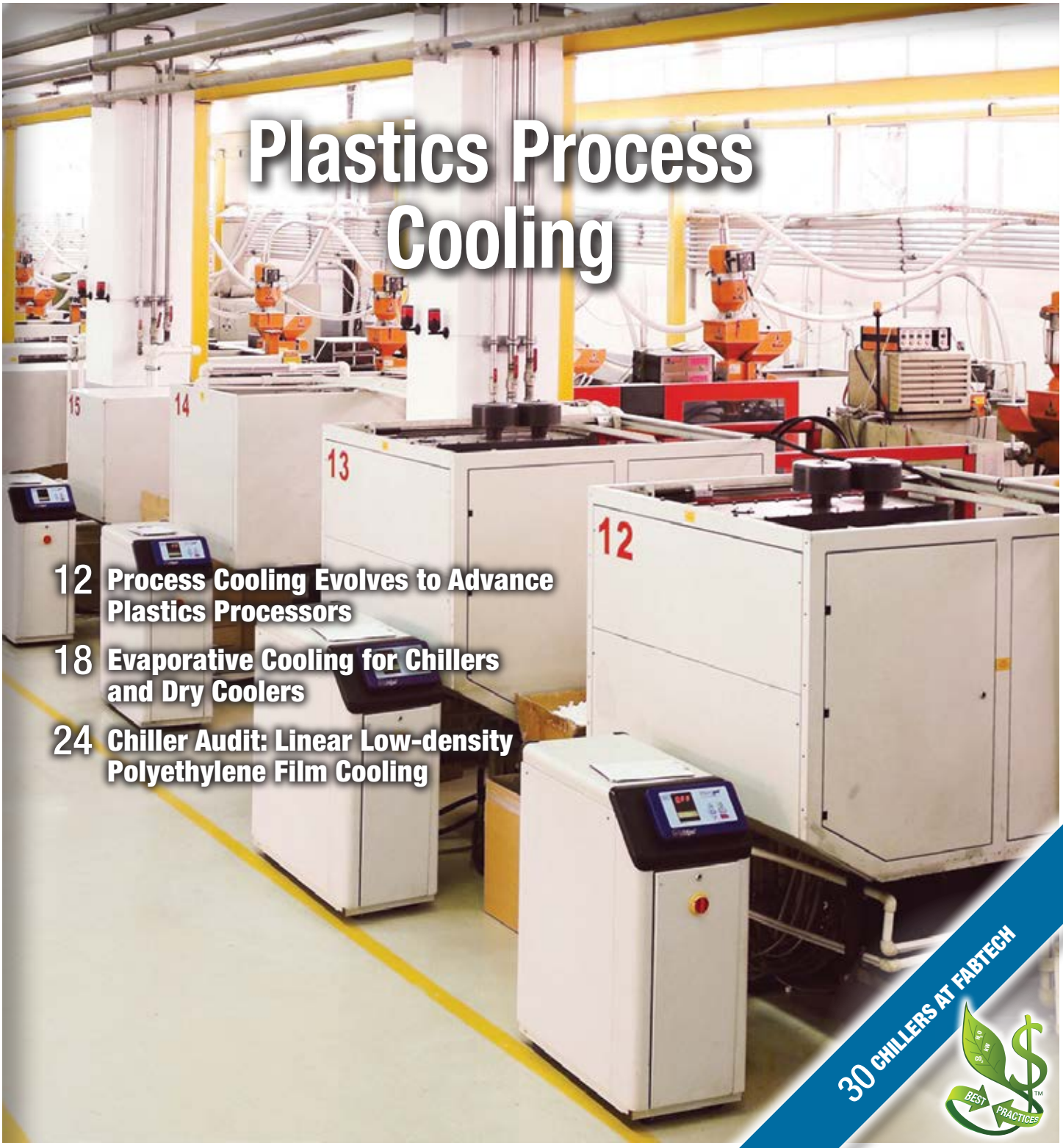
The Magazine for ENERGY EFFICIENCY and WATER CONSERVATION in Industrial Cooling Systems

CHILLER & COOLING BEST PRACTICES

coolingbestpractices.com

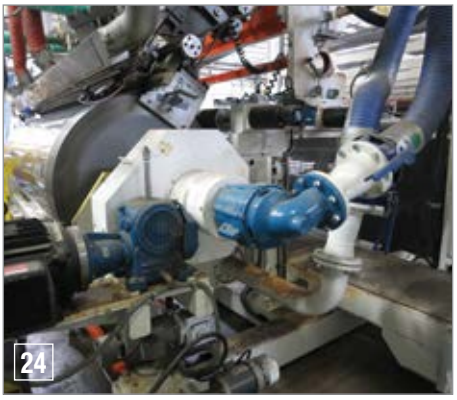
March 2016



Plastics Process Cooling

30 CHILLERS AT FABTECH

SUSTAINABLE MANUFACTURING FEATURES



*Magazine Cover Image Provided Courtesy: Frigel North America, as part of their article on page 12, "Process Cooling Evolves to Advance Plastics Processors."

FROM THE EDITOR | Plastics Processors

We are really enjoying venturing into the process cooling world and bringing our systems approach to the topic. In the plastics industry, process cooling systems are a fundamental part of injection molding, blow molding, thermoforming and extrusion processes.

Frigel North America has a long history of bringing a systems approach to the plastics industry. Global Marketing Manager Al Fosco writes in his lead article in this issue, "When it comes to advanced process cooling, the key regardless of the plastic processing method involved is to first understand the numerous variables of any given operation and the strategies each processor uses to design and manufacture products." Fosco continued, "Typically, the approach involves a full survey and technical analysis of a facility to establish cooling load requirements; plant floor and outside equipment layouts; and cooling equipment parameters including flow, pressure and temperature requirements."

When was the last time you read a Psychometric Chart? Raul Simonetti, from CAREL, flings one at us, in his article this month, titled "Evaporative Cooling for Chillers and Dry Coolers." This is an excellent piece, to be read multiple times and kept on file. He reviews evaporative cooling on the psychrometric chart, evaporative cooling by finned heat exchangers and the advantages/application of atomizing systems.

Our system assessment article reviews a process cooling system consuming 19% of total annual energy use (1.5 million out of 8 million kW/h) in a linear low-density polyethylene film manufacturing plant. Tim Dugan, from Compression Engineering, outlines his audit of the two 140-ton chillers, running all year, and cooling glycol to the plant at 53-49°F temperatures.

Lastly, we hope you enjoy our Show Report on chiller technologies at the 2015 FABTECH Show. We review the process cooling expertise on display dedicated to helping spot and seam welding and metal-cutting/fabrication processes.

Thank you for investing your time and knowledge with *Chiller & Cooling Best Practices* and please remember to visit our new website at www.coolingbestpractices.com.

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CHILLER & COOLING SYSTEM INDUSTRY NEWS

Mokon Redesigns High Temp Duratherm MAX Line

Mokon has completed the redesign of its Duratherm MAX water system line. The new design incorporates a top air discharge directing waste heat away from personnel, increased mechanical compartment ventilation, greater access to components for maintenance, and improved overall performance of the system.

Mokon's Duratherm MAX is a line of high performance water systems with temperatures up to 380˚F (193˚C) and system pressures up to 300 PSI (20.7 Bar). Duratherm MAX is ideal for restrictive processes and high temperature water applications.

The Duratherm MAX design features a stainless steel heater vessel that is designed and tested to ASME standards. The system utilizes nonferrous and stainless steel materials of construction and a seal-less magnetic drive turbine pump fitted with a stainless steel impeller. The Duratherm MAX incorporates a unique fan-cooled heat exchanger that provides safe and dependable cooling of the process fluid and eliminates thermal shock, flashing to steam, mineral buildup and expansion noise.

"Mokon's Duratherm MAX is a line of high performance water systems with temperatures up to 380˚F (193˚C) and system pressures up to 300 PSI (20.7 Bar)."

Standard Features:

- Up to 380˚F (193˚C) and system pressures up to 300 PSI (20.7 Bar)
- Single zone configurations
- Up to 24 kW heating capacity
- 1-1/2 to 5-1/2 Hp pumping capacities
- Magnetic drive seal-less turbine pump

- Stainless steel heater vessel designed and tested to ASME Code
- Air-cooled heat exchanger for rapid cooling

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- Microprocessor-based controller in easily accessible panel
- SCR power controller extending heater life, fast cycling, and energy savings
- NEMA 12 rated electrical enclosure with safety door disconnect switch
- cULus 508A labeled electrical panel
- Meets NFPA 79 electrical safety standards

For more information visit www.mokon.com

AHR Expo Survey Shows HVACR Manufacturer 2016 Market Outlook Optimism

Responses from a recent joint survey, sent to 1,300 2016 AHR Expo exhibitors by *ASHRAE Journal* and International Exposition Co., revealed optimism for the coming year in the HVACR industry.

The survey asked HVACR equipment manufacturers to consider what they anticipate the business climate will be for the industry – regarding their sales, market segment activity and overall expectations – for 2016. Results were compared to a similar survey sent out in November of 2014, which gauged exhibitors' expectations for 2015. While some answers varied from year to year by only slight percentage points in either direction, some were drastically different, representing changes and future trends in the industry.

According to the survey, 86 percent of exhibitors are confident about their business prospects in 2016, with 14 percent answering "excellent" and 62 percent selecting "good." Only 14 percent rated conditions poor or had no opinion. These numbers, particularly the percentage of "good" answers, are fairly consistent with

2015's survey, which showed a significant growth in optimism from previous years.

Exhibitors also expressed positive outlooks when asked about their expectations of sales growth in the new year based on prospective clients. 81 percent expected to see an increase in sales. Of those, 21 percent predicted a 10 percent growth while 33 percent anticipated between 5 and 10 percent growth.

In keeping with the positive outlook for industry growth in 2016, 67 percent of HVACR manufacturers responding to the survey said they plan to introduce a new product at the 2016 AHR Expo in January. Of those new products, 53 percent aim to improve energy efficiency.

The survey question asking, "In general, how much are government and/or utility incentives helping to increase the adoption of energy-efficient products and technologies?" lent additional insight in this regard. Fifty-eight percent answered "some," 28 percent said "very little," and 5 percent responded "not at all," while only 9 percent said "a lot." This feedback shows that the industry would welcome and appreciate more help from incentive programs in the coming year.

When manufacturers were asked about their viewpoints on various market segments in the new year, data and telecom centers, hospitals and healthcare facilities all tied with the residential market for best outlook overall. All were rated "excellent" or "good" by 65 percent of respondents. Data and telecom centers and residences were both rated "excellent" by 10 percent and "good" by 55 percent, while hospitals and healthcare facilities ratings were 16 percent and 49 percent, respectively. Closely following in ratings were light commercial and office buildings with 62 percent each and heavy commercial with 60 percent "excellent" and "good" ratings. These percentages are a sign of stability in the industry, as they are on par with last year's survey results showing the strongest outlooks in the same markets.

When it came to the anticipated best potential for business in 2016, responses skewed from those of 2015's survey. Forty-two percent of respondents selected "retrofit and renovations" as the most opportunistic area of the industry, up 14 percentage points from last year. Thirty percent selected "new construction," which was last year's number one answer. "Maintenance and replacement" decreased from 32 to 28 percent in the year between surveys.

"Numbers like these represent the ever-changing needs of this vast, complex industry," said Clay Stevens, president of International Exposition Company. "Yes, the market segments have stayed consistent, but their needs haven't. We are seeing less new construction and a jump in demand for renovations in existing structures. Much of this

"We are seeing less new construction and a jump in demand for renovations in existing structures."

– Clay Stevens, president of International Exposition Company

CHILLER & COOLING SYSTEM INDUSTRY NEWS

comes from a market-wide push for energy efficiency and conservation of resources, which I am pleased to see. The trend of improved energy efficiency in products lends hope to the future in regard to streamlining energy usage worldwide."

