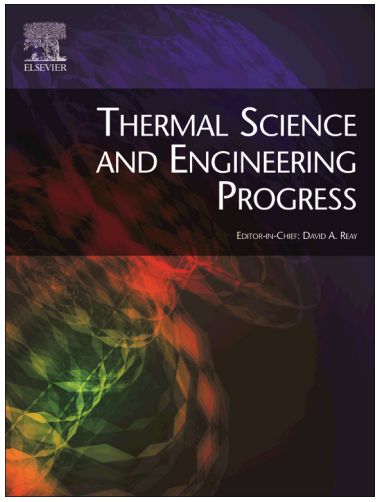

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Thermoacoustic cooler to meet medical storage needs of rural communities in developing countries

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Abstract

Rural communities in developing countries often require small cold storage for vital medicines while having no access to electricity. The utilization of waste heat – produced in biomass burning cookstoves during daily cooking routines – to power a thermoacoustic engine driving a thermoacoustic refrigerator is investigated. The simplicity and affordability is met by the use of atmospheric air as working medium, cheap PVC ducting for acoustic waveguides and locally available blacksmithing technologies for simple heat exchangers. This paper describes DeltaEC modelling, fabrication and experimental evaluation of a laboratory concept demonstrator. The travelling-wave, looped-tube engine/cooler configuration is powered by a propane gas burner to mimic cookstove flue gases. A matching stub is used to match the acoustic impedances of engine and cooler. The optimum location of the cooler is investigated experimentally. The device achieves the minimum temperature of -8.3°C and up to 7 W of cooling power at a storage condition of +8°C.

Keywords: Thermoacoustic refrigeration; Thermoacoustic engine; Travelling wave; Cookstoves; Biomass combustion; Rural communities