



Studienarbeit

Evaluation and comparison of the different channel and fin geometries for an air-cooled supercritical CO₂ heat exchanger in a heat removal system for nuclear power plants

Objective:

The main goal is to find the optimum channel or fin geometry in terms of pressure drop and heat transfer for the heat exchanger at the heat sink. The focus is on air-cooled heat exchangers for supercritical fluids.

Background:

Since the accidents in the boiling water reactors in Fukushima Dai-ichi, the removal of decay heat became a main part of the reactor safety research. For this reason, a new concept has been developed over the last years for decay heat removal. This concept is a sCO₂-operated decay heat removal system based on a Brayton cycle.

The sCO₂-4-NPP project, intends to bring this heat removal system closer to the market. The system mainly consists of a heat exchanger at the heat source, a turbo-compressor system and a heat exchanger at the ultimate heat sink (ambient air). Since the system is a self-sufficient thermodynamic cycle that starts automatically with supplied heat the minimisation of pressure drop for each cycle component plays an important role. The company FIVES Cryo developed plate-fin heat exchangers with supercritical CO₂ as a working fluid for the heat sink. To ensure maximum use of the heat transfer surface and minimum pressure drop it is necessary to select a suitable fin or channel geometry for the heat exchanger. The focus should be on air-cooled heat exchangers.

Approach:

- Familiarisation with the different types of heat exchangers for supercritical fluids with different channel/fin designs.
- Analysis of the heat transfer experiments from an existing experimental database.
- Evaluation of the different types of heat exchangers in terms of a high heat transfer and low pressure drop.
- Elaboration and presentation of the results.

Conditions:

- Ability to work independently and self-motivation.
- Interest in supercritical fluids and literature work.
- Good English reading and writing / German speaking skills.

Start:

Immediately

Supervisor:

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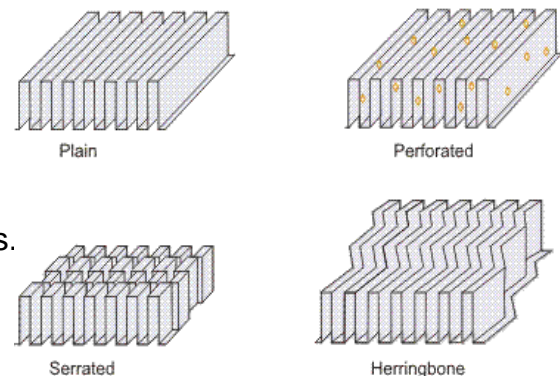


Figure: Different fin geometries
 Source: FIVES Cryo