The next question asked manufacturers to rate the importance of various product features to their customers. Leading the pack of what customers considered "very important" was reliability with 87 percent.

"2016 may see a drastic shift in focus toward creating even more energy-efficient products and technology industry-wide."

An additional 11 percent said reliability was "somewhat important." The playing field was evened out when totals of "very important" and "somewhat important" were calculated. Energy efficiency, indoor air quality, maintenance and first cost totals all fell in the 93- to 98-percent range. Comfort was considered important to 90 percent of customers and sustainability to 82 percent. When it came to use of recycled materials in the product or its packaging, answers were evenly split, with 50 percent deeming it important and 50 percent selecting "not important."

Examining customers' needs along with the needs of the industry as a whole, exhibitors' responses provide a more in-depth understanding of industry trends. When exhibitors almost unanimously agree that reliability is very important to customers, for example, it indicates a trend of engineering and manufacturing to greater reliability across HVACR industry products.

A final, open-ended question asked manufactures what they perceive to be the most important trend or issue in the current HVACR industry. Responses included: renewable fuels, the expansion of the Internet of Things (IoT), building automation, product cost and education, training and recruitment of HVACR staff. At-large, the most common answer was energy efficiency, suggesting that 2016 may see a drastic shift in focus toward creating even more energy-efficient products and technology industry-wide.

About AHR Expo

The International Air-Conditioning, Heating, Refrigerating Exposition (AHR Expo), which began more than 85 years ago as a heating and ventilation show, has now grown into one of the world's largest HVACR events. The Exposition is held annually in key markets and major cities across the U.S., hosting close to 2,000 exhibitors and bringing in crowds of 60,000 industry professionals.

For more information visit www.ahrexpo.com

Chillers and Cooling Systems at WEEC 2015

This year's World Energy Engineering Conference was held at the Orange County Convention Center (OCCC) in Orlando, Florida, from September 30 through October 2. The conference featured an outstanding keynote speech from Dr. Condoleezza Rice, who touched on many diverse topics, such as national security, Vladimir Putin, and other "great powers behaving badly"; the importance of energy management to the U.S. economy; and even NCAA football.

Chiller and cooling system manufacturers held a strong presence on the exposition floor, and they were presenting technologies that help engineers monitor the energy and water use of their chiller and cooling systems.

"The use of multiple refrigeration compressors, in each chiller, can potentially eliminate multiple chillers, controls, and pumps in a over-all cooling system design."

— Marcos Awad P.E., Smardt Chiller Group

tekWorx

tekWorx innovative chiller controls help to optimize chiller systems to cool at the lowest kW per ton, as opposed to normally controlled systems that constantly cool to design-day specifications. Their booth featured several case studies, including one that described how tekWorx helped Chrysler reduce annual cooling costs by 28 percent.

Also prominently displayed at the tekWorx booth was their newly introduced COACH™ chiller plant control and energy optimization system specifically designed for smaller chilled water plants. COACH™ is scalable down to plants with two chillers, and provides the same adaptive control over chillers, pumps, and cooling towers that has helped other clients of tekWorkx cut energy costs and recover lost capacity. And, as with any good control system, COACH™ provides remote notifications and data-logging capabilities for key performance indicators.

Eddie Rogers, Sales Engineer, Mike Flaherty, GM, and Anne Duncan, Marketing Manager of tekWorx

Smardt Chiller Group

Smardt Chiller Group had one of the bigger booths at WEEC 2015, where the company had a large portfolio of its chiller technology on display. Included was their TR chiller, which featured the company's fourth generation of compressors, along with a new refrigerant, 1234ze. Their magnetic-bearing chillers are manufactured in Florida, and come in both water- and air-cooled configurations. Smardt also boasts the largest oil-free centrifugal chiller worldwide.

Smardt chillers are oil-free machines, and require much less maintenance when compared to lubricated units. As discussed with Marcos Awad, P.E., Sales Application Engineer at Smardt Chiller Group, their chillers are commonly used in manufacturing facilities — in industries like the pharmaceuticals, food and beverage, automotive, chemical, and aerospace. He also mentioned that the use of multiple compressors in each chiller allows for redundancy safeguards, and can potentially eliminate multiple chillers, controls, and pumps in a system's design.

Marcos Awad, P.E., Sales Application Engineer, standing next to a Smardt chiller at WEEC 2015

Micronics

Micronics, a manufacturer of ultrasonic liquid flow meters, presented a metering solution for measuring water flow rates and temperatures of both flow and return piping. The flow meter, called the Ultraflo U1000 HM, can clamp on by simply adjusting to pipe diameter, and provides an accurate flow rating of ±1 to 3 percent. It also provides a real-time display of energy rate and totalized energy, which can be communicated via Modbus communication.

Graham Jennings, Export Sales Manager, and Dave Casper, Micronics North America Sales Manager, demonstrating Micronics' new fixed clamp on BTU meter

CHILLER & COOLING SYSTEM INDUSTRY NEWS

Chiller & Cooling Best Practices always preaches: "You can't manage what you don't measure," and this flow meter provides another way for energy managers to evaluate and control a plant's energy spend. The Ultraflo U1000 HM is compatible with steel, plastic, and copper piping, and can be used for hot water, chilled water, and chilled water with glycol.

Martin Previtera and Julie Ferguson at the Delta Cooling Tower booth

Bruce Lung, Industrial Technical Assistance Fellow, and Tom Wenning, Technical Account Manager, at the DOE booth

Delta Cooling Towers

Providentially, adjacent to the Chiller & Cooling Best Practices booth was Delta Cooling Towers, Inc., a manufacturer of cooling towers and packaged cooling systems. Martin Previtera, Delta's Regional Sales Manager, and Julie Ferguson, President of ADI HVAC Equipment, were announcing Delta's new 20-year warranty, along with Delta's full portfolio. The warranty covers each of the cooling tower's plastic (HDPE) shells, which eliminates any risk of corrosion.

Department of Energy

Last, but certainly not least, the Department of Energy's (DOE's) Better Buildings, Better Plants program was exhibiting at WEEC 2015. During the morning keynote speeches, David Friedman, Principal Deputy Assistant Secretary of the Office of Energy Efficiency and Renewable Energy (EERE), announced that the Association of Energy Engineers' Certified Energy Manager certification program is the first to be recognized under the DOE's Better Buildings Workforce Guidelines. The alignment between the AEE and DOE is yet another way Better Buildings is expanding its influence.

At the DOE booth, Bruce Lung, Industrial Technical Assistance Fellow at the DOE's Advanced Manufacturing Office and Tom Wenning, Technical Account Manager, discussed the Better Plants program, which has grown to partner with 157 industrial organizations that represent 11.4 percent of the total U.S. manufacturing energy footprint. Partners include companies like 3M, Ingersoll Rand, Johnson & Johnson, Shaw Industries, and Volvo Trucks.

To read more about ***Chiller and Cooling Technology,*** please visit www.coolingbestpractices.com/technology.

"We have announced a new 20-year warranty covering the cooling towers' corrosion-free plastic (HDPE) shells."

— Martin Previtera, Delta Cooling Tower

Process Cooling Evolves to ADVANCE PLASTICS PROCESSORS

By Al Fosco, Global Marketing Manager, Frigel North America

Plastics processors are looking to advanced process cooling equipment to lower operational costs, and in many cases, improve the quality of products and achieve sustainability goals. But it's more than just a matter of finding a better mousetrap and putting systems to work. Instead, it requires a keen understanding of the processes involved, followed by the design and installation of advanced technology in combination with the right process cooling systems matched to a company's goals.

Plastics Processing Methods

A number of plastic processing methods rely on engineered process-cooling systems to cool previously heated thermoplastic materials to form the shape for a part or product. The basic methods include:

- **Injection molding:** Heated material is injected into a mold with two halves and subsequently clamped shut. The part is ejected from the mold when the plastic inside the mold is properly cooled and solidified.
- **Blow molding:** Much like injection molding, blow molding involves the use of molds. Unlike injection molding, however, the basic process involves the use of compressed air to inflate a heated plastic tube so that it conforms to the interior design of the mold, which is then cooled to set the

A Frigel closed-loop fluid cooler can be used with individual Microgel combination chiller/temperature control (TCU) machines to achieve accurate temperature control with minimal temperature variation at each machine/processes.

material to the shape of the mold. From there, the part is removed from the mold. Variations of blow molding are injection, injection stretch, and extrusion.

- **Thermoforming:** A flat sheet of material is heated to its softening temperature and then forced against the contours of a mold using air, vacuum pressure or mechanical means. The thermoformed part holds its shape after it is cooled. If the mold is aluminum, the mold is often cooled.

- **Extrusion:** Dry materials are fed into one end of a heating chamber and then forced out of an opening or die at the other end to create the shape of the product. Often, the hot extruded plastic is pulled through a water-fed vacuum tank and any number of water baths to remove heat and sufficiently cool and solidify the product.

When it comes to advanced process cooling, the key regardless of the plastic processing method involved is to first understand the numerous variables of any given operation and the strategies each processor uses to design and manufacture products. Typically, the approach involves a full survey and technical analysis of a facility to establish cooling load requirements; plant floor and outside equipment layouts; and

PROCESS COOLING EVOLVES TO ADVANCE PLASTICS PROCESSORS

cooling equipment parameters including flow, pressure and temperature requirements.

Clear Goals and Opportunities

The outcome of a thorough planning process is a list of clear objectives and the identification of opportunities for process cooling to help achieve them. While the strategy is developed around the uniqueness of each operation, many plastics processors share common goals. They include:

- **Operational efficiencies:** Process cooling plays a key role in the efficiencies of plastics processing, whether its decreased cycle times for processes that involve molds, or throughput when the method is extrusion.
- **Product quality:** Consistency in temperature, pressure and flow is essential to the manufacturing of quality products with the lowest possible cycle time, and with minimal scrap.
- **Cost savings:** A carefully planned approach to process cooling, combined with newer technology, can result in considerable water and energy savings. Saving water and energy also aligns with sustainability goals. In addition, cost savings can be realized with systems that require less maintenance.
- **Simplification:** Many processors add process-cooling equipment to the mix over time, which can lead to inefficiencies in training and time needed to service disparate equipment. Often, various machines on the plant floor can also consume limited floor space. Simplification of process cooling can result in a streamlined operation that contributes to the bottom line and more space for processing equipment.
- **Environmental stewardship:** In addition to controlling costs, progressive processors strive to be environmental stewards.

The Frigel Ecodry 3DK closed-loop fluid cooler, which is housed outside a facility, serves as the primary component of an integrated, closed-loop cooling system. It provides clean water at the right temperature to plastics processes year round.

While there are many similarities in what processors hope to achieve, expert analyses and planning is crucial to the strategy used since each operation is unique.

Traditional Systems and Limitations

When assessing options, many processors have recognized limitations of traditional process cooling systems that often take the form of open-cooling towers and central chillers.

A common approach involves the use of open-cooling towers to feed water-cooled central chillers. Open-cooling towers, however, use an evaporative process to cool water making them notorious water wasters. An open-cooling tower also leaves water exposed to outside elements and surrounding communities are at risk for waterborne illnesses such as Legionella. All the while, the open system requires costly chemical treatment and disposal.

Some processors use air-cooled chillers instead of a cooling tower to avoid dirty water. An air-cooled chiller, however, uses ambient air to remove heat from the refrigerant circuit. That means the higher the ambient air temperature, the higher the compressor condensing temperature. As such, the chiller's refrigeration compressor must work harder in turn consuming high amounts of electricity to provide chilled water.

Whether it's an air- or water-cooled chiller, another consideration is that central chillers are designed to only provide water at one water temperature to all machines/processes. Yet the reality is that some equipment or processes might need water at a higher temperature than the chiller provides. A processor must then add a temperature control unit (TCU) to reheat the chilled water for given machines or processes, wasting energy. Some situations call for multiple TCU machines. There are also times when a processor must devote both a TCU and a machine-side chiller to any given machine to deliver the proper water temperatures since, for example, two halves of a mold may require significantly different temperatures, adding even more piping and machines to the mix.

