

Thermodynamic Analysis of CO₂ Trans-Critical Refrigeration with Expander Cycle

Liu Chuntao^{C, S}

*Thermal Energy Research Institute, Tianjin University Tianjin, and School of Energy & Power Engineering,
North China Electric Power University, Baoding, Hebei, China*

Sun Ganglei, Xie Yingbai and Zong Luxiang

School of Energy & Power Engineering, North China Electric Power University, Baoding, Hebei, China

As a natural working fluid CO₂ is receiving more and more attention in the refrigeration. The key technology of the research of CO₂ trans-critical cycle is to improve the coefficient of performance of the system that is competitive with present conventional high performance refrigerant systems. In order to lower the throttling losses in the CO₂ trans-critical cycle, the significant measure is to replace the throttling valve by an expander. The thermodynamic analysis on CO₂ trans-critical refrigeration with expander cycle is carried out in this paper. The major factors of affecting the coefficient of performance of CO₂ trans-critical refrigeration with expander cycle, such as the compressor exhaust pressure, the outlet temperature of gas cooler, and the efficiencies of compressor and expander are analysed. The major factors of affecting the efficiencies of compressor and expander are introduced. The purpose of this paper is to provide a reference for the design of the actual system.