

MicroGroove Copper Tube Coils

Moving Beyond
Residential
Applications

Presented by:



the microgroove advantage

Previous MicroGroove Webinars

Archived at www.MicroGroove.net

“Small Tubes of Copper in ACR Applications: The MicroGroove Advantage” *December 2010*

“The MicroGroove Advantage: Achieving Higher Energy-Efficiency with Smaller Diameter Copper Tubes” *June 2011*

“Boost ACR Energy Efficiency with Copper MicroGroove Tubes” *June 2011*

“The Manufacture of ACR Coils with Smaller Diameter Copper Tubes” *March 2012*

MicroGroove Technology in Commercial and Industrial Applications

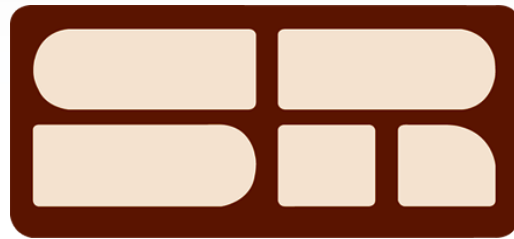
CONDENSERS • EVAPORATORS • INDUSTRIAL HEAT EXCHANGERS



- Air Conditioning
- Air Handling
- Refrigeration
- Food Processing
- Transportation
- Power and Energy
- Industrial Processing

Special thanks to Super Radiator Coils

Manufacturers of commercial and industrial
coils covering a full range of applications

