

Experimental Investigation of Using Ethanol-Gasoline in Spark Ignition Engine

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Abstract:

The consequence of mixing pure ethanol with gasoline on the pollution and performance of SI engine are investigated experimentally in the existent study. The SI engine that employed in the experiment is a single cylinder four stroke. Analysis is carried out for engine operation parameter, CO₂, CO and unburned HC productions. The measurements are recorded for several engine speeds from 1500 – 3000 rpm with load and ethanol addition of (0E, 10E, 20E, 30E, 40E, 50E.). The results displayed increasing in brake power, and brake thermal efficiency while the brake specific fuel consumption decreases when the ethanol- gasoline blends fuel increases. Also it was found that CO, HC, and CO₂ concentrations decrease when the ethanol-gasoline increases. The best results obtained in the study is for the blend of E-50

Keywords: Ethanol, Gasoline, Brake Power, Fuel Consumption, Engine Efficiency, Emission.

1. Introduction

For many recent years the employed of alternative fuels has an important and special place in the area of internal combustion development. The family of alternative fuels proceeding usual petroleum ones is defined by many types and the alcohols represent a significant percent due to adequate properties for internal combustion engines use; good conditions of producing process from agriculture products or green mass [1]. The using of biofuels is great dependent on the obtainable of developing feedstock sources and biomass. Ethanol will be very important increasingly when crude oil prices growth and when governments approve new rules promoting biofuels [2]. The countries using biofuels for reducing oil dependence and for reduce carbon emissions that objectives of the Kyoto protocol [3]. Ethanol is made from all biological feedstock which holds considerable quantities of the sugar [4]. The process of addition alcohols like methanol and ethanol to gasoline leads the fuel for combustion extra completely because of the existence in oxygen, which is growing the engine efficiency and decreasing pollution [5]. The organic emissions (ozone originators) from alcohol combustion have

lower amount, which promotes ozone formation significantly [6]. Corrosion to metallic fuel system components appeared due to the presence of alcohols in fuel [7]. Corrosion must reduce and create the greatest using of alcohols in engine by redesigned the engine. [8].

Numerous academics displayed the influence of ethanol-gasoline blends and methanol-gasoline mixtures, on the measured exhaust emissions of SI engine. It recognized from the literatures texts that methanol or ethanol-gasoline mixtures successfully decrease the pollutant discharges, comparing with only gasoline [9]. Biofuel markets have been grown rapidly in current years. In USA and Brazil there is increasing use for bioethanol as a substituted of fossil fuels, also in the EU increasing for the purposes set by the Paris Climate Agreement [10]. Biofuels production international is shown in Figure (1). Ioannis et al. [11] experimentally found that the engine brake power somewhat increased with engine speeds as ethanol content in mixture fuel is increased, also with low engine speeds there is increasing in engine volumetric efficiency and the blend density with ethanol percentage, that leads to develop in power developed. Yüksel and Yüksel [12] Measured experimentally concentrations of (O₂), (HC), (CO₂), and (CO) in the exhaust gas by analyzer for different speed for fuels up to 60% ethanol by volume. The results indicated CO and HC reduced nearly 80% and 50%, respectively, but CO₂ emissions increased 20%. Ceviz and Yüksel [13] absorbed the influence of ethanol-gasoline mixtures on cyclical changeability and emissions in the SI engine. The results shown that a important decrease in exhaust for CO and HC emissions as 30,01% and 20.21%, respectively, at E-10% compared with pure gasoline, while increased CO₂. Koç et al. [14] studied using of ethanol-gasoline mixtures on both exhaust emissions and performance for the spark-ignition engine with speed of 1500 to 5000 rpm for WOT (wide open throttle). Three different fuels namely (E-0, E-50 and E-85) were tested with each speed value. Improvement of the performance for SI engine is investigated by Siddegowda and Venkatesh [15] and proved increasing in the engine performance and reduction in pollution