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May 2018

COOLING SYSTEM OPTIMIZATION

12 Process Chiller Water Treatment Basics for Plastic Injection Molding

COOLING TOWERS & CHILLERS

16 Free Cooling Fundamentals in Modular HVAC Chillers

20 Beyond the Basics: Considerations When Retrofitting a Chiller

24 ComEd® CHICAGO CHILLER INCENTIVES



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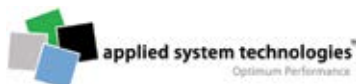
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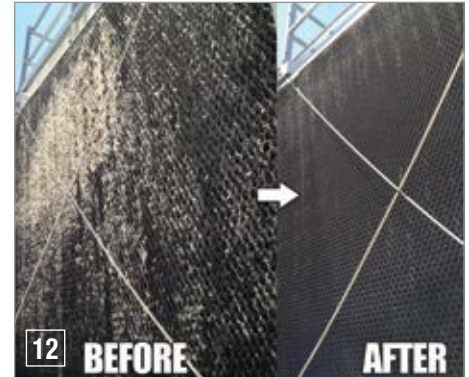
COOLING SYSTEM OPTIMIZATION

12 **Process Chiller Water Treatment Basics for Plastic Injection Molding**

By E. Michael Estermeier, APEX Engineering Products

24 **ComEd® Incentivizes Chiller & Process Cooling Efficiency**

By Wes Lucko, Chiller & Cooling Best Practices Magazine



COOLING TOWERS & CHILLERS

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By Mark Rogan, Arctic Chiller Group

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By Neil Maldeis and Mike Patterson, Trane



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FROM THE EDITOR



Plastic injection molding is a major application for process chillers. Many molds require more than one water temperature and many plants are running multiple molds simultaneously. It's no wonder some chiller firms focus exclusively on the plastics industry.

Apex Engineering Products Corporation helps plastic injection molders protect against mineral deposits forming within the cooling passages of their molds. APEX's Michael Ostermeier comments in his article, "The cooling process within plastic injection molding is critical to the quality of the mold, and may require about 50-75% of the total cycle time." This sounds like an ENERGY STAR® Treasure Hunt project candidate!

Often the best ideas are the simplest ones, yet this doesn't mean they are easy to execute. Mark Rogan, from Arctic Chiller, has contributed an article titled, "Free Cooling Fundamentals in Modular HVAC Chillers." This solid article reviews the basic types and operation of free cooling and then examines how a modular free-cooling system approach works.

Centrifugal chillers nearing the end of their average operating life of 25 years, installed in factories, hospitals and other commercial buildings, are often in remote mechanical rooms, basements and other hard to reach areas. Trane's Neil Maldeis and Mike Patterson have contributed an excellent article titled, "Beyond the Basics: Considerations when Retrofitting a Chiller."

An expressed goal in 2018, of the ComEd® (Chicago) Energy Efficiency Program, is to drive towards a greater volume of process cooling projects. If interested in helping, please contact me! Our own Wes Lucko wrote an interesting article describing their chiller incentives, after we interviewed their Program Managers, titled "ComEd Incentivizes Chiller & Process Cooling Efficiency."

The ComEd® Energy Efficiency Program is a Co-Sponsor of our inaugural 2018 Best Practices Expo & Conference, being held September 17-19, 2018 at the Chicago O'Hare Crowne Plaza. Please consider registering for the event at www.cabpexpo.com.



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

ROD SMITH

Editor

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YORK Expands YLAA Air-Cooled Scroll Chillers

Johnson Controls has expanded its YORK® line of YLAA Air-Cooled Scroll Chillers up to 230 tons. The extended capacity of the YLAA offers a more cost competitive solution to 230-ton opportunities without sacrificing size, quality and efficiency.

With the smallest footprint in the industry, the YLAA (55-230 tons) offers full-load and part-load efficiencies meeting or exceeding ASHRAE standards. Available from stock and shipped to locations in the United States within two to five days. Made to order options now include variable speed drive (VSD) condenser fans to further enhance part load efficiency and sound, as well as integral pump packages to offer a single purchase, shipment and install solution. The scroll compressors have proven reliability, and the units are equipped with two independent circuits for partial redundancy. They also feature a brazed plate heat exchanger, microchannel condenser and native building automation system (BAS) communications, including BACnet®, Modbus and N2.

For more information or to contact a Johnson Controls sales office, please visit: www.YORK.com/YLAA.



The YLAA offers full-load and part-load efficiencies meeting or exceeding ASHRAE standards.

New Marley MD Everest Cooling Tower from SPX Cooling Technologies

SPX Cooling Technologies, Inc., a full-line, full-service industry leader in the design and manufacture of evaporative and air-cooled heat exchangers, announces the new Marley MD Everest, a modular counterflow cooling tower. The Marley MD Everest Cooling Tower is designed to meet today's process cooling demands, and is suitable for power generation plants, chemical, oil and gas plants, and other process applications with a wide range of thermal loads.

Whether designing a new plant or replacing an aging traditional site-constructed cooling tower, the MD Everest tower's pre-configured design offers significant advantages enabling safer assembly processes. This includes 60% faster delivery, and 80% faster installation compared to field-erected cooling towers.

The MD Everest counterflow tower's robust structure meets seismic and wind load requirements per ASCE and IBC building codes. It can also withstand the rigors of process cooling applications using heavy-duty, corrosion-resistant materials. Industrial-strength Marley



The Marley MD Everest Cooling Tower meets seismic and wind load requirements per ASCE and IBC building codes.

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CHILLER & COOLING TOWER TECHNOLOGY PICKS

mechanical components include a five-year maintenance-free System 5 Marley Geareducer® gear drive, energy-efficient, low-clog PVC heat exchange fill media and Motor Outside Airstream (MOA), standard. The MD Everest also includes a five-year mechanical component warranty.

MD Everest cooling tower arrives at the site in modules built and assembled in a controlled factory environment, facilitating high quality and efficient installation. Its thermal performance is pending certification by the Cooling Technology Institute (CTI), eliminating the need and expense for on-site testing.

About SPX Cooling Technologies, Inc.

SPX Cooling Technologies, Inc. is a leading global manufacturer of cooling towers, evaporative fluid coolers, evaporative condensers and air-cooled heat exchangers providing full-service cooling solutions and support to customers in the power generation, petrochemical, industrial, refrigeration, and heating, ventilation and air conditioning (HVAC) markets for 95 years. SPX Cooling Technologies and its product brands are part of SPX Corporation. For more information, please visit www.spxcooling.com.

About SPX Corporation

SPX Corporation is a supplier of highly engineered products and technologies, holding leadership positions in the HVAC, detection and measurement, and engineered solutions markets. Based in Charlotte, North Carolina, SPX Corporation had approximately \$1.5 billion in annual revenue in 2016 and more than 5,000 employees in about 15 countries. SPX Corporation is listed on the New York Stock Exchange under the ticker symbol "SPXC." For more information, please visit www.spx.com.

New BACnet Link Offered for i-Vu from Carrier

Carrier is pleased to announce another new addition to its next-generation BACnet router portfolio, the i-Vu® XT BACnet link. The i-Vu XT BACnet link supports seamless connectivity to other BACnet devices, allowing facilities staff to manage all of the BACnet equipment in their building through a single i-Vu user interface. Carrier, a world leader in high-technology heating, ventilating and air-conditioning solutions, is a part of UTC Climate, Controls & Security, a unit of United Technologies Corp. (NYSE: UTX).

The new i-Vu XT BACnet link follows the recent release of the i-Vu XT BACnet router. Both devices are part of the next generation of i-Vu controls, featuring high-speed communications, increased processing horsepower, integrated diagnostics, flexible mounting options and a reduced footprint.

"The i-Vu XT BACnet link allows customers to manage all of the BACnet equipment in their facilities, including those with Carrier i-Vu controls and those with third-party BACnet controls," said Mark Jones, Carrier Controls' business manager. "Customers can either connect to existing BACnet equipment in their buildings such as VFDs, boilers, and lighting systems, or they can choose best-in-class products when adding new BACnet equipment, knowing that they will be able to manage them easily and efficiently using the i-Vu system."

The new i-Vu XT BACnet link includes built-in functionality for:

- Monitoring and controlling third-party BACnet devices within a building
- Routing BACnet communications between the i-Vu system and various networks including BACnet/IP and BACnet/Ethernet (up to 1GB), BACnet MSTP and/or BACnet over ARCnet
- Executing customized control programs built with Carrier's SNAP graphical programming tool
- Troubleshooting BACnet network communications using diagnostic dashboards and trend graphs inside of the i-Vu building automation system. Operators can visualize network statistics including logs/counters, transmit/receive activity and network traffic latencies for the connected BACnet networks
- Capturing BACnet network traffic either continuously or on-demand and saving the information to a file for uploading into third-party network analysis tools

About Carrier

Founded by the inventor of modern air conditioning, Carrier is a world leader in high-technology heating, air-conditioning and refrigeration solutions. Carrier experts provide sustainable solutions, integrating energy-efficient products, building controls and energy services for residential, commercial, retail, transport and food service customers. Carrier is a part of UTC Climate, Controls & Security, a unit of United Technologies Corp., a leading provider to the aerospace and building systems industries worldwide. For more information, visit www.carrier.com or follow @Carrier on Twitter.

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New PCA 400 Portable Combustion and Emissions Analyzer from Bacharach

Bacharach, Inc. a leading provider of gas and refrigerant leak detection, combustion and emissions analysis instrumentation, energy management, and data analytics announced the release of the PCA[®] 400 portable combustion and emissions analyzer for commercial and industrial applications such as boilers, engines, generators. The PCA[®] 400 provides efficiency measurements and combustion emissions data during the fuel burning process helping facilitate improved system performance, a reduction in energy consumption, and decreased emissions impact on the environment.

"The PCA[®] 400 is an industrial-grade product at a commercial price point. It provides features and benefits not typically seen in this level of instrument by surpassing our competition in design, sensor life, run time and software," said Doug Keeports CEO and President of Bacharach, Inc. "With true NO_x and data logging, the PCA[®] 400 and sample conditioner are important tools for technicians to improve system performance and productivity."

