

The Construction and Performance Evaluation of Thermoelectric Generator System for Engine Waste Heat Recovery

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Abstract

This study combined the porous medium heat absorber and the thermoelectric generator to build a thermoelectric generator system of high heat transfer performance for engine waste heat recovery. Experimental tests were utilized to investigate the effects of various parameters on the generating electricity. The relevant variable parameters were (1) the configuration of the heat absorber, (2) the inlet temperature of hot air ($T_i=150\sim 350^\circ\text{C}$), (3) the flow rate of hot air ($FH=3\sim 15\text{ m}^3/\text{hr}$) and (4) the flow rate of cooling air ($FC=122\sim 366\text{ m}^3/\text{hr}$). The porous medium heat absorber had two modes: (1) brass beads packed bed and (2) copper foams brass. The beads packed bed the two modes divided into 2mm-diameter and 6mm-diameter. The copper foams brass porosity is 0.96. Besides, heat absorbers Placed in exhaust channel to absorb the channel exhaust heat, with and without bypass an exhaust channel the heat absorber and System flow rate on the generating electricity the impact will also be explored. Experimental results indicate that: no-bypass exhaust channel 6mm-diameter a brass beads packed bed heat absorber ,in $T_i =350^\circ\text{C}$ 、 $FH=15\text{ m}^3/\text{hr}$ 、 $FC=366\text{ m}^3/\text{hr}$ had the maximum generating electricity of 6.3 Watt. With and without bypass an exhaust channel the flow rate on the generating electricity has a significant impact.

Keywords: Porous medium, Thermoelectric generator, Waste heat recovery.