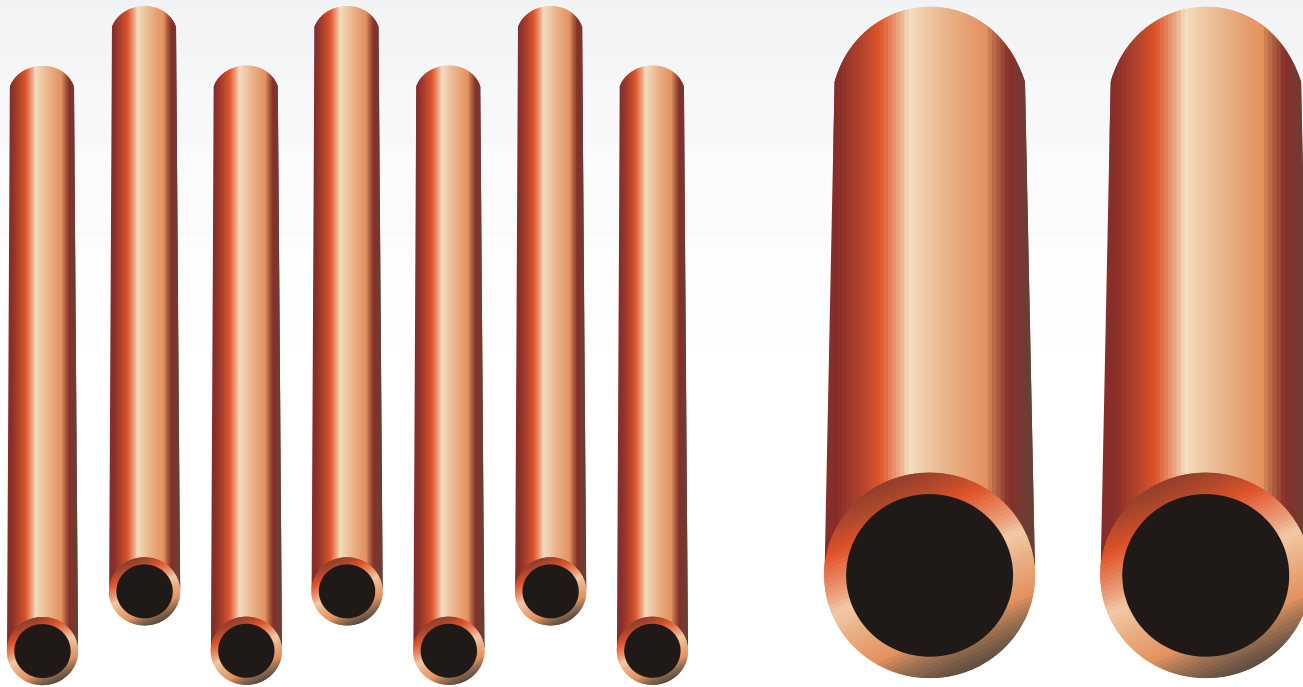


***SUPER
RADIATOR
COILS™***



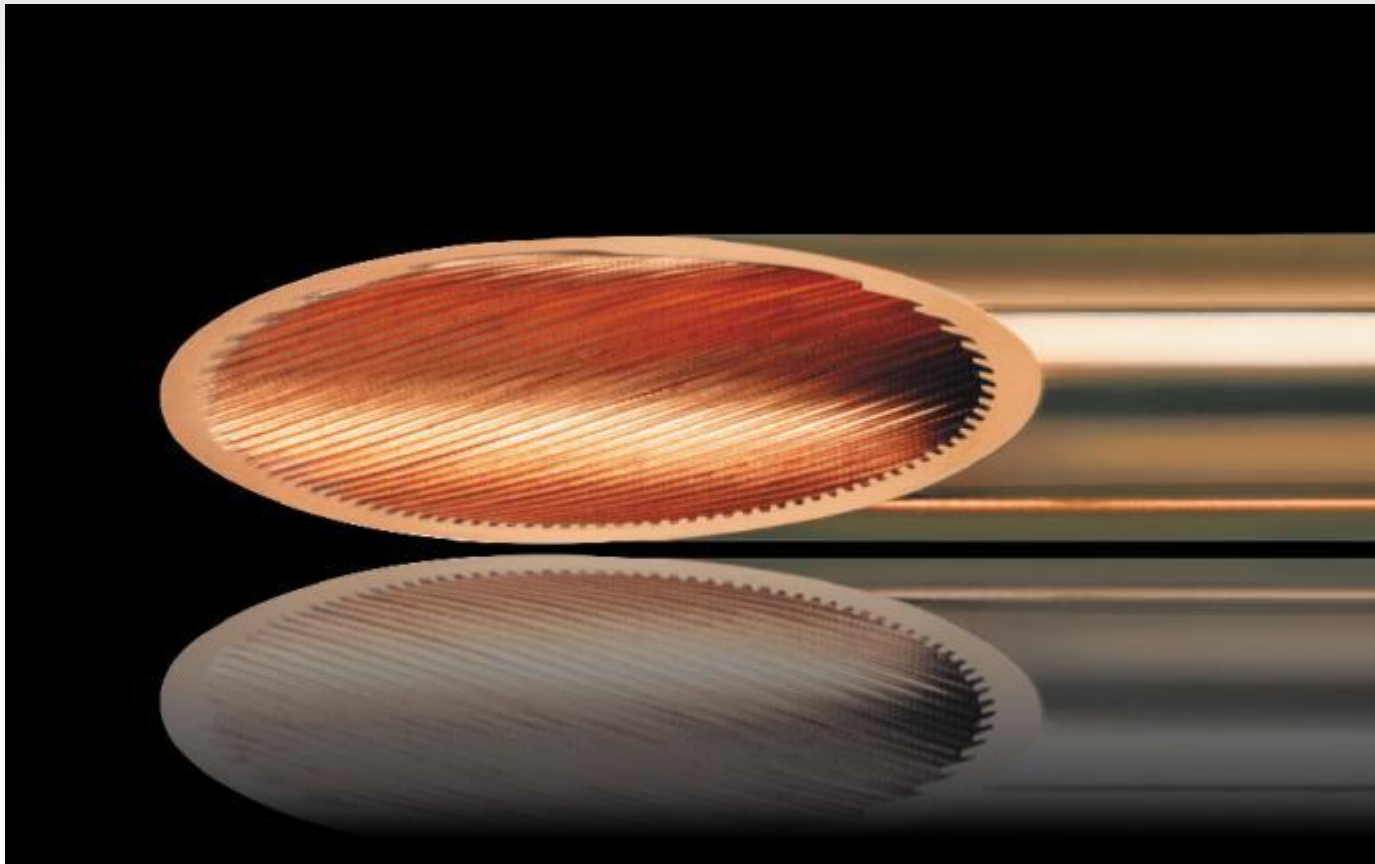
MicroGroove Basics

“Micro” = reduced diameter copper tubes



MicroGroove Basics

“Groove” = internally enhanced copper tubes



MicroGroove Basics

Increased
Surface Area

+

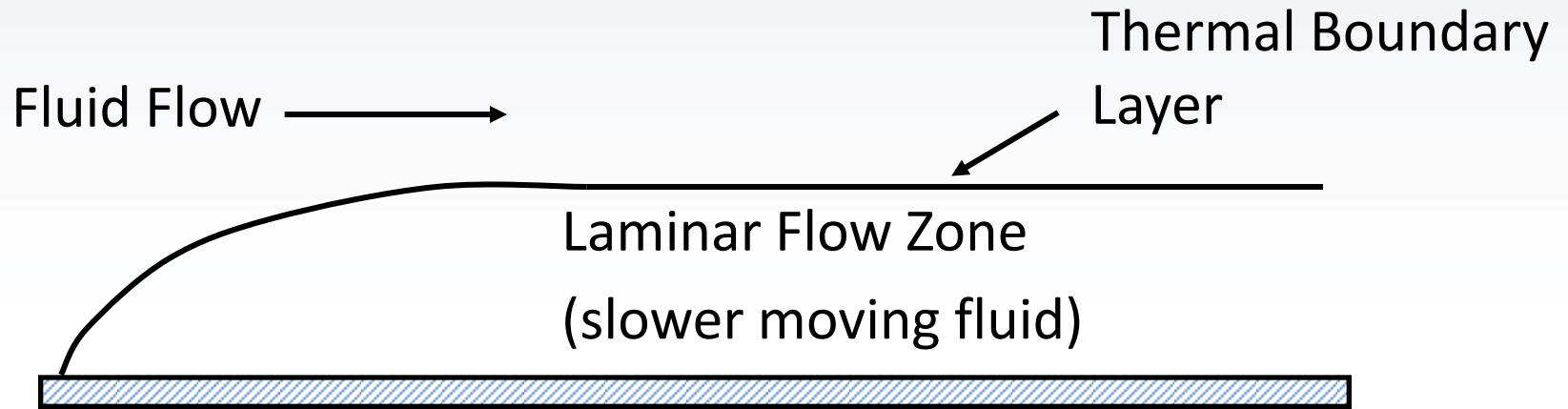
Reduction of
Boundary Layers



INCREASED
HEAT TRANSFER

MicroGroove Basics

