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Design analysis and development of a thermoacoustic engine

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Content :

Thermoacoustic devices deal with the conversion of thermal energy to acoustic energy and vice versa without using any moving component in them. Solar energy or waste heat from industries can be effectively used as the source of thermal energy for running such devices. When a Stirling-type pulse tube cryocooler is driven by a thermoacoustic engine, then the entire system becomes vibration free making it suitable for long-term space applications.

In this paper, we bring out the various criticalities involved in designing a thermoacoustic engine. Based on the knowledge available in open literature, a thermoacoustic engine is designed and presented. The stack is placed inside a cylindrical resonance tube of 140 mm internal diameter. It is made of 0.2 mm thick stainless steel tubes. The tubes are flattened using a suitable fixture and are heated in a controlled manner such that the gaps between the walls remain within 0.8 mm. The engine operates at 800 K at hot end of stack through electrical heater placed inside the resonance tube and the other end of stack is cooled using air at normal temperature. The fabrication work of the engine is underway. The detailed description of the experimental setup is also presented in the paper.

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