MASTER OF SCIENCE
IN
ENGINEERING SCIENCE

DESIGN AND CONSTRUCTION OF A SOLAR POWERED THERMOACOUSTIC REFRIGERATOR

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This thesis describes the design, construction, and testing of a solar thermal powered thermoacoustically driven thermoacoustic refrigerator. This device uses an 18 inch diameter Fresnel lens to concentrate sunlight at 500°C directly onto the hot end of a heat driven prime mover stack, thereby eliminating the need for a hot heat exchanger. The one inch diameter prime mover and refrigerator stacks are located at opposite ends of a 12 inch long half-wave resonator pressurized to six atmospheres absolute with helium and argon, and operating at 600 Hz. The prime mover is capable of producing peak sound pressure levels of up to 5.5% of the resonator's ambient mean pressure, while the refrigerator has produced a maximum of four Watts of cooling power with an ultimate cold temperature of 5°C and a temperature span of 18°C. This refrigerator requires no external power to operate, and uses solar voltaic cells to run electric cooling fans to reject heat from the ambient heat exchangers.

DoD KEY TECHNOLOGY AREA: Environmental Quality

KEYWORDS: Thermoacoustic Refrigerator, Thermoacoustic Prime Mover, Solar Thermal Powered