New copper –based heat exchangers for R744
Part II: Systems design and case studies

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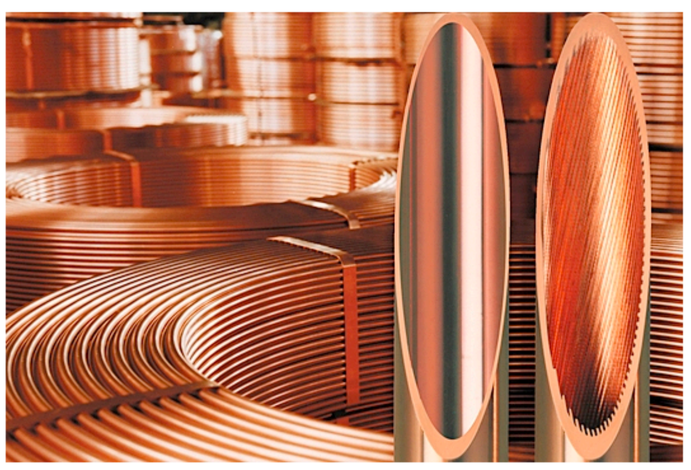
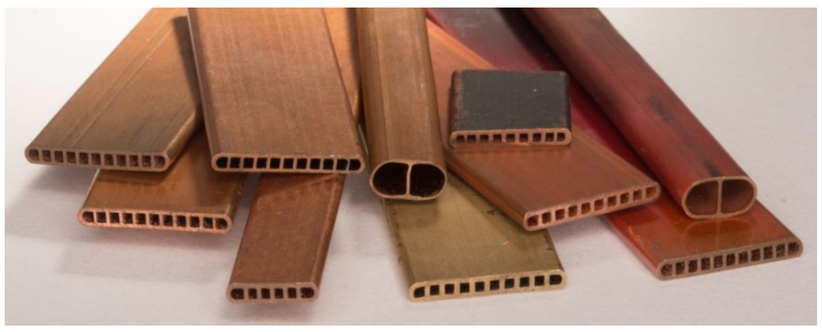
Heat Transfer Technologies

- Smooth or Inner-grooved tubes made of a high-strength copper alloy (CuFe2P) and suitable for high pressure R744 applications
- Wall diameter 0.25 to 2.0mm
- Brazeable and weldable
- Withstands 2X the pressure of standard copper ACR tube

- Multichannel Copper profile, 1.0-1.3mm channel width
- Precision, thin-wall, 0.2-0.3mm
- Up to 62MPa burst pressure with 0.4mm wall and 1mm channels

