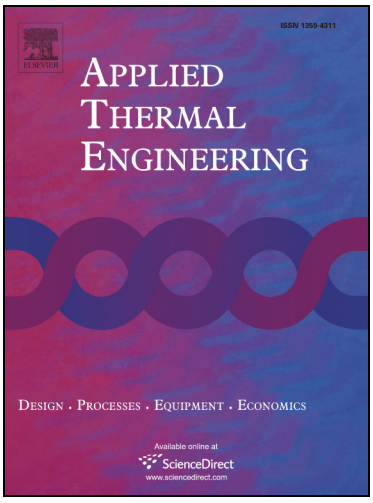

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Experimental investigation on controllable loop thermosyphon with a reservoir

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Abstract

The controllable loop thermosyphons (CLTs) can be widely applied in temperature control applications, such as cool-storage refrigerators powered by solar energy or electricity with the TOU (time of use) price. However, the performance of the CLT requires further optimization. In this study, a new CLT is designed and reservoir structure is adopted to improve the steady-state heat transfer performance. Three control modes are available to control the start-stop of the CLT and their influence on the start-stop performances is investigated. For each control mode, the valve location and test conditions are varied; results are compared and analyzed. Control mode A performs well and is affected weakly by the valve location. The control ability of control mode B is acceptable only when the valve is located on the lower liquid line. The start-stop performance of control mode C is better than that of control mode A and B; and with its best valve location, the CLT starts up quickly in approximately 25 s and stops in about 75 s under various test conditions. The experimental investigation revealed that control mode C is the optimal one and that valves are better to be installed in lower positions for all control modes.

Keywords: Refrigerator; Loop thermosyphon; Reservoir; Start-stop; Control mode