

LESSON - Oil free compressor based high temperature heat pumps

Modification of oil free compressor to measure the variation of internal pressure with cavity volume (indicated diagram) . Detailed validation of wet compressor model. Design of CRHP.



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Incentive

Wet compression resorption heat pumps are promising but require two-phase compressors. Indicated diagrams are essential to be able to identify the real performance of compressors. Design of CRHP is needed to more accurately estimate its costs.

Objective

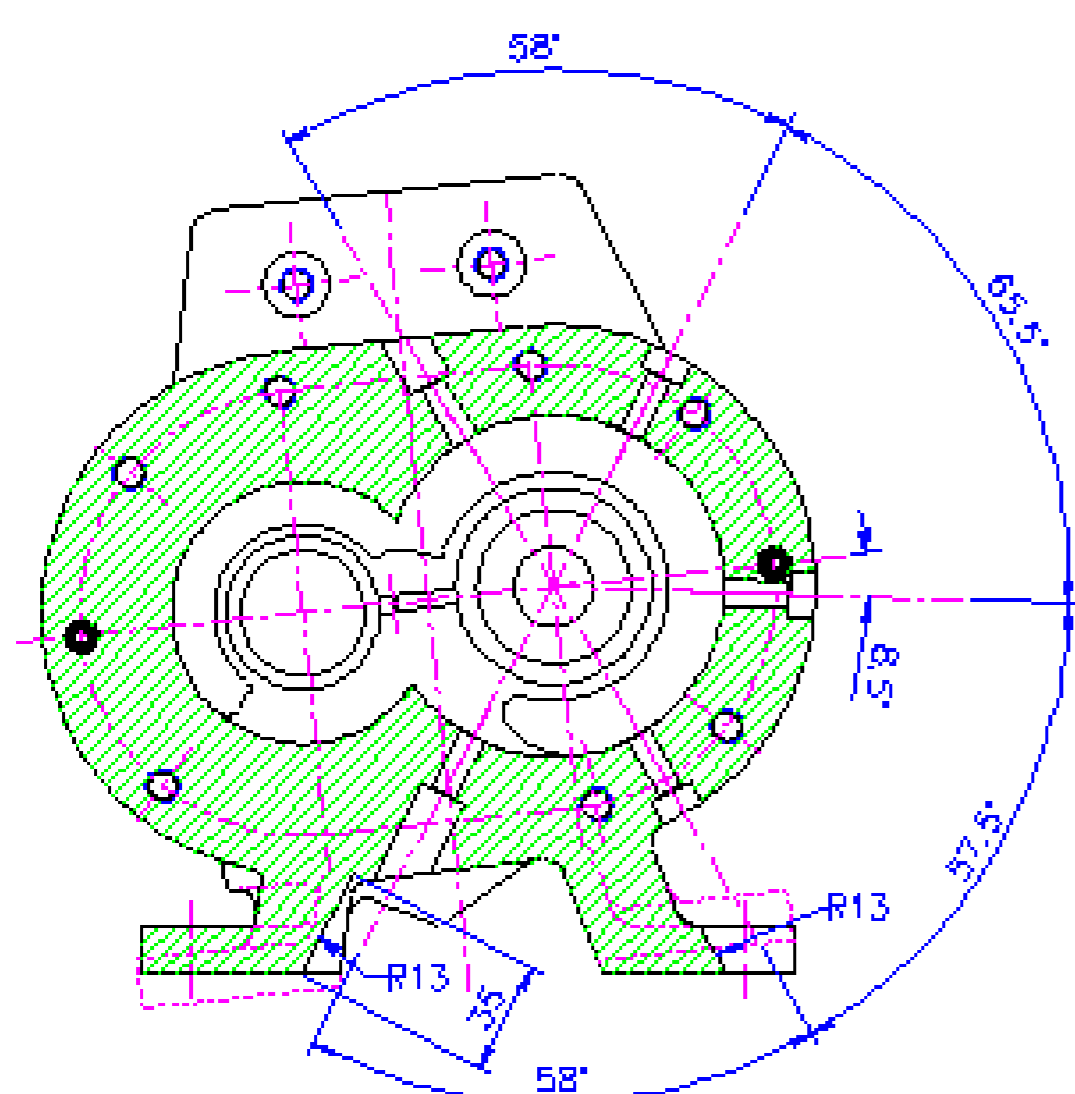
Modify the prototype wet compressor of UH-20-10 to allow for measurement of the cavity pressure as a function of shaft rotation angle. Measure the indicated diagram of the wet compression process and use it to validate / improve the wet compression model developed in UH-20-10.

