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CFD Analysis of Exhaust Heat Exchangers in Automobile Thermoelectric Generators: A Review

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Abstract: *A novel way to boost the efficiency of engines, including those found in cars and power generators. Large amounts of heat are produced as engines run, yet this heat is frequently lost. We're seeking to alter that with the help of a thermoelectric generator, a device that can transform heat into power. We're using computer simulations (CFD analysis) to understand how heat moves through the engine and a special heat exchanger to figure out how to do so efficiently. With the aid of this exchanger, the engine's heat may be most efficiently transferred to the thermoelectric generator. Hopefully, this will lead to engines becoming more efficient, generating fewer dangerous gases, and requiring less fuel. and being more environmentally friendly. Here, we compared heat exchangers with different designs. By using CFD analysis we observed pressure drop and heat transfer rate. Heat exchanger types empty cavity, serial plate structure, Novel pipe structure, Wavy fin plate and Obstruction and created designs with changing the internal structure of heat exchanger, etc. By using CFD result we preferred the heat exchanger with low pressure drop and high heat transfer rate corresponding with exhaust mass flow rate. However, this will increase the pressure drop, this arrangement needs a pressure-relieving mechanism to work as desired. A compromise between heat transfer rate and pressure drop can be achieved by using a heat exchanger with a smaller heat transfer area and a higher flow rate. The results of this study show that CFD can be used to effectively design exhaust heat exchangers for TEGs. The CFD model can be used to optimize the design of the heat exchanger to achieve the desired balance between heat transfer rate and pressure drop.*

Keywords: Thermoelectric Generator, Waste heat recovery, Heat exchanger, Heat transfer, pressure drop and internal structures

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