Project proposal

Cold steam cycle waste heat injection

December 11, 2017

| Duration: | To be discussed |
| Institute: | Laboratory for Applied Mechanical Design (LAMD) |
| Partners: | Internal |
| Supervisors: | Christoph Schreiber, Prof. J. Schiffmann |
| Location: | Neuchâtel (travel and lunch allowance - lump sum) |
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1 Background and objectives

Cold steam cycles are applied to a broad variety of applications in form of heat pumps, air conditioning units or refrigeration systems. A generalised cold steam cycle is depicted in figure 1 on the left. A cold steam cycle is always driven via the compressor. The work input into the compressor can be realised in different ways, for example via an electric motor in combination with a power circuit board (PCB) to control it, as shown in figure 1 on the right. Those components suffer from a certain amount of loss and consequently release a certain amount of waste heat energy.

2 Tasks

- Understanding the problem and getting familiar with the cold steam cycle
- Modify an existing code to account for waste heat addition
- Perform parameter studies regarding main variables
- Report

3 Deliverables

- Set of parameter studies allowing to determine the optimum heat addition point in a cold steam cycle
- Working numerical model
- Report

4 Requirements

- Good understanding of thermodynamics, particularly cold steam cycles
- Good coding capabilities in Python (Matlab)

Figure 1: Cold steam cycle with cooling heat from motor and PCB; Potential injection points

This project intends to investigate how the waste heat energy sourcing from the compressor drive components can be integrated into the cold steam cycle in the most effective way. Different parameter studies such as heat addition location, type of process or number of process stages have to be taken into account in order to obtain a full overview.

The project will be carried out in close collaboration with the researcher. Interested students are encouraged to send an email to Christoph.Schreiber@epfl.ch. Curious students who are excited about engineering are particularly welcome.