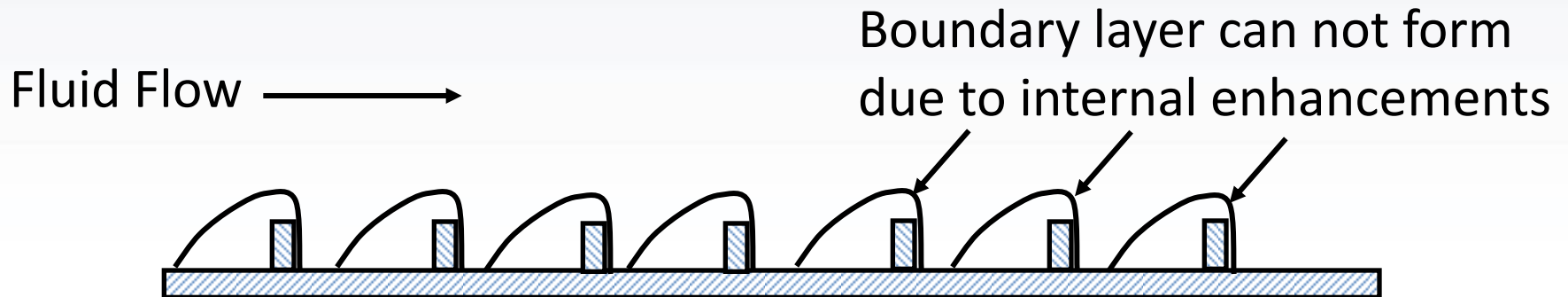
Reduced Boundary Layers Inside Tubes



Smooth Internal Tube Wall

MicroGroove Basics

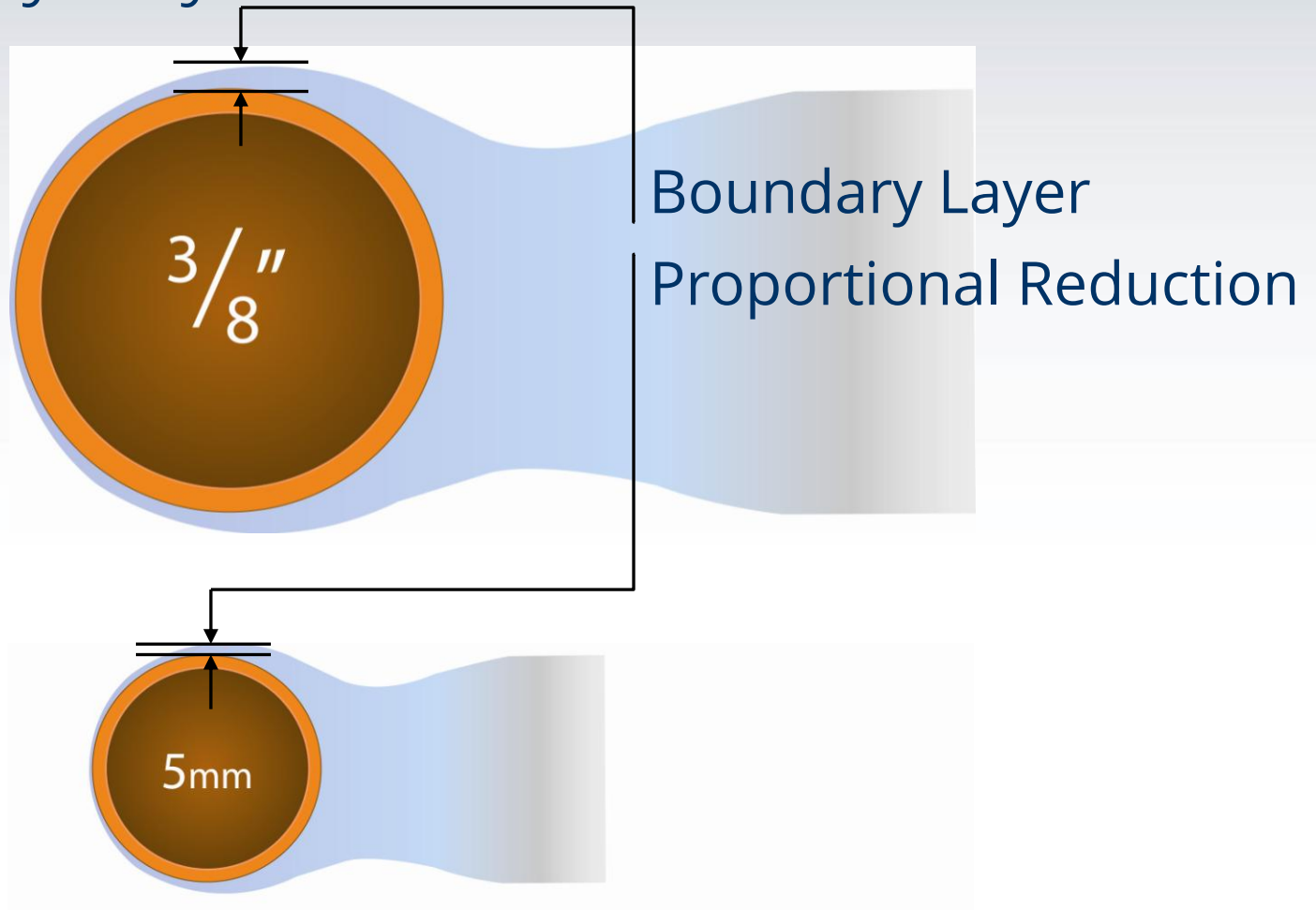
Reduced Boundary Layers Inside Tubes



MicroGroove Tube

MicroGroove Basics

Boundary Layers on the Outside of Tubes



Benefits of Manufacturing Coils

with Small Diameter MicroGroove Tubes

- Energy Efficient
- Less Material
- Less Refrigerant
- Proven, Economical Manufacturing Process
- Minimal Equipment and Process Changes
- Established World-Wide Supply and Support

MicroGroove Coils

with 5mm Tubes

5mm MicroGroove Coils vs. Traditional $\frac{3}{8}$ " (9.5mm)

- 40-50% reduction in tube weight
- 40-50% reduction in fin weight
- 50+% reduction in internal volume
- 50% reduction in required wall thickness to meet pressure requirements