The challenges and limitations of conventional methods used in plastics process cooling opened the door for alternate methods and more sophisticated technology.

One approach introduced by Frigel is known as Intelligent Process Cooling. It involves technically advanced systems configured to match customers' unique processes and goals.

Central Fluid Cooler Advantages

One newer technology is the company's closed-loop Ecodry fluid cooler, which is located outside a facility's plant. It uses heat exchangers and an internationally patented adiabatic chamber to cool water circulated to it from machines/processes within a plant. The adiabatic chamber pre-cools ambient air on hotter days before it enters the unit's heat exchanger compartment. Cooled water is then re-circulated to machines/processes. A microprocessor-based controller automatically maintains precise cooling temperatures.

As a closed-loop system, it allows users to reduce water consumption by as much as 95 percent when compared with open cooling towers. Using the same clean water continuously also greatly minimizes maintenance issues and eliminates costs associated with water disposal and treatment.

The central fluid cooler also offers "free cooling" because it uses ambient air to cool process water. Free cooling means there is no need for chillers to meet cooling loads when ambient conditions permit. Instead, the system automatically shuts down the chillers to capitalize on free cooling.

> "The challenges and limitations of conventional methods used in plastics process cooling opened the door for alternate methods and more sophisticated technology."
>
> — Al Fosco, Global Marketing Manager, Frigel North America

PROCESS COOLING EVOLVES TO ADVANCE PLASTICS PROCESSORS

Shown Frigel Microgel chiller/TCU combination machines, which supply water to dedicate machines/processes, ensuring a consistent supply of pressure and high turbulent flow where needed. The compact modules also provide temperatures from 48˚F to 195˚F with accuracy of plus/minus 0.5˚F.

The closed-loop system also ensures water cleanliness. Additionally, it avoids the risk of proliferation of harmful bacteria, such as Legionella, due to the absence of stagnant water. Compared with cooling towers, it also results in significantly reduced maintenance and minimization of water treatment chemicals.

Advanced Approach to Machine-side Cooling

Another newer technology is the Frigel Microgel, which combines a chiller and TCU in one machine. A combination chiller/TCU includes a refrigeration system and, depending on the machine, either one or two temperature control zones within the same cabinet. A traditional TCU is without a chiller.

In plastics processing, each combined chiller/TCU is dedicated to its own machine or process and operates independently from the others. A high-flow process pump within the combined chiller/TCU also feeds water to the dedicate machine/process, ensuring a consistent supply of pressure and high turbulent flow where needed. It also provides temperatures from 48˚F to 195˚F with accuracy of plus/minus 0.5˚F.

A combined chiller/dual zone TCU, for example, lets molders independently control both mold halves with one machine to accommodate precise heating and cooling requirements. As such, it eliminates the need for three machines to perform the same task.

For extruders, older extrusion tanks are not equipped with a heat exchanger or recirculation pumps. However, an advanced chiller/TCU can provide the heat exchanger and necessary tank recirculation pump – in addition to the refrigeration system.

The end result is overall efficiencies and more control over process cooling temperatures, leading to repeatability, improved cycle times and reduced scrap in molding. Extruders are able to achieve stable heat profiles, resulting in increased throughput.

Advanced chiller/TCUs can also be paired with the central fluid cooler as part of an integrated closed-loop process cooling system.

Plastics Processors Win

Plastics processors throughout the world have found success with the more advanced approach to process cooling – giving them an advantage in a highly competitive industry where every step in process efficiency adds value.

As an example, an injection molder focused on products for the medical industry replaced an open cooling tower with two closed-loop fluid cooler systems. Additionally, the company replaced separate TCUs with 15 combination chiller/dual zone TCU machines. The central fluid coolers supply water to the chiller/TCUs throughout operation. The system also allows the individual chiller/TCU modules to power down the compressors when the fluid coolers can provide sufficiently cool water, depending on outdoor ambient conditions.

The integrated system gives the molder the ability to control process-cooling temperatures within +/- 3 degrees F versus +/- 5 degrees F with the old system – and do it year-round for improved repeatability and increased throughput of high-quality parts cycle-to-cycle and cavity-to-cavity.

The processor has also eliminated the need for multiple portable chillers and TCUs for each press location. In addition, it now consistently supplies clean water to machines, while consistently saving approximately 95 percent in process cooling water compared to the open cooling tower. Additionally, it virtually eliminated maintenance issues associated with the cooling tower and it no longer discharges chemicals to the municipal wastewater system.

Another example involves a company that uses this technology in the extrusion of drinking straws. The company replaced two five-ton air-cooled chillers with two closed-loop fluid coolers and added combined chiller/TCU units at three tanks. The fluid coolers provide water to the company's three extruders, as well as chiller/TCU units located at each line.

By installing the system, the company consistently achieves a stable heat profile. Doing so ensures dimensional stability on the extrusion lines, as well as the desired color and clarity of products. The company has also increased throughput by as much as 15 percent and saves tens of thousands per year in water and energy costs when compared to the alternative of a cooling tower/central chiller. BP

For more information, contact Frigel North America at tel: 847-540-0160, email: sales.fna@frigel.com, www.frigel.com

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"Plastics processors throughout the world have found success with the more advanced approach to process cooling – giving them an advantage in a highly competitive industry where every step in process efficiency adds value."

— Al Fosco, Global Marketing Manager, Frigel North America

EVAPORATIVE COOLING for Chillers and Dry Coolers

By Raul Simonetti, HVAC/R Corporate Business Manager, CAREL

Physics teaches us that water, when evaporating in an adiabatic system, removes sensible heat from such system. The temperature thus decreases. In order for the water to evaporate, energy is required, specifically 2501 kilojoules for each kilogram of evaporated water. In the absence of an external energy source, the water absorbs the required energy from the environment, in this case from the surrounding air. As a consequence, the air is cooled. In simple terms, it can be stated that evaporation of water converts the sensible heat of the air (temperature) into latent heat (humidity). As a result, the system is cooled and humidified at the same time. This type of cooling is referred to in literature as evaporative cooling or adiabatic cooling.

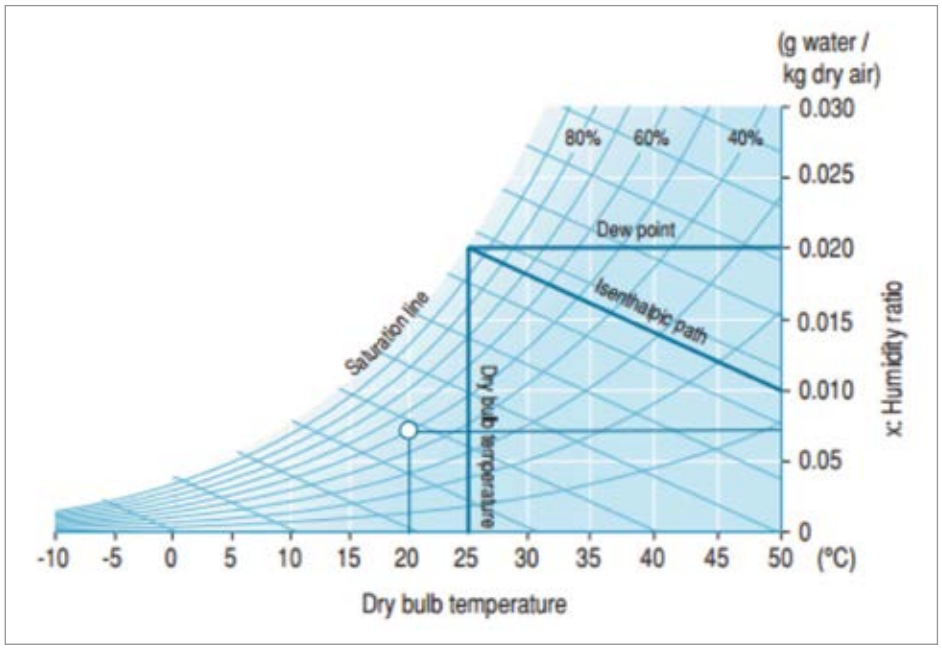

Figure 1. Psychrometric chart

Evaporative Cooling on the Psychrometric Chart

Psychrometric charts show the air humidity ratio on the Y axis, and the dry bulb temperature, i.e. the temperature measured by an ordinary thermometer, on the X axis. The curved lines connect points with the same relative humidity (e.g. 40%, 60%, 80%rh).

At a certain temperature, the air contains a certain quantity of water vapor. When the quantity of vapor is at the maximum (100%rh), saturation point has been reached and the vapor starts to condense. The saturation points are joined by the saturation curve. The higher the temperature, the more water vapor the air can contain. The following example explains the effect of evaporative cooling. The dry bulb temperature is 40˚C, and the relative humidity is 15% (the air is not saturated). By allowing water to evaporate spontaneously, the temperature of the humid air will fall until reaching the saturation curve. The heat in the air is absorbed by the water as it evaporates: sensible heat is converted into latent heat. The effect in the example is that the temperature falls by 20˚C. This psychrometric transformation is represented by a segment that joins two points with the same enthalpy, i.e. the same amount of energy, as sensible heat is transformed into latent heat yet the sum of these remains constant.

The wet bulb temperature is measured by an ordinary thermometer wrapped in a moist cloth. Continuous evaporation of water causes the temperature to fall. The wet bulb temperature is always less than the dry bulb temperature, except when relative humidity is 100%, i.e. when the air contains the maximum quantity of water vapor possible at that specific temperature.

Below is an example of a direct evaporative cooling application in summer. In an air handling unit, the supply air, a mix of fresh air and recirculated air, is adiabatically humidified and is transformed from a temperature of 30˚C at 30%rh to 25˚C at 50%rh.

