

Efficiency increase in CO₂ Refrigeration system through a parallel compressor

Initial conditions

Refrigeration systems consume power around the clock and have become the focus of measures to enhance efficiency. Furthermore, the use of environmentally harmful refrigerants has been gradually limited by national and European laws. Natural refrigerants, such as CO₂, propane, or ammonia present an alternative.

By using a CO₂refrigerator as used in grocery stores, the potential of a parallel compressor to enhance efficiency is investigated. In this context, the refrigeration system with parallel compressor is definitely deemed more efficient than a traditional system. However, minimal efficiency increases are required, if the system operator seeks to compensate for the higher investment expenditure with lower operating costs.

Results

The energy efficiency of the traditional refrigeration system and the refrigeration system with parallel compressor was experimentally examined in relation to the most significant impacting factors. The results match the calculations made using a simulation model designed specifically for this purpose. It is possible to demonstrate the operating conditions under which an increase in efficiency of at least 10 % can be achieved using the parallel compressor. In such cases, it can be assumed that the slightly more expensive refrigeration system positively affects profitability. This test, then, provided a foundation for making decisions regarding the use of the parallel compressor in practice.

