

## Performance Study of Cascade Refrigeration System Using Alternative Refrigerants

**Authors :** Gulshan Sachdeva, Vaibhav Jain, S. S. Kachhwaha

**Abstract :** Cascade refrigeration systems employ series of single stage vapor compression units which are thermally coupled with evaporator/condenser cascades. Different refrigerants are used in each of the circuit depending on the optimum characteristics shown by the refrigerant for a particular application. In the present research study, a steady state thermodynamic model is developed which simulates the working of an actual cascade system. The model provides COP and all other system parameters like total compressor work, temperature, pressure, enthalpy and entropy at different state points. The working fluid in Low Temperature Circuit (LTC) is CO<sub>2</sub> (R744) while ammonia (R717), propane (R290), propylene (R1270), R404A and R12 are the refrigerants in High Temperature Circuit (HTC). The performance curves of ammonia, propane, propylene, and R404A are compared with R12 to find its nearest substitute. Results show that ammonia is the best substitute of R12.

**Keywords :** cascade system, refrigerants, thermodynamic model, production engineering

**Conference Title :** ICMPE 2014 : International Conference on Mechanical and Production Engineering

**Conference Location :** Miami, United States

**Conference Dates :** March 10-11, 2014