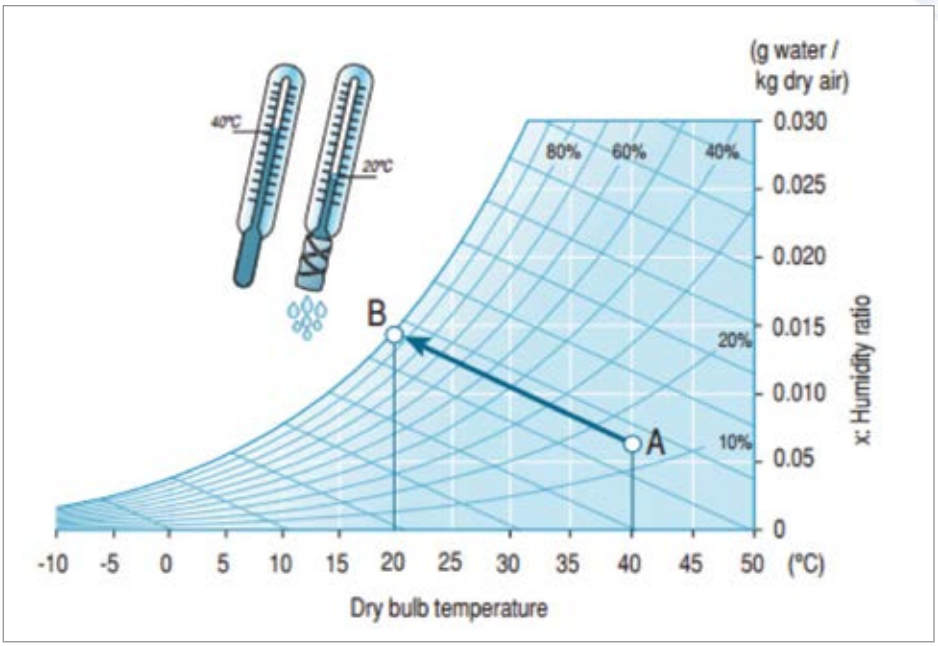

Figure 2. Adiabatic air humidification

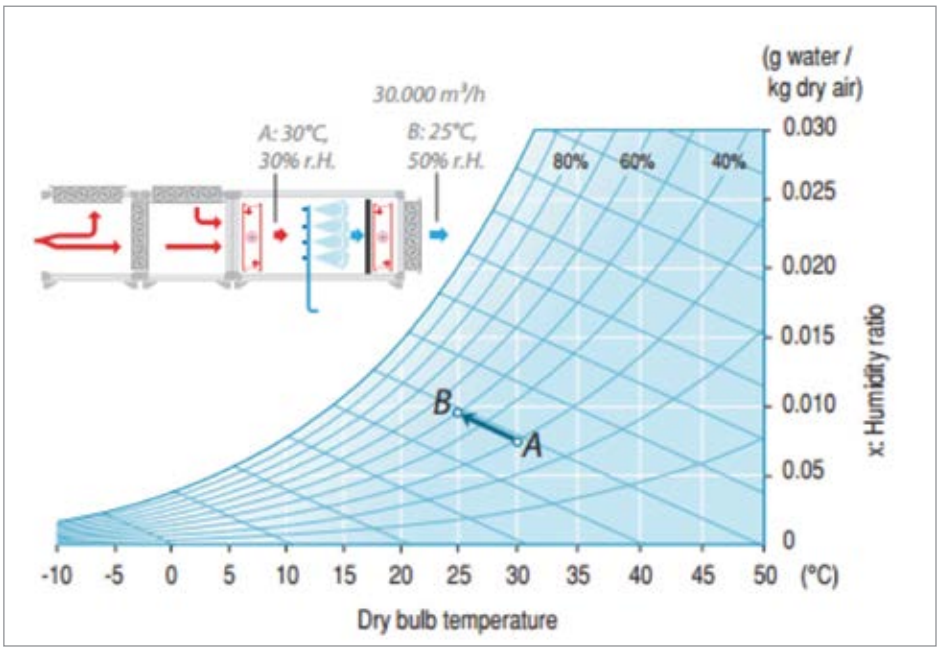

Figure 3. Direct evaporative cooling

EVAPORATIVE COOLING FOR CHILLERS AND DRY COOLERS

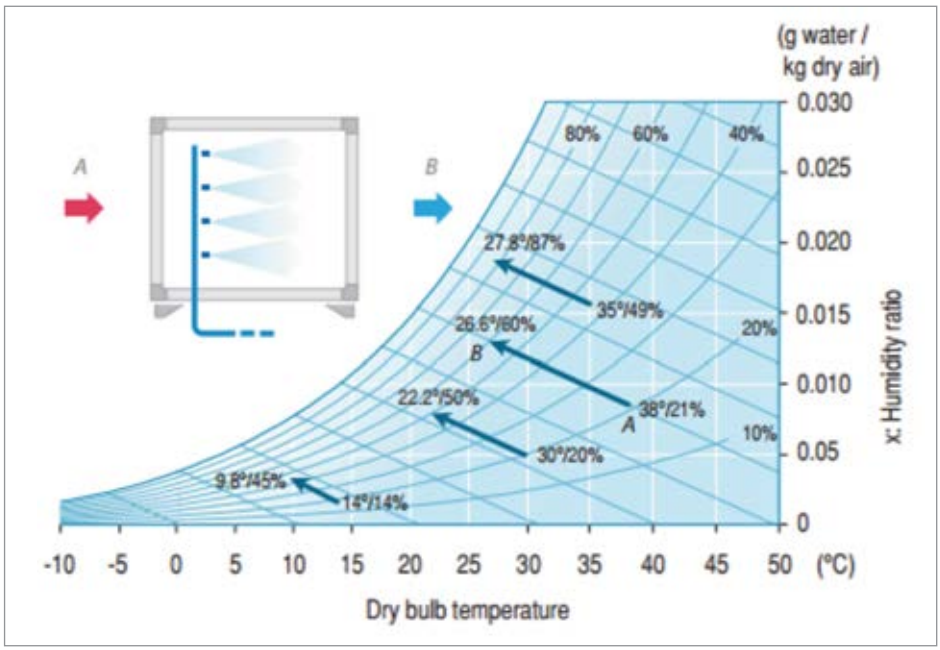

Figure 4. 80% saturation efficiency with different starting conditions

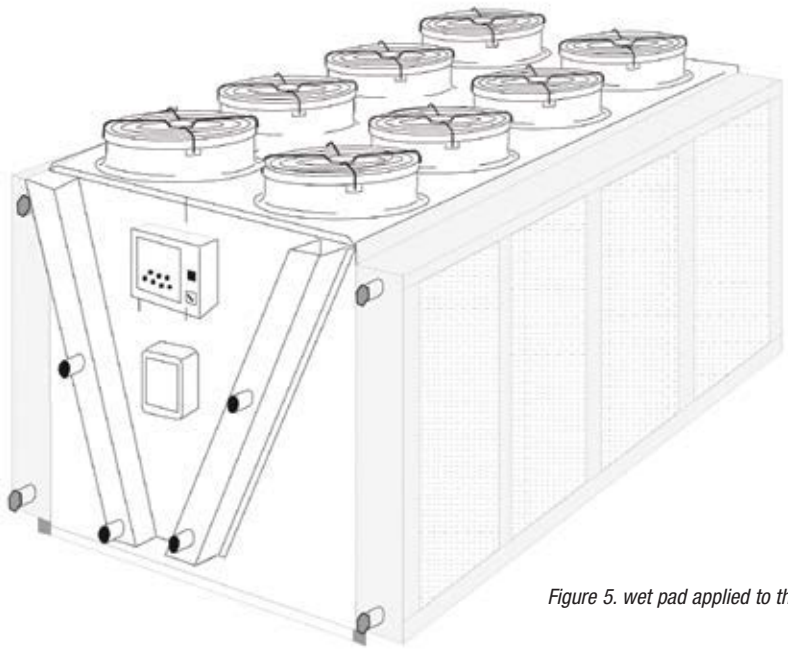

Figure 5. wet pad applied to the coil

Key:
A: supply air before humidification;
B: supply air after humidification;

The heat removed from the supply air can be calculated using the formula:

$$q_{sens} \approx G_a \cdot c_{pa} \cdot (t_2 - t_1)$$

where:
q_{sens} = sensible heat, in kW;
G_a = air flow-rate, in kg/s;
c_{pa} = specific heat of dry air at constant pressure = 1.005 kJ/(kg · K).

In the example shown in the figure:
G_a = 30000 m^3 /h · 1.225kg/m^3 = 36750 kg/h -> 10.2kg/s;
t_A = 30°C; t_B=25°C;
q_{sens} = 10.2 · 1.005 · (30-25) ≈ 51.255 kW.

The result of evaporative cooling depends on the starting temperature-humidity conditions. The arrows in the figure indicate different dry bulb temperature and relative humidity conditions.

Evaporative Cooling by Finned Heat Exchangers

The amount of heat extracted by air-conditioning systems using chillers or dry coolers depends on various factors, including the outdoor dry bulb temperature. In climates where dry bulb temperature is greater than wet bulb temperature by at least 5°C, evaporative cooling of the outside air can also be exploited. Most chiller and dry cooler installations are sized according to the

> "In climates where dry bulb temperature is greater than wet bulb temperature by at least 5°C, evaporative cooling of the outside air can also be exploited."
>
> — Raul Simonetti, HVAC/R Corporate Business Manager, CAREL

maximum outdoor temperature, a fact that has had more impact in recent years as a result of summer heat waves. Oversizing the units means more pollution, higher noise levels and higher investments in heat exchange areas that are unproductive in during when demand is lower. Evaporative coolers can simplify system operation in these specific conditions. Various technical solutions are available on the market, including:

a. wet pads applied directly to the heat exchange coils;

b. shade covers wetted by nozzles;

c. pumping unit and distribution system to spray finely atomized water in the opposite direction to the air flow through the coils.

Let's analyze the latter solution in detail. The pumping unit is activated based on outdoor temperature or condensing pressure, or a combination of the two.

The water droplets evaporate spontaneously, absorbing energy from the air, which is consequently cooled, and comes into contact with the finned coil at a lower temperature. In this way, the heat exchanger can dissipate the rated amount of heat even when the climate is hotter than expected. Note that the atomized water particles do not evaporate completely before reaching the finned coil, both due to the short distance available and variations in outside air conditions; consequently, the heat exchanger fins are wetted, and this further increases overall system efficiency. Atomizers used for evaporative cooling can operate on untreated mains water or demineralized water. The advantages of mains water are ready availability and lower cost compared to demineralized water; against this, some of the mineral

