that are close to linear. The load/unload curve is shown as a straight line, however this only applies to lubricant free compressors. The lubricated compressor load/unload curve is shown in Figure 3, the shape of the curve is not linear and varies with storage size, pressure band width, and sump blowdown time. What usually happens in the field is the auditor assumes one certain curve, but the compressor is really operating on another, due to mis-adjustment or some other issue, resulting in big errors in flow calculation. Simply measuring the flow with a properly installed flow meter is much simpler and more accurate.

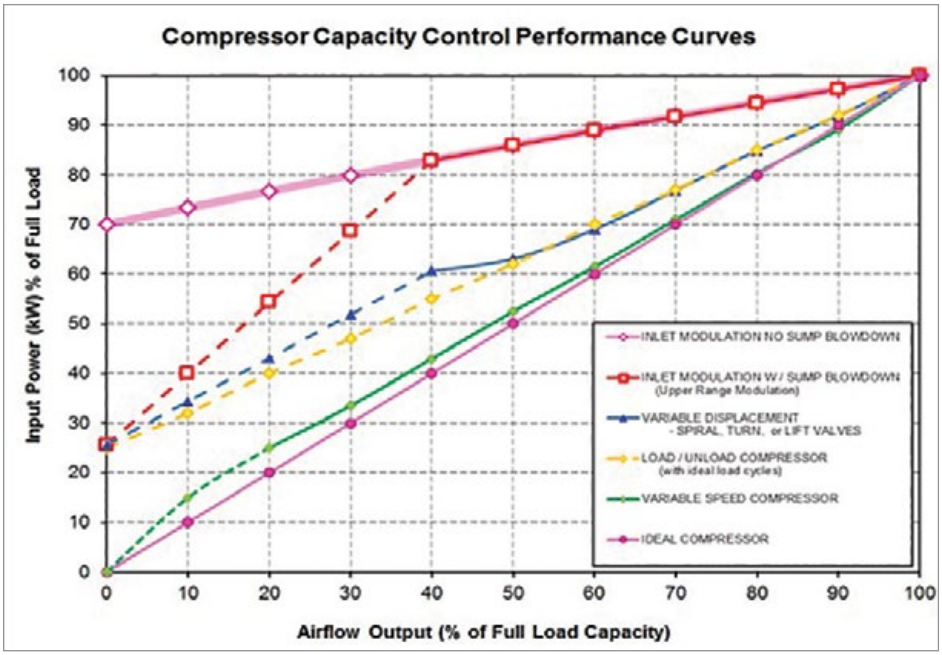
When improving a compressed air system, with goals to increase efficiency and reduce electrical costs, the baseline flow parameter is very important. It is the starting point to find higher efficiencies and to use as an input to calculate potential energy savings. An auditor will thoroughly examine a system to find waste and misuse on the demand side of a system,



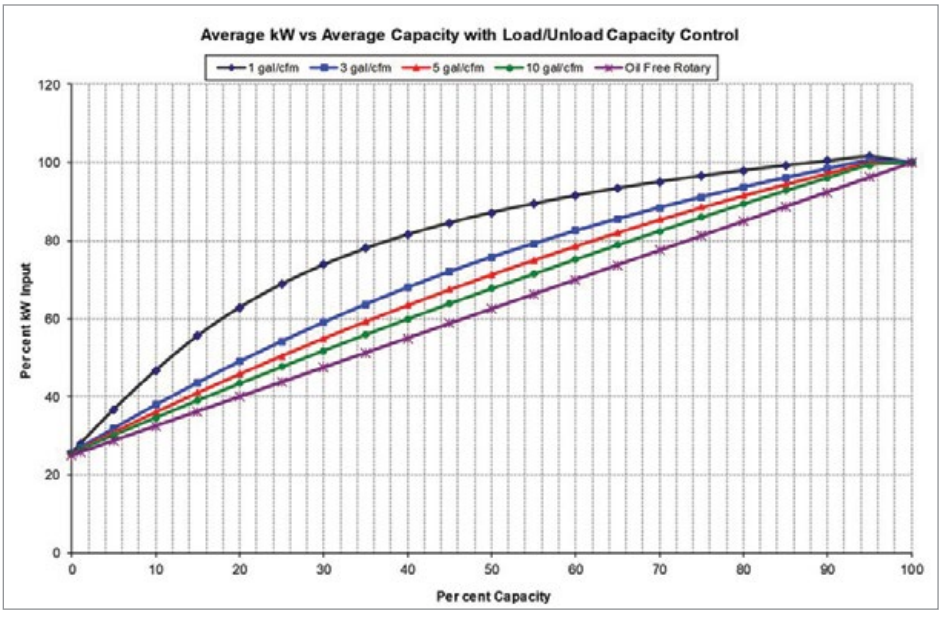
A typical pressure/amp/flow profile of a small two compressor system. This profile could not be used for a valid baseline because there was a Monday holiday, this is something that should be considered when auditing. The profile showed a breathing air system that was consuming 80% of the total compressed air production.

then assess the air compressors, dryers, and filters on the supply side for potential control or efficiency improvement base on the reduction of waste flow.