Source: Super Radiator Coils

Super Radiator Coils

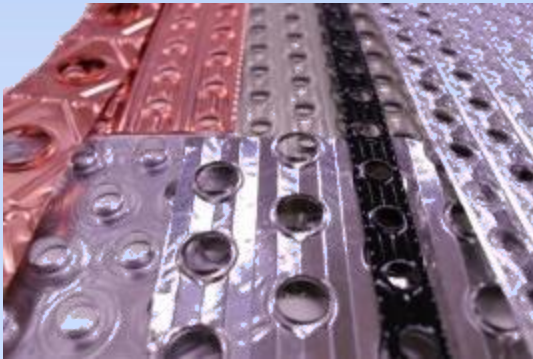
HEAT TRANSFER SPECIALISTS SINCE 1928



- 3 Facilities
- 240,000 ft² of Manufacturing
- ISO 9001:2008

Super Radiator Coils

WE KNOW HEAT TRANSFER



26 Fin Patterns

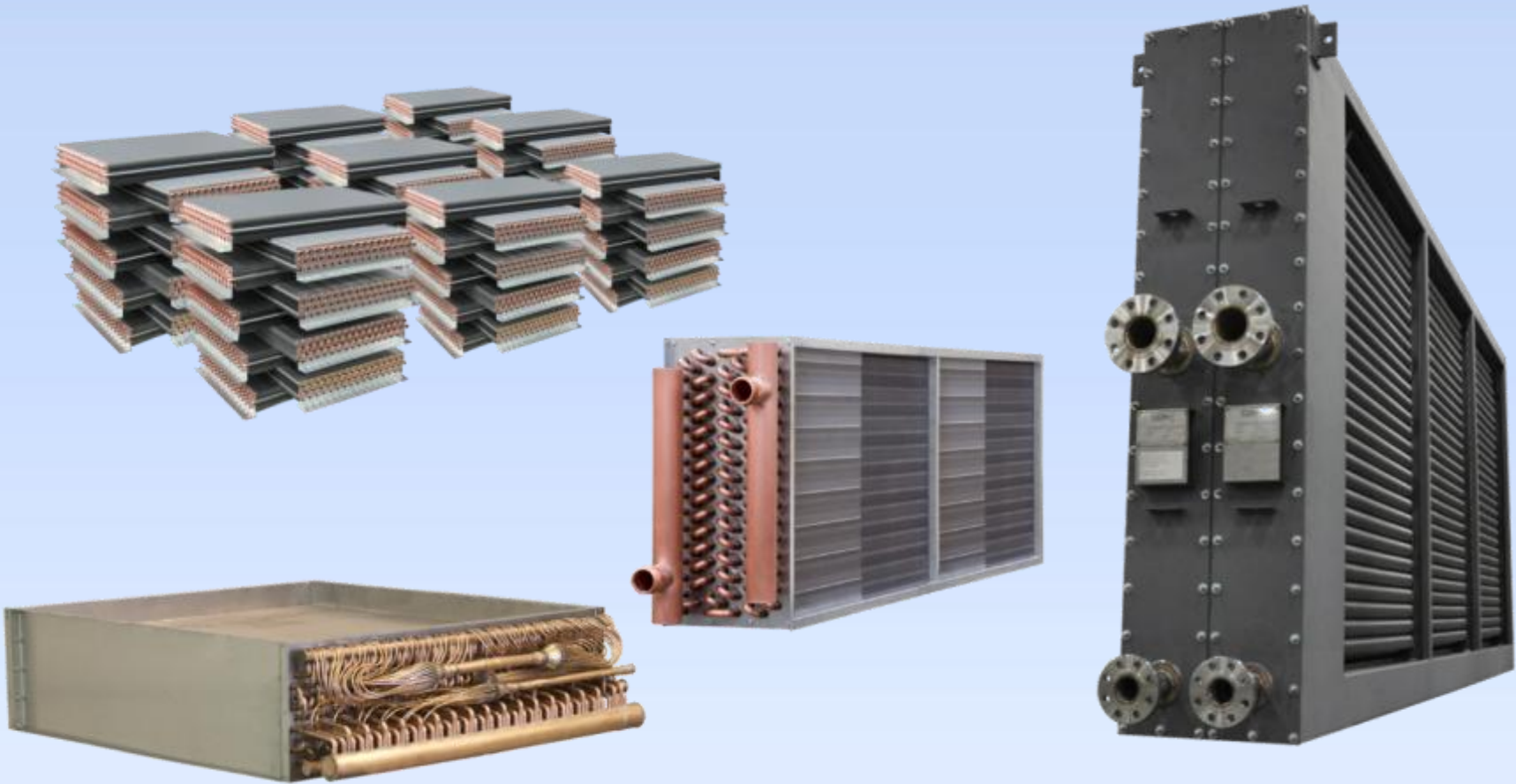


24 Applications
Engineers



+8 Tube Diameters

A Full Range of COMMERCIAL & INDUSTRIAL COILS



Wind Tunnel & Test Lab

THE MICROGROOVE COILS WERE DEVELOPED IN THE SUPER RADIATOR COILS
WIND TUNNEL TEST LAB, IN RICHMOND, VA



Dr. Jian Yu

Director of Product Development

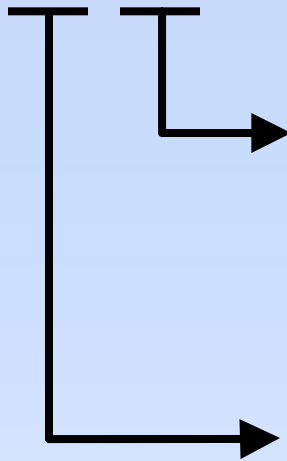
- Airflow from 100 – 8,500 cubic feet per minute.
- Air temperatures from 23°F – 140°F and humidity from 20 – 95%.
- Separate fluid testing loops for: Refrigerants, Water, Glycol, Oil, & Steam
- Available for 3rd Party Testing Services

Learn more about the test lab at: <http://www.superradiatorcoils.com/test-lab>



Compounding Benefit

$$Q = U A \times \Delta T$$



Less Metal Required For the Same Effective Area (A)

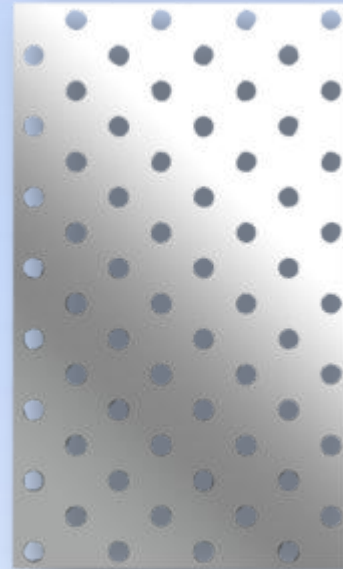
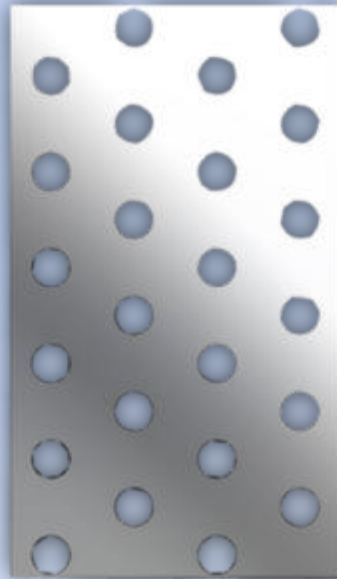
Better Inside Heat Transfer Coefficient (h_i) and Better Outside Heat Transfer Coefficient (h_o)

More Primary Area (A) For the Metal

$$Q = U \underline{A} \times \Delta T$$

STANDARD $\frac{3}{8}$ "
PATTERN

5mm MICROGROOVE



Sum of Tube
Circumference

28 in.

40 in.

