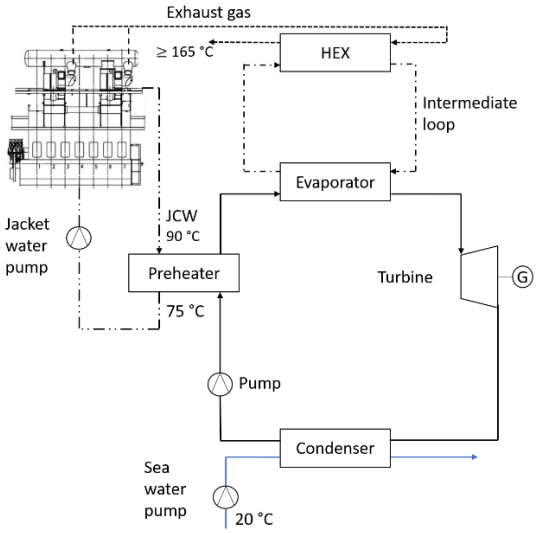
Technische Universität München

Lehrstuhl für Energiesysteme

Technoeconomic analysis of ORC system utilizing marine engine's waste streams

Description:

The decarbonization of maritime transport requires innovative solutions to improve onboard energy efficiency. One such approach is the recovery of low- and medium-grade waste heat from ship engines using Organic Rankine Cycle (ORC) systems. This thesis investigates a dual-source ORC configuration that recovers waste heat from both exhaust gases—via an intermediate loop—and jacket cooling water (JCW) of a marine diesel engine. The goal of this work is to evaluate the economic feasibility of the proposed ORC system under realistic operating profiles of a selected vessel type, considering fuel savings from diesel gensets.



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

WP1: Conduct a comprehensive literature review on existing cost estimation methodologies for marine energy systems, focusing on capital (CAPEX) and operational expenditures (OPEX). Emphasis will be placed on established correlations and models for component costs (e.g., heat exchangers, turbines, pumps) and auxiliary systems (e.g., intermediate loop, piping, control systems). The review will also include approaches for estimating installation and integration costs for onboard systems.

WP2: Develop an economic model of the proposed ORC system to calculate key economic indicators, such as **Payback Period**, **Levelized Cost of Electricity (LCOE)** and **Net Present Value (NPV)**. The model will integrate future projections for **fuel and carbon prices**, **interest rates** and **system lifetime**. A **sensitivity analysis** will be performed to assess the impact of varying operating conditions (e.g., engine load profile) and design parameters on economic performance.

WP3: Analyze and interpret the results of the techno-economic assessment in terms of **economic feasibility**, **fuel savings** and **carbon emission reduction**.

Requirements:

- Motivation, creativity and structured working
- Experience in modelling of thermodynamic systems or conducting financial assessments (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

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