Key features of the PCA[®] 400 include:

- Engineered for ease-of-use in rugged environments
 - Robust touch screen, physical navigation buttons and Bluetooth[®] wireless connectivity, allow for easy, remote, safe and convenient operation in tough environments
 - 12-hour rechargeable and optional alkaline batteries keep the analyzer at the ready for all day operation
- Sensor protection and long warranties for key combustion gases
 - Measurement of key combustion gases including CO, NO, NO₂, and SO₂
 - Automatic sensor protection for quality measurements



The PCA 400 provides efficiency measurements and combustion emissions data during the fuel burning process.

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- Innovative evaporator with finned pack and in-tank configuration, for low pressure drops and reduced sensitivity to impurities
- Eco-friendly refrigerant R410A (ODP=0) ensures high performance thanks its outstanding heat conductivity properties
- Parametric microprocessor controller
- Compact structure
- Suitable for outdoor installation
- Easy installation, use and maintenance



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- 5-year O₂ sensor performance and warranty for lower cost of ownership
 - Support for Bacharach's pre-calibrated B-Smart® sensors enabling easy sensor replacement in the field
 - Data viewing options with wireless printing
 - Windows® application for continuous data collection and management, with built-in wireless printing for on-site report generation
 - On-board data logging for 500 measurements
 - Rugged probe connections for quick and easy tests
 - Color-coded, single probe connector to make integrated, rugged probe extensions fast, easy and secure
- As an accessory to the PCA® 400, Bacharach has also developed an active sample conditioner to remove water vapor from the stack gas sample, ensuring accurate results in commercial and industrial applications where NO₂ and SO₂ measurements are necessary. The PCA® 400 is available through Bacharach's global distributor network with an MSRP starting at \$2,695.

About Bacharach

Bacharach is a leading provider of gas and refrigerant leak detection, combustion and emissions analysis instrumentation, energy management, and data analytics solutions for commercial and industrial applications. Bacharach products make the heating, ventilation, air-conditioning and refrigeration (HVAC-R) industries safer, cleaner, and more energy efficient, enabling customers to increase productivity, reduce costs, and protect lives and the environment.

Please visit www.mybacharach.com for additional information.

Geoclima Presents Circlemiser Chiller Series

Geoclima, a company specializing in the design and production of non-standard chillers for applications in air conditioning and refrigeration systems, is proud to present Circlemiser, the new series of high efficiency air cooled chillers. The new Circlemiser series is characterized by incomparable performance and efficiency levels, with an increase in EER up to 15%. This improves the high efficiency already provided by Turbomiser, designed by Geoclima. The technological innovation of Circlemiser is in the design and development of special cylindrical condensers, and the installation of cascade flooded evaporators.

The special cylindrical condensers have an increased heat exchange surface of 45%, compared to traditional condensers, while maintaining the same footprint. Thanks to the increased heat exchanger capacity, this special cylindrical configuration makes it possible to reduce condensing temperature as well as approach temperature.



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In addition to cylindrical condensers, Circlemiser chillers are also equipped with cascade flooded evaporators, leading to the reduction of the ΔT between evaporation temperature and outlet temperature of the fluid. The cascade arrangement of the evaporators increases the evaporation temperature, and at the same time, reduces energy consumption. Using this type of evaporator Geoclima has been able to further increase efficiency across the range of the Turbomiser air cooled chillers.

The new Circlemiser series sets itself as the most efficient air-cooled chiller series available on the market today, with the highest achievable value of EER 4.35 and up to 15% efficiency increase, compared to other high efficient technologies. Geoclima present the new Circlemiser series for air cooled

Turbomiser units, both with R134a and with HFO-1234ze refrigerants.

For more information: www.geoclima.com/circlemiser/

About Geoclima

Geoclima is an Italian company with more than 20 years of experience in the HVAC sector, specialized in the design and production of non-standard chillers for applications in air conditioning and refrigeration systems, with particular attention to quality and environment. Established in 1994 in Italy, Geoclima has continued to expand worldwide and now it can count on production facilities in Italy, Russia and Thailand and sales and service offices in Italy, Austria, Russia and Australia. Geoclima group also includes companies specialized in production of AHUs, heat exchangers and



The new Circlemiser series are equipped with cascade flooded evaporators.

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flanges. This presence in different countries and in different areas of HVAC makes it possible for Geoclima to provide complete service and turnkey solutions.

For more information, visit: www.geoclima.com

Danfoss Extends Range of Z-Design Heat Exchangers

Danfoss has announced an extension to its range of innovative Z-design Micro Plate heat exchangers. Z-design technology offers water chiller and heat pump manufacturers the opportunity to improve the economic and environmental efficiency of their equipment. The innovative Z-pattern channel plate technology enhances performance of the heat exchanger by fully mixing liquid and gas refrigeration through a “zigzag” flow.

From 90 to 400 kW Capacity Range with Higher Efficiency and Lower Refrigerant Charge

The Z-design range now includes custom-size heat exchangers with capacities from 90 to 400 kW with R-410A. Optimized for R-410A, they can, however, be used with other commercial air-conditioning refrigerants such as R-410A replacements including flammables. They are also compatible with refrigerants for commercial refrigeration like R-134a, R-448A, R-449A, R-452A, R-290 and more.



New Danfoss MPHE with extra slim design.

The main benefits of the Z-pattern design include optimized heat transfer and a reduced loss of charge for the water circuit, contributing to higher energy efficiency, lower energy consumption and refrigerant charge.

- The reduced internal volume represents a smaller refrigerant charge and reduced installation costs.
- The high heat transfer also limits CO₂ emissions.
- A reduced number of plates represents a limited weight and carbon footprint.

The new C118(L)-EZ is a single-circuit evaporator for use in high-efficiency chillers with a capacity of 70-250 kW, optimized for refrigerant R-410A. It is available in two versions: one for 435 psi/30 bar design pressure, and one for 653 psi/45 bar design pressure.

Available for Single and Dual Circuits

These heat exchangers are compatible with other Danfoss product groups including oil-free systems. Single or double circuit models are available for chillers and heat pumps dedicated to large commercial buildings such as hotels, office spaces, and data centers. They are also suitable for new applications dedicated to heat recovery, such as heat transfer between data center cooling systems and central heating.

“We have completely redesigned the circulation of liquids and heat exchange in order to improve the energy performance of plate exchangers, all while optimizing installation costs and volumes for chillers and heat pumps and reducing refrigerant charge, which can be key in some installations,” explains Victor Marinich, marketing director for air-conditioning controls, Danfoss.

OVERVIEW OF THE RANGE BY APPLICATION TYPE					
APPLICATION	CAPACITY	AIR-COOLED		WATER-COOLED	
		EVAP.	COND.	EVAP.	COND.
Chillers	20-90 kW	C62L-EZ	MCHE**	C62L-EZ	C62L-CX
	70-250 kW	C118L-EZ	MCHE**	C118L-EZ	C118L-C
	70-250 kW	C117L-EZD*	MCHE**	C117L-EZD*	C117L-EZD*
	200-400 kW	C212L-EZD* (2018)	MCHE**	C212L-EZD* (2018)	C212L-EZD* (2018)
Heat Pumps	5-20 kW	N/A	H62L-CX	H62L-EZU	H62L-CX

* Dual Circuit

** Cooling only

CHILLER & COOLING TOWER TECHNOLOGY PICKS

About Z-Pattern Design

Danfoss' new range of Z-design heat exchangers feature dimpled micro plates, maintaining the liquid's asymmetrical circulation in a Z-shaped pattern. This is an excellent way to optimize the surface area, dedicated to heat transfer, and to ensure perfect synchronization of the refrigerant's liquid and gas phases for better heat exchange with the water circuit. As a result, fewer plates are needed to reach a specific capacity in comparison to the standard design, making it possible to reduce installation costs.

As architects and developers look for technologies that can adapt to their new low-energy building concepts, the impact of this innovation is significant. The entire range of Danfoss MPHE with Z-design was designed for use in both new and retrofit installations.

For more information or product selection, please visit www.hexact.danfoss.com.

About Danfoss

Danfoss engineers technologies enabling the world of tomorrow to do more with less. We meet the growing need for infrastructure, food supply, energy efficiency and climate-friendly solutions. Our products and services are used in areas such as refrigeration, air conditioning, heating, motor control and mobile machinery. We are also active in the field of renewable energy as well as district heating infrastructure for cities and urban communities. Our innovative engineering dates back to 1933 and today Danfoss is a world-leader, employing more than 25,000 employees and serving customers in more than 100 countries. We are still privately held by the founding family. Read more about us at www.danfoss.com.



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Process Chiller Water Treatment Basics FOR PLASTIC INJECTION MOLDING

By E. Michael Ostermeier, Technical Sales, Apex Engineering Products



BEFORE

Cooling tower media is susceptible to scale as are other water-operated components in an industrial cooling system.

AFTER

► Plastic injection molding is the process of heating plastic resin to the point of melting, where the material is pressed into a mold and cooled into its final shape. Aerospace, automotive, material handling, packaging, and food & beverage are a few of the many industries utilizing plastic parts created by these molds. The parts may vary in design, size, and color, but they all become an essential component to finished goods that are used on a daily basis.

Plastic injection molding has been around since the 1870s and has seen improvements in the production process, but the basics are still viable today: Raw material granules (resin) are placed in a hopper and plunged through a heated channel to be melted to liquid prior to reaching a mold and subsequently cooled to become a solid final piece.

One of the most important steps in the mold making process is a consistent and proper cooling cycle. This is due to the fact cooling rates can have a significant influence on the overall quality of the finished item. The cooling cycle must remain consistent throughout the entire production run to ensure all items are equal in quality.