↑ 40% Primary Contact

Sum of Tube Cross
Sectional Area

0.41 in²

0.37 in²

↓ 10% Copper

Improving h_o On Extended Surface

$$Q = \underline{U} A \times \Delta T$$

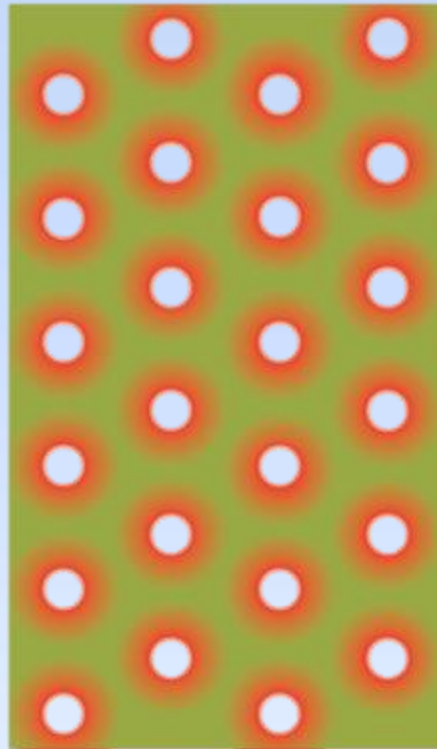
Fin Efficiency



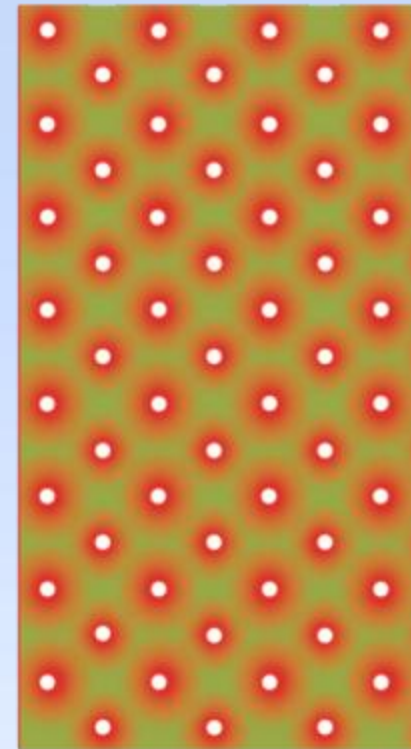
High

Low

STANDARD $\frac{3}{8}$ "
PATTERN



5mm MICROGROOVE



Design Software Demonstration

A TRADITIONAL 14 NOMINAL TON CONDENSER
USING $\frac{3}{8}$ " DIAMETER ENHANCED COPPER TUBE

Face Area: 36" x 60"

