

Experimental study on a new type of geothermal power generation cooling device

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ABSTRACT

The medium and low-temperature geothermal energy is rich in China, so geothermal energy for power generation is widely used in China. The ORC geothermal power generation system is a common form of using geothermal energy. In the condensing system of geothermal power generation in China, there are many applications of air cooling and water cooling, but both of them have some shortcomings. The water-cooled condenser needs a lot of water and freezes easily in winter, and the air-cooled condenser needs a large fan, which is not conducive to energy saving. In this paper, a new type of evaporative cooler is proposed for the condensing system components of the ORC geothermal power generation system, and a single-tube test bench is built to study the effects of ventilation, heat source flow and seepage water pressure on heat transfer performance. In the range of different temperatures, different airflow, different heat source flows and different seepage water pressure, the optimal heat transfer coefficient varies from 500W/(m²·K) to 780W/(m²·K). The experimental results show that the heat transfer and heat transfer coefficient of the percolation evaporative condenser proposed in this paper is significantly higher than that of the conventional water-cooled and air-cooled condenser, and overcome some shortcomings of the traditional evaporative condenser. Finally, the correlations of the heat transfer coefficient between the heat source and tube wall and mass transfer between water film and air are obtained by fitting the correlation. Through analysis, the new evaporative condenser proposed in this paper is suitable for application in the ORC power generation system and is optimized for efficient utilization of the ORC cycle for the geothermal power generation system.