

Experimental Investigation of Thermoelectric Heat Recovery from a Diesel Engine

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Abstract– The paper presents several actions in the field of waste heat harvesting from exhaust gas and surfaces of diesel engines by means of thermoelectric modules. It illustrates preliminary research work performed by the authors for the investigation of TEG efficiency when mounted on diesel engine exhaust gas systems, stressing on the validation of the measurement chain. A four stroke, two cylinder, diesel engine, rated at 20 kW @ 1800 rpm was tested in eight operation modes, finding the weights of each term from the engine energy balance. Two Peltier elements - TEC1-12710 - were set on exhaust pipe, being connected to a HYTEK iUSBDAQ - U120816, data acquisition system controlled by National Instruments LabVIEW virtual instrumentation software. The research work had three phases. The first one used a metal plate to support the thermoelectric elements; the temperature sensors were set into three metal blocks acting as coolers for the heat sink. In the second phase, the thermoelectric elements were mounted directly on the exhaust gas pipe, being measured twelve points [voltage – gas temperature]. In the third phase, the thermoelectric elements were mounted using an aluminum cooler. The temperature measurement accuracy was validated by means of infrared thermography. The second method proved to be the best; practical results of power generation were compared with literature values showing good correlation and a precise operation of the data acquisition system.