Plain and inner-grooved tubes for CO_2 applications



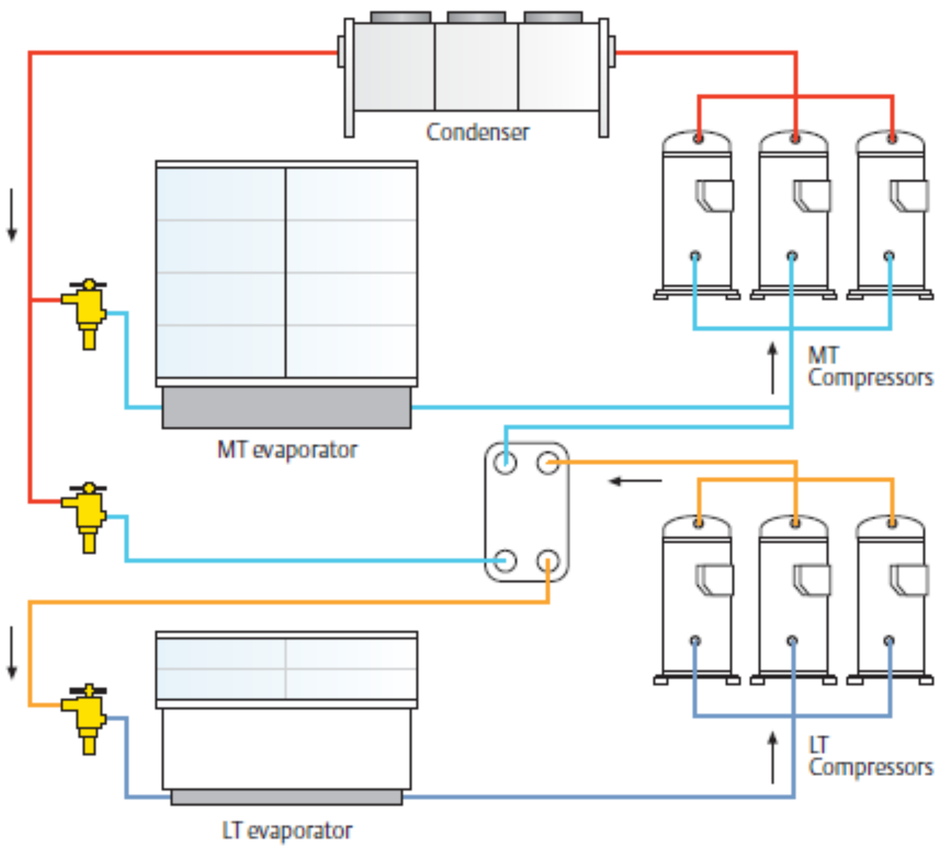


Applications

R717/R744 Cascade refrigeration system

For large food freezing and storage warehouses, with R744 in the LT loop - suitable for small diameter copper tube, microchannel and CuFe2P tube (Emerson 2010)

Emerson Climate Technologies. 2010, Refrigerant Choices for Commercial Refrigeration – Finding the Right Balance.



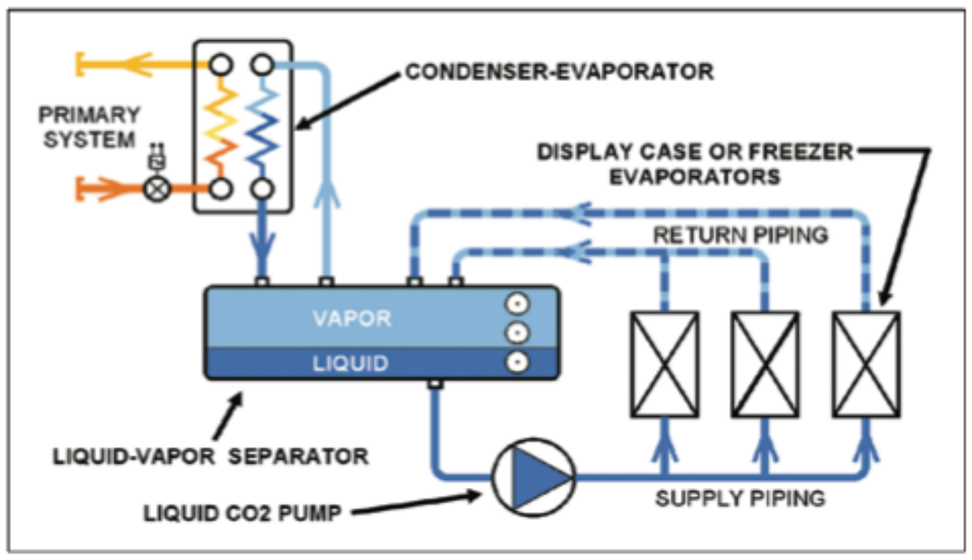
R744 Secondary loop system

Considerable savings can be materialize from the use of small diameter copper tubes in the transmission lines

Hill Phoenix SecondNature ™ Low Temp system

System	Length	Diameter	Insulation	Costs
Direct Expansion (copper tubing)	100m 100m	32mm 10mm	10mm -	100%
Secondary Refrigerant System (plastic tubing)	200m	32mm 10mm	30mm	167%
CO_2 Secondary Refrigerant System (copper tubing)	100m 100m	18mm 6mm	30mm 10mm	83%
CO_2 Cascade System (copper tubing)	100m 100m	18mm 6mm	10mm 5mm	42%
Additional costs not included: fittings, insulation Additional costs for CO_2 : extended pressure range or 2nd defrost system				

U. Hesse, "Secondary Refrigerant Systems for Supermarket Application with Brine or Carbon Dioxide," International Refrigeration and Air Conditioning Conference at Purdue University,



R744 Vending machines

R744 refrigeration cassette with both evaporator and condenser using 5mm inner-grooved copper tube (Sanden Vendo)