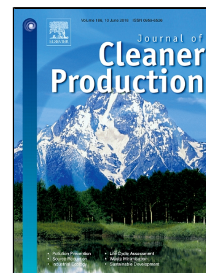


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Effect of Working Fluid on the Performance of the Duplex Stirling Refrigerator

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ABSTRACT

Duplex Stirling refrigerator is one of the best alternative systems for providing green and clean energy solutions. It consists of Stirling refrigerator and Stirling heat engine in a back to back configuration. The main constraint of the duplex system is the work equality between the supplied one by the heat engine and the consumed one by the refrigerator. In this study, the overall performance and the design of the duplex Stirling refrigerator are examined analytically for different couples of working fluids and the refrigerants. Helium, hydrogen and carbon dioxide are selected as the coolant and working fluid for the duplex system which leads a nine different fluid couples investigated in the present study. The compatibility of these refrigerants and working fluids are examined by observing the high overall performances of the duplex Stirling refrigerator. In order to figure out the fluid couple which maintains the highest performance, nine different couple paired among the given gasses are evaluated. As regard to the obtained results, not only the couples which provide both higher cooling performances at the refrigerator and the better efficiency at the heat engine are identified but also the right design parameters which could achieve these higher performances are determined. The outcomes of the study would be very helpful for the designers in practice since the results are presented in a wide spectrum by the diagrams.

Keywords: Refrigerant, Working fluid, Stirling refrigerator, Coefficient of Performance, Duplex Stirling

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