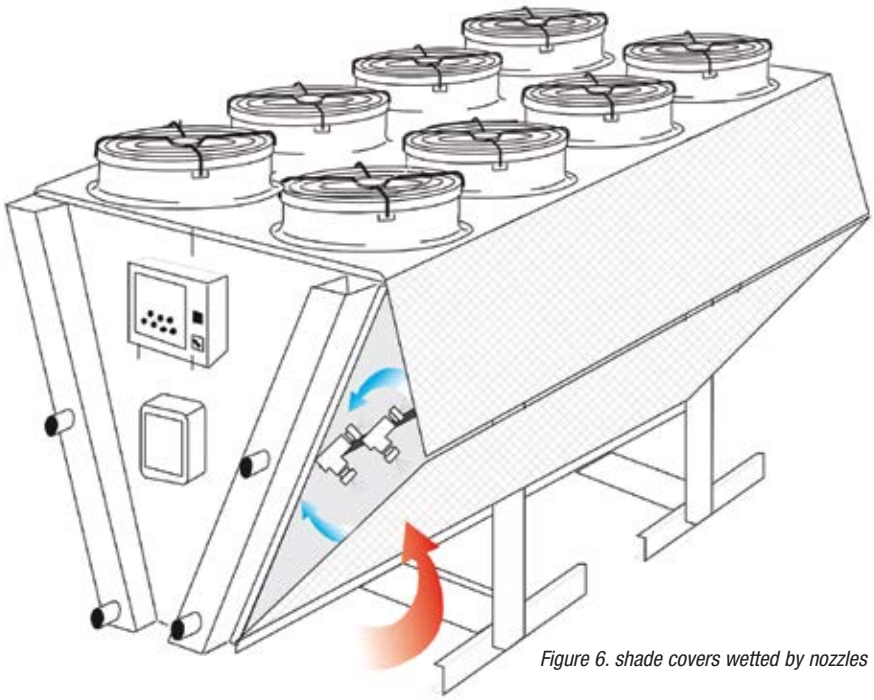

Figure 6. shade covers wetted by nozzles

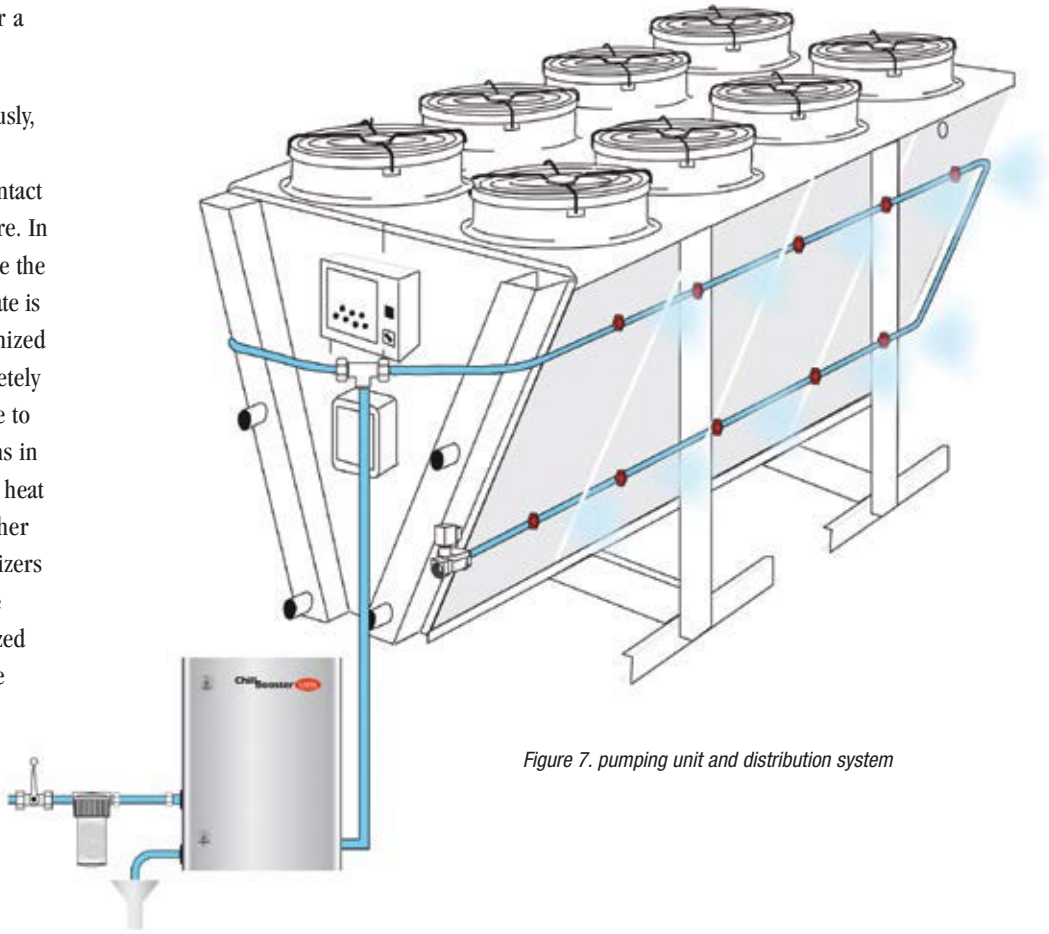

Figure 7. pumping unit and distribution system

EVAPORATIVE COOLING FOR CHILLERS AND DRY COOLERS

PROS	A	B	C
Increased cooling capacity and smaller footprint, less usage of polluting refrigerants (gases), lower noise, reduced running costs	✓	✓	✓
Coils not exposed directly to the sun	✓	✓	
High heat exchange efficiency of coils that are kept clean (e.g. from dust, snow, sand, paper)	✓	✓	
Lower condensing pressure and compressor discharge temperature, and consequently longer working life	✓	✓	✓
Less compressor maintenance and greater system reliability	✓	✓	✓
Cooling capacity at least 20-30% higher	✓	✓	✓
Easy to install: simple assembly on existing (retrofit) and new units, without affecting the warranty		✓	✓
No water treatment required	✓	✓	✓
Reduced environmental impact: lower power and water consumption		✓	✓
Supply air temperature around 5°C lower	✓	✓	✓
CONS	**A**	**B**	**C**
High maintenance costs (change pad, covers)	✗	✗	
Less precise control	✗	✗	
Pressure drop all year round	✗	✗	

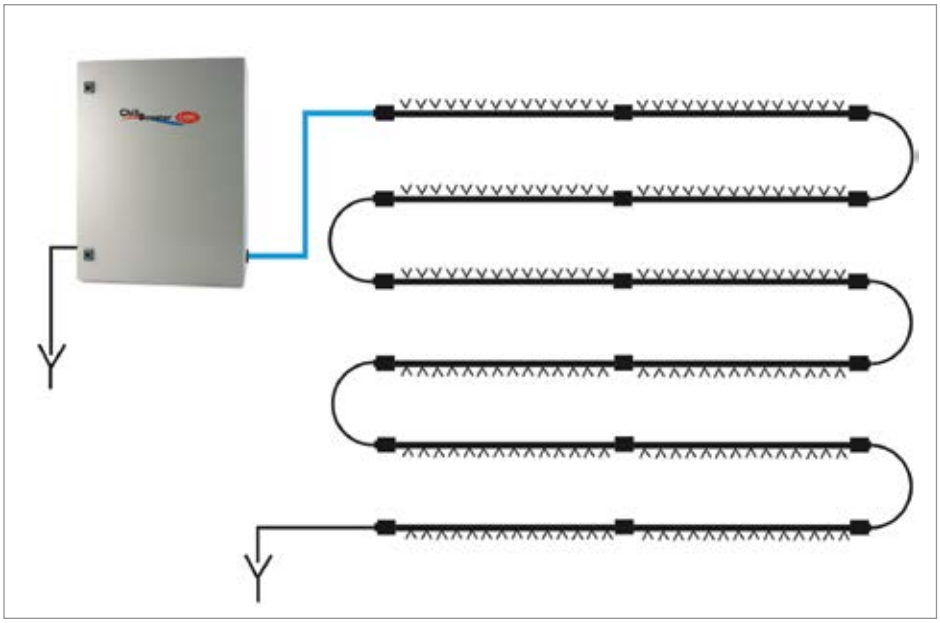

Figure 8. Layout of manifolds with nozzles to prevent water stagnation

salts contained in mains water will accumulate on the fins, which therefore need to be cleaned periodically. Many manufacturers recommend against atomizing mains water more than 200 h/year so as to limit such fouling, a period that nonetheless is in line with peaks in demand.

Demineralized water has a much lower mineral content, and therefore causes less fouling; manufacturers tend to agree that the units can atomize for up to 900 h/year before having to clean off mineral salts. The table below lists the advantages and disadvantages of the units illustrated in previous figures.

Advantages of Atomizing Systems

Units equipped with atomizing evaporative coolers have many benefits when compared to traditional liquid coolers and condensers:

- No oversizing, smaller dimensions, lower air flow-rates, reduced fan and compressor energy consumption and less noise generated by the system;
- Easy to install: the system can be easily installed on both new and existing

DESIGN DATA			
cooling water supply temperature (°C)	36	Coil area (m2)	1608.6
cooling water outlet temperature (°C)	31.3	Fin thickness (mm)	1
outdoor temperature (°C)	26	Fin material	Aluminium
outdoor humidity (%rh)	50	Air low rate (m^3/h)	186600
power consumption (kW)	21.3	Heat dissipated (capacity) @ 26°C (kW)	340.3

WITHOUT EVAPORATIVE COOLING		WITH EVAPORATIVE COOLING			
OUTDOOR TEMP (°C @ 50%RH)	DRY CAPACITY (KW)	WET CAPACITY (KW)	CAPACITY INCREASE (%)	WATER (L/H)	EQUIVALENT TEMP (°C)
15	823.6	860.9	5	50	14.2
20	597.3	649.9	9	50	18.8
25	385.5	420.6	9	50	24.2
30	161.2	365.9	127	300	25.4
35	—	339.3	—	600	25.9

air-conditioning and refrigeration installations. As the evaporative cooler is installed outside the building, no changes are need to the circuits inside the installation and the validity of the warranty on new or existing units is in no way affected;

- Reduced environmental impact: lower power consumption (and corresponding CO_2 emissions) due to the heat exchanger and less water consumption compared to evaporative cooling towers and wet pad coolers; in the latter case, for each liter of evaporated water around 3-4 liters are recirculated (hygiene problems) or wasted if using once-through units;
- If the atomized water is treated and purified there is less possibility of fouling or biofilm forming;
- The water inside the pipes may be heated by sunlight when the unit is not being used. The pumping unit manifolds face south and have a slight downward slope, and this, together with the automatic draining function that is activated whenever the pumping unit stops, helps prevent water stagnation. If there are any uncertainties surrounding possible bacterial contamination in the supply water, a special UV lamp kit can be used to improve the properties of the water;
- Longer compressor life when used with condensers: lower compressor discharge pressure and condensing temperature diminish mechanical stress on the entire system, making operation more reliable and reducing maintenance.

Application

Below are manufacturer's data relating to a dry cooler and the corresponding improvement in performance available through evaporative cooling, assuming fan speed is constant. Note that the heat dissipated decreases as the outdoor temperature increases, and that **with evaporative cooling dry cooler capacity at 30°C (365.9 kW) is comparable with the capacity at 25°C (385.5 kW) when dry,** using 300 l/h of water. The equivalent temperature refers to the outside air temperature that can dissipate the same quantity of heat when dry. Assuming inverter-controlled variable speed fans are available, low temperature systems can achieve even higher efficiency.

Note:

- Assuming fan and pump speed is constant, power consumption in all conditions is 21.3 kW;
- All the capacity data in conditions other than design data (26°C@ 50%rh) have been estimated using a special tool developed by CAREL. BP

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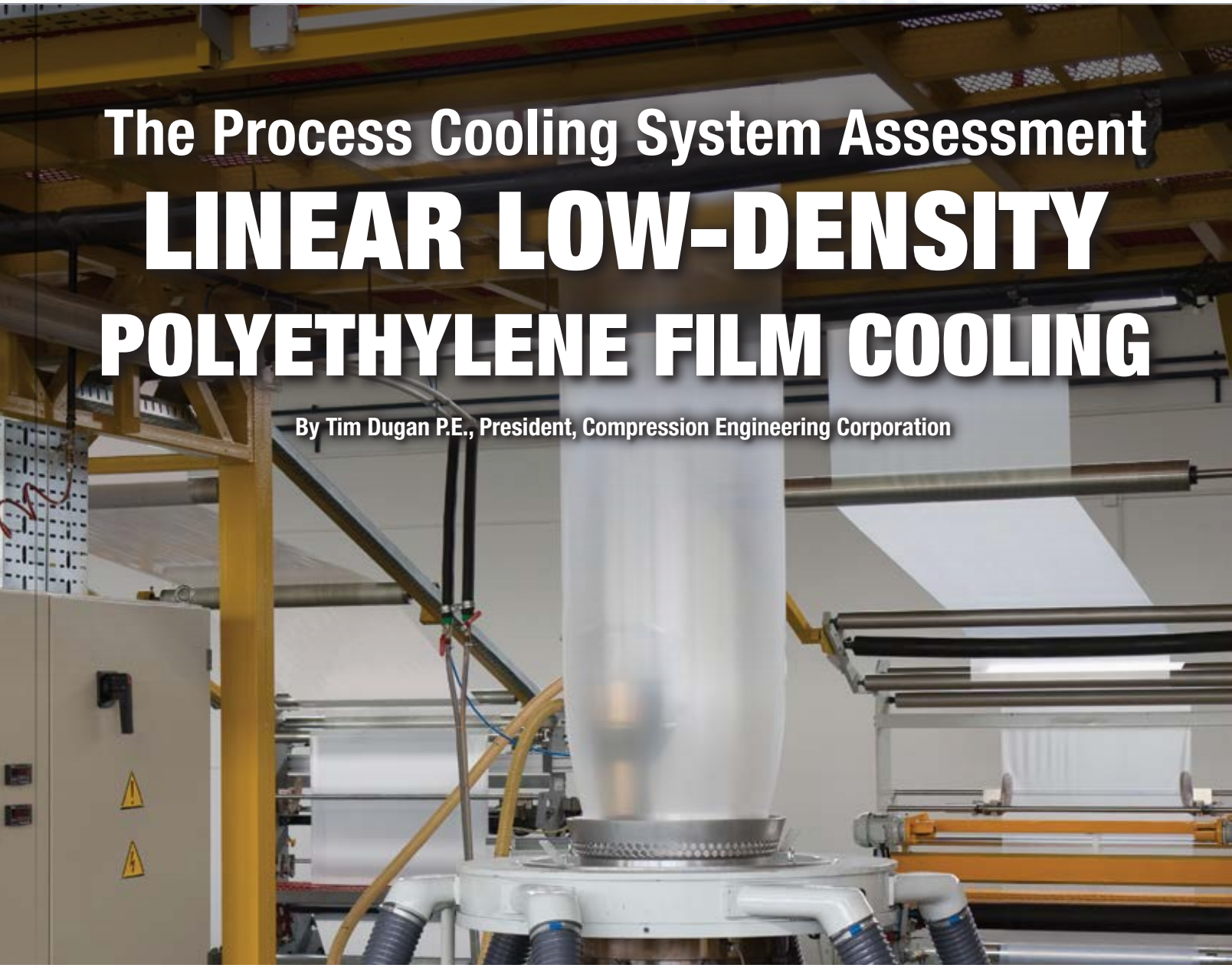

The Process Cooling System Assessment
LINEAR LOW-DENSITY POLYETHYLENE FILM COOLING

By Tim Dugan P.E., President, Compression Engineering Corporation

➤ Introduction

Controlled cooling is an essential part of manufacturing polyethylene stretch film. The process starts with granulated polyethylene raw product with very low strength, and develops thin, clear, strong film used in a variety of applications. It does this by melting, extrusion, "casting" and winding. See Figure 1 for a typical system diagram. "Casting" is forming and cooling at the same time. The extruded polymer is stretched and cooled on large, chrome-plated rollers with cooling water flowing inside. Thinner film is for manual use, like wrapping around food products. Thicker, stronger product is made for machine use, like automatically wrapping pallets of concrete bags.

