



Universität Stuttgart

Institute of Nuclear Technology
and Energy Systems

Prof. Dr.-Ing. Jörg Starflinger
Institute of Nuclear Technology and
Energy Systems

Bachelor or
Master Thesis

Analysis of Different Control Methods for the Cooler of a Supercritical CO₂ Cycle

Objective:

The objective of this work is to apply and analyse various control methods (e.g. MPC) for the cooler of a supercritical CO₂ (sCO₂) cycle.

Background:

sCO₂ is a promising working medium for various next-generation applications, both in the field of renewable and conventional power generation (project ISOP, SOLARSCO2OL, ShunShot, Misha).

Within the scope of this work, the control of the cooler of the sCO₂ cycle is analysed in detail. Controlling the cooler is challenging since it operates close to the critical point of CO₂, where the thermodynamic properties exhibit a highly non-linear behaviour.

Applying Matlab and the simulation code ATHLET (Analysis of THERmal-hydraulics of LEaks and Transients), the cooler is modelled based on existing models and tools. Afterwards, different approaches for the control of the cooler are implemented and tested over a wide range of conditions.

Approach:

- Literature study on sCO₂ coolers (focusing on control)
- Familiarization with the existing code and tools
- Implementation of different control approaches
- Test of these approaches over a wide range of conditions
- Thesis preparation and presentation

Requirements:

- Fundamentals of thermodynamics, fluid dynamics and control
- Experience in programming preferably in Matlab
- Interest in simulation and control
- Analytical thinking and self-initiative

Start: as soon as possible

Contact: Dr.-Ing. Markus Hofer
Pfaffenwaldring 31 • 70569 Stuttgart
hofer@ike.uni-stuttgart.de
+49 (0) 711 685-60855

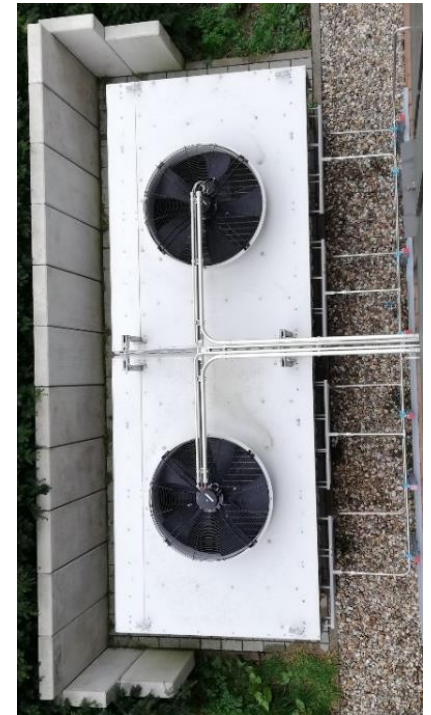


Figure 1: Air-cooled sCO₂ heat exchanger at the sCO₂ test loop in Essen, Germany



The University of Stuttgart would like to increase the proportion of women in the scientific field and is therefore particularly interested in applications from women. Severely disabled persons are given priority in the case of equal suitability.



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