All waste that can practically be removed will be subtracted off the baseline flow profile, then the resulting new flow is run through a simulation using proposed more efficient



These typical flow versus power curves are often used by compressed air auditors to calculate flow output from power. Some curves are non-linear requiring complex equations that may not match real life performance. (Source: Compressed Air Challenge)



Load/unload operation for lubricated screw compressors depends on storage size, pressure band width and blowdown time. Incorrect assumptions about these curves can lead to large errors in the flow estimates. (Source: Compressed Air Challenge)

A Case for Using Compressed Air Flow Meters

supply side equipment. The result is a simulated new power profile. When the new energy profile is subtracted from the original energy baseline, it yields an estimate of the possible energy savings.

Flow Measurements

There are a great number of types and styles of flow meters available, it is not the purpose of this article to compare them, but by far the most affordable, and most commonly used in compressed air auditing work is the thermal mass style, based on the principle of hot wire anemometer measurement. This type of meter needs be installed on a dry system located downstream of the system air dryers because any free water will artificially cool the hot probe, causing the meter to read high. Should a system need to be measured at a point where wet compressed air flows, there differential pressure style flow meters available that are designed for this service Some companies also offer ultrasonic meters that do not need probes inserted into the pipe.

Calculating Specific Power

The profile in Figure 4 shows the challenge in measuring some abnormal systems. The compressors are running in modulation mode with no blowdown, however the input power remains very flat for all levels of flow. We can see that for a flow increase of 340 cfm (70%) the power increases only 16 kW (15%). If we had no flow meter installed and were calculating flow from the typical power curve, assuming 3 percent power change for every 10 percent flow change, we would have had a large error in our calculations. But simply installing a flow meter allows us to quickly assess the true flow/power characteristics.

The chart also shows some automatic calculations of the system specific power, for this example we use kW per 100 cfm, we can see that during light loading the SP increases to a high of 135 and to a low of 25 when a single compressor is running fully loaded, this being the most efficient point for a modulating

This example pressure/flow/power curve shows abnormal performance of the compressors as the flow changes. Attempting to calculate flow from power in this case would lead to large errors. Not captured by the flow meter is the purge flow of a desiccant dryer in this system, this needs to be accounted for in the system calculations (Source: Calms.com).

compressor. Specific power is calculated simply by dividing the average power consumption by the average flow within the measurement period, something that can very easily done using a spreadsheet or a viewing program with mathematical functions.

The potential savings in optimizing the compressor control can be estimated by having a look at the rated specific power of potential new replacement compressors, data that can be taken from Compressed Air & Gas data sheets, or calculating the performance of the existing compressors running in a more efficient control mode, such as load/unload with large storage capacity. In this case we know that new compressors should be able to supply this load at about 18 kW per 100 cfm if they operated in VSD mode. The actual average specific power for this example system is 48.5 kW per 100 cfm.

But before we jump to conclusions there is one more added piece, a fixed cycle desiccant dryer is operating in this system. The flow meter is installed downstream of the dryer, meaning the dryer purge is not measured by the flow meter. In this case special testing is needed, we need to determine how much flow the dryer purge is consuming to create a proper baseline. This purge was measured at 120 cfm. This means the actual flow produced by the compressors is about 520 cfm. The real specific power of the compressors in this system is 30 kW per 100 cfm if we take the dryer purge into account. Of course, the dryer purge is also one source of extra savings if we could optimize using dew point control or a different dryer style.

The flow meter makes it easy to assess baseline low flow periods as well, the 120 cfm in consumption we see during weekend periods is mostly leakage, something that can be easily addressed by an aggressive repair effort. Once done the results can be seen by tracking the flow meter readings.

