

Thermodynamic Optimization of an R744 Based Transcritical Refrigeration System with Dedicated Mechanical Subcooling Cycle

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Abstract : The thermodynamic analysis shows that the performance of the R744 based transcritical refrigeration cycle drops drastically for higher ambient temperatures. This is due to the peculiar s-shape of the isotherm in the supercritical region. However, subcooling of the refrigerant at the gas cooler exit enhances the performance of the R744 based system. The present study is carried out to analyze the R744 based transcritical system with dedicated mechanical subcooling cycle. Based on this proposed cycle, the thermodynamic analysis is performed, and optimum operating parameters are determined. The amount of subcooling and the pressure ratio in the subcooling cycle are the parameters which are needed to be optimized to extract the maximum COP from this proposed cycle. It is expected that this study will be helpful in implementing the dedicated subcooling cycle with R744 based transcritical system to improve the performance.

Keywords : optimization, R744, subcooling, transcritical

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