

FUSE- Full Scale Industrial Heat Pump Using Natural Refrigerants



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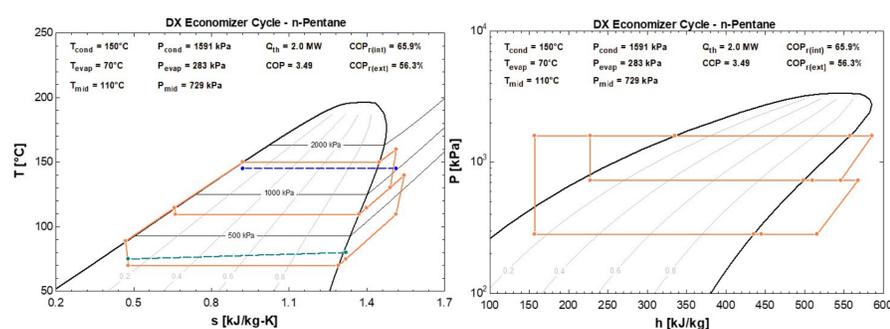
Incentive

High temperature industrial heat pumps are an emerging technology that will play a decisive role in providing a sustainable solution for industrial heat demand up to 200°C. Previous projects demonstrated the operation of pilot scale compression heat pumps for industrial applications, however it was also shown that CAPEX costs in the order of 500 /kWth proved to be prohibitive for market introduction. Lack of standardization and the use of a flammable refrigerant were the most important cost determining factors, while use of a non-flammable synthetic working medium (HFOs) still poses concerns about not being a long term sustainable solution.

The development and success of an industrial heat pump market is indeed dependent on the ability to produce a standardized, modular, flexible compression heat pump technology on a scale level of 1-10 MWth that uses a natural refrigerant and has low CAPEX.

Objective

- To develop a full-scale (1-2 MW), steam producing, industrial heat pump using natural working media that uses waste heat sources in the range of 60°C-90°C and produces medium pressure steam (range of 2-5 bar) with a specific investment cost of < 200 /kWth
- To develop a modular compression heat pump design that can be configured in numerous ways to cover > 70% of the industrial heat pump market.
- To establish a Dutch manufacturer for the standardized, modular, flexible compression heat pump.



Approach

- A full scale (1-2 MWth), modular compression heat pump will be designed, constructed and tested at ECN.TNO, both screw and centrifugal compressors are considered
- Secondly, unit will be tested in industrial conditions at DOW Terneuzen
- Prepare necessary measures for establishing a Dutch manufacturer for industrial, steam producing heat pumps will be implemented.

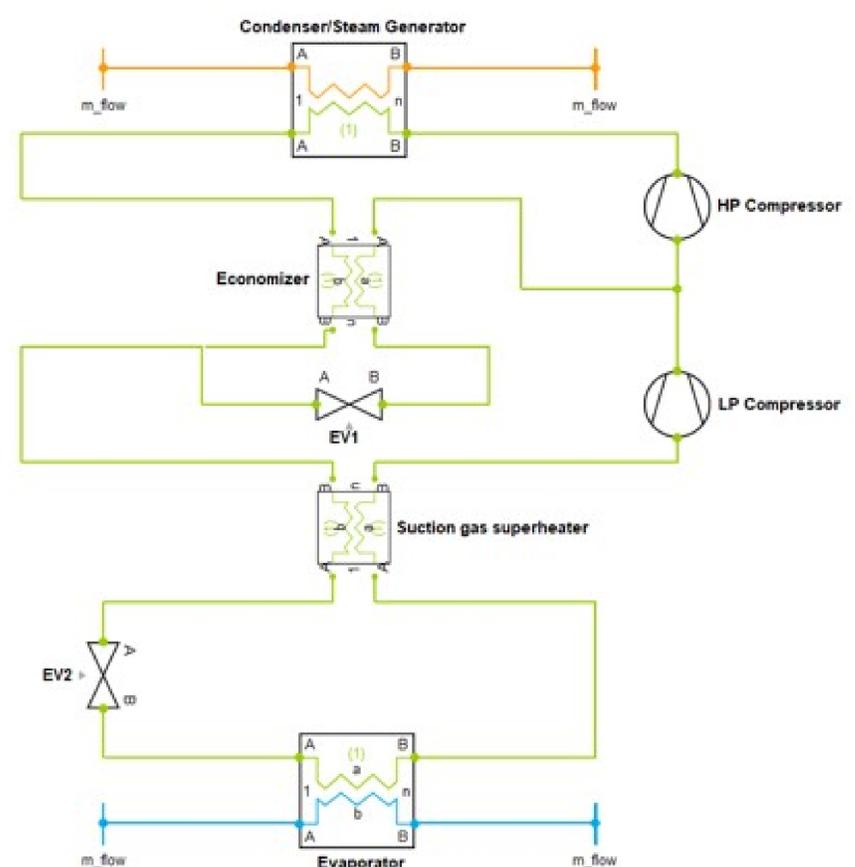


Figure 1. Dx Economizer Cycle Process Flow Diagram

Results

Standardized, modular, flexible, and cost effective industrial compression heat pump using a natural refrigerant for a Dutch manufacturer, at scale levels of 1-10 MW.



Institute for Sustainable Process Technology



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