Conclusion

The use of flow meters when assessing compressed air systems is recommended to increase the accuracy of the measurement. The measurement and resulting key performance indicator calculations are a lot simpler using flow meter data. Flow meters can be used to track changes in the system to ensure savings are sustained after efficiency measures are applied. BP

For more information about this article, contact Ron Marshall at Marshall Compressed Air Consulting, tel: 204-806-2085, www.marshallcac.com

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Compressed Air & Cooling Technology News

FS-Curtis Announces RES Dryer Line Extension

FS-Curtis has introduced new water-cooled 800-2,000 scfm RES Series refrigerated dryer models. RES Series refrigerated dryers are designed with 4-in-1 heat exchangers (patent pending) and a phase change material (PCM) encapsulated between the refrigeration and compressed air circuits, serving as a highly effective reservoir for thermal storage. The PCM possesses high latent heat properties which enables it to melt or freeze at a constant temperature. The phase change material will absorb heat from warm, moisture-laden compressed air without a significant rise in temperature. The phase change material stays colder for longer periods of time, cycling the refrigerant compressor less often than conventional energy saving designs.

The RES Series offers an innovative approach to efficiently removing liquid contamination from compressed air, making it an ideal solution to dry compressed air reliably and economically.

FS-Curtis RES Series refrigerated dryers now include a new water-cooled option for 800-2,000 scfm models.

RQT Series Family of Temperature Control Units shown with Standard, Advanced and Premium Controllers.

Please contact your local FS-Curtis channel partner for more information at https://us.fscurtis.com/support/distributor-finder/.

About FS-Curtis

FS-Curtis is committed to offering a world-class portfolio of compressed air technology products. Through the dependability of our people and our quality-focused manufacturing, FS-Curtis will continue to be a leading company in the compressed air industry serving markets through our ever-growing global presence. For more information find us online at www.fscurtis.com.

Thermal Care Introduces Aquatherm RQT Series

Thermal Care, a leading manufacturer of process cooling equipment, has announced the commercial launch of a new feature-rich line of mold temperature controllers, the Aquatherm RQT Series. Units are available with three different, simple-to-operate control options: premium, advanced and standard. All maintain consistent temperatures and provide real time data to match the exact requirements of a process to keep it running smoothly. The most notable controller option is the new PLC touchscreen HMI on the RQT Premium.

"It's all about the controls," said Chris Garich, Product Manager at Thermal Care. "The RQT Series controllers come with a number of features and options that our competitors do not offer. For example, the RQT Premium and Advanced units monitor actual data and trends in digital pressure and digital flow via the PLC for much greater accuracy and control than using standard meters found on a typical temperature controller. Combining this with revolutionary control features like adaptive maximum setpoint – allows the user to operate when their cooling pressures are very low, and adaptive pressure relief – anticipates pressure changes to prevent pressure relief valve activations, both maximize uptime and performance. The RQT premium takes it one level further showing detailed trending data, logs and charts for tracking performance which are critical to identifying potential issues before they occur."

Another notable feature on the RQT Premium controller is Recipes. This allows a user to easily store detailed instructions for specific materials or applications. Other standard features include: intelligent air purge, password protection, electrical phase error, and Modbus TCP/IP and OPC/UA communications. When a process requires less KPIs, the RQT Advanced and RQT Standard PLC controllers come standard with data on set point, actual temperature, pump running hours, temperature deviations and

alarms, adjustable alarm delay and trackable heat contactor life. RQT Series temperature controllers are available from ¾ to 10 HP, 0 kW to 48 kW, in single or dual zone configurations.

About Thermal Care

Founded in 1969, Thermal Care is a developer of leading-edge process cooling technology with energy-saving and cost-efficient product designs. The company provides heat transfer equipment to more than 50 industries and specializes in meeting the specific needs of all customers by offering both standard and custom designed industrial process cooling solutions. Thermal Care's broad product line includes portable, packaged and central chillers, cooling towers, adiabatic fluid coolers, pumping systems, and temperature controllers. The company also delivers extensive experience and engineering knowledge to develop and execute plant-wide cooling solutions. For more information, visit www.thermalcare.com.

Filter Element Store Now Offering Allied Witan Mufflers

Filter Element Store has announced the addition of Allied Witan mufflers to their filtration lineup. The Allied Witan Exhaust Mufflers and Air Dryer Mufflers remove particulates, reduce over 80% perceived noise, and provide over 90% flow factor. ALWITCO ATOMUFFLER® exhaust mufflers expertly reduce Exponentially Perceived Noise (EPNdB) without impeding equipment performance. The primary filtration stage traps particulates allowing cleaner air to permeate freely though the secondary noise reduction stage.

