

## **By-Product Alcohol: Fusel Oil as an Alternative Fuel in Spark Ignition Engine**

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**Abstract :** Fusel oil is a by-product obtained through the fermentation of some agricultural products. The fusel oil properties are closer to other alternative combustible types and the limited number of studies on the use of fusel oil as an alcohol derivative in SI engines constitutes to the base of this study. This paper experimentally examined the impacts of a by-product of alcohol, which is fusel oil by blending it with gasoline, on engine performance, combustion characteristics, and emissions in a 4-cylinder SI engine. The test was achieved at different engine speeds and a 60 % throttle valve (load). As results, brake power, BTE, and BSFC of F10 are higher at all engine speeds. Maximum engine BTE was 33.9%, at the lowest BSFC with F10. Moreover, it is worth seeing that the F10 under rich air-fuel ratio has less variation of COVIMEP compared to the F20 and gasoline. F10 represents shorter combustion duration, thereby, the engine power increased. NOx emission for F10 at 4500 rpm was lower than gasoline. The highest value of HC emission is obtained with F10 compared to gasoline and F20 with an average increase of 11% over the engine speed range. CO and CO2 emissions increased when using fusel oil blends.

**Keywords :** fusel oil, spark ignition engine, by-product alcohol, combustion characteristics, engine emissions, alternative fuel

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