Design a CRHP and estimate its costs and performance.

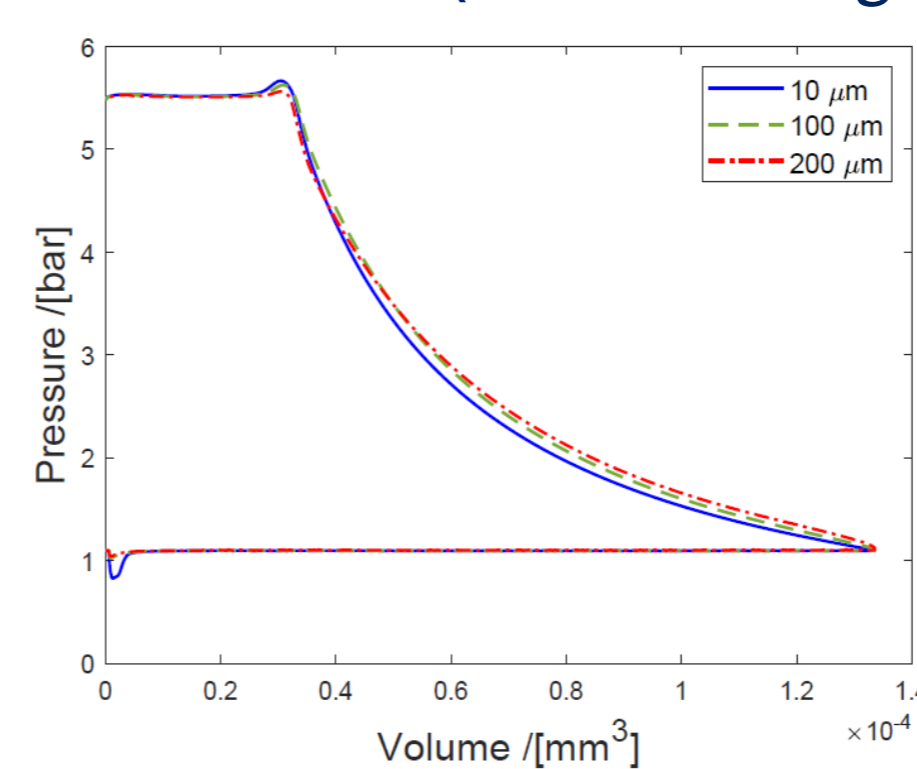


Approach

Modify the compressor to include several pressure transducers along the rotation angle..



Implement at TU Delft set-up and perform experiments to derive the P-V (indicated diagrams) of the processes.



Use validated model to come to a compressor design with higher isentropic efficiency. Design heat pump (on paper) which makes use of this compressor and predict its technical (COP) and economic performance (payback time).

