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DESIGN AND SIMULATION OF AN EXHAUST BASED THERMOELECTRIC GENERATOR (TEG) FOR WASTE HEAT RECOVERY IN PASSENGER VEHICLE

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ABSTRACT

The increasing demand for electric power in passenger vehicles has motivated several research focuses since the last two decades. This demand has been revolted by the unrelenting, rapidly growing reliance on electronics in modern vehicles. Generally, internal combustion engines lose more than 35% of the fuel energy in exhaust gas. Comparing this huge loss to every day's growing oil price, one could understand how the recovery of such losses could help the economy, as well as providing the additional power sources required by contemporary vehicle systems. There are three fundamental advantages of thermoelectric generators (TEGs) over other power sources; they do not have any moving parts as they generate power using Seebeck solid-state phenomena, they have a long operation lifetime, and they can be easily integrated to any vehicle's exhaust system. This project presents a novel TEG concept aims to resolve the thermal and mechanical disputes faced by the research community. Several simulation models are used to analyse the TEG performance. The significance of the novel TEG is discussed through a detailed comparison with experimental results from Clarkson University TEG prototype tests. The simulation results showed a huge increase in the power generated.

KEYWORDS: Thermoelectric Generators, Seebeck Solid-State Phenomena