DEVELOPMENT OF A COMPACT THERMOACOUSTIC-STIRLING ELECTRIC GENERATOR

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Thermoacoustic-Stirling engines, or acoustic traveling-wave heat engines, have been shown to convert high temperature heat into acoustic power while maintaining a simple design with few moving parts. Previous experiments have demonstrated that a thermoacoustic-Stirling heat engine can convert thermal power to acoustic power with a conversion efficiency of 30% in the laboratory. [1] Typically, laboratory prototypes rely on embedded hot zones placed directly inside the pressure vessel to apply heat to the working fluid, have a long, bulky acoustic resonator, and deliver their work to an acoustic load rather than as electricity. While these features are acceptable for examining the fundamental acoustic and thermodynamic cycles in a laboratory setting, they do not address the challenging design requirements necessary for a commercially acceptable product. Recently, a compact thermoacoustic-Stirling electric generator, or TaSEG, consisting of two mirrored thermoacoustic engines coupled to a pair of electrodynamic alternators has been designed, constructed and is being tested. The main focus of this work has been developing a TaSEG design that has an acceptable thermal-to-electric conversion efficiency and moves this technology away from the laboratory towards a commercially viable product. This talk will explore the TaSEG design, touch on the tradeoffs between performance and manufacturability and present the TaSEG's experimental performance. Based on the TaSEG's performance results, recommendations for future work that might improve the overall efficiency of the TaSEG will also be discussed.

References

[1] Backhaus, S. and Swift, G. "A thermoacoustic-Stirling heat engine: detailed study". The Journal of the Acoustical Society of America, **107**, (2000), 3148–66.