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## PRESENTATIONS

### UPCOMING WEBINAR

**“MicroGroove Copper-Tube Coils: Moving Beyond Residential Applications”**

**June 11, 2013, 1:00 p.m. EDT**

Free registration is open via [www.microgroove.net/webinars](http://www.microgroove.net/webinars) or directly [here](#).

### PAST SEMINARS

Download PDF of slideshows from the **“MicroGroove Technology for Commercial Systems”** seminar as presented at the AHR Expo 2013.

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### PAST WEBINARS

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- The Manufacture of ACR Coils with Smaller Diameter Copper Tubes
- Boost ACR Energy Efficiency with Copper MicroGroove Tubes
- Achieving Higher Energy-Efficiency with Smaller-Diameter Copper Tubes
- Small Tubes of Copper in ACR Applications

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## NEW APPLICATIONS FOR SMALLER-DIAMETER COPPER TUBES

OEMs, coil makers and researchers continue to develop new applications that use smaller-diameter copper tubes. MicroGroove technology is fast becoming adopted in both the residential and commercial sectors.

MicroGroove is already found in many window air-conditioners and split systems. Since the smaller tubes and inner grooves increase the heat transfer coefficients, the materials savings and performance gains cannot be ignored in volume production. Fin design, tube spacing and tube circuitry have all been carefully optimized in these products to increase coefficients of performance. The efficiency of air conditioners with MicroGroove tubes is now enjoyed by millions of residential users globally.

And, the same advantages are being gained in commercial air conditioners as well as refrigeration systems. Here is an overview of new applications for smaller diameter tubes with inner grooves.



A two-hour seminar on the commercial applications of MicroGroove drew many attendees. Slides of the presentations are now available online.

### MICROGROOVE GOES MAINSTREAM

At the MicroGroove Seminar earlier this year at the 2013 AHR Expo, Super Radiator Coils (SRC) and Burr OAK Tool Inc. as well as three major copper tube suppliers unveiled the story behind the uptake in commercial and refrigeration applications

A hundred or more persons were in attendance for the two-hour event, including representatives from some of the biggest names in the industry. “The seminar was a watershed event,” says Nigel Cotton, MicroGroove Team Leader for the International Copper Association. “The industry understands the message that MicroGroove benefits extend well beyond the residential air-conditioners.” Slideshows for the six presentations are now available for downloading from the event section of [microgroove.net](http://microgroove.net).

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Each of the presentations was twenty minutes in length, providing snapshots of current activities in coil design and manufacture. The presentation by Matt Holland of SRC especially piqued the interest of many of the attendees. Due to the strong audience response, MicroGroove is holding a one-hour webinar in partnership with Super Radiator Coils on 11 June 2013 at 1:00 pm ET. Registration is now open for this free webinar via the webinar page on [microgroove.net](http://microgroove.net).

"Matt Holland really struck a chord with the audience at the AHR Expo," says Nigel Cotton. "Super Radiator Coils is a US company that is leading the way in the development of large heat exchangers for commercial applications using MicroGroove tubes. An hour-long webinar with time for Q&A will allow SRC to fully share its successes with MicroGroove. We look forward to answering technical questions from a large webinar audience in June."

Meanwhile, MicroGroove brought news of successful applications to the China Refrigeration Expo in Shanghai in April 2013. Many attendees were drawn to the large attractive booth and were introduced to MicroGroove via printed case studies and colorful posters in both English and Chinese as well as OEM products on display. Chinese OEMs are familiar with the advantages of MicroGroove for residential air conditioners and now they are broadening its use. New design software will shortly be available specifically to aid in the design of commercial air conditioning equipment and refrigeration systems.



The MicroGroove exhibit at the 2013 China Refrigeration Expo in Shanghai attracted many curious heat exchanger engineers. Messages were presented in both English and Chinese.

## R290 READY FOR AMERICA

Recently, the US Environmental Protection Agency's Significant New Alternatives Policy (SNAP) program has authorized R290 as one of the available hydrocarbon refrigerants for use in household and small commercial refrigerators and freezers.

MicroGroove smaller diameter copper tubes are an effective way to reduce refrigerant charge and meet performance requirements. Significant development work has already been accomplished in China on the use of propane (R290) as a refrigerant in evaporator and condenser coils made from MicroGroove Copper tubes.

R290 is not the only natural refrigerant that can be used with MicroGroove tubes. Smaller diameter copper tubes are also well suited for use with carbon dioxide (R744) as a refrigerant.

Spirotech is one company that has developed coils with 5-mm copper tubes for use with CO<sub>2</sub> refrigerant. The company displayed a compact heat-exchanger coil made from 5-mm diameter tubes at the AHR Expo in Dallas. According to Shonali Suri, who is the US-based director for Spirotech Heat Exchangers, the 5-mm tubes result in a rugged, compact design that is well suited for use with R744 as a refrigerant in vending machine applications as well as other applications for refrigeration systems in the cold chain.

