ROYAL INSTITUTE OF TECHNOLOGY

green Heat Pump

Minichannel Heat Exchanger used as Condenser

Green Heat Pump Condenser

Aluminium Mini-channel Water to Refrigerant Heat Exchanger as Condenser

Main advantages

- High heat transfer coefficients on both refrigerant and water side
- Very small internal volume
- High number of parallel channels keep pressure drop low

Main challenges:

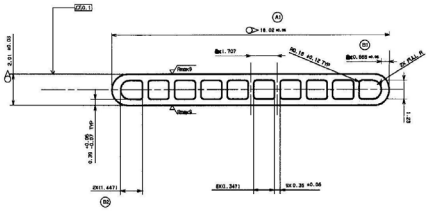
- New design
- New production method
- Risk of corrosion with aluminium in water

Aluminium Minichannel Heat Exchanger

- Heat exchanger produced entirely in Aluminium
- New type of water to refrigerant heat exchanger
- Refrigerant inside multiport extruded (MPE) Tubes
- Water-side in bar-plate-design with 2mm-turburators
- Aluminium heat exchanger brazed in vacuum furnace

Prototype

Prototype Aluminium condenser with counter-current flow of refrigerant and water

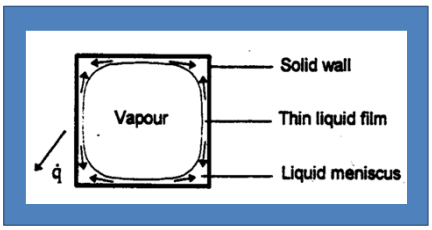


Top: Detailed view of condenser with water inlet and refrigerant outlet. Refrigerant passage straight through multiple MPE-tubes

Bottom: Drawing of single MPE-tube

Capillary Condensate Drainage enhance heat transfer

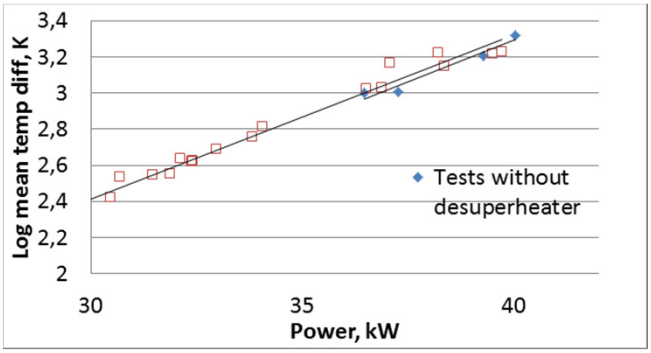
- During condensation in small vertical rectangular channels surface tension forces will pull the liquid to the corners thereby decreasing the average film thickness and enhancing heat transfer.



Film thickness in small rectangular channel influenced by surface tension forces

Test results

Condenser in preparation for testing



Sample test results expressed as log mean temp difference vs condenser power.

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