

Entropy Analysis of a Thermo-Acoustic Stack

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Abstract : The inherent irreversibility of thermo-acoustics primarily in the stack region causes poor efficiency of thermo-acoustic engines which is the major weakness of these devices. In view of the above, this study examines entropy generation in the stack of a thermo-acoustic system. For this purpose two parallel plates representative of the stack is considered. A general equation for entropy generation is derived based on the Second Law of thermodynamics. Assumptions such as Rott's linear thermo-acoustic approximation, boundary layer type flow, etc. are made to simplify the governing continuity, momentum and energy equations to achieve analytical solutions for velocity and temperature. The entropy generation equation is also simplified based on the same assumptions and then is converted to dimensionless form by using characteristic entropy generation. A time averaged entropy generation rate followed by a global entropy generation rate are calculated and graphically represented for further analysis and inspecting the effect of different parameters on the entropy generation.

Keywords : thermo-acoustics, entropy, second law of thermodynamics, Rott's linear thermo-acoustic approximation

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