Refrigerant: R134a

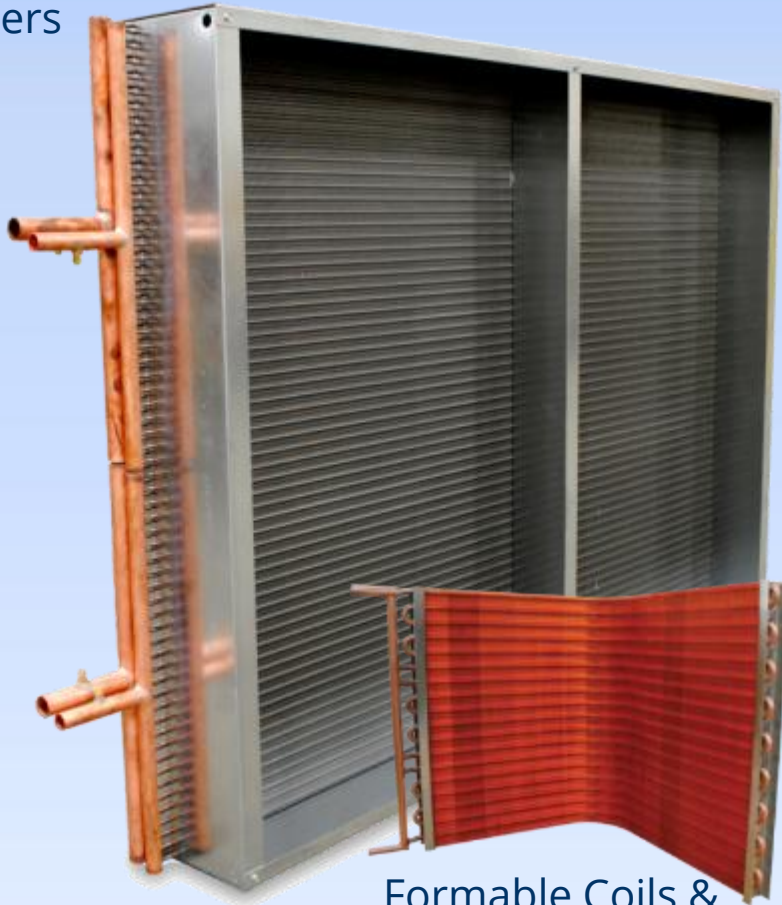
Ambient: 95°F

Condensing Temp: 120°F

Demonstration by: Louis Rogerson, Director of Engineering/Sales

Flexible Sizes and Configurations

Large Multi-Row
Condensers



Formable Coils &
Copper Fins

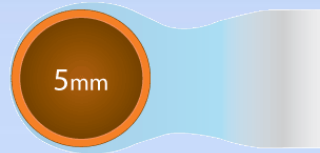
Evaporator
Coils



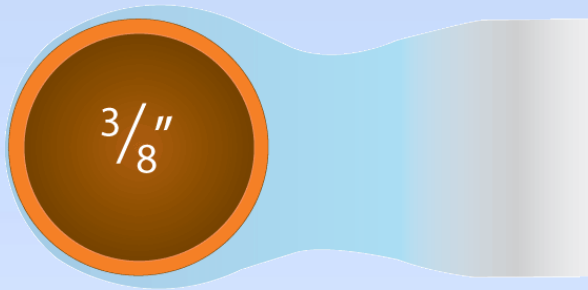
Other Compact
Designs

Lower Refrigerant Charge

LESS VOLUME REQUIRED FOR THE PRIMARY SURFACE AREA, A



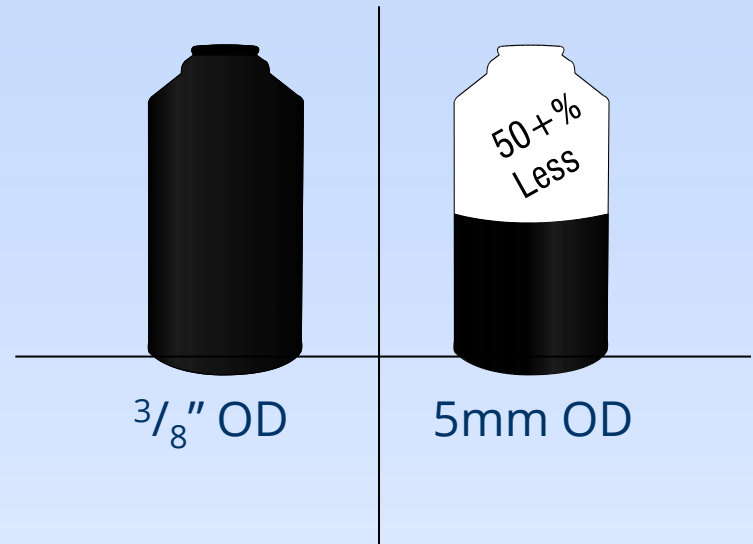
48 % less A, but
72% less volume



Less Primary (A) Required Due To:

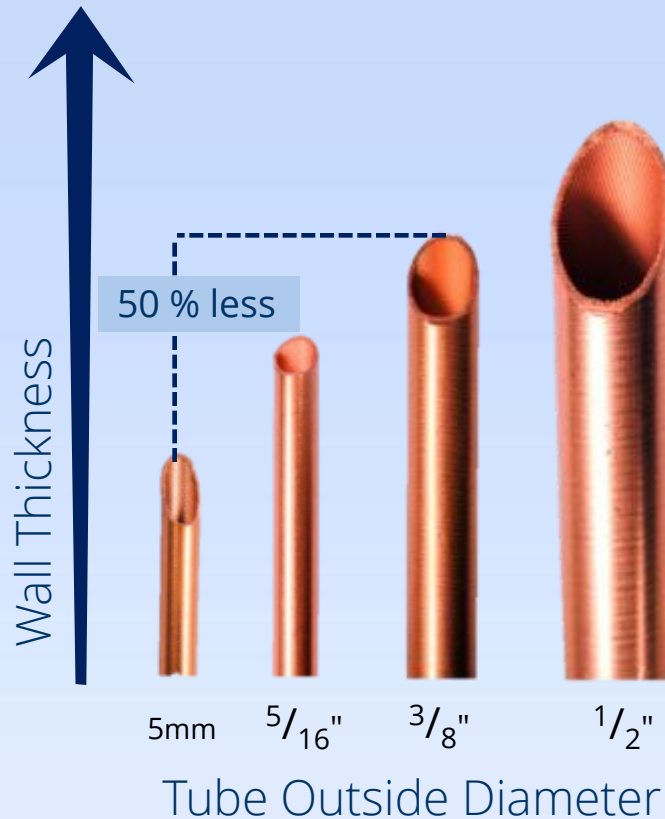
- Better h_i , and
- Better h_o

SIGNIFICANT REDUCTIONS IN REFRIGERANT CHARGE



Higher Pressure With Thinner Tube

COMPARISON OF TUBE WALL THICKNESS REQUIRED
FOR 600 PSIG DESIGN RATING



Perfect for CO₂ and 410A
Applications



MicroGroove Coils Available Today

Preliminary Selections



Controlled Testing



Rapid Prototypes



Volume Production



Enterprise Software Download

TWO WAYS TO DOWNLOAD OUR SOFTWARE

- Go to this URL
<https://enterprise.superradiatorcoils.com/Registration/Register>
- -- OR --
- Go to www.superradiatorcoils.com
> Resources Tab > Coil Sizing Software



Questions

**Download the
Enterprise Program**

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the microgroove. advantage



**SUPER
RADIATOR
COILS™**



International Copper
Association
Copper Alliance

Contact

Enterprise Software

<https://enterprise.superradiatorcoils.com/Registration/Register>

Test Lab Video

www.superradiatorcoils.com/test-lab

MicroGroove Product

www.superradiatorcoils.com/microgroove

www.microgroove.net

WE KNOW HEAT TRANSFER