Filter Element Store has added Allied Witan mufflers to their filtration lineup.

Air Exhaust Mufflers feature a unique obstruction-free expansion chamber to prevent

Compressed Air & Cooling Technology News

blockage. As air exhaust enters the muffler at high velocity, the muffler redirects it into smaller air streams that rebound off opposing walls of the muffler chamber. These air streams collide with each other thereby reducing the velocity. This air diffusion also prevents troublesome air flow and injury to operators from dangerous after-blasts. Exhaust air flows gently to atmosphere, free of contamination, for a clean and safe environment.

Air Dyer Mufflers remove particulates and desiccant downstream of a compressed air dryer. The Air Dryer Mufflers also include a relief valve to divert airflow to the atmosphere upon blockage. They are designed to manage demanding service issues associated with desiccant regenerative compressed air dryers. It is always recommended to purge desiccant dust from your air dryer before installing a new muffler or when replacing desiccant.

Available sizes range from 1/8-inch to 6-inch with Male NPT connections and the most common sizes are typically stocked in several warehouses. The Air Exhaust Mufflers are recommended for pressures up to 125 PSI and the Air Dryer Mufflers operate up to 175 PSI.

Proven for over 65 years, Allied Witan mufflers are private labeled by many compressor manufacturers and offered at a much higher price. Reduce shop noise with gentle air exhaust that is free of noise, oil fog and other contaminants for a healthy and happy workplace.

About Filter Element Store

Filter Element Store is an online leader of filter elements, separators, compressor oil and parts. Founded in 1976, the three generation family-owned business began providing air intake filters, coalescing filters, and panel filters to manufacturing plants across the Midwest. We take pride in the services we offer our customers. The online portion of the business was launched in 2008. Filter Element Store has since shipped millions of filters and gained many loyal customers. For more information regarding our genuine Allied Witan mufflers, visit us at https://filterelementstore.com or call us at 800-551-0774.

Tsunami Extends Air Filtration & Drying Product Lines

Tsunami Compressed Air Solutions is releasing a larger lineup of new products for the summer – adding more capacity and customization to its air filtration & drying product lines.

Tsunami's new products include the 300 and 600 CFM Water Separator, the 300 and 600 CFM Oil Coalescing Filter, two 120 CFM 3-Stage Filter Packages and the Drain Minder II Controller – 12v; which will now come standard with the 300, 600, and 800 CFM pneumatic drains. These higher capacity products will provide more flexibility for users with larger air demand.

"This gives us the ability to scale up to meet the needs of larger manufacturing and application demands," said Troy Robins, Product Portfolio Manager. "The increased capacity of the filters provides more flexibility to meet the needs of the industry."

About Tsunami Compressed Air Solutions

For over 35 years, Tsunami Compressed Air Solutions, a division of Suburban Manufacturing Group, has set the industry standard for quality compressed air filtration and drying solutions. While we strive to bring cutting-edge technology to the world of pneumatics, we continue to focus on the core principles that built the foundation of our successful business: quality, value, and world-class customer service. For more information, visit www.tsunami.us.com.

Emerson's New Emergency Shutdown Discrete Valve Controller

Emerson introduced the TopWorx™ DX PST with HART® 7. Units provide valuable valve data and diagnostic information, enabling the digital transformation of process applications. The new DX PST integrates seamlessly with existing valves and control systems, giving operators access to critical valve data, trends, and diagnostics that can be used to predict and schedule maintenance.

Tsunami's new oil coalescing filter with pneumatic drain.

The DX PST's partial stroke test ensures the system's reliable function without shutting down the process. A safety feature that confirms the valve will fully close and stop the process if an emergency is detected, and the test is activated by simply pressing the local PST button – no additional equipment is required. To prevent critical failure in upset conditions, the unit will override testing to perform an emergency shutdown (ESD).

Certified for operation in harsh and hazardous applications, the adaptive DX PST is designed to ensure the integrity of valves, improving overall safety and facility uptime in oil and gas, refinery, chemical, industrial energy and mining applications.

"The digital transformation of the process industry continues to make operations

safer and more productive," said Prayag Vatsraj, Global Product Manager of Emerson's Switchbox. "The DX PST with HART 7 supports digital transformation by providing reliable data that delivers valuable insight into the condition of valve assemblies that ensures the integrity of the system without shutting down the process."