## COPPER IN THE COLD CHAIN

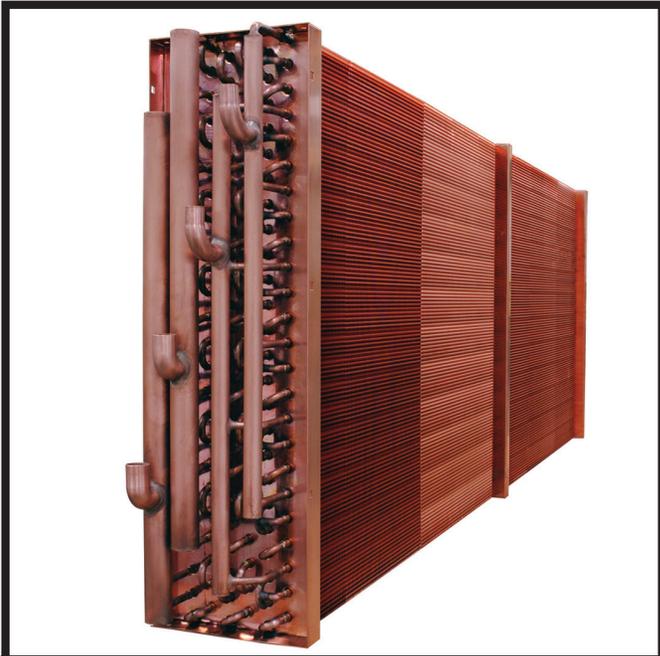
The cold chain is a modern miracle that brings fresh produce, food and dairy products from the farm to the supermarket on a daily basis, allowing hundreds of millions of people to enjoy a wide variety of convenient, safe and affordable food products.

Copper tubes are widely used in evaporators and condensers in the cold chain. They are used to advantage in the transport, processing, storage, distribution and display of chilled and frozen food products. The Copper Alliance and its member companies are conducting technical research and market research on the advantages of copper tubing in the cold chain and how MicroGroove technology can be used to increase these advantages.

"The industry is beginning to understand the advantages MicroGroove could bring to the cold chain," says Nigel Cotton. "For restaurants and supermarkets as well as for refrigerated transport and food processing, there are many applications for which MicroGroove, along with new refrigerants, can increase efficiencies while allowing for more compact designs."

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Super Radiator Coils is one of the first companies to make an all-copper coil with MicroGroove tubes. This coil uses 7 mm copper tubes and copper fins. Antimicrobial copper inhibits the growth of microorganisms, contributing to longer-lasting heat transfer performance and reduced odors.

## ANTIMICROBIAL COILS

Copper is inherently antimicrobial. There is no need to coat copper tubes to benefit from the antimicrobial properties of copper. All that is necessary is to use copper fins and copper tubes.

Bacteria can thrive on materials such as aluminum or stainless steel, which have no measured antimicrobial properties. Evidently the bacteria can form layers on these materials and become a substrate for further growth of microorganisms. However, on copper surfaces, the growth of bacteria, mold and mildew is quickly suppressed as a result of the antimicrobial properties of copper, so the surface is cleaner and easier to maintain.

The increased thermal conductivity of the MicroGroove tubes pairs well with the high thermal conductivity of copper fins, allowing for more compact antimicrobial coil designs and reducing the weight of the coils.

Official endorsement of research conducted by the Copper Alliance was received via the US Environmental Protection Agency "Treated Article Exemption" registration for copper alloys in HVAC applications. Granted in September 2010, the registration allows copper HVAC components to make product protection claims in the US. These products can claim to suppress the growth of bacteria, mold and mildew that reduce system efficiency and cause product deterioration or foul odors.

As previously reported in the MicroGroove Update ("In the Spotlight," Volume 2, Issue 4) field tests were conducted by the Shanghai Municipal Center for Disease Control and Prevention (SCDC) on evaporator coils installed in buses. Evaporator coils with aluminum fins were replaced with units with copper fins, which can eliminate bacterial, fungal and viral growths. Their surface remains cleaner for longer, offering a greatly expanded service life and contributing to improved air quality.

More recently, a leading coil manufacturer Super Radiator Coils began offering all-copper heat exchanger made with small diameter copper tubes as well copper fins; and so became one of the first companies to combine MicroGroove tubes with copper fins, according to Matt Holland, Vice President of Operations at the Richmond Division of Super Radiator Coils.

"The performance of the all-copper coil with MicroGroove tubes is outstanding," says Holland. "Several customers are quite interested in applying these small diameter copper tube coils in tough applications. The all-copper coils with MicroGroove offer the advantages of compact size and high efficiency as well as antimicrobial properties."

The coils were developed in a world-class wind tunnel which allows for the monitoring of refrigerant temperature and pressure and the control of refrigerant flow through the coil while the wind tunnel is operating.