The cooling process within plastic injection molding is critical to the quality of the mold, and may require about 50-75% of the total cycle

time. From a production standpoint, this process must be a fixed variable in order to produce quantities on time and keep rejection rates to a minimum. Therefore, it is imperative to maintain a clean, efficient cooling channel capable of removing heat at the required rates. Any deviation would result in an inconsistent mold quality from cycle to cycle throughout the production run. Thereby extending production time and skyrocketing rejections.

The cause of these cooling issues can frequently be attributed to mineral deposits accumulating within the cooling passages of the mold and retarding the heat transfer from the melted resin and increasing the required cooling time.

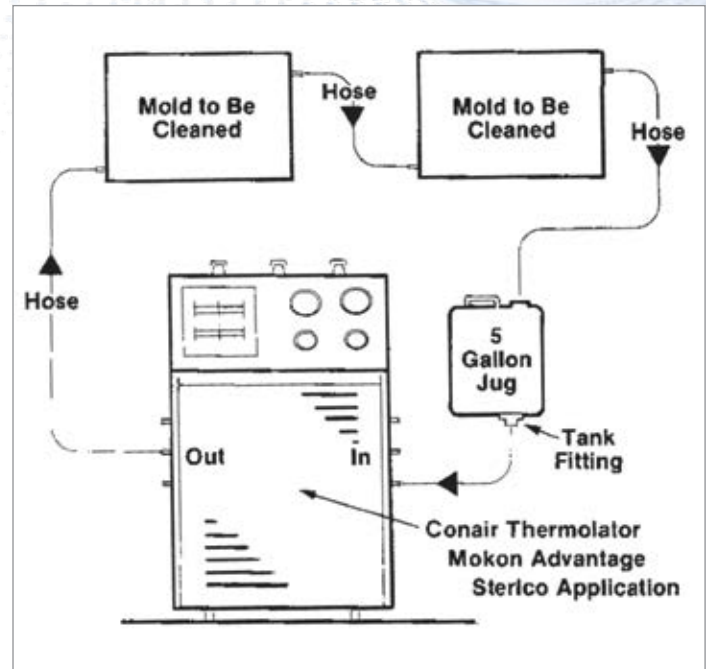
Basics Of Scale Build Up

Minerals within the water circuit will deposit throughout facility equipment over time. However, the highest amounts of these minerals will deposit near elevated temperatures. Such as the cooling passages within molds. When mineral deposits from the cooling water drop out and attach to cooling passage walls or heat exchanger tubes, a thermal barrier is created significantly reducing heat transfer. The minerals accumulate as scale resulting in reduced cooling ability and flow rate.

The scale also causes uneven temperatures on the mold surface (uneven shrinkage) resulting in parts with molded-in stresses, warped/twisted sections, sink marks, poor surface appearance and varying part dimensions from cycle to cycle. Just like plaque can accumulate in our body's arteries, scale can become a major concern if proper maintenance practices are left unchecked.

Any facility utilizing water for heat transfer purposes will eventually encounter scale in its water-operated equipment. This is not limited to just the injection molds, but scale will also accumulate in:

- Heat Exchangers
- Hydraulic Oil Coolers
- Heater Bands
- Water Cooled Chillers
- Air Compressors
- Valves
- Temperature Controllers
- Cooling Towers



Example of simple circulation set up for descaling.

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PROCESS CHILLER WATER TREATMENT BASICS FOR PLASTIC INJECTION MOLDING

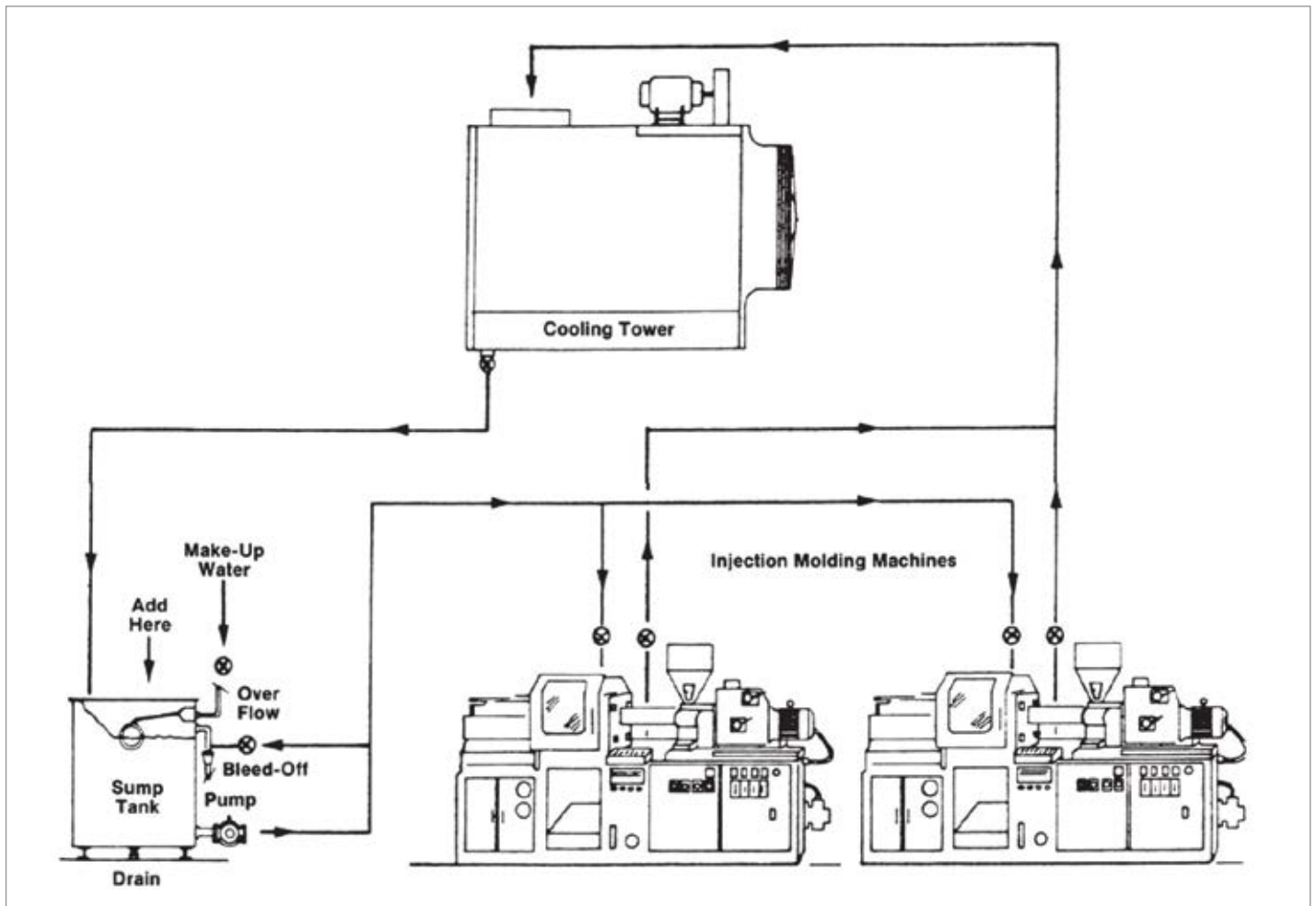
Cleaning And Scale Removal Methods

Removing scale from heat exchangers, water lines etc. is essential in returning equipment back to peak operating efficiency as well as increasing the lifespan of the equipment. If the equipment is left uncleaned, then it is forced to work harder causing excessive wear leading to costly repairs or replacing equipment entirely.

One of the most economical and beneficial methods to remove this scale is by using a biodegradable, liquid, chemical descaler. Using a descaler on, for example, a shell and tube heat exchanger allows the end user to leave the tube bundle in place and circulate the descaler around the shell or through the tubes to effectively and completely dissolve the scale. This saves time by eliminating the need to remove and reinstall the tube bundle or brush individual tubes. In fact, a safe chemical descaler can be utilized with an auxiliary cooler in order to conduct the cleaning while the equipment is in operation.

The easiest method to remove scale accumulation would be to utilize the facility's own cooled water circuit. A cooling tower can be dosed with the descaler and the tower's pumps will circulate the chemical throughout the piping, which may develop minimal to light scale over time. The descaler will circulate through all of the equipment in a looped fashion. Below is a diagram of a cooling loop system in a typical plastic injection mold series.

All water-operated heat exchange equipment throughout the facility will eventually become fouled with water scale, lime and rust deposits. This can lead to the shutdown of production equipment. A biodegradable descaler can quickly remove these mineral deposits and return the equipment back to peak efficiency. The total time required for a complete chemical descaler cleaning can be less than 8 hours. In small volume equipment, the time required may be as low as 1 hour.



Utilizing safe chemical solutions can extend the useful life of your critical operating equipment.



Just 1/32" of scale accumulation results in extended cooling cycles and increased rejection rates.

The frequency of these cleanings will depend on your facility's water quality. The water hardness, equipment-operating temperature, total operating hours and the operational load of the equipment all contribute to your preventative maintenance practice. Monitoring and logging data on flow rate, rejection rate, inlet and outlet temperature will enable better analysis of equipment condition and required cleaning materials.

Michigan Plant Increases Manufacturing Rate by 30%

An injection molding company in Michigan was experiencing problems with one of its Mitsubishi 950 injection molding machines. The machine was shutting down on high temperatures up to four times a day. Severe scale accumulation in the machine's cooling system was the cause of the high temperature shutdowns. The company circulated a safe, biodegradable descaler through the cooling passages of the machine via a pumping system for just 2 hours.

After the circulating time, the machine was briefly rinsed and returned to service. Upon full operation load, the operating temperature dropped by 20 °F (-6 °C) resulting in a 20-second decrease in each cycle time! This efficiency gain resulted in a 30% increase in parts manufactured daily!

A Typical Production Rate Efficiency Example

For example, a mold has a cooling circuit with water passages properly designed for its predicted use. The standard cooling cycle time is 11 seconds. After 1000 hours of operation, the water passages have developed a coating of scale just 1/32" thick. The scale has extended

the cooling cycle to 17 seconds. Rejection rates have also increased, but they're only a minor setback at this point.

