**MicroGroove Supercharges A3 Refrigerants at 500 Gram Use Condition**

*Smaller-Diameter Copper Tubes Favored as Charge Limit Increases for Propane*

**New York, New York (15 June 2019)** – MicroGroove technology already is used in light commercial refrigeration with flammable refrigerants such as propane (R290) and isobutane (R600a) because it allows for the same cooling capacity to be realized using significantly less refrigerant charge.

This application of smaller-diameter copper tubes is expected to grow now that the International Electrotechnical Commission (IEC) has approved an increase in the charge limit for A3 (flammable) refrigerants to 500 grams from 150 grams in self-contained commercial refrigeration cabinets under IEC standard 60335-2-89.

When the charge limit was set at 150 grams (5.29 ounces), MicroGroove copper tubes were vital in the adoption of propane (R-290) and isobutane (R-600a). Nearly every major manufacturer of “reach in” cool display cases began to offer models with propane or isobutane as a refrigerant subject to the 150 gram use condition.

“The new 500 gram usage condition allows for the development of higher capacity systems without the need for multiple compressors. The standard allows for a broader capacity range in a single refrigeration circuit,” says Nigel Cotton, MicroGroove Team Leader for the International Copper Association. “Whatever the charge limit, MicroGroove increases the capacity. Refrigeration equipment manufacturers maximized the capacity attainable from a very small refrigerant charge under the 150 gram limit. This know-how with respect to the efficient use of refrigerant can now be transferred and applied to much larger systems.”

**Economic Success Story**

Initially, the phasedown of HFCs contributed to interest in low-GWP hydrocarbons such as propane and isobutane. Yet it is the attractive physical properties of these refrigerants that led to their quick adoption, once the regulatory hurdles in favor of hydrocarbons and against HFCs were in place.

The excellent thermodynamic properties of propane and isobutane and the fact that they are readily available and affordable are important drivers of change. Refrigeration systems that use isobutane as a refrigerant offer high-efficiency and high-performance. They have proven their reliability in Europe, where isobutane has been used in refrigerators for many years.

Although R290 and R600a are classified as A3 flammable refrigerants, they are deemed safe to use when proper protocols are followed. They are not drop-in replacements for hydrofluorocarbon refrigerants. The appliance components must be specifically designed for flammable hydrocarbon refrigerants, they must comply with the charge limit and they must be labeled with warnings.

“Propane and MicroGroove copper tubes are ecofriendly partners in the campaign to reduce the volume of F-gases released in the atmosphere from commercial refrigeration applications” said Cotton. “MicroGroove technology is uniquely suited for use with propane and isobutane, particularly with respect to reduced refrigerant charge.”

The website www.microgroove.net includes additional data on heat exchanger design and manufacturing technology. It also includes links to the MicroGroove series of webinars. A technical literature section provides links to technical papers relating to laboratory experiments, tube circuitry optimization, fin design and manufacturing equipment.

**References**

1. Nigel Cotton, Adam Rhoads, Anderson Bortoletto, Yoram Shabtay, “Optimization of MicroGroove Copper Tube Coil Designs for Flammable Refrigerants,” 17th International Refrigeration and Air Conditioning Conference at Purdue, July 9-12, 2018, Paper 2332.

<https://www.conftool.com/Purdue2018/index.php?page=browseSessions&search=2532>

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