Typical stretch film cooling systems include at least one chiller, since designers anticipate that some products might require coolant at a temperature lower than is achievable with an evaporative cooler. They also can include recirculation at each cooling roll. A typical plant has multiple cooling rolls per line and multiple lines, and change product on those lines. That requires independently adjustable coolant loops.

Manufacturing Linear Low-density Polyethylene (LLDPE) Film

Plant ABC manufacturers linear low-density polyethylene (LLDPE) film used to unitize packaging. Two lines are run constantly. Two 140-ton chillers are run all year. They cool glycol solution from 53 to 49 degrees, which is delivered to the plant via insulated piping. There are two lines with three cooling zones each, with typical control temperatures of 75 to 108 degrees F. Temperatures are maintained at each zone via a recirculation pumping system, very energy-intensive. See

TABLE 1: PROJECT ECONOMICS

UTILITY RATE SCHEDULE:		XYZ	$8.000 /KW-MO $0.05000 /KWH					
EEM NO.	DESCRIPTION	EEM LIFE EXPECTANCY (YRS)	PEAK POWER SAVINGS (KW)	DEMAND REDUCTION (KW)	ANNUAL ELECTRIC SAVINGS (KWH/YR)	ANNUAL ELECTRIC SAVINGS ($/YR)	INSTALLED COST ($)	PAYBACK (YRS)
EEM1	Tower Free Cooling & Controls	15	0	0	494,050	$24,703	$139,150	5.6
EEM2	VFDs on Recirculation Pumps	15	62	31	524,881	$29,220	$19,250	0.7
Total			**62**	**31**	**1,018,931**	**$53,923**	**$158,400**	**2.9**

Figure 4 for an overall view and Figure 5 for a typical zone. Processes are described in more detail in this article. The process cooling system consumes about 182 kW average, about $90,000/yr, or 19% of facility energy use (about 1,500,000 kWh/yr out of 8,000,000). Savings of about 67% of that can be gained by optimization (12% of total facility – about 1,000,000 kWh/yr).

In this case, we are recommending an evaporative cooler sized large enough to cool the entire facility when the outside wet-bulb temperature is low enough, and controls to shift between the existing chillers and the evaporative cooler. This is called "tower-free cooling", or "economizer cooling". At this site, which is a fairly dry location, that freezes in the winter, that would be 75% of the year. For plants in warmer and more humid environments, the economics will not be as good. We are also recommending running the recirculation pumps for each zone at lower speed.

Table 1 is a summary of preliminary estimates of costs and benefits for the energy efficiency measures evaluated for this proposed project. Incentives may be available for the measures. If both of the measures are implemented at one time, and the predicted savings are gained, an investment of about $158,000 will result in savings of about $54,000/yr and less than a 3 yr payback. This is an attractive investment.

Glycol for the Stretch Film Production Process

Plant ABC operates three shifts Monday to Friday, and keeps the two extruders running all the time except for full plant shut downs and brief product changes. Process systems at the site include extruders, process cooling, pumping, material transport, trim collection, and compressed air. Aside from the production and warehouse areas, the facility includes an office area and warehouse. Lighting and HVAC are not addressed in this Process Cooling Energy Audit.

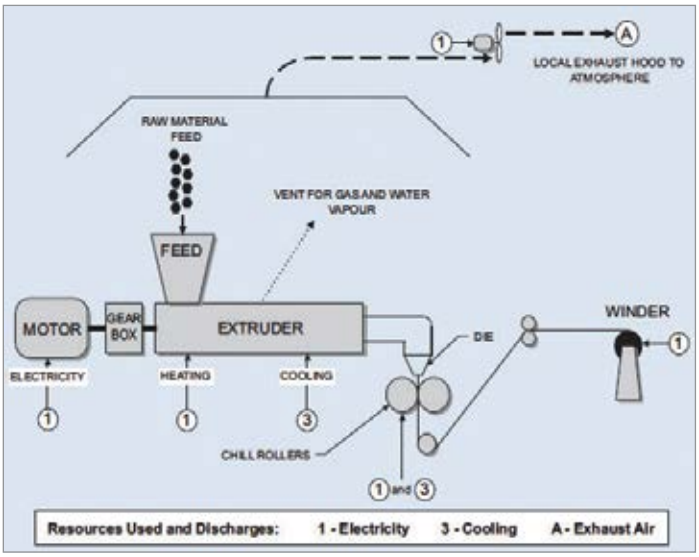

Figure 1. Typical Stretch Film System Diagram

The plant has been operating at full capacity since startup, and plans on increasing capacity as soon as they can justify the cost of a third extruder. A typical stretch film production process is shown in simplified form in Figure 1. The overall process cooling system is described in Figures 2 and 4. The chillers are providing 49 degrees all year long, even though the primary cooling process doesn't require less than 75 degrees. Chillers are multi-stage and fairly efficient. Controls are up to date, except that both units are always running. This isn't particularly inefficient. It just requires more maintenance than necessary, since one chiller can handle the load. Chiller pumps deliver glycol from the warm sump to the chillers, using VFD control. Process pumps deliver coolant from the cool sump to the plant, also with VFD control, set at 18 psig.

A typical "zone" for cooling one roll is shown in Figure 5. The recirculation system bleeds in just enough chiller water to maintain the

THE PROCESS COOLING SYSTEM ASSESSMENT

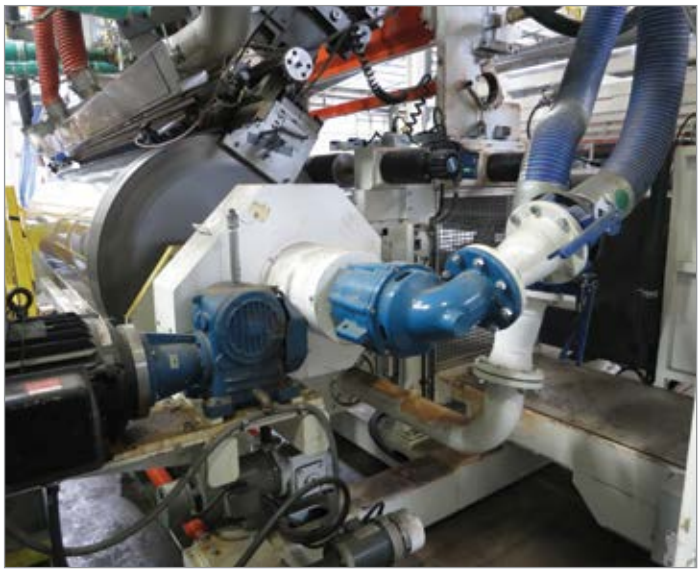

Figure 2. Typical Cooling Roll

Figure 3. Typical Recirculation Pumping System

desired roll outlet temperature. A small amount of coolant comes and goes to the chiller, controlled by a control valve, while most of the flow recirculates through the cooling roll. Excessive pressure differential on the recirculation pumps (and excess power consumption) occurs because the pump is developing more flow than required. They are oversized and are balanced against the system resistance of the cooling roll. This excess recirculation flow results in a temperature differential of only 1.0 degree F across the cooling roll. This low delta T is not adding any value to the process control. Doubling it to 2.0 degrees by running the pumps at about half speed would not even be noticed by the process. Temperature control would still occur by the mixing valves.

Existing Equipment

Process Cooling

- Chiller No 1: Trane Series R 140 ton, with two compressors, 118 RLA/each. It uses R134A refrigerant. This chiller is likely capable of about 0.8 to 1.2 kW/ton efficiency, depending on load and set point. However, when we saw it, the load was low because two chillers were being run when only one could have handled the load.
- Chiller No 2: Trane Series R 140 ton, with two compressors, 122 RLA/each. It uses R22 refrigerant, and will have to be phased out soon due to unavailability of refrigerant. This chiller is likely capable of about 0.8 to 1.2 kW/ton efficiency, depending on load and set point. However, when we saw it, the load was low because two chillers were being run when only one could have handled the load.
- The average total chiller load is about 82 kW.

> "The addition of an evaporative cooler and tower-free cooling controls to a process cooling system can idle a chiller much of the year in dryer climates. This can save over half the chiller energy."
>
> — Tim Dugan P.E., President, Compression Engineering Corporation

- Piping to process appears to be adequately sized. We did not investigate in detail if there is throttling at the loads.
- Cool and warm storage tanks, about 1,500 gallons/ each. Warm glycol solution is pumped from the chiller tank through the chillers and to the process tank by the chiller pumps. Then, process pumps pump the cool glycol solution from the cool process tank to the system. Then it returns to the chiller tank. The chiller cools the chiller glycol loop from 53 to 48 deg F, which is pumped directly to the process. We estimate that the average heat load is about 51 tons on average.

Chiller and Process Pumping

- (3) 15 hp centrifugal process pumps (one off, two on VFDs.) Plant ABC's installed power metering indicated 12 kW and 13 kW load.
- (2) 15 hp centrifugal process pumps.

Recirculation Pumping

- Line 1 recirculation system:
  - (1) 30 hp pump for primary chill roll. Control valve at the inlet takes 52F coolant from chilled water supply (CWS) and mixes with recirculated coolant. Pump discharge is about 85 psig. Coolant is discharged to chilled water return (CWR.)
  - (1) 10 hp pump for secondary chill roll, similar to the 30 hp.
  - Some pumps are dead-headed.
- Line 2 recirculation system:
  - (1) 40 hp pump for primary chill roll, similar to Line 1.
  - (2) 10 hp pump for secondary chill rolls, similar to Line 1.
  - Some pumps are dead-headed.