Production quotas must be met so another 1000 hours are loaded on the equipment. By this time, the passages have begun to clog and the cooling cycle has reached 29 seconds. The equipment is now only cooling at 40% of its designed capacity. Rejections continue to increase. The scale already deposited is now dragging more minerals to exponentially collect and completely clog cooling passages.

How Efficient is your Manufacturing Rate?

How much production value has been lost if this was your equipment?

What about the extra man-hours?

What about the opportunity cost of not being able to begin other products?

What about the condition of the other molds?

All of these values can sum to a significant amount that makes utilizing a fast, safe, biodegradable descaler a simple and effective choice for a best practice in the plastics industry. **BP**

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Free Cooling Fundamentals in MODULAR HVAC CHILLERS

By Mark Rogan, Senior Vice President
Sales & Marketing, Arctic Chiller Group

► Free Cooling, simply put, is using colder ambient air (colder than the supply chilled water set point) to perform cooling rather than the refrigeration cycle of the chiller. In our HVAC-systems world, the proper technical name is waterside economizer. Many people are familiar with how an airside economizer works but we are talking about a waterside economizer.

An airside economizer is typically used on a packaged rooftop or tied to an indoor AHU, allowing filtered outside air into the space when outdoor temperatures drop below 55 °F (12 °C) (the common supply air temperature of indoor spaces) thus alleviating the need for the refrigeration cycle to be running. Interior

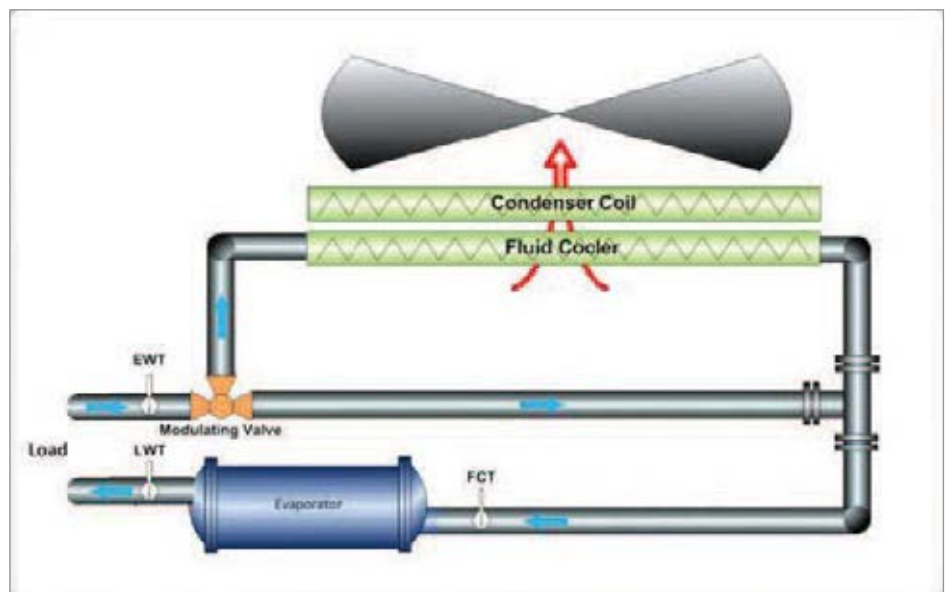


Figure 1

space is being cooled yet the refrigeration system is not running, hence the name Free Cooling.

If we now transition back to the chiller world, the equivalent would be a free way to supply whatever temperature chilled water we need without running the chiller. Free Cooling isn't literally free because it does require an initial capital investment to own. But payback periods can be very rapid depending on your range of ambient temperatures where you live, and the needed leaving (or supply) temperatures of your chilled water demands. For instance, it might take five years for a hospital in New Orleans to recoup their investment if running 40 °F (4 °C) chilled water for an operating room suite, but it might take less than a year for a data center in Boston running 70 °F (21 °C) chilled water to its servers.

Types of Free Cooling

There are many ways to achieve free cooling with different types of systems. For water-cooled systems it is common to use a large plate & frame heat exchanger to transfer cooling between the cooling tower loop (when temperatures are favorably low) and the chilled water loop. There is also a thermosyphon system using colder than normal condenser water temperatures to move refrigerant around without

the use of the compressor while still achieving some heat exchange at various levels, depending on the exact temperature difference. For the purposes of this article, let us focus on a more recent and expanding technology for free cooling associated with air-cooled chillers. To be clear, dedicated air-cooled free coolers, or fluid coolers, have been around for many years but now we can economically integrate this function within a packaged air-cooled chiller or a modular air-cooled chiller system.

Operation Of Free Cooling

The operation of these systems has proven to be highly reliable and surprisingly simple. The engagement of the free cooling system is through a modulating three-way valve connected to the building load or load side of the chilled water system, the chiller system, and the free cooling system made up of a copper tube/aluminum fin water coil with condenser fans.

In an integrated system, there is a water coil sandwiched directly against the normal copper tube/aluminum fin refrigerant coil being used as the condensing surface of the air-cooled chiller with condenser fans pulling air simultaneously across both (see Figure 1). Note the three-way valve is fully configurable to an owner's desired activation temperature



Figure 2

FREE COOLING FUNDAMENTALS IN MODULAR HVAC CHILLERS

(Figure 2 is a field installed chiller in Boston with access panels removed to show both coil header pipes from the side).

- I. **High Ambient** – Under high ambient conditions, there is no potential for free cooling and therefore the free cooling coils or modules are bypassed, and 100% mechanical cooling will be used.
- II. **Mid-Range or Pre- Cooling** – Depending on how aggressive you want to control your system; the three-way valve can begin to open to the free cooling coils between 2 °F (-16 °C) and 4 °F (-15 °C) below your chilled water set point. This temperature approach (difference between set point temperature and free-cooling activation) is much lower than most people realize until they study air-cooled designs. So, if a system is running at a standard chilled water temperature (44 °F or 6 °C) it will start to take advantage of free cooling when the outside ambient dry bulb temperature reaches 42 °F (5 °C). At these

temperatures you will still need the mechanical cooling system for full capacity, but the load is now being shared and system is gaining everything it can from the ambient environment. The refrigeration system is then finishing off whatever is left with perhaps 50% of your compressors/capacity. Energy use is cut in half in this example.

- III. **Winter Operation** – Once the system reaches the range between 5 °F (-15 °C) and 9 °F (-12 °C) below its chilled water set point, it can achieve 100% of its capacity with the free-cooling coils. At this point, the three-way valve will be 100% open to the free-cooling coils and the mechanical refrigeration system will be shut down. You can't get more efficient than off. Of course, the condenser fans will continue to draw ambient air over the free cooling coils, but it will also slow down and shut off if ambient temperatures continue to fall, further increasing energy savings.



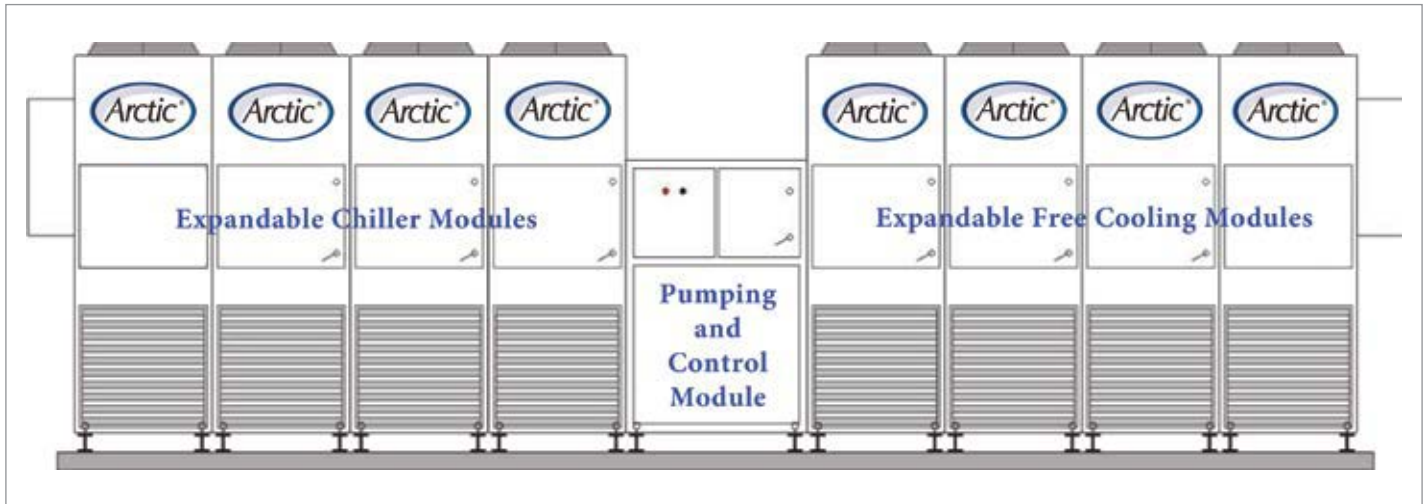


Figure 3

IV. Limitations – The final stage of operation is reached when cooling demand is exceeded and the three-way valve will then begin to throttle back to avoid overcooling and maintain set point. In northern climates, there will be a glycol solution in use and therefore the risk of freezing the free cooling coils is reduced. However, in southern climates where water would be used, a new limitation around the freezing point is introduced. In this case, operation below 34 °F (1 °C) would be prohibited.

Different Approaches Toward Free Cooling

At the Arctic Chiller Group, we do free cooling in one of two ways: the integrated coil-on-coil in a large packaged chiller described above and also in a modular way. We are known as a modular chiller specialist so it's no surprise we would have a modular take on free cooling that has been very popular. In this design, we start with an air-cooled bank of chillers and then add on free-cooling modules to a predetermined amount of free cooling requested.

This is a great way to maximize the amount of free cooling available but does require additional real estate to accomplish. It can be thought of as adding mini-fluid coolers with the same cabinet size as the modular chillers. It also maximizes the redundancy of the system and gives an owner the flexibility to add chillers and free cooling modules in the future as more capacity is needed. This has been a very popular approach for data centers starting with a base load and know they will need room to grow as they sell more and more co-location space to clients.

