DEVELOPMENT AND DESIGN OF LOW COST THERMOELECTRIC MODULES FOR WASTE HEAT HARVEST

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Thermoelectric generators (TEGs) convert heat energy directly into electric energy using the phenomena called "Seebeck effect". "Peltier effect" and "Thompson effect" are the other phenomena related to this energy conversion. Thermoelectric devices are very robust energy converters as they have no any moving parts and almost no wear and tear. Nowadays, semiconductor materials are widely used to produce thermoelectric generators which are highly expensive and they need high technology. However, in this study we have focused to develop a low cost thermoelectric module using low technology to harvest waste heat. In Sri Lanka, there are many areas that they do not have electricity facility yet. The major objective of this research study is to give a solution for them to fulfill their energy needs of day to day life. Different commercially available metals and material combinations were tested in this study and highest per couple per Celsius voltage among those was studied. The highest per couple per Celsius voltage was given by the Iron/Brass combination. It was 0.0108 mV. Iron/Brass combination was used to build the thermoelectric module. Low cost low tech designs were tested to harvest waste heat from exhaust fumes and gases. Tested thermoelectric modules show good potential and it can be developed to overcome energy needs in rural areas using exhaust heat in their daily affairs. Further, proper material selection and the use of new metal alloys are greatly advantageous for efficiency enhancement of these modules.

Keywords: Peltier effect, Seebeck effect, Thermoelectric generators, Thompson effect, Thermoelectric devices