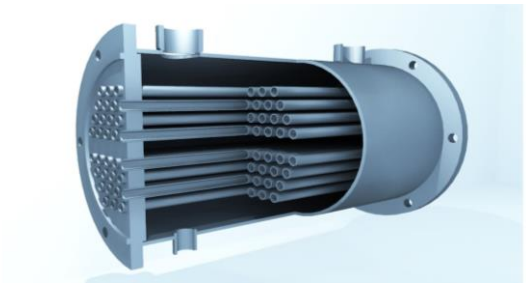
Technische Universität München

Lehrstuhl für Energiesysteme

Modeling of Shell-and-Tube heat exchangers for low- and medium-grade marine ORC systems



Description:
Waste Heat Recovery (WHR) Organic Rankine Cycle (ORC) technologies are gaining increasing attention as a promising solution for decarbonizing the shipping sector and reducing fuel consumption in marine engines. Among the key components of ORC systems, heat exchangers play a critical role in system efficiency, especially due to their compactness and effectiveness. Since they account for 70–80% of the total investment cost and occupy significant volume compared to other system components, improving the design of shell-and-tube heat exchangers is essential for enhancing the overall performance and cost-effectiveness of marine ORC systems.

The following work packages (WPs) form the content and tasks of the thesis:

WP1: Conducting a comprehensive literature review on modeling and optimization approaches for shell-and-tube exchangers. Evaluate state-of-the-art heat exchanger design methodologies, including analytical, empirical, and numerical approaches

WP2: Developing a 1-D discretization model for calculating required heat transfer area and determining design parameters (based on an existing model). Implementing different heat transfer and pressure drop correlations to evaluate their impact on exchanger performance. The waste heat sources of interest are the exhaust gases (used in the ORC evaporator) and the scavenge air (used in ORC preheater)

WP3: Validating the developed model and assessing its accuracy using data from experimental studies and published benchmarks.

Requirements:
- Motivation, creativity and structured working
- Experience in modelling of thermodynamic systems (e.g. assignments, internship, bachelor/ semester thesis)
- Programming skills (MATLAB® or Python)
- Good knowledge of English

Please, send your application with a **Curriculum Vitae** to

Contact:
Amalia Stainchaouer, Dipl.-Ing.
amalia.stainchaouer@tum.de

A short motivation letter (1-page maximum) would be highly appreciated, but it is not mandatory for the consideration of your application.