

Abstract Submitted
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Determining the Order of Importance of Six Geometric Parameters Related to Heat Exchangers for Thermoacoustic Prime Movers

MICHAEL JORGENSEN, BONNIE ANDERSEN, Utah Valley University — Thermoacoustic devices can be used to convert heat energy into sound energy. Heat exchangers (HEXs) deliver to and remove heat from the device. HEX elements have thicknesses and spacing between elements to allow heat to flow to the working fluid. A significant portion of thermal and viscous losses can, therefore, result from non-optimal HEXs. For high frequency engines, using pre-fabricated copper-woven screens for HEXs is an attractive alternative to more traditional structures at the small scales required. However, with set wire sizes and spacing, the ideal geometry is not easily achieved. Principal component analysis is employed to determine which factors contribute the most variability to the performance of the device. The parameters explored are the relative sizes of the thermal penetration depth of both the working fluid and the screen to the wire spacing and wire radius of the screens and the relative size of the oscillating displacement of the working fluid to the diameter of the wires of the screens. The relative size between the oscillating displacement and the wire diameter is found to have the largest impact.

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