## KEYS TO SUCCESS: THE NEXT BIG THING

Who knows what will be the next big thing for MicroGroove smaller-diameter tubes? The growing use of heat pumps; variable refrigerant volumes; new synthetic refrigerants and natural refrigerants; the elimination of leaks from supermarkets; the development of energy-efficient display cases; the integration of hot-water systems with air-conditioning; "cold energy" storage; and the rise of zero net-energy homes.

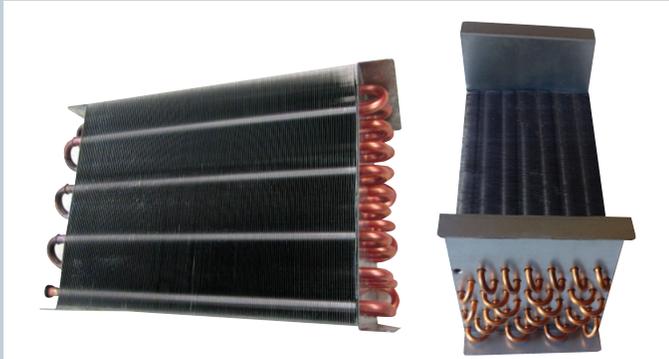
It is a good time to be in product development in the ACR industry. The next big thing in ACR might be made from small tubes. And it may come from your laboratory work bench. Will MicroGroove tubes be the key to your success? Join our discussion group on LinkedIn and let us know what you think. . 

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## IN THE SPOTLIGHT



This heat exchanger features internally-grooved, 5-mm copper tubes with aluminum fins. Energy-efficient clothes dryers and beverage cooling equipment using R744 as a refrigerant are among the many applications for MicroGroove technology. According to Dr. R.K. Malhotra, many manufacturers are switching to Microgroove technology for domestic split air-conditioning systems, too, where it raises energy-efficiency and increases reliability, especially with new refrigerants that operate at higher pressures.

### SPIROTECH MOVES TO SMALLER-DIAMETER COPPER TUBES

The SPIROTECH team is led by a highly experienced top management with core competence in the cooling and condensing coils industry and decades of hands-on expertise. SPIROTECH supplies its products to a prestigious clientele including Carrier Group, Blue Star, Voltas and Hitachi in India. Export customers include BSH Home Appliances, Ingersoll Rand and NIBE, accounting for about 65 percent of its sales.

SPIROTECH exhibited its next-generation heat exchanger coils made with 5-mm copper tubes at the AHR Expo this past January and now is preparing to deliver coils made with MicroGroove tubes in volume.

According to its chairman Dr. R.K. (Raj) Malhotra, the thermal efficiencies of MicroGroove tubes allows for the design of coils

that offer either higher efficiencies, lower costs, or a combination of both. "Both of these advantages are important to our customers," says Dr. Malhotra.

"Besides the advantages of lower materials costs and higher performance, certain other design advantages are gained through the use of 5-mm diameter copper tubes," he explains. "Compact coils contribute to smaller and lighter system designs. Furthermore, less refrigerant charge is required, further reducing costs for our OEM customers."

When asked to compare copper to aluminum tubes, Dr. Malhotra pointed out that copper-tubes continue to have the advantages of greater corrosion resistance and ease of field servicing compared to aluminum tubes. As for comparing MicroGroove with microchannel, he says, "The coils could be cost competitive compared to microchannel parallel-flow aluminum coils for many applications."

For India in particular, there is a move towards natural refrigerants such as butane and carbon dioxide, which have higher operating pressures compared to conventional refrigerants. Considering the higher operating pressures and safety regulations, "Coils in these applications need to have much higher bursting pressures to meet safety and statutory regulations. This is possible at lower cost with smaller diameter 5.0 mm copper tubes with moderate wall thicknesses," he says.

For coils using MicroGroove tubes, SPIROTECH currently uses the following design parameters: fin pattern, 5.0 mm x 19.05 mm x 16.50 mm, or 5.0 mm x 0.75 in. equilateral pattern; finned length between end plates, 300 mm to 1600 mm, or 12 in. to 63 in.; number of rows, 1 to 12; fin spacing, 2.50 mm to 1.30 mm, or 10 to 20 fins per inch; and fin thickness, 0.10 mm to 0.19 mm, or 0.0039 in. to 0.0075 in.

SPIROTECH has already ordered the equipment necessary for volume production. It is planning to ramp up to a production capacity of 300,000 units per year. "We are investing in the necessary production equipment so we can offer superior products to our customers," says Dr. Malhotra. "Production of coils using the 5-mm technology is scheduled to start in July 2013."

For more information, visit [www.spirotechindia.in](http://www.spirotechindia.in). Customer enquiries and requests for samples for supply in July 2013 are welcome. Please direct your request by email to [rk.malhotra@spirotechindia.in](mailto:rk.malhotra@spirotechindia.in) at the SPIROTECH headquarters in New Delhi. In the USA, you can also contact Ms. Shonali Suri, Director, who is based in Oakton, Virginia.

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