Investigation of the Influences of Heat Sinks on the Thermal Efficiency of a Two Cylinder Stirling Engine Using the Taguchi Method

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Abstract : In this study, experimental methods and finite element numerical simulation are used to investigate the influences of three different types of heat sinks on the output power of a two-cylinder Stirling engine. The Taguchi method is employed to optimize the geometric parameters of the air-cooled heat sink, aiming to optimize the output thermal efficiency. The parameters of the Taguchi method include the materials of the heat sink, and the shape, height, width, and spacing of the heat sink. The L18 orthogonal array is used for experimental design. The experimental results show that the thermal efficiency of the Stirling engine is significantly influenced by the material and geometric parameters of the heat sinks. The heat sinks effectively decrease the temperature at the cold end of the cylinder, increase the temperature difference between the hot and cold ends of the cylinder, and enhance the thermal efficiency of the Stirling engine. The experimental results are in agreement with the numerical simulation analysis. The results of this study will be more helpful for the application of Stirling engines.

Keywords : two cylinder Stirling engine, Taguchi method, heat sink, finite element method
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