The HART® protocol, the specifications of which are owned by the FieldComm Group, builds another layer of information that ensures data, trends and diagnostics are monitored and tied into the Industrial Internet of Things. This information can be used to effectively predict and schedule maintenance.

Capable of Safety Integrity Level 3 (SIL 3), the DX PST is available with an integrated 2oo2 or 2oo3 solenoid valve redundancy when paired with ASCO™ Series Advanced Redundant Control 1/2 System (ARCS) to further enhance safety and open terminals that allow an additional pressure transmitter along with two pressure switches. The discrete valve controller offers simple local and remote calibration.

TopWorx DX PST with HART 7 monitors and tests valve assemblies, providing detailed data and diagnostics and enabling the digital transformation of process applications.

About Emerson

Emerson, headquartered in St. Louis, Missouri (USA), is a global technology and engineering company providing innovative solutions for customers in industrial, commercial, and residential markets. Our Automation Solutions business helps process, hybrid, and discrete manufacturers maximize production, protect personnel and the environment while optimizing their energy and operating costs. Our Commercial and Residential Solutions business helps ensure human comfort and health, protect food quality and safety, advance energy efficiency, and create sustainable infrastructure. For more information visit www.Emerson.com.

Compressed Air & Cooling Technology News

PeakView Solutions Launches Application for Compressor Sales and Distribution Businesses

PeakView Solutions LLC will be introducing a new order, financial and workforce management application suite for small/mid-sized businesses.

PeakView's new application is called CareView, and it helps companies manage sales quotes, inventory, invoicing, work orders and workforce management. CareView includes an optional accounting and financial management tool, called FinanceView. FinanceView will integrate with CareView and provide a simplified and easy-to-use accounting system.

"After 15 years of providing workforce and order management applications in the cable television and healthcare industries, we are very excited to be bringing CareView to the compressor sales and service industry," said Manny Miera, PeakView's CEO. "We've been working closely with a compressor distributor for over a year and have gained valuable insight into the business. We are really excited to be launching CareView in the 3rd quarter of 2022!"

"PeakView Solutions' applications already serves telecom companies in 47 states and handle millions of orders each month," Miera said. "We are bringing our flexible and innovative software design experience to the compressor business first, because the need seems the greatest. As we go forward, we'll be looking to provide new software solutions to other sales and service businesses, such as HVAC, electrical and other small/mid-sized business."

Visit our website www.peakviewsolutions.com and check out the CareView product page and our CareView video.

About PeakView Solutions

PeakView Solutions has been a cutting-edge provider of workforce logistics and capacity management software solutions to the cable and healthcare industries since 2006. With PeakView's software, companies have been able to optimize workforce productivity and order management, minimizing days to fulfillment and narrow appointment window times. PeakView's applications support more than 31,000 technicians, office, and management staff across 47 states, covering over 33,000,000 cable customers. See our new application videos at www.peakviewsolutions.com.

Festo Introduces the NFPA-Compliant DSNB Actuator

Festo introduces the rugged, versatile, and economical DSNB actuator for NFPA mounting applications. The DSNB is ideal for sorting, stacking, insertion, loading, lifting, dispensing, clamping, and gate applications on converting machines. Customers can order the DSNB in 7 bore sizes, 11 variations, and 15 different NFPA mounting configurations, offering maximum flexibility and the advantage of standardizing on a single actuator for many applications. Average ship time for this USA manufactured actuator is less than 10 days.

Such features as polyurethane rod-wiper seal, hard anodized aluminum cylinder, and synthetic grease ensure high performance. For long service life, Festo utilized anodized aluminum end caps, a high strength steel piston rod with chrome plating, and composite rod bushing and PTFE wear band. For easy maintenance, the rod bearing cartridge can be replaced without disassembling the cylinder. Customers have the option of air cushioning and customizing these units.

The new fast-ship DSNB economical NFPA-compliant cylinder from Festo features high quality construction and a host of variation and customization opportunities.

The DSNB joins the competitively priced Festo NFPA-compliant DSNA actuator, interchange-ready round-body and compact inch-based cylinders, and the 30,000 products in the Festo catalog that provide the supply-chain advantages of Festo's one stop shop for world-class quality products and services.

About Festo

Festo is a leading manufacturer of pneumatic and electromechanical systems, components, and controls for process and industrial automation. For 50 years in the U.S. and 97 years since its founding, Festo has been a positive force for manufacturers. Our passion is automation – intelligent automation solutions that transform the way people work – and the way companies compete. Ultimately, it's about continuously stimulating progress. In big ways and in small ways. For more information, visit www.festo.com/us.

