Comparison of Heat Pump Design and Performance for Modern Modern Refrigerants

Due to increasing awareness of global warming, the types of refrigerants used in heat pumps are changing globally. Regulations for HFC refrigerants are being introduced due to their high global warming potential (GWP). This can create a shift in demand for different refrigerants since HFCs are still commonly used in many countries. As a result, the refrigerant charge will play a significant role when determining the most feasible refrigerant. This paper presents a numerical study of the performance of natural, HFC, and HFO refrigerants for a one-stage cycle and focuses on the refrigerant charge influence. The study shows that R717 is the most optimal refrigerant, exhibiting a 51% to 87% smaller charge and 12% to 27% lower cost of heat compared to other refrigerants. In addition, the results show that the refrigerant price should be included when conducting economic evaluations.

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Organisations: Department of Mechanical Engineering, Thermal Energy, New York University Tandon School of Engineering
Contributors: Nielsen, S., Christensen, S. W., S. Thorsen, R., Elmegaard, B.
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