

Thermodynamic Analysis of Cascade Refrigeration System Using R12-R13, R290-R23 and R404A-23

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Abstract : The Montreal protocol and Kyoto protocol underlined the need of substitution of CFC's and HCFC's due to their adverse impact on atmospheric ozone layer which protects earth from U.V rays. The CFCs have been entirely ruled out since 1995 and a long-term basis HCFCs must be replaced by 2020. All this events motivated HFC refrigerants which are harmless to ozone layer. In this paper thermodynamic analysis of cascade refrigeration system has been done using three different refrigerant pairs R13-R12, R290-R23, and R404A-R23. Effect of various operating parameters i.e evaporator temperature, condenser temperature, temperature difference in cascade condenser and low temperature cycle condenser temperature on performance parameters viz. COP, exergetic efficiency and refrigerant mass flow ratio have been studied. Thermodynamic analysis shows that out of three refrigerant pairs R12-R13, R290-R23 and R404A-R23 the COP of R290-R23 refrigerant pair is highest.

Keywords : thermodynamic analysis, cascade refrigeration system, COP, exergetic efficiency

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