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其他

R404A / CO2复叠式制冷系统的火用分析

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摘要：

为了降低R404A / CO2复叠式制冷系统的能耗,对该系统进行了能量分析。通过火用分析方法分析系统设计与运行参数对系统性能系数ε、各组成部件及整个系统的火用损X和火用效率ηe的影响。结果表明,在一定蒸发温度Te、冷凝温度Tk和冷凝蒸发器的传热温差ΔT条件下,在相同最佳T4opt时,Xtot取得最小值,ε和ηe取得最大值;为了有利于减小X、提高ηe和ε,应尽量升高Te、降低Tk和ΔT;高温级膨胀阀、压缩机、冷凝蒸发器和低温级压缩机的火用损约占总火用损的80%。对数据进行多重线性回归分析,得到以Te、Tk和ΔT为自变量的t4opt、εmax和ηe,max关系式。

关键词： 二氧化碳 复叠式制冷系统 火用损 火用效率

Exergy analysis of the R404A / CO2cascade refrigeration system

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Abstract:

In order to decrease the energy consumption of the R404A / CO2 cascade refrigeration system, exergy analysis was applied to this system. An exergy analysis method was adopted to obtain the influence of the design and operating parameters on the coefficient of performance ε, the exergy destruction X and the exergetic efficiency ηe of this system. The design and operating parameters include the evaporating temperature Te, the condensing temperature Tk and the temperature difference ΔT in the cascade-condenser. The results indicate that there were a maximum ε, ηe and a minimum Xtot at the same optimal condensing temperature of the cascade-condenser T4opt when Te, Tk and ΔT were constant in the system. It is helpful to reduce X and improve ηe and ε through increasing Te, decreasing Tk and ΔT. The total exergy destructions of the throttling device and the compressor of the R404A circuit, the cascade-condenser and the compressor of the CO2 circuit were 80% of the total exergy destruction of the system. A Multiple linear regression analysis was employed in term of Te, Tk and ΔT to develop mathematics expressions for t4opt, εmaxand ηe,max.

Keywords: CO2 cascade refrigeration system exergy destruction exergetic efficiency

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