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RSM Based Prediction of Engine Performance and Exhaust Temperature Fuelled with Preheated Cotton Seed Methyl Ester

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Abstract: - The conventional fuels are major sources of energy in the world. However, their limited reserves are a great concern owing to fast depletion due to increased demand worldwide. The biodiesel is gaining more importance as an alternative fuel and may be used in 100%, but it requires engine modifications to avoid viscosity problems. The preheating is done to overcome this difficulty. RSM is vital in the solution of many types of problems. This work aims to study the effect of engine torque and the preheat temperature on the usage of cotton seed methyl ester (COME) blends on engine performance and exhaust gas temperature (EGT) with response surface methodology. The interaction curves indicate the increased preheat of higher COME blends shows increased BTE. Further, the highest BTE was observed at 60°C preheat temperature. From the extensive experimentation with RSM, the tedious experimental work was reduced and the preheated lower COME blends were marginally found better in terms of performance and lower EGT.

Keywords*: RSM, Prediction, Engine Performance, Exhaust gas temperature, Preheat, COME.*

1. Introduction

The fossil fuels are the reason for atmospheric pollution. Hence efforts are being to find alternative sources. Renewable vegetable oils can be used in engines with little or no modification. Thus, lots of efforts are directed at finding fuels as direct substitutes to diesel fuel. The cotton plant is a shrub native to tropical and subtropical regions of the world. The Figure 1a) -1d) illustrates the flower, seed and COME.

1.1 Preheated Vegetable Oil and Their Derivatives

Heated bio-fuel is thinner and makes it easier for the injector pump to deliver fuel to the engine. There is a short time available for the mixing, vaporization and distribution where the vaporization is controlled by the temperature. The ignition lag therefore decreases with increases in the temperature. The ignition limits are wider at increased temperatures because of higher rates of reaction and higher diffusivity coefficient of the mixtures.