In Figure 3, we are showing the ArcticChill Wing Design™ which features a central pumping section where supply and return piping would connect to the bank. The pumps and the header piping system are sized for the largest future capacity that can be foreseen. We have the immediately needed free cooling modules to the right and chillers to the left. Imagine the supply water entering the bank and going right, through the free-cooling module header pipe system, and then left through the modular chiller system before returning to the building at set point. Figure 3 shows four of each but imagine if eight would eventually be needed. Structural supports and a base frame would be installed for the future modules at the beginning.

Now, an owner can easily add a chiller and/or a free cooling module only when they are warranted by a growing customer demand (and not have to spend that money beforehand). In situations where real estate is hard to find, we can also build integrated coil-on-coil free cooling systems right into modular chillers as well to minimize the footprint where needed. Where variable primary flow is advantageous, we can also build into the pumping section the variable speed drive and controls for a truly integrated system and also be open protocol to be further integrated into the whole building automation system for full transparency and control. **BP**

For more information, visit www.arcticchillergroup.com.

To read similar **Free Cooling** articles visit
www.coolingbestpractices.com/system-assessments/free-cooling.



BEYOND THE BASICS: Considerations When Retrofitting a Chiller

By Neil Maldeis and Mike Patterson, Trane

Trane®, a brand of Ingersoll Rand: Sensors in connected buildings provide insight to optimize heating and cooling systems.

► Commercial buildings in the United States will be looking to replace centrifugal chillers as many are near or past their median replacement life of 25 years. This becomes apparent when you consider nearly half of all commercial buildings were constructed before 1980 according to data from the U.S. Energy Information Administration.¹ The same can be said of buildings on American college campuses, which according to the same data, more than half of which were built before 1990.¹ Bottom line — if you're a commercial building owner or a facility manager/director in the United States, you may need to replace a chiller.

Unfortunately, when these buildings were constructed, the idea that large machinery would need to eventually be replaced was not a top

consideration during the design process. Aesthetics overruled ease-of-access, resulting in centrifugal chillers being built in hard-to-reach places, such as small mechanical rooms located in basements. Now, owners are faced with challenging installations and contractors have to do expensive and disruptive construction to get a new chiller installed.

But, what if there was another way?

Advancements in chiller manufacturing mean that retrofitting centrifugal chillers is easier, more cost effective, and more beneficial than ever before. Now, there are retrofit solutions that allow building owners to modernize their building's HVAC system while keeping installation costs low and improving energy efficiency. Many solutions don't even require

¹ U.S. Energy Information Administration. A Look at the U.S. Commercial Building Stock: Results from EIA's 2012 Commercial Buildings Energy Consumption Survey (CBECS). <https://www.eia.gov/consumption/commercial/reports/2012/buildstock/>. Accessed March 12, 2018.

disruptive construction — some are small enough or have the ability to be easily broken down into sections to make installation easier.

With good planning, proactive building improvements, and a trusted partner in the process, you can have both an easy and successful chiller retrofitting project.

Essential Retrofitting Considerations

Before you get started, one of the most important considerations is planning. Sounds simple, but there are a few things you should plan for that may not be obvious. First, a quality partner who understands your needs and will be there to help throughout the process, beginning to end, is essential to making your life easier. Each building has its own unique sets of needs, and a good equipment manufacturer will go beyond supplying the chiller, providing systems knowledge, and taking the time to understand your needs and make recommendations to best address them.

To avoid repeating past installations that didn't take into account future needs, take some time now to ensure your building's future needs are addressed in your retrofitting plan. Maintenance, for example, is something that may not be top-of-mind now because you have a new piece of equipment, but will be an important factor later. Make sure you're choosing a solution that considers your future maintenance needs, including easy access for cleaning and regular inspections. Your planning stage also is an opportunity to work with a local service provider to develop a regular maintenance routine and plan for the life of the equipment. Thankfully, some maintenance items are much easier nowadays due to integrated controls and connected technology. Planning

up front that takes your entire building and its needs into account can lower costs in the future.

Look Beyond The Mechanical Room

It may be tempting to skip the time necessary to properly plan for chiller retrofitting, but comprehensive planning can help your operation well beyond the mechanical room. Thinking broader than your chiller and mechanical room needs, this project could help address entire building upgrades that ultimately save you time and money.

A rather safe assumption for most chiller retrofitting projects nowadays is that a new chiller is far more energy efficient than what is being replaced. However, looking beyond the equipment may yield additional improvements. By looking at things like ancillary equipment, lighting systems, and insulation, you can find opportunities to reduce the overall building load resulting in smaller equipment and less operating hours, saving even more money. Taking a comprehensive look at all your building's systems can provide a greater impact in reducing costs and improving operation than by addressing equipment alone.

The best part is that this doesn't fall solely on your shoulders. A good equipment manufacturer will look outside the mechanical room for the solutions that make your project work for the entire building and help your operation run more efficiently.

Make Your New System Work For You

Another consideration is investigating how you can make your building more connected and easier for you to manage. Buildings today are full of potential because they have energy coursing through them —



Agility™, a new water-cooled centrifugal chiller product line is suitable for a wide variety of commercial building applications, especially for retrofits of aging chiller replacements. Agility incorporates innovative designs in both its compressor and heat exchangers to create a compact design that is easier to install. The compact design saves time and money.

BEYOND THE BASICS: CONSIDERATIONS WHEN RETROFITTING A CHILLER

heating, cooling, lighting. This energy produces data, and that data is full of valuable information and insight. When you understand what that data means and how you can act on it, you can transform your building into a stronger asset. Analytics can tell you where your building is running well, where things could be better, and what you can do about it.

What does this have to do with retrofitting a chiller? During the retrofitting process, you have a unique opportunity to look into how connected building solutions can improve your environment because often integration starts with the HVAC system. Your new chiller can be integrated with other building systems like lighting, security or water — both existing and new — to give you mobile access and control. These tools provide you with data for analytics and better building management, especially for those with a portfolio of buildings to manage. Overall, this means you can have 24/7/365 system monitoring analytics for improved energy efficiency, higher reliability, and reduced operating costs.

A Portrait Of Success

After planning out your specific building needs and finding the proper solutions, what goals should you be setting? A successful retrofitting project goes beyond being completed on time and within budget. The most successful retrofitting projects look at your organization's needs and deliver on them without causing unnecessary demolition or disruption. As mentioned above, a good partner helps you determine and execute exactly that by recommending or specifying products that can fit into your space without breaking down walls, and developing solutions to make sure the people within your building are comfortable and productive during the transition.

Often, the most successful retrofitting projects deliver more than you expected. That can come in the form of improved efficiency at both full- and part-load conditions, which can contribute to lower operating

expenses and potential utility rebates if offered in your area. This means you can reduce energy consumption across the board (not just in one area), helping not only to reduce the impact on the environment but also your wallet. Additional positive outcomes of a retrofitting project could come from the connection mentioned earlier, providing you with more information about your building and giving you the tools to make better decisions. This all can start with the proper planning of your retrofitting project.

To make sure that success lasts well after chiller implementation, plan for regular meetings with your provider to understand upgrades and retrofits available to improve or maintain designed efficiencies of your chiller. With regular contact, you can better understand how to take care of your chiller and how to make it work better for you.

No matter how advanced systems get, none of this matters if your chiller breaks down. Work with a partner whose equipment you trust and who you know will be around to help should anything go wrong. But also go back to the basics by preventing issues before they occur with regular maintenance. It's important to understand your chiller and, as mentioned above, have a regular maintenance schedule that you execute on dutifully.

Overall, retrofitting centrifugal chillers doesn't have to be difficult and is an opportunity for complete building enhancements. By finding a partner that can provide solutions that meet your specific building needs, planning for additional performance enhancers, and setting appropriate goals for the project, you can make difficult chiller replacement jobs easier and more successful. **BP**

Neil Maldeis is the Energy Solutions Engineering Leader at Trane. Mike Patterson is the Product Manager of Centrifugal Chillers at Trane. To learn more about Trane visit www.trane.com/Index.aspx.

To read similar **Chiller System Assessment** articles visit www.coolingbestpractices.com/system-assessments/chillers.



“Often, the most successful retrofitting projects deliver more than you expected. That can come in the form of improved efficiency at both full- and part-load conditions, which can contribute to lower operating expenses and potential utility rebates if offered in your area.”

— By Neil Maldeis and Mike Patterson, Trane

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Sustainable Energy & Water Savings with Chiller & Cooling Best Practices

Chiller & Cooling Best Practices is a technical magazine dedicated to discovering Energy and Water Savings in industrial chiller and cooling systems. Our editorial focus is on case studies and technical articles where application and system knowledge drives technology selection, creating energy savings in projects delivering excellent ROI's.

"The average tape plant has plastic extruder motors and electric heated dyes as the largest energy consumers. Other consumers are chilled water (20%), compressed air (3%) and lighting (1%). We look at chiller set-points and try to maximize them for energy efficiency. At our Danville plant, we have a capacity of 5,000 tons of cooling managed by over fifteen chillers."

— Michael Jones, Corporate Energy Team Leader, Intertape Polymer Group

From Chillers, Dry Coolers and Cooling Towers to Hydronic Specialties and Master Controls

Our readers embrace Sustainability as a profitable business opportunity. We believe the industrial process cooling and HVAC installed base to be at a tipping point — one where "energy and water retrofits" will fuel a new era of market growth, similar to what we've seen in the compressed air industry. Better applying more varied cooling technology combinations to better understood partial-load demand profiles will fuel system improvements. This will combine optimizing system components and using master controllers to further improve efficiencies.

"VSDs can cut a chiller's annual energy use by up to 30 percent while maintaining operating reliability."

