**Heat Exchangers Made from Smaller-Diameter, Inner-Grooved Copper Tubes Ease Transition to Low GWP Refrigerants, Says Copper Alliance**

*Amendment to Montreal Protocol Aims to Phase down the Use of HFCs*

**New York, New York (29 November 2016)** – Low refrigerant volumes are universally desirable because of the flammability of low GWP refrigerants. One of the advantages of smaller diameter copper tubes is that they allow for a reduction in refrigerant volume in heat exchangers while still allowing for high efficiencies.

In October 2016, Kigali, Rwanda hosted a Meeting of the Parties of the Montreal Protocol to develop an amendment that would phase down the use of harmful greenhouse gases (GHGs). A deal was reached by more than 150 countries [1].

More than 100 developing countries, including China, will start taking action by 2024 and developed countries including the United States agreed to a gradual process beginning in 2019.

**HFCs and HFOs**

R32 is a hydrofluorocarbon (HFC) similar to methane except that two of the four hydrogen atoms have been replaced by fluorine atoms. It has a GWP of 675, which is still quite high but relatively low compared to other HFCs still in use. Hydrofluoroolefins (HFOs) are also compounds of hydrogen, fluorine and carbon but are distinguished from HFCs by being derivatives of alkenes (olefins) rather than alkanes. Researchers are already seeking to understand how R32 and HFOs and blends of these refrigerants behave when they are passed through smaller diameter copper tubes.

The HFOs have ultralow GWP and factually are less flammable than R32; however, they are currently more costly because production of these compounds has not been scaled up. Meanwhile, R32 is cheaper and more widely available but it is more flammable and has a much higher GWP.

**MicroGroove and R290**

Applications that use hydrocarbons such as propane (R290) as a refrigerant typically also use smaller diameter copper tubes to reduce the requirements for refrigerant charge. HFOs are not as flammable as R290 but still they are flammable and minimizing refrigerant charge is desirable.

A recent article from the Institute of Refrigeration and Cryogenics, Shanghai Jiao Tong University, Shanghai, China reviews research on R290 condensation and evaporation [2]. According to the authors, this review paper is a starting point for future R290 studies and R290 applications in air conditioning systems.

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 requirements in light commercial applications; furthermore, propane is gaining acceptance for use in room air-conditioning systems in India, for example.

An R290 air-conditioner condenser application from Super Radiator Coils used MicroGroove tubes to reduce refrigerant charge and maintain high burst pressures with thinner walls [3]. In another application from Super Radiator Coils, smaller-diameter (5 mm) copper tubes were used rather than conventional-diameter (9.52 mm) copper tubes in a heat exchanger design for an R290 refrigeration system.

For more information, visit [www.microgroove.net](http://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](http://www.linkedin.com/groups/Microgroove-4498690).

**References**

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**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](http://www.copperinfo.com) for more information about ICA.

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