Numerical thermodynamic model of alpha -type Stirling engine

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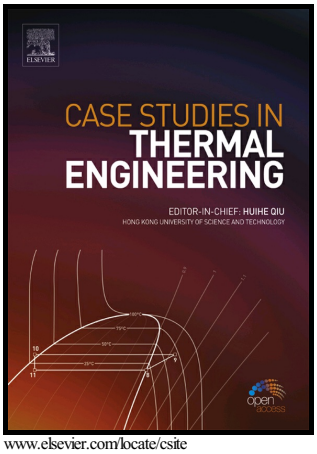

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ABSTRACT

The objective of this study is to develop accurate practical thermodynamic model for alpha -type Stirling engine with Ross Yoke mechanism. Thermal, pumping, and regeneration loses are considered in developing the thermodynamic model. Two methods for solving the governing equations are proposed. The model is used to predict the power output, and the thermal efficiency. The proposed model is validated against experimental data available from the General Motor GPU-3 Stirling engine prototype. Parametric study is used to investigate the effect of geometric and operation parameters on the engine performance. The effect of regenerator effectiveness, the dead volume ratio, regenerator thermal conductivity, and the heat source temperature, the swept volume ratio on the maximum on engine performance are evaluated. It is found that significant improvement on engine performance can be achieved by optimizing geometric and operating parameters.

Keywords: Stirling engines, Alpha type, thermal losses, Ross Yoke, numerical simulations.

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Nomenclature