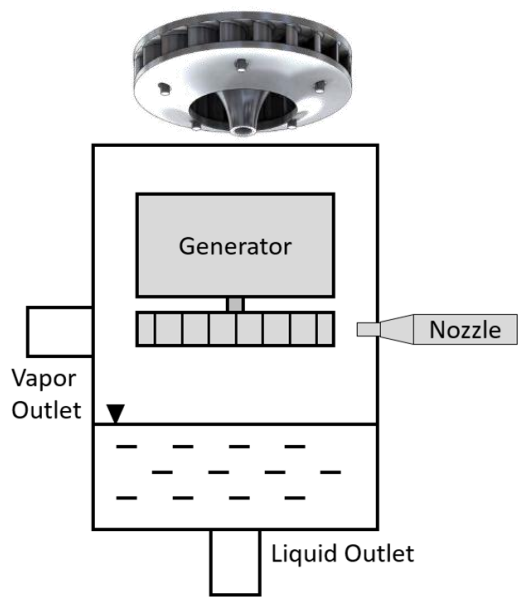


Project Description

- Turbomachine expander called the Viper Expander to harvest expansion work.
- Combine expansion work recovery and open economization in one device.
- Increase COP by reducing net work input and increasing cooling capacity.



Approach

- The Viper Expander is tested in a split-system heat pump installed in twin psychrometric chambers.
- Nozzles, housings, and turbines are interchanged iteratively in an effort to reach maximum performance.
- Analytical analysis of key components like the flash tank or nozzle are conducted consistently.

Discussion

- Process stability is reached by control of housing outlets.
- Improvement of the power output is reached by optimizing nozzle position and size.
- Effects of separating liquid and vapor to reduce friction on turbine are quantified.

Results

- $W_{viper} = 70\text{ W}$
- $\eta_{is,viper} = 20\%$
- Phase separation approaching quality within 10% of ideal
- Friction reduction on turbine can increase power output by 10-20%