— Fred Berry, Chiller Channel Manager, Johnson Controls
("VSD Chillers Deliver Energy Savings Under Real World Operation," May 2017 Issue)

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ComEd® Incentivizes Chiller & Process Cooling Efficiency

By Wes Lucko, Chiller & Cooling Best Practices Magazine

Commonwealth Edison Company (ComEd) provides electric service to more than 4 million customers across northern Illinois, or 70 percent of the state's population.

► The ComEd® Energy Efficiency Program offers incentives to help facilities save money by improving the efficiency of their equipment. Industries can receive standard cash incentives for common energy efficiency improvements or custom cash incentives for making improvements not included in the standard program.

Under the Future Energy Jobs Act, all ComEd commercial and industrial customers who had an account with a load below 10MW during the 12 months ending December 2017 are eligible for standard and custom incentives.

Standard, otherwise known as prescriptive incentives, are available to business customers for various items such as centrifugal, reciprocating, scroll or screw water-cooled chillers. They also focus on

variable speed drives on HVAC chillers, HVAC fans or pumps under 200 HP and industrial process fans or pumps under 200 HP.

Thomas Johanson, the Program Manager at ComEd stated, "Custom incentives of up to \$0.07/kWh of first-year savings are also available for improvements in system efficiency resulting in permanently reduced consumption." ComEd also offers an Early Commitment option that pays \$0.06 per kWh of estimated first-year savings as soon as the application is approved (only available for projects estimated to save greater than 500,000 kWh).

The early commitment incentive option provides a firm commitment to an incentive amount upon approval of the preapproval application. Once approved by ComEd the

incentive amount will not change as long as the project has been verified as installed and commissioned.

Process Cooling Program Overview

The ComEd Energy Efficiency Program Process Cooling Study is available to qualifying customers within the ComEd service territory. The goals of this program are to help industries identify opportunities to improve the efficiency of their facility's process cooling system and reduce energy costs without adversely affecting system operations. ComEd provides a one-time incentive payment of \$0.07 per annual kWh saved after study recommendations are properly implemented and verified. Eligible annual kWh savings are determined through final measurement and verification activities. The total incentive



"Custom incentives of up to \$0.07/kWh of first-year savings are available for improvements in system efficiency resulting in permanently reduced consumption."

— Thomas Johanson, Energy Efficiency Program Manager, ComEd

will not exceed the total implementation and incremental costs for improvements recommended in the study.

Minimum Commitment for the Process Cooling Study

Once accepted into the program, the client must agree to provide access to the facility while providing time for facility personnel to interface with the service provider during all phases of the project. They must also provide and assist with reporting and collection of information pertaining to the operation of the industrial system during all phases of the project. “Lastly, they must confirm the minimum installed capacity is at least 500 tons and agree to spend at least \$15,000 on the implementation of measures identified through the study,” added Johanson, “with an estimated total project simple payback of 1.5 years or less based upon energy savings and estimated cash incentives.”

Johanson continued by clarifying The Process Cooling Study portion will be considered complete when the industry’s commitment is met, and the mutually accepted study measures are fully installed and verified, or 120 days from the industry receiving the final version of the Investigation Study Report. “If additional time is needed to complete implementation, a request may be submitted by the industry,” said Johanson.

Specifications for Water and Air-Cooled Chillers for HVAC Cooling

1. This incentive is only applicable to systems used for space cooling. Process cooling systems are not eligible for this incentive.
2. Must have a rated kW/ton for the Integrated Part Load Value (IPLV)

that is less than or equal to the qualifying efficiency.

3. Efficiency rating must be based on AHRI Standard 550/590 (I-P)-2011 for IPLV conditions and not based on full-load conditions.
4. Must meet AHRI standards 550/590-2003 and be UL listed.
5. Refrigerant must comply with local codes.
6. The AHRI net capacity value should be used to determine the chiller tons.
7. A manufacturer’s specification sheet with the rated kW/ton-IPLV or COP-IPLV and nominal tonnage must accompany the application.

ComEd® Energy Efficiency Program

EQUIPMENT TYPE and DEFINITION	SIZE CATEGORY NOMINAL TONNAGE	QUALIFYING EFFICIENCY NOMINAL TONNAGE	INCENTIVE
Water-Cooled Chiller New or replacement water-cooled chiller (centrifugal, scroll/helical- rotary, reciprocating).	Centrifugal	< 300 tons	0.50 kW/ton-IPLV
		300 - 399 tons	0.47 kW/ton-IPLV
		≥ 400 tons	0.45 kW/ton-IPLV
	Scroll or helical- rotary (screw)	< 75 tons	0.54 kW/ton-IPLV
		75 - 149 tons	0.50 kW/ton-IPLV
		150 - 299 tons	0.49 kW/ton-IPLV
		≥ 300 tons	0.47 kW/ton-IPLV
	Reciprocating	< 75 tons	0.54 kW/ton-IPLV
		75 - 149 tons	0.50 kW/ton-IPLV
		150 - 299 tons	0.49 kW/ton-IPLV
		300 - 599 tons	0.47 kW/ton-IPLV
		≥ 600 tons	0.45 kW/ton-IPLV
Air-Cooled Chiller New or replacement air-cooled chiller.	All	< 150 tons	0.79 kW/ton-IPLV
		≥ 150 tons	0.77 kW/ton-IPLV

**\$20 per ton
plus \$3.50
per ton
efficiency bonus***

**\$30 per ton
plus \$3.50
per ton
efficiency bonus***

*Efficiency bonus is paid for an efficiency rating above the qualifying efficiency. The bonus is \$3.50 per 0.01 kW/ton IPLV for water- and air-cooled chillers.

ComEd® INCENTIVIZES CHILLER & PROCESS COOLING EFFICIENCY

Project 1

Tangent Technologies Comprehensive Process Cooling Study

As one of the leading manufacturers of hi-tech plastic lumber, Tangent Technologies runs 24/7, using energy around the clock. One of its largest uses of electricity involves removing heat from production processes. With a goal of increasing efficiency, cutting costs and lowering environmental impact, Tangent Technologies decided to pursue a ComEd Energy Efficiency Program Comprehensive Process Cooling Study. Plant Manager Ralph Holmes says, “We were looking at our chiller capacity when we were approached by the

program about understanding our energy use. We recognized the opportunity to take our analysis to a whole new level through an energy study.”

THE SOLUTION

The study provided a detailed analysis of Tangent Technologies’ process cooling system and energy consumption. This information was then used to design a cooling optimization plan that would positively affect system operations, identifying opportunities for capital upgrades, low-cost and no-cost projects. Estimated energy savings, project costs and incentives were calculated for each recommendation.

Tangent Technologies implemented the following recommendations from the Comprehensive Process Cooling Study:

- Installed thermostatic control valves on each of the 20 production lines to regulate flow and eliminate overcooling
- Installed two new high-efficiency 120-ton chillers
- Optimized chilled water set points
- Insulated chilled water lines
- Re-configured chilled water system from constant-speed, primary-secondary to variable-speed, primary-only
- Installed two 165-ton dry coolers for supplemental cooling in the winter

Project Snapshot

Customer

Tangent Technologies

Cost funded by the ComEd Energy Efficiency Program

\$16,000

Implementation cost paid by customers

\$372,676

Estimated annual energy savings

943,425 kWh

Estimated annual cost savings

\$70,757*

Incentive received

\$66,040

Estimated payback period without incentive

7 years

Estimated payback period with incentive

5.8 years

*Estimated annual cost savings are based on an electricity rate of \$0.075 per kWh.





PROJECT BENEFITS

Tangent Technologies received incentives totaling \$66,040 from the ComEd Energy Efficiency Program after implementing the recommendations. The business is now more energy efficient and saves an estimated \$70,757 in energy costs annually. Holmes states, “Once the physical changes were completed, we started seeing the difference in our energy costs. We also gained greater reliability and redundancy.” Participating in the ComEd Energy Efficiency Program study has given Tangent Technologies a better understanding of its process cooling system and identified improvement opportunities that have led to a measurable reduction in energy usage.

Project 2

Tredegar - The Big Chiller Optimization

As an international manufacturer of plastic films and aluminum extrusions, Tredegar is known for everything from diapers to high-value electronic components. Not surprisingly,

producing such a wide range of products comes with a high-energy cost — most notably at the company’s two-building campus in Lake Zurich, Illinois. The two aging facilities operate 24/7, with over 220,000 sq. ft and six chillers between them. Already familiar with ComEd’s Energy Efficiency Program, Tredegar’s Global Director of Environmental Health and Safety reached out to the program to identify cost-saving opportunities.

THE PROJECT

After a comprehensive study of the two facilities’ process cooling systems, an Energy Advisor provided Tredegar with a report full of energy-saving recommendations. The company moved forward with several cost-effective cooling system upgrades, including resetting the chiller condenser water temperature, adjusting and repairing the air-side economizer operation, improving the tower pump staging process, and installing a variable frequency drive and controls in the cooling tower.

Project Snapshot

Customer

Tredegar Corporation

Measures

Processed cooling assessment and Upgrades

Project cost

\$28,068

Estimated annual energy savings

324,848 kWh

Estimated annual cost savings

\$24,364*

ComEd incentive received

\$22,739

Estimated payback period without incentives

1.2 years

Estimated payback period with incentives

3 months

*Estimated annual cost savings are based on an electricity rate of \$0.075 per kWh.

THE SAVINGS

ComEd provided Tredegar with \$22,739 in incentives, covering over 81 percent of the project costs. The chiller upgrades are also estimated to save nearly 325,000 kWh a year, cutting the facilities’ annual energy costs by \$24,739. Thanks to the savings, Tredegar’s investment in the project paid off in just three months. **BP**

For more information, visit www.comed.com. The ComEd Energy Efficiency Program is funded in compliance with state law.

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INDUSTRIAL COOLING SYSTEM INDUSTRY NEWS

Frigel's Turbogel TCUs Now Available with Variable Frequency Drives and Digital Flow Meters for Plastics Processing

Frigel announced the availability of Variable Frequency Drives (VFDs) and digital flow meters on its line of Turbogel water temperature control units (TCUs) for a wide range of plastics process cooling applications.

