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CFD Analysis of the Oscillating Flow within a Stirling Engine with an Additively Manufactured Foil Type Regenerator.[1] SONGGANG QIU, LAURA SOLOMON, West Virginia Univ — The simplistic design, fuel independence, and robustness of Stirling convertors makes them the ideal choice for use in solar power and combined heat and power (CHP) applications. A lack of moving parts and the use of novel flexure bearings allows free-piston type Stirling engines to run in excess of ten years without degradation or maintenance. The key component to their overall efficiency is the regenerator. While a foil type regenerator outperforms a sintered random fiber regenerator, limitation in manufacturing and keeping uniform spacing between the foils has limited their overall use. However, with the advent of additive manufacturing, a robust foil type regenerator can be cheaply manufactured without traditional limitations. Currently, a CFD analysis of the oscillating internal flow within the novel design was conducted to evaluate the flow loses within the system. Particularly the pressure drop across the regenerator in comparison to a traditionally used random fiber regenerator. Additionally, the heat transfer and flow over the tubular heater hear was evaluated. The results of the investigation will be used to optimize the operation of the next generation of additively manufactured Stirling convertors.

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