

Ground Source Heat Pump Modeling

Case Study Summary

Goal:

Create a detailed model of the heat exchangers to minimize heat transfer coefficient (HTC) errors when the refrigerant undergoes a phase transition.

Requirements:

Refine the thermal and hydraulic calculations of the scheme. Ensure accurate discretized calculations of all HEXs, heat gains in the transport networks, and refine the design geometry parameters if necessary.

Parameters:

Pressures, temperatures, and mass flow rates of the working fluids.

Constraints:

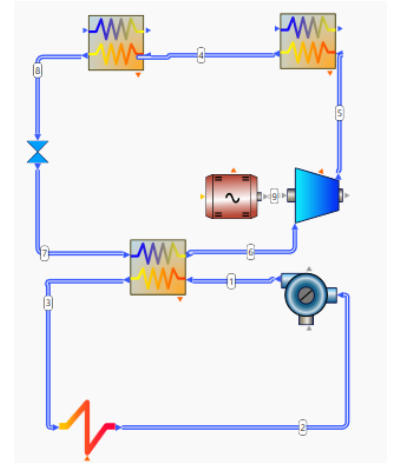
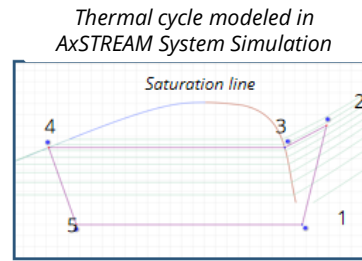
Hydraulic resistance of the system.

Results:

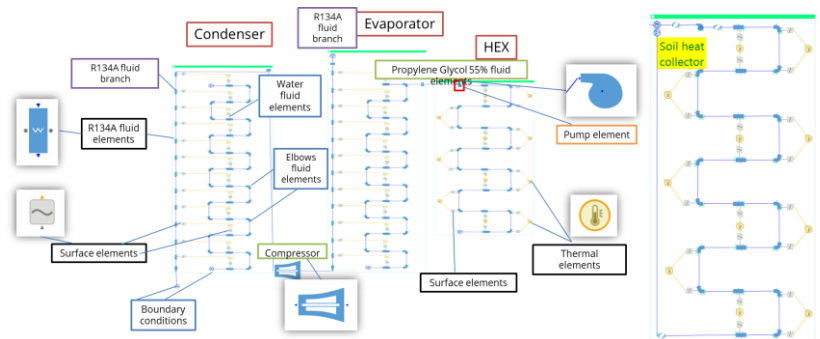
By accurately discretizing the heat exchangers and accounting for the pump and compressor characteristics, the fluid-thermal model of the ground source heat pump was successfully designed for every potential application. The heat transfer coefficients of the heat exchangers were determined and the hydraulic resistance of the system was calculated for different modes.

Design a Viable Heat Pump Across all Modes

The heat pump contains a soil heat collector, evaporator, condenser, pump, and compressor.



After estimating the boundary conditions, the thermal-hydraulic modeling was performed in AxSTREAM System Simulation.



Thanks to an accurate model, the change in the HTC was evaluated. The HTC values increase due to the refrigerant phase transition.

