

Study on a silica gel–water adsorption chiller integrated with a closed wet cooling tower

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Abstract

A silica gel–water adsorption chiller integrated with a closed wet cooling tower is proposed. This adsorption chiller consists of two vacuum chambers, each with one adsorber, one condenser and one evaporator. Vacuum valves were not adopted in this chiller in order to enhance the reliability. A novel heat recovery process was carried out after a mass recovery-like process to improve the coefficient of performance (COP). Integration of the closed wet cooling tower into the chiller could ensure the cleanliness of cooling water circulating in the chiller and also promote the convenient setup of the chiller. A transient one-dimensional mathematical model was adopted to study this adsorption chiller. The simulated results showed that the cooling power and COP were 10.76 kW and 0.51 respectively when the hot water inlet temperature, the chilled water inlet temperature, the air inlet wet bulb temperature and dry bulb temperature were 85, 15, 28 and 30 °C respectively.

Keywords

- Silica gel;
- Water;
- Adsorption;
- Refrigeration;
- Cooling tower