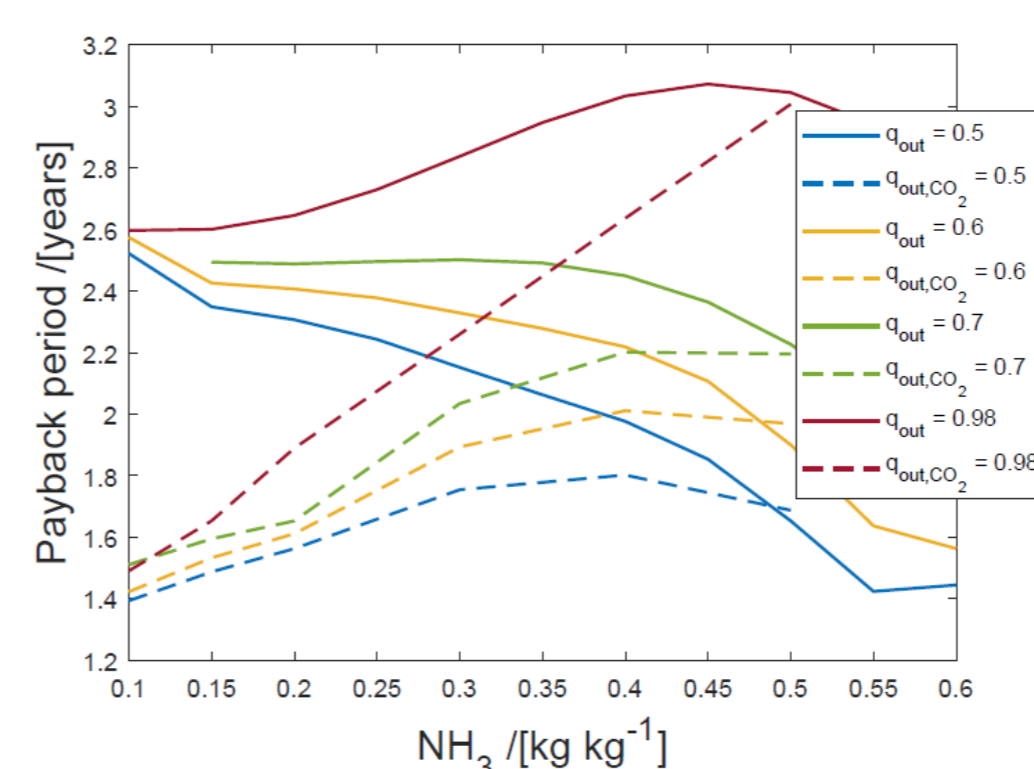


Fig.: 90 °C to 130 °C – 5 MW – solid lines NH₃-H₂O – dotted lines +CO₂ (5 wt%) – q is vapor quality at compressor outlet

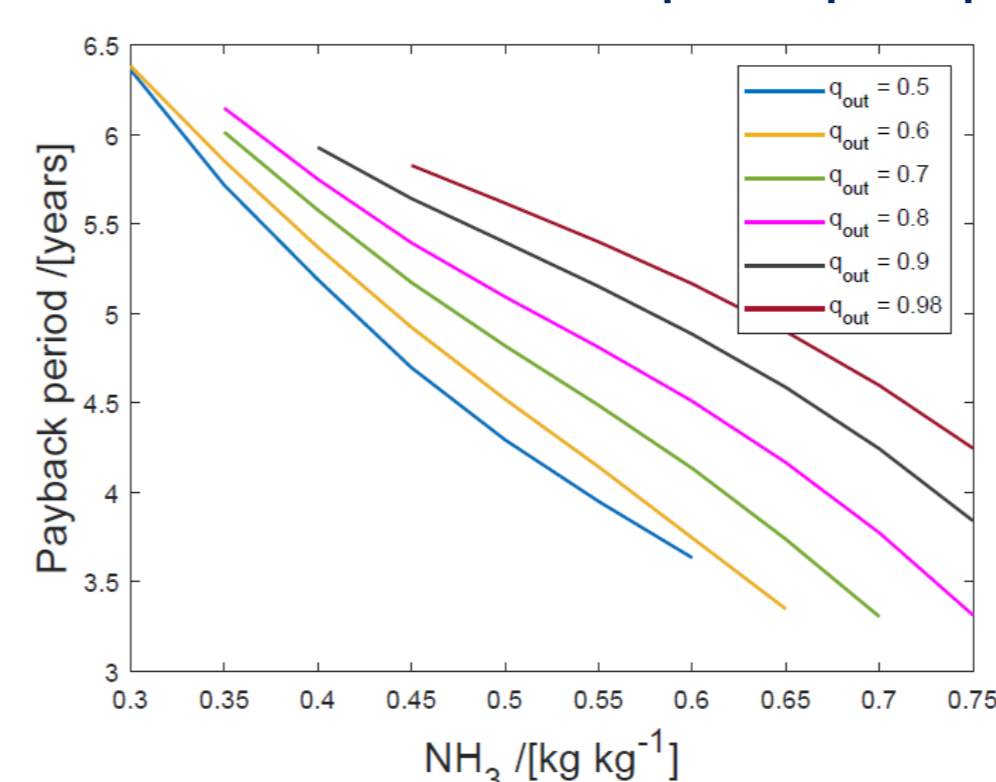


Fig.: 60 °C to 140 °C – 5 MW – solid lines NH₃-H₂O

Results

Project has just started.



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