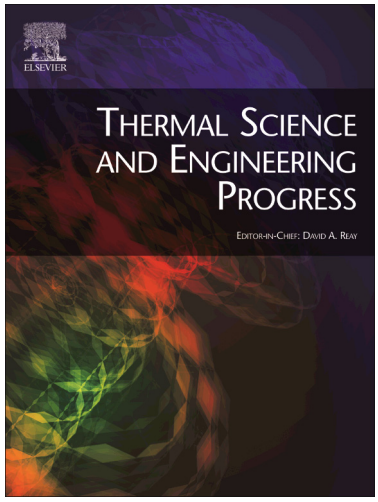

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Thermoacoustic cooler to meet medical storage needs of rural communities in developing countries – high pressure system

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Abstract

Development of a thermoacoustic cooler driven by a thermoacoustic engine is presented. The engine is of standing wave type and is coupled to a coaxial travelling wave cooler. This is to test the principles of building a linear thermoacoustic engine-cooler coupling that would be easy to make and thus lend itself to the deployment in rural communities of developing countries. These often lack electrical grid connection but require refrigeration capabilities for storing vital medical supplies. Such function could be provided by using waste heat from everyday cooking (biomass combustion) to drive the proposed device. In the presented laboratory demonstrator, the heat input is mimicked by resistive heating (varied from 1.75 to 2.5 kW), the acoustic resonator is made from 6-inch diameter stainless steel pipe with the total device length of about 3.7 m, and the working gas is air at the mean pressure of 10 bar. The system is modelled using DeltaEC and its performance verified experimentally. The lowest temperature, obtained at zero cooling load, is –19.7 C, while the cooling load of 120 W can be applied at the cooling temperature of +8 C, which is one of the criteria for storing medical supplies. The maximum COPR is 5.94%.

Keywords: Thermoacoustic cooler; Coaxial; Travelling wave; Thermoacoustic engine; Standing wave; Engine-cooler coupling; Rural communities; Developing countries