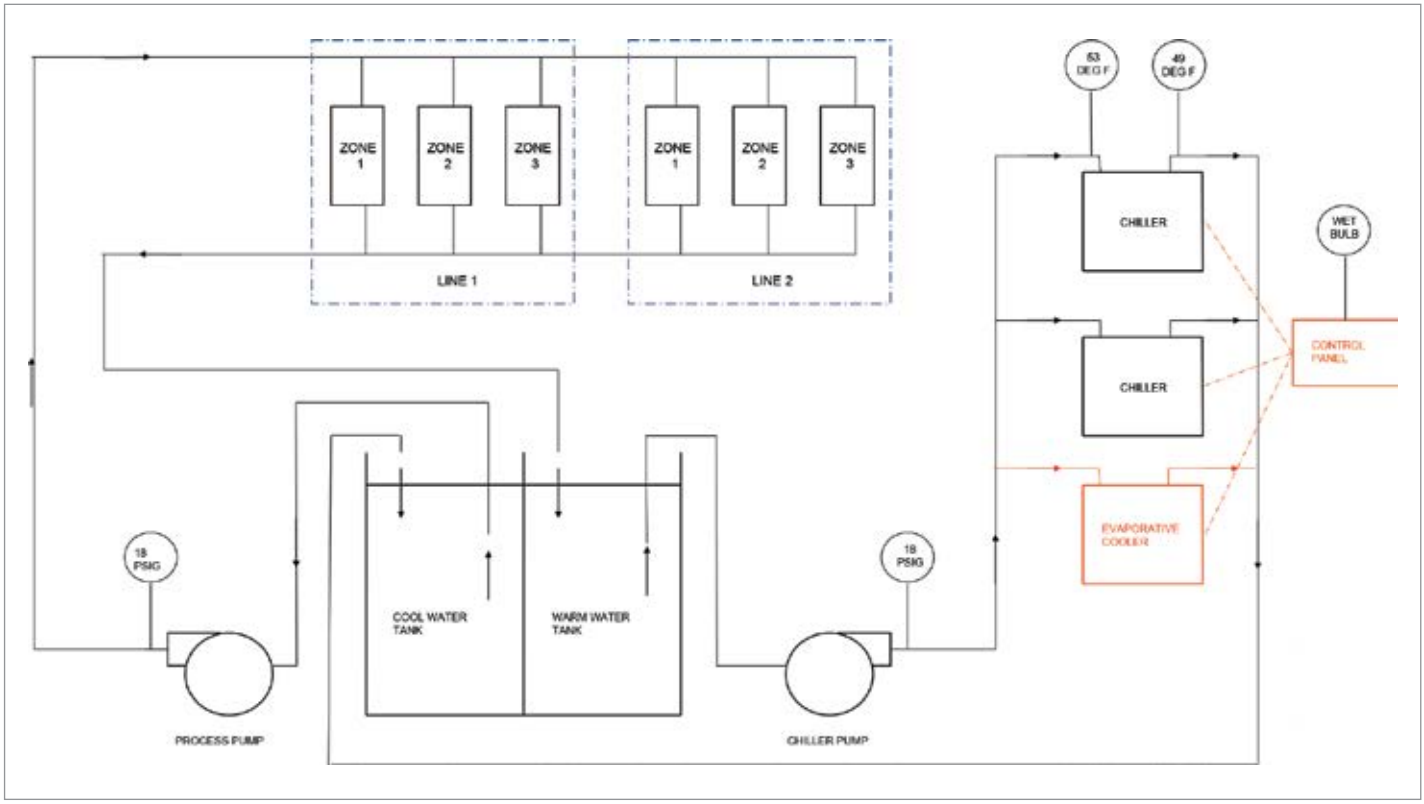

Figure 4. Existing Overall Process Cooling System (recommendations in red)

THE PROCESS COOLING SYSTEM ASSESSMENT

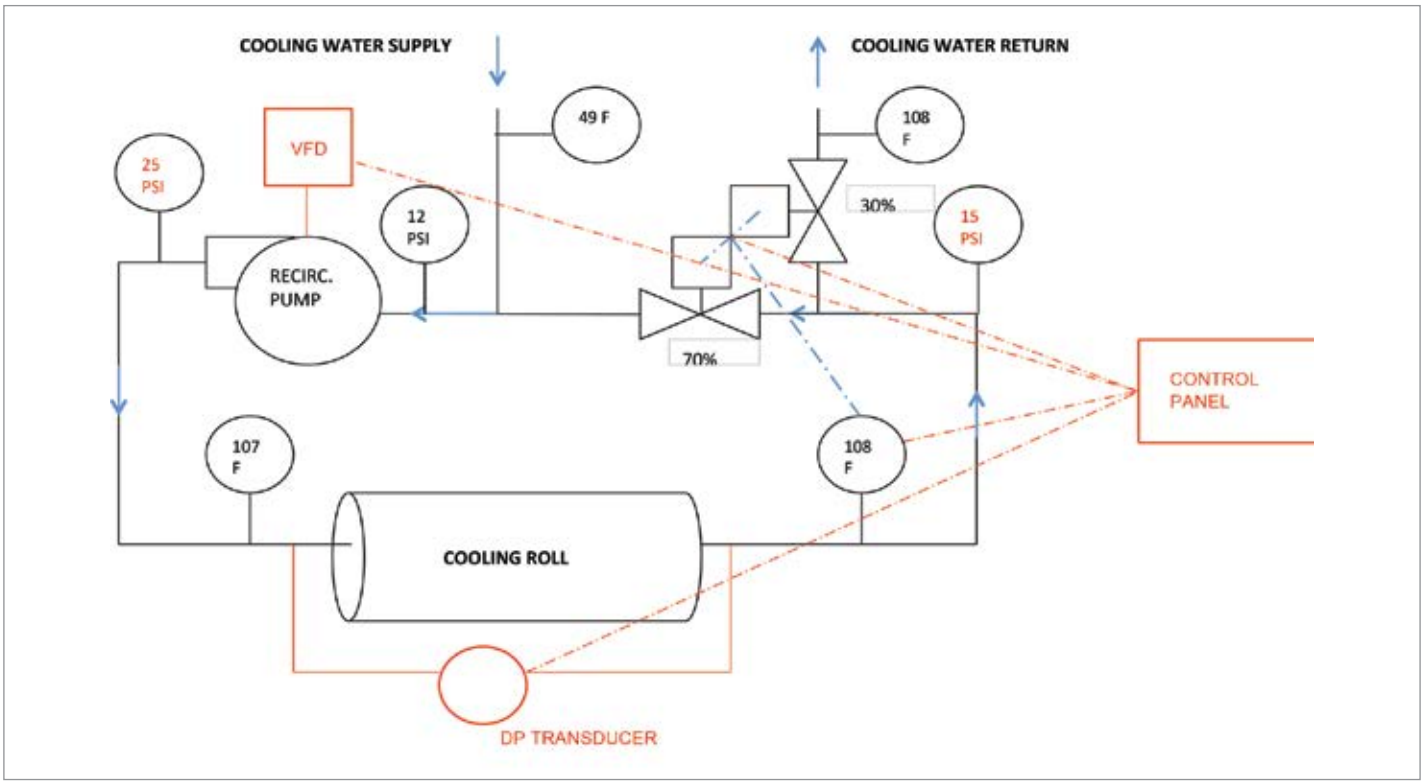

Figure 5. Existing Zone Cooling System (recommendations in red)

TABLE 2: PRELIMINARY IMPLEMENTATION COST ESTIMATES

EEM1: TOWER FREE COOLING & CONTROLS					
ITEM	DESCRIPTION	PRICE EA	QTY	QTY PRICE	SOURCE
1	Fluid Cooler	$70,000	1	$70,000	Vendor ABC quote
2	Dedicated Fluid Cooler Pump	$1,500	1	$1,500	CEC Estimate
3	Dedicated Small Chiller	$10,000	2	$20,000	Vendor ABC estimate
4	Controller	$20,000	1	$20,000	Vendor ABC estimate
5	Fluid Cooler & Chiller Installation	$15,000	1	$15,000	CEC Estimate
		Contingency	10%	$12,650	
			Total EEM1	**$139,150**	
EEM2: VFDS ON RECIRCULATION PUMPS					
ITEM	DESCRIPTION	PRICE EA	QTY	QTY PRICE	SOURCE
1	40hp VFD	$5,000	1	$5,000	CEC Estimate
2	30hp VFD	$4,000	1	$4,000	CEC Estimate
3	Pressure transmitters	$500	2	$1,000	CEC Estimate
4	Installation	$3,000	2	$6,000	CEC Estimate
5	Startup/calibrations	$1,500	1	$1,500	CEC Estimate
		Contingency	10%	$1,750	Estimate
			Total EEM2	**$19,250**	

Proposed Improvements

See Figures 4 and 5 for recommended improvements. The recommended project includes the following components:

- **EEM 1: Process Cooling – Tower Free Cooling and Controls.** This measure addresses the process cooling system, not pumping. It includes the following:
  - New approx. 140 ton closed loop evaporative cooler.
  - Controls to run newer chiller only when cooling tower can't achieve coolant temperature, usually warm months. Run at about 65 deg F coolant temperature.

TABLE 3. BASELINE SUMMARY			
SYSTEMS AFFECTED BY RECOMMENDED MEASURES	AVERAGE POWER (KW)	OPERATING HOURS/YR	ENERGY CONSUMPTION (KWH/YR)
CHILLERS	88.6	8,400	744,042
CHILLER/PROCESS PUMPS	20.2	8,400	169,956
RECIRC PUMPS	73.5	8,400	617,508
TOTAL	**182**	**8400**	**1,531,506**

TABLE 4. SAVINGS SUMMARY						
EEM #	SYSTEM	AVERAGE POWER (KW)	OPERATING HOURS/YR	REDUCED ENERGY CONSUMPTION (KWH/YR)	REDUCED DEMAND (KW)	ENERGY SAVINGS (KWH/YR)
1	CHILLERS, HIGHER SET POINT	88.6	2,364	209,406	88.6	534,636
	NEW COOLING TOWER	6.7	6,036	40,586	6.7	(40,586)
	TOTAL EEM1 SAVINGS:				**95.3**	**494,050**
2	RECIRC PUMPS	11.0	8,400	92,626	62.5	524,881
	TOTAL	**106.3**		**342,618**	**253.1**	**1,018,931**

- Integration of new cooler into piping. Some design is needed.
- Two small chillers for the two extruders, in case they need cooler temperatures than the evaporative cooler can provide. Run at about 52 deg F coolant temperature.

EEM 2: VFDs on Recirculation Pumps. This measure consists of the following:

- (1) 40 hp & (1) 30 hp VFD for recirculation pumps
- Differential pressure transmitters
- Reprogram existing PLC to control pump speed and recirculation valve for required pressure differential and controlled temperature.

The energy required to cool using the "free" heat sink provided by nature, the condensing (or "wet bulb") temperature is dramatic. For the ¾ of the year that the evaporative cooler can handle the load, the energy requirement is less than 10% of the chiller power at the same heat load. The recirculation pumps can be run at about half speed most of the time, requiring only about 15% power. Additional benefits to the proposed improvements include reduced chiller maintenance and improved process control.

Implementation Cost Estimate

Total implementation cost of these measures is estimated to be between $140,000 and $160,000, depending on customer preference in measure selection. Estimated costs are shown in the tables below.

Estimate of Baseline Energy Consumption and Energy Savings

Tables 3-4 below show the estimated baseline and energy savings for the measures recommended in this project.

