

BREWERS REAP THE ADVANTAGES OF SMALLER-DIAMETER COPPER TUBES

MicroGroove Excels in Process Cooling Application

New York, New York (June 8, 2016) – The International Copper Association announced that MicroGroove copper tubes are now being used in the condenser coils of turnkey refrigeration systems from PRO Refrigeration.

The refrigeration systems are used to cool wort, control fermentation and chill conditioning tanks. Smaller-diameter copper tubes offer improved performance in a smaller footprint compared to larger-diameter copper tubes or aluminum microchannel tubes.

Recognizing that MicroGroove could easily become a game changer for the large condensers used in process cooling and commercial refrigeration, Tommy Gaubatz of Innovative Cooling & Equipment Inc. (ICE) teamed up with PRO Refrigeration, a company with extensive experience in building industrial-sized refrigeration equipment. ICE designed and assembled the condenser module with 5-mm copper tubes for PRO Refrigeration's process chiller. Already the first PRO Refrigeration system using MicroGroove tubes has been installed and more are being built for breweries across the country.

According to Gaubatz, the advantages of smaller-diameter copper tubes apply as well for large outdoor condensers as for smaller systems. Copper tubes offer better corrosion resistance compared to aluminum microchannel. Customers could reap the benefits of reliability and familiarity as well as high efficiency and reduced refrigerant charge.

While it is true that a large cooling system requires a large surface area to exchange heat with the ambient air, the refrigerant tubes need not have a large diameter. In fact, smaller diameter tubes allow for a more compact design. The higher heat-transfer coefficients of the smaller diameter tubes allow for heat to be transferred more efficiently from the refrigerant inside-the-tube, through the tube wall, and ultimately to the fins on the airside of the condenser.

Less Refrigerant

The unique design of the condenser also resulted in less refrigerant. For a brewer the cost of refrigerant could be a significant fraction of the total system cost, says Gaubatz. This factor becomes even more important as new, more costly refrigerants are developed. The use of smaller-diameter copper tubes can greatly reduce the amount of refrigerant in the system.

“When refrigerant sold for a few dollars per pound, these costs were manageable,” explains Gaubatz, “but as the price of new refrigerants climbs to ten dollars or more per pound, it becomes a big deal.”

Aluminum Not Up to Task

Gaubatz preferred MicroGroove copper over aluminum microchannel coils for a number of reasons. One reason was that none of the microchannel coils available would fit his design requirements. Also, he preferred copper tubes because they are proven technology and contribute to better system reliability.

According to Gaubatz, corrosion in microchannel coils could result in a catastrophic system failure. Such failures are especially troublesome because the coils cannot be easily repaired in the field. Ultimately corrosion-resistant coatings were developed but these added heavy costs to the coils. In nearly all applications where microchannel is used, and especially in mission-critical process cooling applications, such coatings are mandatory when using aluminum-only coils.

Meeting the Needs of Brewers

Process cooling at the brewery is mainly needed for rapid cooling of the “wort.” As every zymurgist knows, wort is a key intermediate ingredient obtained from boiling crushed hops in a malt extract. The carb-rich wort is cooled rapidly and precisely held at various temperatures. Yeast is added and fermentation occurs at these set temperatures.

Temperature control is paramount to successful brewing!

Process cooling is accomplished using a chilled mixture of glycol and water. A stainless steel sanitary heat exchanger employs a counter-flow of chilled coolant to cool the wort. Coolant is pumped to cool the wort in a precisely regulated process. Once it picks up heat from the wort, it is pumped to the outdoor refrigeration system and then stored in tanks, typically ranging in size from 500 gallons to 2000 gallons but also as small as 20 gallons.

PRO Refrigeration makes turnkey refrigeration systems specifically for breweries. The outdoor system is a complete package; the condenser rests atop the evaporator. This system functions more or less as a chiller except that the circulated liquid is a glycol-water mixture rather than just water.

Design Optimization

“Right now, the ICE condenser can outperform any microchannel condenser,” Gaubatz says. “With further optimization of the coil design and improvements in manufacturing, I believe that smaller diameter copper tubes will be the winning technology for most process cooling applications that rely on an outdoor condenser.”

For more information, visit www.microgroove.net. Join the MicroGroove Group on LinkedIn to share your ideas about research directions and product development. www.linkedin.com/groups/Microgroove-4498690.

About ICA

The International Copper Association (ICA) leads the world's copper industry on the issues critical to securing copper's future growth. ICA's members represent a majority of global copper production, and include many of the largest copper and copper alloy fabricators. ICA's status as a not-for-profit trade association provides its members with a credible, independent advocate to address challenges faced by the collective industry. ICA increases awareness and use of copper by communicating the unique attributes that make this sustainable element an essential contributor to the formation of life, to advances in science and technology, and to a higher standard of living throughout the world.

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