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Theoretical Study on Standing Wave Thermoacoustic Engine

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Applications of thermoacoustic engine are not limited to driving the pulse tube cryocooler. Performance of thermoscousitc engine is governed by various design parameters like type of resonator, stack geometry, frequency, type of working gas etc. and various operating parameters like heat input, charging pressure etc. It is very important to arrive at an optimum configuration of the engine for which a theoretical model is required. In the present work, a theoretical analysis, based on linear acoustic theory of a standing wave type half wavelength thermoacoustic engine is carried out using DeltaEC software. The system dimensions like length of resonator, stack, hot and cold heat exchangers are fixed with helium-argon mixture as a working gas and assuming parallel plate type stack. Later on, two plate spacings, corresponding to helium-argon mixture and nitrogen gas, is used for carrying out analysis with helium, argon, nitrogen, carbon dioxide and helium-argon mixture as working gases of the system. Effect of charging pressure on performance of the system is studied in terms of resonating frequency, onset temperature, pressure amplitude, acoustic power and efficiency. The conclusions derived from the analysis are reported in the paper.

Key words: Thermoacoustic, Standing Wave, Engine, Frequency.

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