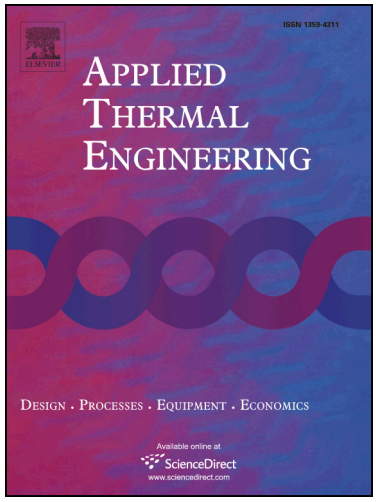

Numerical Simulation of Thermal and Flow Fields inside a 1-kW Beta-Type Stirling Engine

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Numerical Simulation of Thermal and Flow Fields inside a 1-kW Beta-Type Stirling Engine

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Abstract

This study is aimed at development of a numerical model based on computational fluid dynamics simulation for analysis of thermofluidic phenomena in a 1-kW beta-type Stirling engine. The numerical model is applied to analysis of a prototype engine, Model 1000BR-1, developed by Power Engines and Clean Energy Laboratory (PEACE Lab.), NCKU, and is found efficient in providing valuable, detailed information for further modifying the engine. In this study, a parametric study of effects of the influential variables, including charged pressure, heating temperature, regenerator porosity, engine rotation speed, number of heating pipes, and working fluid, on P-V diagrams of the thermodynamic cycles is performed extensively. Of primary concern of the present study is the output power of the Stirling engine. For verifying the numerical model, experiments on output power of the prototype engine are conducted in parallel. A comparison in the output power between the experimental data and the numerical predictions is made, and agreement in trend between the two sets of data has been found.

Keywords : Stirling Engine, Numerical simulation, CFD, Prototype engine, Experiments.