Conclusions

The addition of an evaporative cooler and tower-free cooling controls to a process cooling system can idle a chiller much of the year in dryer climates. This can save over half the chiller energy. Optimization of recirculation cooling systems can also be done saving over ¾ of pump energy. BP

For more information, please contact Tim Dugan P.E., President, Compression Engineering Corporation, tel: 503-520-0700, email: Tim.Dugan@comp-eng.com, www.comp-eng.com

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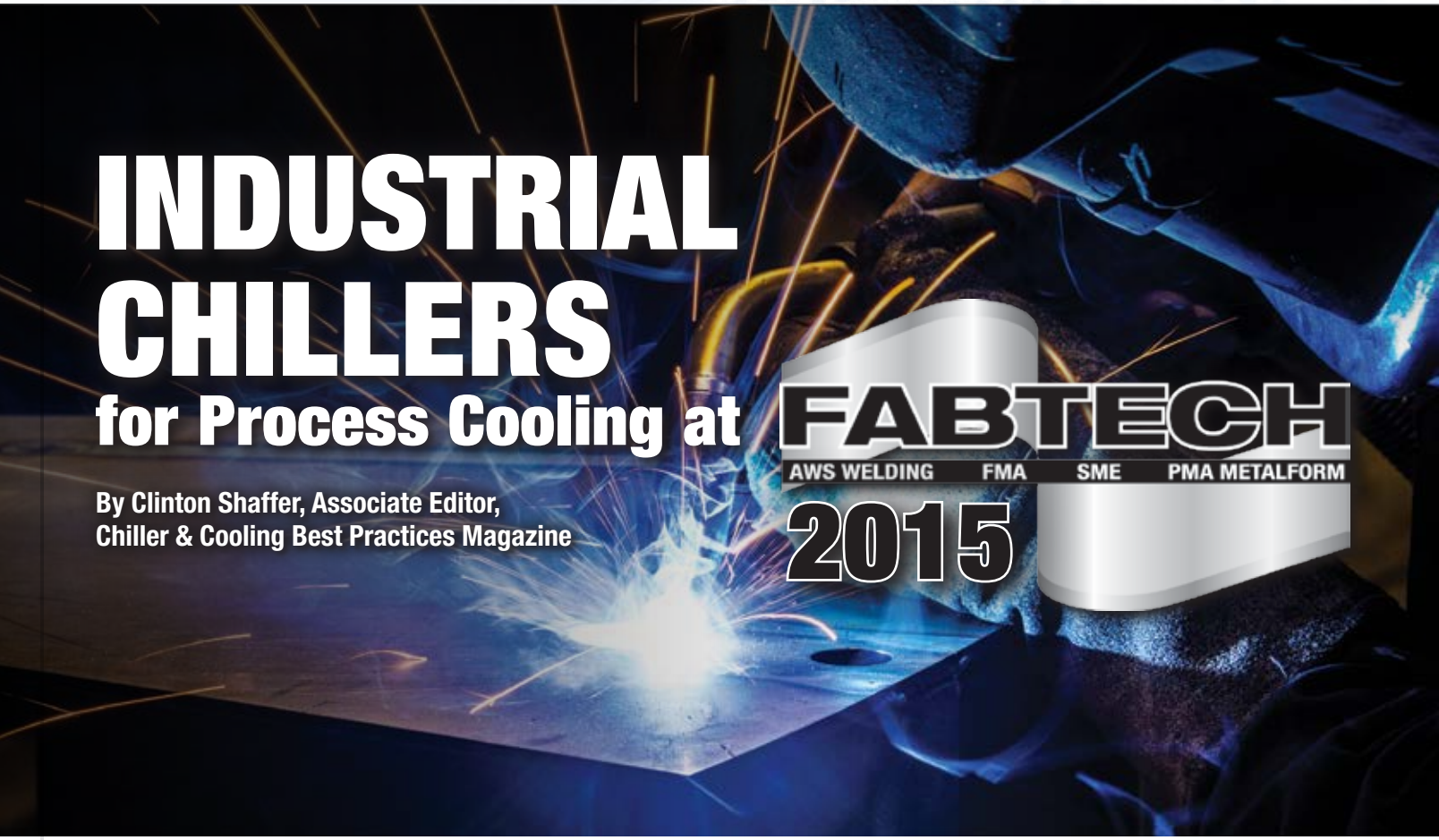


INDUSTRIAL CHILLERS for Process Cooling at FABTECH 2015

By Clinton Shaffer, Associate Editor, Chiller & Cooling Best Practices Magazine

Whether it is a high-power CO_2 laser or a spot welder, metal fabrication machines tend to generate a bit of heat. Consequently, process cooling equipment like chillers are a mainstay at FABTECH, a tradeshow dedicated to metal fabrication and machining. Held at Chicago's McCormick Place from November 9 through November 12, FABTECH 2015 was the show's largest installment to date, with a grand total of 43,836 attendees and more than 1700 exhibiting companies.

"This year's show was incredible. It's difficult to fully express our gratitude to all those who made FABTECH a success—the city of Chicago, our loyal exhibitors and the thousands of attendees that not only made the week special, but who continue to drive and move our industries forward," said Mark Hoper, show co-manager, FABTECH. "Between the variety of events and education programs, to our diverse and expansive show floor, attendees walked away with more knowledge, expertise and industry connections than ever before."

"Walked away" indeed. Spanning more than 730,000 square feet, FABTECH 2015 provided a lot of ground to cover. The show featured all manners of metal fabrication and machining technology—from fiber laser cutting systems and arc welders to metal bending machines and waterjet cutting equipment.

> "Resistance and spot welding could require as much as 100,000 secondary amps to generate enough heat to fuse metal. With those heat requirements, there are also demanding chilled water requirements."
>
> — Tom Snow, CEO, T.J. Snow Company

Much of that technology requires chilled water, with cooling requirements as varied as the applications. The team at Chiller & Cooling Best Practices had an opportunity to visit with several companies that help supply chillers for those applications. While this article does not provide a comprehensive list of every chiller manufacturer in attendance, it does detail several examples of the process cooling technology on display at FABTECH 2015.

MTA-USA

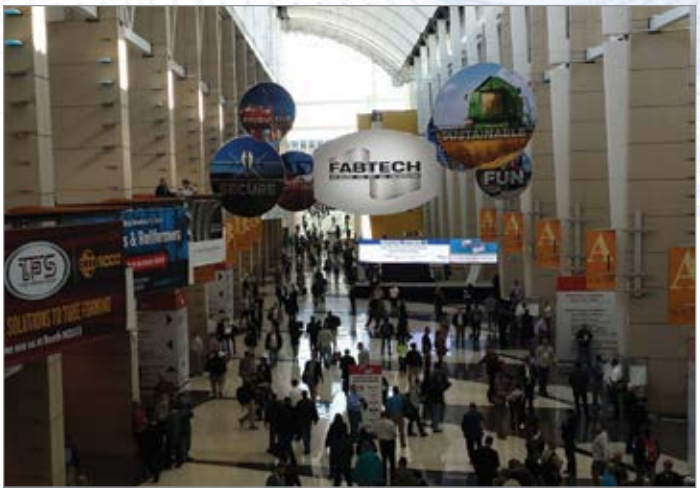
MTA-USA, a manufacturer of chillers and compressed air dryers, presented a new product at FABTECH 2015—the TAEevo Tech series of air-cooled industrial chillers. Packaged up to 105 tons, TAEevo Tech chillers feature energy-efficient scroll compressors and an oversized evaporator-in-tank configuration, which operates with high flow rates and reduced pressure drops. Similar to other innovations at MTA, the chiller uses a technique comparable to free cooling, passing water through the evaporator before it enters the tank to provide a ready-chilled water supply. MTA-USA also uses a new refrigerant, the environmentally friendly R410A, for minimized energy waste.

The TAEevo Tech is designed for harsh industrial processes, as it has non-ferrous, stainless steel components and can handle contaminated process water. Its robustness is complemented by its unique, multiple-compressor design. Models 201 to 351 have two compressors, while models 402 to 802 are equipped with four compressors, ensuring maximum efficiency and precise cooling control at both full and partial load. Also unique, the TAEevo Tech chiller can operate in both open and closed chilling circuits, adding to its versatility.

Dimplex Thermal Solutions — Koolant Koolers

Dimplex Thermal Solutions (DTS), the North American chiller manufacturer of Koolant Koolers, had big news at FABTECH 2015: The company announced a strategic partnership with Glen Dimplex Deutschland, the German manufacturer of Riedel process chillers. Best known in the laser OEM market, Riedel chillers are heavily used in applications like heat induction and resistance welding. Under the agreement, DTS and Riedel will be able to provide cooling solutions tailored to specific industrial applications, along with global service and support.

At the show, professionals from Koolant Koolers presented a suite of Redundant Modular Chillers for industrial process cooling. Designed for reliability with duplicate refrigerant circuits, Redundant Modular Chillers—like the customized 10-ton W Series exhibited at the



FABTECH 2015 was the show's largest installment to date.

The team from MTA-USA presented the TAEevo Tech series of industrial chillers at FABTECH 2015. Members included (from left to right) Don Joyce, John Medeiros, Angelo Mastrangelo, and Lewis Rains.

Bonnie Martens, Jeff Wadington, Jimmy Croal, and Raschell Hickmott (left to right) of Dimplex Thermal Solutions educated end users about process cooling at FABTECH 2015.

INDUSTRIAL CHILLERS FOR PROCESS COOLING AT FABTECH 2015

Joe Benson, Dan Rogowski, Allan Hoerner, and Garrett Rusin (left to right) presented the Parker Hyperchill line of process water chillers at FABTECH 2015.

Michael Omstead, Global Service Group, and Denise Klaren, Johnson Thermal Systems (left to right), standing next to the JTS ET Series air-cooled chiller.

Tom Snow is CEO of T. J. Snow Company, a 52-year-old, family-owned company that provides resistance welders and chillers.

show—can adjust to varying load requirements. This enables the chiller to use the minimum amount of refrigerant needed, making it more energy efficient. Adjusting to varying loads also reduces wear on the chiller's components, adding to its reliability. Another benefit is the ease of scalability that comes with modular units. Instead of buying additional chillers, smaller, more affordable modules can be added to an existing Koolant Kooler installation.

Parker Gas Separation and Filtration Division

Parker's Gas Separation and Filtration (GSF) Division presented its Hyperchill Process Water Chiller at FABTECH 2015. As part of the newly formed division, Garrett Rusin, Product Engineer at Parker, discussed the features of the Hyperchill. Notably, end users can easily modulate the cold water set point by using the controller located on the front of the unit. While the unit quietly ran, the team at Parker could make adjustments to the water temperature right from the exhibition floor. Easy adjustments to temperature help to maintain the 60 to 70˚F temperature needed to avoid condensation and maintain the welding process.

According to Rusin, the Hyperchill is ideal for tip welding applications, because it can turn off water flow with a pneumatically controlled RIP (robot install panel). During the traditional tip welding process, the tip needs changed two to three times per shift, causing water spills, corrosion and safety concerns. The ability to turn the water flow off can be very beneficial—not only for the water use of the plant, but for the maintenance staff charged with facility and machine upkeep.

Johnson Thermal Systems

Johnson Thermal Systems (JTS), a process chiller manufacturer based just outside of Boise, Idaho, addressed the laser cutting industry at FABTECH 2015. The company's MT Series of air-cooled, closed-loop chillers was recently expanded to provide 1/4- to 2-ton cooling capacities. They are designed to provide free cooling for process fluids (water or water/glycol) between 40 and 80˚F (in ambient temperatures up to 105˚F). The MT Series is an agile and compact suite of products, with its largest model measuring 36.33 inches x 36.33 inches x 34.60 inches (W/L/H). Other suitable applications for the MT Series include spot welding, induction, machine tooling, and waterjet cutting.

Global Service Group shared a booth with JTS. Where JTS presented products suited for specific applications, Global Service Group

INDUSTRIAL CHILLERS FOR PROCESS COOLING AT FABTECH 2015

stressed the importance of preventative maintenance, and tailoring maintenance to the environment in which a chiller runs. "Application makes a huge difference," Michael Omstead, CEO of Global Service Group, told Chiller & Cooling Best Practices. "The same machine in three different locations might perform three different ways." The company has more than 1700 qualified service partners in the U.S., and they perform comprehensive inspections beyond standard monthly cleanups.

T.J. Snow Co.

With approximately 6000 spot welds performed on a typical vehicle, spot welding is a common application in the automotive industry. It is also demanding. Resistance and spot welding could require as much as 100,000 secondary amps to generate enough heat to fuse metal. With those heat requirements, there are also demanding chilled water requirements. Supplied at 3 to 5 GPM through the water circuit, the chilled water needs to adhere to a tight window, below the prevailing dew point, so as to supply water cold enough for the process, but not cold enough to cause condensation.

As CEO of T.J. Snow Company, a family-owned company with more than 50 years experience with heavy-duty resistance welders, Tom Snow is keenly aware of the chilling requirements of those machines. He also understands how to reduce water use in welding applications. At FABTECH 2015, T.J. Snow Co. presented a suite of heavy-duty resistance welders, equipped with their own closed-loop recirculating water chillers. The company stocks chillers from MTA and Koolant Koolers, and supplies chillers for non-welding applications as well. The company also advocated a new chiller with Automatic Dew Point Compensation, since condensation can damage a resistance welder over time, causing rust, mildew and mold. BP

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