

HercuEX Heat exchanger test rig

Utilization of natural working fluids such as hydrocarbons can reduce direct and indirect GHG emissions considerably. Natural working fluids are competitive with the commonly used synthetic fluids in efficiency and applicability, but components and systems need to be developed further or adapted to fully exploit their thermo-physical properties.

Heat exchanger performance has a considerable impact on system efficiency, and typically constitutes a substantial fraction of the total costs in waste-heat-to-power and heat pump systems. It is therefore necessary to get a better understanding of the heat transfer coefficients and pressure losses for these fluids in heat exchangers.

This is particularly the case for working fluid mixtures that have non-isothermal (gliding temperature) during evaporation and condensation. A mixture can therefore be optimized to fit the enthalpy-temperature curve of a heat source in power- and heat pumping cycles, thereby maximizing both efficiency and utilization of constrained heat sources.

Optimal condenser and evaporator design are however crucial to exploit the temperature glide and the changes in composition during the heat exchange.

A new heat exchanger test rig will therefore be built in SINTEF and NTNU's thermal laboratories at Gløshaugen. The rig can be used to test new heat exchanger prototypes as well as for more fundamental studies of heat transfer coefficients and pressure drops for both evaporation and condensation. A simple schematic of the test rig is shown in figure 1.

The rig is designed for testing of heat exchangers up to 10 kW capacity at temperatures between 0 and 150 °C and pressures up to 70 bar.

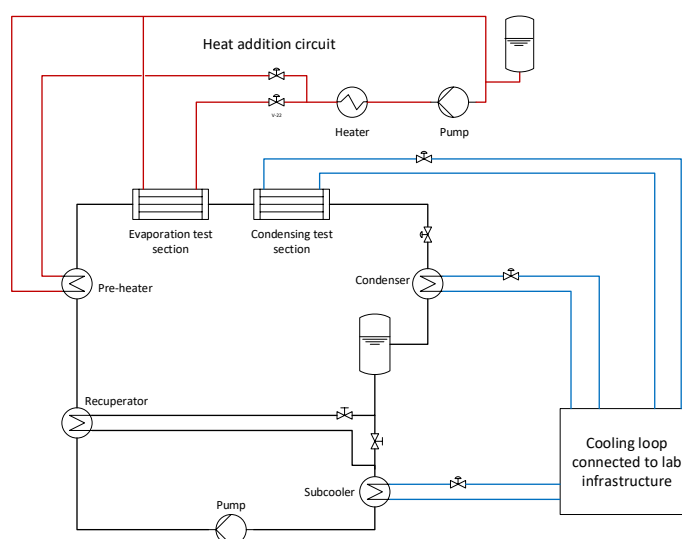


Figure 1: Simple schematic of the heat exchanger test rig

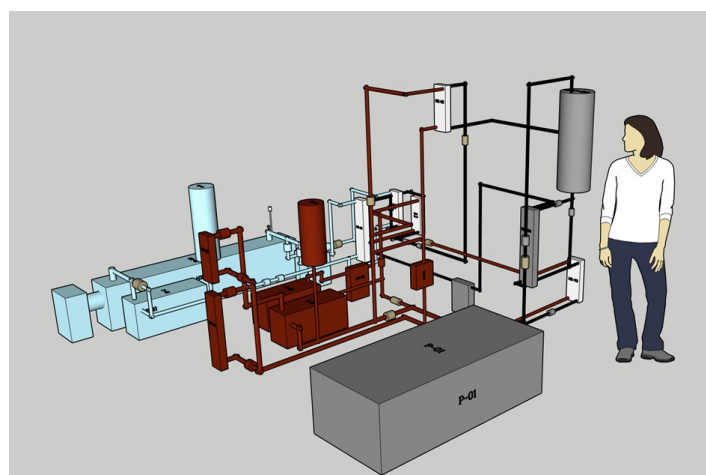


Figure 2: 3D sketch of the rig layout

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