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Investigations on the Use of Rubber Seed Oil in a Diesel Engine Using Waste Exhaust Heat Energy

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Abstract

Rubber seed oil can be used as an alternative fuel for diesel engine operation. But its high viscosity causes improper atomization of fuel during injection, resulting in incomplete combustion. This leads to smoky exhaust in diesel engines. The high viscosity of vegetable oils can be reduced by preheating. The heat energy from the exhaust, which is otherwise wasted, can be used to preheat the vegetable oil. In the present work a heat exchanger was designed and fabricated to preheat the rubber seed oil (RSO) for use in diesel engines. It was observed that the RSO requires a temperature of 155°C and 133°C to bring down its viscosity to that of diesel and rubber seed oil methyl ester (RSOME). The work is related to the study of exhaust preheated RSO and its ester on the performance and emission characteristics of a single cylinder DI diesel engine. Experimental results indicated that there is a marginal increase in brake thermal efficiency when the fuel is preheated to a temperature of 155°C. Smoke level of preheated RSO is significantly reduced, compared with RSO (without preheating). Preheated fuel improves the fuel spray pattern that leads to better mixing; hence the ignition delay and combustion duration decreases with preheated oil, which indicates an increase in combustion rate. The overall result shows that by preheating the RSO, the engine performance and exhaust emission characteristics improves significantly and approaches the performance of RSOME in a diesel engine.