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The Effects of Displacer-Cylinder-Wall Conditions on the Performance of a Medium-Temperature-Differential γ-Type Stirling Engine

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Abstract : In this study, we conducted CFD simulation to study the gas cycle of a medium-temperature-differential (MTD) γ-type Stirling engine. Mesh compression and expansion as well as overset mesh techniques are employed to simulate the moving parts of the engine. Shear-Stress Transport (SST) k-ω turbulence model has been adopted because the model is not prone to generate excessive turbulence upon impingement regions. Hence, wall heat transfer rates at the hot and cold ends will not be overestimated. The effects of several different displacer-cylinder-wall temperature setups, including smooth and finned walls, on engine performance are investigated. The results include temperature contours, pressure versus volume diagrams, and variations of heat transfer rates, indicated power, and efficiency. It is found that displacer-wall heat transfer is one of the most important factors on engine performance, and some wall-temperature setups produce better results than others.

Keywords : CFD, finned wall, MTD Stirling engine, heat transfer
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