Simulation Model of Condensing Units with an Economizer Loop

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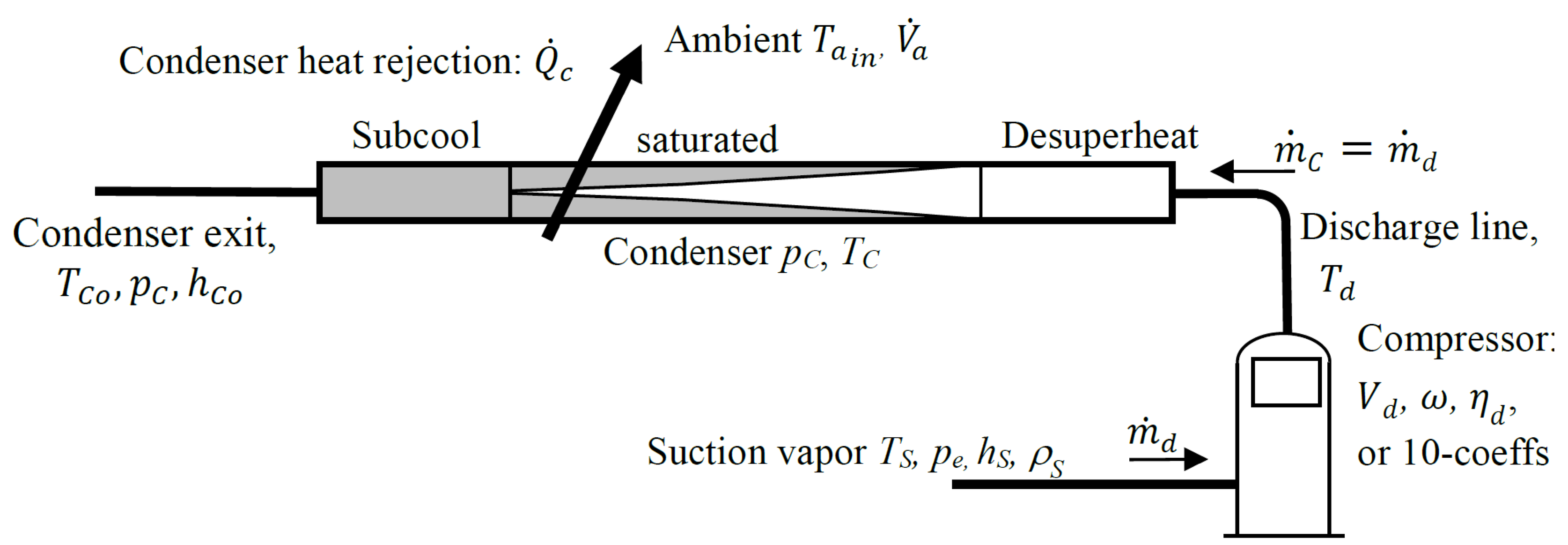
Motivation

Working design engineers desire a ‘usable’ computer simulation model to improve refrigeration system performance. The objective of the model is to balance simulation accuracy with requiring minimum input parameters and solution time.

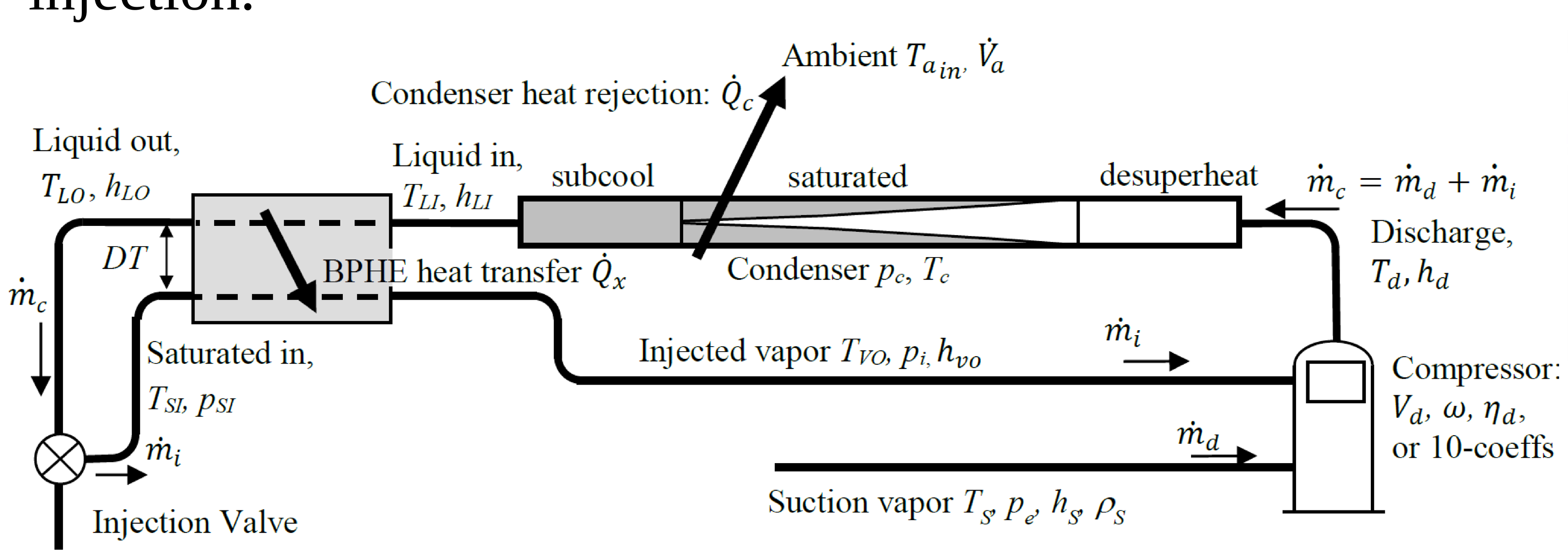
Standard System

An air-cooled condensing units include a compressor, condensing coil, tubing, and fans, fastened to a base or installed within an enclosure.

