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Evaluation of optimal subcooling in subcritical heat pump systems

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Highlights

- A general methodology to calculate the optimal subcooling is presented.
- The improvement derived from optimizing the subcooling in heat pumps is evaluated.
- The optimum is found when two pinch points are given in the condenser.
- Optimal subcooling strongly depends on the temperature lift of secondary fluid.
- The influence of system parameters on the optimum is analyzed.

Abstract

The performance of a transcritical cycle is highly dependent on the rejection pressure. The optimal rejection pressure depends mainly on the inlet and outlet temperature at the heat sink (secondary fluid). For the subcritical cycles, recent studies have demonstrated that the performance of these systems depends significantly in the degree of subcooling and its optimal value vary depending on the application. This paper presents a general methodology to calculate the optimal subcooling depending on the boundary conditions. The refrigerants R290, R134a, R1234yf and R32 are analyzed. Exergy analysis is used in order to see the subcooling effect at condenser and expansion valve independently. The optimal subcooling strongly depends on the temperature lift at the secondary fluid, and it is found

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