The configurable line of Turbogel TCUs with new options is one of numerous innovations Frigel will showcase at NPE2018 in Orlando, Fla., May 7-11, 2018. Show attendees are invited to Frigel Booth W193 to see a Turbogel configured to provide up to 50 kW of heating capacity for fast mold heat-up times, even with the largest of molds.

Frigel North America Marketing Manager Al Fosco said the new Turbogel TCU options illustrate Frigel's commitment to continually advancing its technologies and the value

of the rigorous approach it takes to giving plastics processors a clear-cut advantage in the marketplace.

"Our first step with customers is to thoroughly analyze process cooling variables involved with their distinct processes, machines and molds," Fosco said. "We then customize each Turbogel to match their exact needs. This scientific approach, combined with innovation, gives processors the ability to leverage process cooling to optimize productivity, profitability and quality. It's one of the Frigel Diamond Service advantages."

The Frigel family of Turbogel TCUs have proven to deliver high turbulent flow and accurate temperature control for decades, often improving processing cycle times by as much as 20 percent. When equipped with a VFD, the unit's pumps now deliver only the amount of water pressure differential and flow needed, when needed, for peak operating efficiency with the least amount of energy consumption. The optional digital flow meter provides flow data with an unprecedented level of accuracy to ensure the best possible mold performance based on the unique characteristics of every tool.

Other highlights of the Frigel Turbogel TCU family include:

- Pumps up to 7.5 kW (10 hp) for a single-zone Turbogel RCM model, or a dual-zone Turbogel RBD model for flow rates up to 30 m³/hr (120 gpm) per zone.
- Dual-zone units with heaters that deliver up to 48 kW, or 24 kW heating capacity per zone. A heater that delivers as much as 50 kW heating capacity is available on the Turbogel RCM to meet special requirements.

- High-cooling capacities for temperature control to within less than 2 °F (1 °C) of the cooling water inlet temperature.
- Motorized servo-modulating valves, eliminating sharp temperature peaks and valleys found with traditional on/off solenoid valves, and for control typically approaching plus/minus .5 °F (plus/minus .25 °C).
- User-friendly, microprocessor-based controls with proportional logic for extremely accurate temperature control.

Frigel is also excited to showcase technological innovations at the NPE2018 Bottle Zone – the new dedicated pavilion spotlighting innovations and solutions to meet the needs of the rapidly growing beverage bottling and polyethylene terephthalate (PET) market. At its Bottle Zone booth, Frigel will display its Microgel RCP chiller, specifically engineered to meet the demands of high-speed, high-volume production involved in bottling and blow-molding operations everywhere. In addition, Frigel will also display a high-speed cap cooler unit.

This year at NPE there will be a total of 24 Frigel units operating in 10 booths of leading plastics machinery manufacturers, unprecedented for any process-cooling equipment company.

About Frigel

Frigel has been a worldwide market leader in intelligent process cooling since the 1960s. Foremost among Frigel's products is Ecodry, a unique, internationally patented, closed-loop intelligent cooling system that has been proven at more than 5,500 manufacturing installations worldwide. Ecodry, an environmentally friendly cooling solution, keeps cooling water



Shown is a Variable Frequency Drive (VFD) inside a Frigel Turbogel TCU. The VFD delivers only the amount of water pressure differential and flow needed, when needed, for peak operating efficiency with the least amount of energy consumption.

clean, delivers substantial savings on water, chemicals, energy and maintenance. Frigel also manufactures and markets the unique, cycle-time improving Microgel combination chiller/temperature control unit (TCU), as well as Turbogel and Thermogel TCUs, Aquagel pumping and filtration equipment and Heavygel central chillers. Visit www.frigel.com for more information.

Daikin Names Harrison Energy Partners as Service Alliance Provider

In 2017, Daikin announced its new relationship with Harrison Energy Partners (HEP), the largest commercial and industrial HVAC firm in Arkansas, as the authorized manufacturer's representative in central, northwest and western Arkansas, eastern Oklahoma, and Oklahoma City. Effective immediately, Daikin Applied is pleased to extend that relationship, making HEP the Service Alliance Provider in Oklahoma City and the surrounding region. As a Service Alliance Provider, HEP is now authorized and responsible for responding to customers' Daikin Applied equipment service, operation and maintenance needs.

With strengths in HVAC applications, system service, controls and energy services, HEP helps customers efficiently maintain comfort in their buildings. HEP brings over 30 years of experience as a top service and solutions provider to the Oklahoma City region. Oklahoma customers will benefit from this expertise throughout the life-cycle of their equipment, as well as from consistent coverage from one provider located in the market.

HEP's CEO, Bill Harrison, is confident in his team's ability to meet the needs of Oklahomans. "Having recently established our presence in Northeast Oklahoma, we're genuinely excited to expand to the state's capitol and are now positioned to serve

the majority of the state. We will continue our mission of delivering commercial HVAC excellence at a superior value to become our client's first choice in Oklahoma."

Daikin Applied's EVP of Sales, Marketing and Aftermarket, Kirk Thorne, believes expanding Daikin's relationship with HEP to service the Oklahoma City region will fuel Daikin's growth in that market. "With HEP representing Daikin equipment in the territory already, we'll be able to serve our customers more consistently and efficiently. HEP has proven again and again to be both a top employer in Arkansas and the top HVAC solutions provider. Together, we believe we will grow to be an unmatched force in HVAC systems and solutions in the region."

About Daikin Applied

Daikin Applied, a member of Daikin Industries, Ltd, designs and manufactures technologically advanced commercial HVAC systems for customers around the world. Customers turn to Daikin with confidence they will experience outstanding performance, reliability and energy efficiency. Daikin Applied equipment, solutions and services are sold through a global network of dedicated sales, service, and parts offices. For more information or the name of your local Daikin Applied representative, call 800-432-1342 or visit, www.DaikinApplied.com.

About Harrison Energy Partners

Harrison Energy Partners (HEP), founded in 1983 by CEO Bill Harrison, provides commercial HVAC excellence through new systems, controls, energy services and system maintenance and repairs. Headquartered in Little Rock, Arkansas, HEP has been named "One of the Best Places to Work in Arkansas" by Best Companies Group in 2013, 2016 and 2017. For more information, call (501) 661-0621 or visit www.harrisonenergy.com.

ASHRAE Earns Partnership Award from UN

ASHRAE has received the prestigious Partnership Award from the United Nations Environment Programme's (UN Environment) Ozone Secretariat. ASHRAE received the award for its extraordinary commitment and contribution to the progress and achievements of the Montreal Protocol on Substances that Deplete the Ozone Layer, celebrating its 30th anniversary.

The award was presented to ASHRAE at the 2017 Ozone Awards ceremony in Montreal. The Partnership Award recognizes the work of civil society and other international organizations playing a critical role in the development of the Kigali Amendment and/or implementation of the Montreal Protocol.

"We could not be more pleased to have earned this recognition. Receiving the Partnership Award is a great honor and acknowledgment of the tireless work ASHRAE and our members are doing to support the phase-out activities of ozone-depleting substances around the world," said 2017-2018 ASHRAE President Bjarne W. Olesen, Ph.D. "We are proud to be a part of this initiative and look forward to continuing our partnership with UN Environment as we work toward a more sustainable built environment."

Commonly referred to as "the treaty that saved the ozone layer," the Montreal Protocol, signed in 1987, is an international agreement designed to substantially reduce emissions of substances depleting the stratospheric ozone layer. The Protocol has led to the phase-out of more than 99% of nearly 100 ozone-depleting chemicals and significantly contributed to climate change mitigation, according to UN Environment.

"I congratulate ASHRAE for this well-deserved award honoring its exceptional efforts to

INDUSTRIAL COOLING SYSTEM INDUSTRY NEWS



ASHRAE President Bjarne W. Olesen (Left) Receiving UN Environment Partnership Award.

support the advancement of technologies which help protect the ozone layer. We appreciate the organization's dedication to the Montreal Protocol and its contribution to the success of the treaty," said Tina Birmpili, head of the Ozone Secretariat.

ASHRAE's partnership with UN Environment has been highly transparent and visible since it began and has been recognized with appreciation by governments around the world, as well as the HVAC&R industry. Through ASHRAE's more than 56,000 members in more than 100 countries, the Society has mobilized its resources to develop, implement and support UN Environment and Montreal Protocol projects.

Most recently, ASHRAE and UN Environment launched a work plan titled, "Working Beyond High Global Warming Potential (GWP) Refrigerants." It is the organizations' fifth joint biennial work plan, and is another tangible example of ASHRAE's dedication to promote the Montreal Protocol by leading the way in research to identify effective refrigerant alternatives with low GWP.

Another way ASHRAE is leading this charge is through its collaboration with the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) and the U.S. Department of Energy (DOE). Through a \$5.2 million joint investment, the three organizations are funding vital research to expedite findings and establish a more robust fact base about the properties and use of flammable refrigerants. This will also help update international standards.

About the United Nations Environment Programme

The United Nations Environment Programme (UN Environment) is the leading global environmental authority setting the global environmental agenda, promotes the coherent implementation of the environmental

dimension of sustainable development within the United Nations system, and serves as an authoritative advocate for the global environment.

About ASHRAE

ASHRAE, founded in 1894, is a global society advancing human well-being through sustainable technology for the built environment. The Society and its more than 56,000 members worldwide focus on building systems, energy efficiency, indoor air quality, refrigeration and sustainability. Through research, standards writing, publishing, certification and continuing education, ASHRAE shapes tomorrow's built environment today. More information can be found at www.ashrae.org/news.

SPX Cooling Technologies Video Series on Cooling Tower Components

SPX Cooling Technologies, Inc., a full-line, full-service industry leader in the design and manufacture of evaporative and air-cooled heat exchangers, has issued a series of videos on Cooling Tower Components. Each of the seven videos in this series focuses on one component or aspect of cooling tower technology, and discusses its function and advantages.