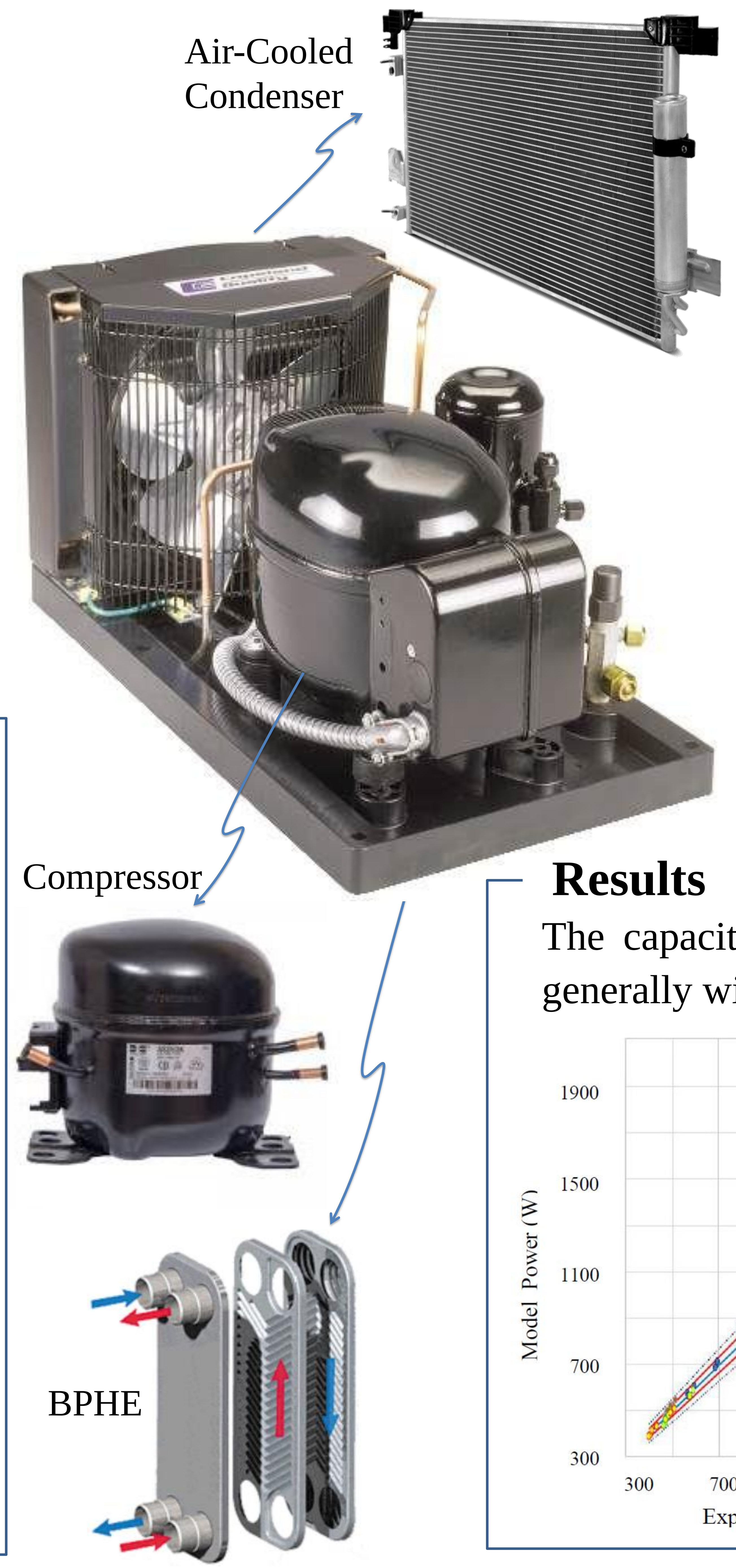


Economizer Loop

To increase capacity and efficiency, an economizer loop can be used, which includes an injection valve, brazed-plate heat exchanger (BPHE) and scroll compressor adapted for vapor injection.



A BPHE is designed to transfer heat from one fluid to another fluid across a solid surface. It is constructed from a series of thin plates that are brazed together



Modeling Strategy

- A standard condensing unit system simulation model is assembled from conventional, physics-based component equations.
- A four-section, lumped-parameter approach is used to represent the condenser.
- Well-established equations model compressor mass flow and power.
- An artificial neural network is used to simulate the performance of the economizer.
- A refrigerant database (REFPROP) is used to obtain state properties.
- An iterative method is used to assemble and solve the component equations.

Results

The capacity and power results from condensing unit model are generally within 5% when compared to experimental data.