

MicroGroove Technology Unlocks Potential of Ultra-Low GWP Air conditioning and Refrigeration Systems, Says the International Copper Association

Smaller-Diameter Copper Tubes are the Key to Efficient Use of Propane in ACR Products

New York, New York (June 6, 2016) – Also known as R-290, propane (C₃H₈) is a flammable hydrocarbon with an ultralow global warming potential (GWP) index of only 3.3, that is, many hundreds or thousands of times lower than conventional refrigerants.

Although classified according to ASHRAE 34 as a Group A3 (flammable) refrigerant, R-290 is allowable for refrigeration and air-conditioning applications under certain conditions, according to rulings by the US EPA as well as regulatory agencies in other countries. Notwithstanding specific regulations under development, R-290 is expected to be an important eco-friendly refrigerant for the foreseeable future. Safety standards include such requirements as limiting the refrigerant mass per refrigerant loop, eliminating nearby sources of ignition and prohibiting the use of such equipment near points of egress.

Recently, the U.S. Environmental Protection Agency's (EPA's) Significant New Alternatives Policy (SNAP) program has proposed to list as acceptable, subject to restrictions, the use of propane in certain commercial refrigeration applications. According to the Copper Alliance, MicroGroove technology can help meet the regulatory requirements for R-290 because refrigerant volumes can be greatly reduced by using smaller-diameter copper tubes. Already, in the US, cold display cases and freezers are meeting safety requirement in light commercial applications; furthermore, propane is gaining acceptance for use in room air-conditioning systems in India, for example.

R-290 Refrigeration System: Refrigerant Volume Reduced by 50 Percent

As an example, smaller-diameter (5 mm) copper tubes were used rather than conventional-diameter (9.52 mm) copper tubes in a heat exchanger design for an R-290 refrigeration system, reducing tube weight by 30 percent, fin weight by 47 percent and internal volume for refrigerant by 50 percent, according to Dr. Jian Yu, Director of Product Development at Super Radiator Coils, Richmond, Virginia. [The smaller diameter tubes had an outer diameter of 0.197 inches, or 5 mm and wall thickness of 0.010 inch; the conventional-diameter tubes had an OD of 3/8 inch, or 0.375 inches, or 9.52 mm; and wall thickness of 0.015 inch.]

R-290 Air Conditioner: Copper Usage Reduced by 26 Percent

In an R-290 air-conditioner condenser application from Super Radiator Coils, to be presented by Yoram Shabtay at the 2016 ATMOsphere America Conference in Chicago, MicroGroove allowed for a reduction in refrigerant charge and maintained high burst pressures with thinner walls. Copper usage was reduced up to 26 percent while increasing capacity up to 6.5 percent as tube diameters were decreased from 9.52 mm (3/8 in.) and 7.94 mm (5/16 in.) to 5 mm; and tube walls were thinned from 0.41 mm (16 mils) and 0.33 mm (13 mils) to 0.25 mm (10 mils), respectively.

Manufacturers oftentimes can offer eco-friendly R290 refrigeration systems at nearly the same cost as refrigeration systems using conventional technology. In other words, thanks to the more efficient, smaller diameter tubes, less material is required to build eco-friendly systems on par with conventional systems of the same cooling capacity.

“The use of MicroGroove smaller-diameter tubes is unlocking the potential for higher efficiencies and less materials usage in many industry sectors, including small and large refrigeration systems as well as residential and commercial air conditioning systems,” says Nigel Cotton, MicroGroove Team Leader for the International Copper Association. “Manufacturers are seeing the many benefits of harnessing new copper tube technologies in the development of improved ACR systems.”

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, Ltd. (ICA) is the leading organization for promoting the use of copper worldwide. ICA’s mission is to promote the 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 worldwide. Visit www.copperinfo.com for more information about ICA.

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