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The Effect of Mean Pressure on the Performance of a Low-Grade Heat-Driven Thermoacoustic Cooler

Authors : Irna Farikhah

Abstract : Converting low-grade waste heat into useful energy such as sound energy which can then be used to generate acoustic power in a thermoacoustic engine has become an attracting issue for researchers. The generated power in thermoacoustic engine can be used for driving a thermoacoustic cooler when they are installed in a tube. This cooler system can be called as a heat-driven thermoacoustic cooler. In this study, low heating temperature of the engine is discussed. In addition, having high efficiency of the whole cooler is also essential. To design a thermoacoustic cooler having high efficiency with using low-grade waste heat for the engine, the effect of mean pressure is investigated. By increasing the mean pressure, the heating temperature to generate acoustic power can be decreased from 557 °C to 300 °C. Moreover, the efficiency of the engine and cooler regenerators attain 67% and 47% of the upper limit values, respectively and 49% of the acoustical work generated by the engine regenerator is utilized in the cooler regenerator. As a result, the efficiency of the whole cooler becomes 15% of the upper limit value.

Keywords : cooler, mean pressure, performance, thermoacoustic
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