Cascade Transcritical CO₂ Refrigeration Cycle Utilizing Two-Phase Ejector

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Project Description

- Assess performance benefits of employing an ejector in a cascade CO₂ refrigeration cycle applied to low temperature application
- Compare baseline cycle to ejector cycle both numerically and experimentally

Approach

- Preliminary modeling using EES software
- Build combined system to experimentally test baseline and ejector
- Provide direct comparison of cycle performance with minimal changes

Discussion

- Testing three-stage compression with economization will allow understanding of transient and startup behavior of complex cycles
- Flashing at two stages will enable validation of control theory and phase separation

Results

- Initial simulations show potential COP improvement of 20%
- Evaporating at −30 °C will allow simulation of two stages of flashing towards low temperature refrigeration