The first three videos in the series are presented by Ryan Miller, SPX regional sales manager. He addresses the Marley® Cooling Tower Duty Motor, the Marley NC Single Bottom Inlet and the Markey™ Drift Eliminator. In these videos, Ryan explains how each component is used in SPX technology to better performance and/or efficiency. He explains the self-cooling function of the Duty Motor; the cost-effectiveness of the Single Bottom Inlet piping method, and the patent-pending design of Markey Drift Eliminator technology.

In the fourth video, Mitch Case, sales engineer, discusses a key component of the Marley MD Cooling Tower – the Mechanical Float System – explaining its function and benefit. Robert Swafford, SPX parts manager, provides an overview of the Marley HC Flow Control Valve in the fifth video of the series. He details how each component of the valve operates in the NC cooling tower and how to maintain optimal performance of the valve. The sixth video features Brent Feters-Crouch, technical sales representative, presenting on Marley Belt Drive Components. The video covers design aspects of the components, and demonstrates belt tensioning and sheave alignment.

The final video is presented by Mark Groothuis, SPX global product manager. In this video, Mark discusses the Mechanical Vibration Switch. This is commonly used in both package towers and field-erected towers for emergency fan shut-off after the detection of excessive vibration in



Regional Sales Manager, Ryan Miller, addresses the Marley Cooling Tower Duty Motor, the Marley NC Single Bottom Inlet and the Marley Drift Eliminator.

the tower. Together, these seven videos provide an overview of several key components of Marley cooling towers, helping customers gain a working knowledge of their function and importance.

To watch additional videos, visit: www.spxcooling.com/video

About SPX Cooling Technologies, Inc.

SPX Cooling Technologies, Inc. is a leading global manufacturer of cooling towers, evaporative fluid coolers, evaporative condensers and air-cooled heat exchangers providing full-service cooling solutions and support to customers in the power generation, petrochemical, industrial, refrigeration, and heating, ventilation and air conditioning (HVAC) markets for more than 100 years. For more information, please visit www.spxcooling.com. SPX Cooling Technologies and its product brands are part of SPX Corporation.

About SPX Corporation

SPX Corporation is a supplier of highly engineered products and technologies, holding leadership positions in the HVAC, detection and measurement, and engineered solutions markets. Based in Charlotte, North Carolina, SPX Corporation had approximately \$1.5 billion in annual revenue in 2016 and more than 5,000 employees in about 15 countries. SPX Corporation is listed on the New York Stock Exchange under the ticker symbol "SPXC." For more information, please visit www.spx.com.

Danfoss Named Winner at 2018 AHR Expo Innovation Awards

Danfoss, the pioneer of oil-free, magnetic bearing, variable speed technology, has been named a winner in the prestigious 2018 AHR Expo Innovation Awards, green building category, for its Turbocor® TTH/TGH high-lift compressors.

Featuring the award-winning oil-free, variable speed, magnetic bearing operation of other Danfoss Turbocor® compressors, the new Danfoss Turbocor® TTH/TGH high-lift compressors offer outstanding full- and part-load efficiency, low vibration and sound, a small footprint, and reduced maintenance. They also provide an expanded operating map suitable for high-lift applications like air-cooled chillers and heat recovery.

In air-cooled chillers, Turbocor® TTH/TGH compressors can support operation at high ambient temperatures with pressure ratios as high as 6.2. This facilitates a greater operating range in hot climates, while still being able to support applications such as air-to-water heat pump chillers. The compressors can also support high-lift applications such as heat recovery in water-to-water heat pumps, enabling additional operating cost savings by utilizing waste condenser heat to heat water.

Danfoss Turbocor® high-lift compressors are available in two versions, a nominal 325-kW (90 ton) model using R-134a or R-513A (TTH325) and a nominal 250-kW (70 ton) model using low-GWP HFO-1234ze (TGH250).

"We are thrilled to have been recognized once again by ASHRAE for our commitment to innovative engineering that pushes boundaries on energy efficiency and looks toward meeting future challenges," said Jose Alvares, vice president, sales and marketing, Danfoss Turbocor Compressors. "This marks the 27th time Danfoss has been recognized in the Innovation Awards program — the fifth time for Danfoss Turbocor Compressors, including having won Product of the Year in 2015 for our Turbocor® VTT compressor series."

"The new Danfoss Turbocor® TTH and TGH compressors give chiller manufacturers a new, high-efficiency, oil-free compressor option for use in air-cooled chiller, heat recovery, and water-to-water



Danfoss Turbocor TTH/TGH High-lift Compressor.

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heat pump applications,” said Ricardo Schneider, president and CEO, Danfoss Turbocor Compressors. “Up until now, positive displacement compressors have been the commonly-used compressors in these applications. But now for the first time, chiller manufacturers have an oil-free option that can significantly boost full- and part-load efficiency by 25% and lower sound by as much as 8 dBA in an oil-free platform with no performance degradation over the life of the product. Plus, the available low-GWP R-513A and ultra-low GWP HFO-1234ze refrigerant options on the Turbocor® TTH and TGH models provides a future-proof, environmentally-friendly solution today that complies with evolving refrigerant regulations and standards around the world.”

The annual awards competition honors the most inventive and original products, systems and technologies showcased at each year’s AHR Expo (International Air-Conditioning, Heating, Refrigerating Exposition) in the categories of: building automation; cooling; green building; heating; indoor air quality; plumbing; refrigeration; software; tools & instruments; and ventilation. Winners were selected by a panel of third-party ASHRAE member judges who evaluated all award entries based on innovative design, creativity, application, value, and market impact.

About Danfoss

Danfoss engineers technologies enabling the world of tomorrow to do more with less. We meet the growing need for infrastructure, food supply, energy efficiency and climate-friendly solutions. Our products and services are used in areas such as refrigeration, air conditioning, heating, motor control and mobile machinery. We are also active in the field of renewable energy as well as district heating infrastructure for cities and urban communities. Our innovative engineering

dates back to 1933 and today Danfoss is a world-leader, employing more than 25,000 employees and serving customers in more than 100 countries. We are still privately held by the founding family. Read more about us at www.danfoss.com.

Science Museum of Minnesota Honored with Trane Energy Efficiency Leader Award

Trane®, a leading global provider of indoor comfort systems and services and a brand of Ingersoll Rand, presented the Energy Efficiency Leader Award to the Science Museum of Minnesota. The award recognizes the museum’s long-term commitment to providing a learning atmosphere with minimal impact on the environment.

The Science Museum of Minnesota, one of the most visited museums in the upper Midwest and a national leader in providing informal science, technology, engineering and mathematics (STEM) education, invested in a more sustainable solution after learning building upgrades could save millions of dollars in energy costs. This was done by decreasing fossil fuels and high-energy sources coming from their building. Through a collaboration with Trane, the project exceeded expectations surpassing 75% of hot water heat savings since installation, and decreasing the amount of energy supply used in the community. The smart design practices and energy efficient systems implemented will save the museum more than \$300,000 in operating costs year-over-year.

“Our team was determined to reach its energy efficiency goals, to not only provide long term environmental benefits to our local community, but to make our building a living laboratory that demonstrates energy and sustainable solutions,” said Alison Brown, president and CEO, Science Museum of Minnesota. “We want

to inspire visitors that energy efficiency in large buildings is possible and feasible.”

As a part of the ceremony, Mitchell Farrell, vice president, commercial heating, ventilating and air-conditioning (HVAC), presented the grant and award to the museum’s leaders, including Alison Brown and Patrick Hamilton, director of global change initiatives at the Science Museum.

The museum’s goals extend beyond the building, and they continue to invest in the community by partnering with the Ingersoll Rand Foundation for their 2018 Year of the Engineer campaign. This year-long initiative will showcase unique programs and experiences designed to inspire and celebrate engineering’s power to turn ideas into innovations. The Ingersoll Rand Foundation provided a \$30,000 grant to invest in the museum educating kindergarten through 12th grade students on creating a more sustainable world.

“We are very proud to honor the Science Museum of Minnesota with the Ingersoll Rand Foundation grant and Energy Efficiency Leader award,” said Mitchell Farrell, vice president. “The museum exemplifies how partnerships can impact the sustainability efforts of an entire city, in this case St. Paul.”

Prior to implementing the upgrades, the museum’s leadership completed an energy research project of the building to identify opportunity for improvements. Based on the results, Science Museum of Minnesota maximized energy conservation measures for the building. Selected upgrades included chillers designed to lower environmental impact. The project team also added a building automation system to control heating, ventilation and air conditioning, as well as lighting systems to keep the machines running at an optimized condition every day.



Matt Spresser, account manager for Trane, Patrick Hamilton, director of global change initiatives at the Science Museum of Minnesota, Mark Platt, sales manager at Trane, Alison Brown, president and CEO of the Science Museum of Minnesota, Todd Gray, facility director of the Science Museum of Minnesota, and Mitchell Farrell, vice president at Trane (from left).

Each year, Ingersoll Rand and its family of brands – including Club Car®, Ingersoll Rand®, Thermo King® and Trane® – recognize organizations demonstrating an outstanding commitment to implementing best practices in energy efficiency and sustainability.

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About Ingersoll Rand

Ingersoll Rand (NYSE:IR) advances the quality of life by creating comfortable, sustainable and efficient environments. Our people and our family of brands – including Club Car®, Ingersoll Rand®, Thermo King® and Trane® – work together to enhance the quality and comfort of air in homes and buildings; transport and protect food and perishables; and increase industrial productivity and efficiency. We are a \$13

billion global business committed to a world of sustainable progress and enduring results. Trane solutions optimize indoor environments with a broad portfolio of energy efficient heating, ventilating and air-conditioning systems, building and contracting services, parts support and advanced control. For more information, visit www.ingersollrand.com or www.trane.com.

About the Science Museum of Minnesota

The Science Museum of Minnesota is one of the state’s most popular museums, with a reach extending well beyond its riverfront location in downtown Saint Paul. It serves hundreds of thousands of people each year with its engaging exhibits, breathtaking giant screen films, and unique special events. Science Museum education programs touch students in all of Minnesota’s 87 counties each year, and its research programs span the globe. For more information, visit smm.org.



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