A General Open-Source Platform for Evaluating Advanced Vapor Compression Air Conditioners and Heat Pumps *PI: James E. Braun*

Objective:

- Enhance the **open-source ACHP** platform
- Include **alternative** and **novel vapor compression cycle technologies** and working fluids
- Detailed cycle modeling and calibration for **off-design performance predictions**

Problem

Improve robustness, and capabilities of cycle solver for **design and off-design performance predictions**

Expected Results / Impact:

- Deliver an **open-source, engineering tool** for vapor compression cycle simulation & optimization
- Prediction of negative **impact of fouling, frosting and oil retention** among others
- Accurately predict the **performance during off-design or faulty conditions**
- Evaluate impact of **new working fluids** on existing and new systems

Approach:

- Develop simulation models for novel vapor compression cycle configurations (e.g., oil flooded, vapor injection) with multi-objective optimization
- Develop generalized heat exchanger model to include non-ideal effects such as fouling & frosting
- Integrate empirical and semi-empirical compressor models
- Develop detailed models to better characterize the effects of charge and oil retention

Schedule

Tasks Months	1	2	3	4	5	6	7	8	9	10	11	12
Project Startup	■											
Component Model Development		■	■	■	■							
Overall System Model						■	■	■	■			
Model Validation										■	■	
Final report												■

Herrick Laboratories
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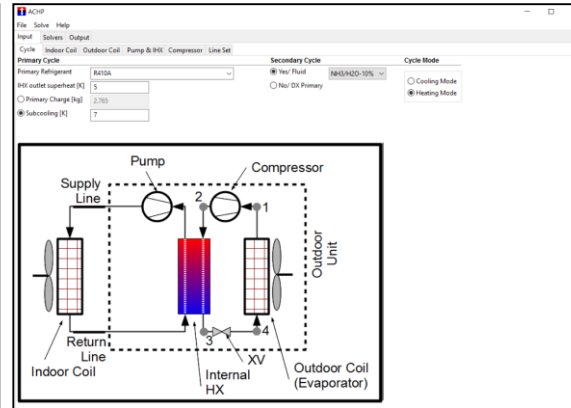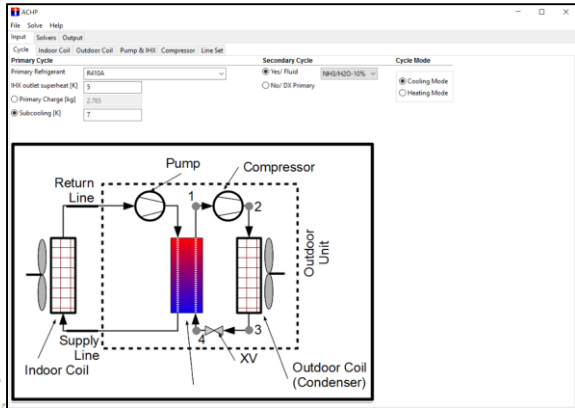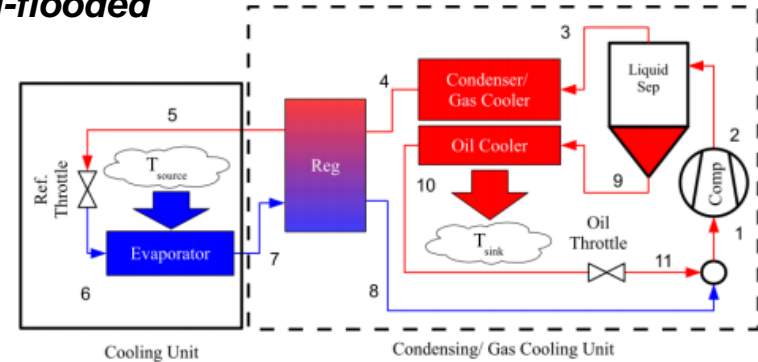Center for High Performance Buildings at Purdue
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Investigation of novel vapor compression cycle architectures:

Single and dual vapor-injection
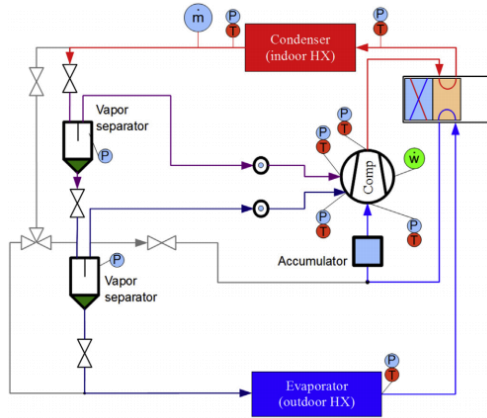
Oil-flooded

Vapor compression system with secondary loop in cooling mode (left) and heating mode (right)