Carrier to Offer Cooling-as-a-Service for the FNB Financial Center

Carrier Global Corporation, the leading global provider of healthy, safe, sustainable and intelligent building and cold chain solutions, has entered into an agreement with Office Partners XXIII Block G1 LLC (Office Partners) to design, build, own and operate the heating and air conditioning plant at the new FNB Financial Center in Pittsburgh. Carrier will provide a turnkey high-efficiency heating

and cooling plant for the new building that will contribute to the building's targeted LEED Silver rating. Supported by its advanced Abound digital controls and BluEdge services capabilities, Carrier's Cooling-as-a-Service offering will deliver high energy efficiency, uptime and comfort over the life of the contract while reducing operational cost risk for the building owner. Office Partners, the owner and development company for FNB Financial Center, is comprised of the Buccini/Pollin Group (BPG), the Pittsburgh Penguins and other investors.

FNB Financial Center is a new 26-story and 475,000-square-foot mixed-use tower with Class A office space that will consolidate FNB Corporation regional headquarters operations. The FNB Financial Center is the first step in the redevelopment of the 28-acre site in the Lower Hill District of Pittsburgh.

"Carrier is excited to collaborate with BPG and the Pittsburgh Penguins to make this transformational project a resounding success," said Rajan Goel, Senior Vice President, Building Solutions Group, Carrier. "Carrier is bringing the most innovative and advanced service capabilities to design, install and operate this plant providing a highly intelligent, sustainable and productive building space."

Carrier helped design and configure the 1,250-ton central plant to include best-in-class Carrier chillers combined with high-efficiency condensing boilers that are continuously optimized by advanced controls. The plant will be backed by Carrier's Abound IoT platform for remote monitoring including advanced analytics for continuous commissioning and diagnostics to deliver high availability of cooling and heating capacity. Carrier service experts will operate, maintain and upgrade the plant for the life of the contract to ensure it is performing to the highest level of energy efficiency, maintaining comfort for building occupants and delivering lowest cost of operations.

FNB Financial Center, is a 26-story mixed-use tower that leads the redevelopment of the historic Pittsburgh neighborhood and will serve as the corporate headquarters of FNB, the parent company of First National Bank.

"FNB Financial Center and the entire Lower Hill redevelopment will be a catalyst for the City of Pittsburgh. The Carrier team collaborated with BPG and our construction and design partners to provide a unique development solution coupled with ongoing operational efficiencies when construction is completed," said Chris Buccini, President, BPG. "This will complement our efforts to meet or exceed the goals of Pittsburgh's 2030 District and position FNB Financial Center as a leader in the future of commercial office buildings."

Construction of FNB Financial Center is led by P.J. Dick and JLL is the owner's advisor for the Pittsburgh Penguins on the project. Construction of the tower is expected to be completed late 2023.

"In keeping with the vision to bring innovative sustainable solutions to our clients, JLL is delighted to have partnered with Carrier to provide a high-efficiency Cooling-as-a-Service solution that meets the energy and sustainability outcomes for one of the most advanced community and sustainable projects in the region and country," said JC Palusi, Market Director, JLL.

About Carrier

As the leading global provider of healthy, safe, sustainable and intelligent building and cold chain solutions, Carrier Global Corporation is committed to making the world safer, sustainable and more comfortable for generations to come. From the beginning, we've led in inventing new technologies and entirely new industries. Today, we continue to lead because we have a world-class, diverse workforce that puts the customer at the center of everything we do. For more information, www.carrier.com

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"Some of our plants have created Air Strike Teams to focus on compressed air, particularly compressed air leaks. The teams have purchased ultrasonic leak detectors, and we expect these will help us with our Energy Treasure Hunts."

— Michael Jones, Director of Corporate Energy, Intertape Polymer Group

"We have had supply-side compressed air audits performed, within the last three years at around forty percent of our plants. Generally, we are looking for a ten to fifteen percent energy savings from most of the projects we identify and execute."

— Daniel K. Pemberton, Corporate Project Engineer, Berry Global

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VPInstruments	23	www.vpinstruments.com
ZEKS	25	www.zeks.com
AHR Expo	31	www.ahrexpo.com
Compressed Air and Gas Institute	39	www.cagi.org/personnel-certification
Compressed Air Challenge	41	www.compressedairchallenge.org

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THE MARKETPLACE

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Rules for Plant Engineers

Rule #4

KNOW IT ALL.

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