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Research Project: Mixture Optimization of Mixed Gas Joule-Thomson Cycle

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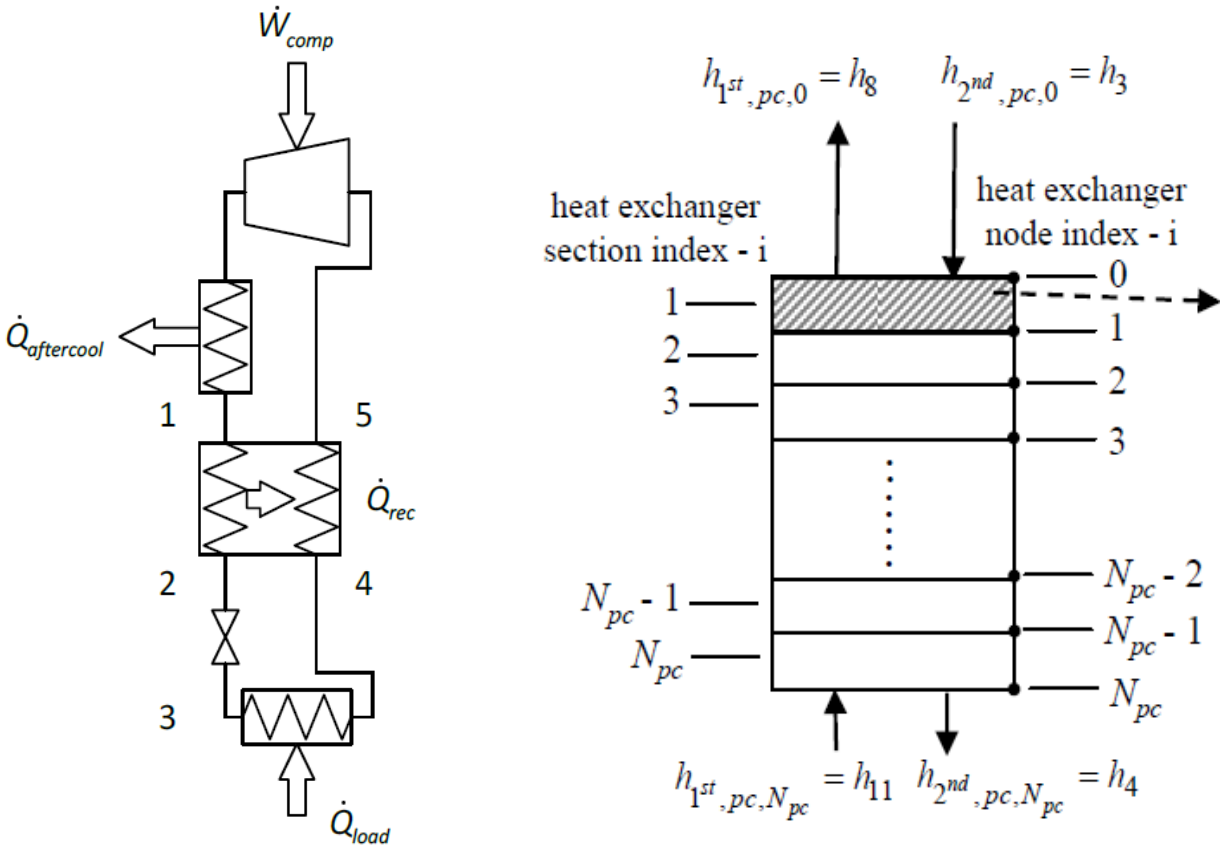
Background

- The Joule-Thomson cooling effect results from expansion of a non-ideal gas through a valve and is a common technique for achieving cooling at cryogenic temperatures.
- Selecting gas mixtures and JT cycle parameters to meet specific cryogenic cooling loads is a challenging design problem.
- Current literature focuses largely on selecting mixtures based on favorable thermodynamic properties but does not include the effects of multi-phase, multi-component mixtures.

Schematic



Schematic of single stage JT cycle and precooling heat exchanger divided into N sections.

Goals and Objectives

- We are interested in modeling the Joule-Thomson system using mixed gases to determine mixtures that enable a more efficient JT system.
- We have developed a computational tool to optimize mixture composition for specific operating parameters of a mixed gas JT system.
- We have identified attractive candidate mixtures and begun building a thermodynamic model of the JT system.
- We will experimentally test the candidate mixtures to determine the validity of the computational model and ascertain the optimal mixture for a specified set of operating parameters.