Flexibility evaluation of heat exchanger network retrofits

Brief background

Heat integration is one of several options for improving the energy efficiency of industrial plants. Heat is widely used in the chemical and oil refining industry as well as in, for example, the pulp and paper and steel industry. Consequently, an energy and cost efficient use of heat is of great importance. Heat integration is used to recover heat from the process to replace external heating, thereby improving the energy efficiency. Implementing heat integration retrofit proposals requires a wider perspective than including only the energy savings. Practical considerations, operability issues, non-energy benefits, costs and climate consequences needs to be accounted for. Previous studies have investigated some operability and practical aspects of selected heat exchanger network retrofits at the Preem oil refinery in Lysekil. Additionally, different tools have been developed to evaluate the flexibility of (industrial) heat exchanger networks to a-priori defined variations in operating conditions. These tools have been embedded in a framework to achieve flexible and cost-optimal retrofit measures.

Aim

This project aims to evaluate the flexibility of selected heat exchanger network retrofits proposed for the Preem oil refinery in Lysekil. The work includes:

- Select a limited number of existing heat exchanger network retrofit proposals to include in the project
- Identify variations in operating data
- Evaluate the flexibility of the selected heat exchanger network retrofit proposals using the provided tools
- Propose design adjustments and identify their impact on the flexibility of the network
- Identify the retrofit proposal which results in the lowest total cost

Additional information

The master thesis will be a part of a collaboration between two PhD projects. The project is preferably carried out by two students. The work corresponds to 30 ECTS credits (approximately 20 weeks).

Prerequisites

The students are expected to have a background in chemical engineering or mechanical engineering, preferably from master programs Sustainable Energy Systems or Innovative and Sustainable Chemical Engineering. The course Industrial Energy Systems or equivalent is required and prior knowledge on mathematical optimization can be advantageous.

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