COMBUSTION PARAMETERS OF SPARK IGNITION ENGINE USING WASTE POTATO BIOETHANOL AND GASOLINE BLENDED FUELS

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ABSTRACT

The purpose of this study is to investigate the combustion parameters of a SI engine operating on bioethanol-gasoline blends. The combustion parameters from the engine running on bioethanol (derived from potato waste) and blended with gasoline (E5, E10, E15 and E20) were evaluated and compared with gasoline fuel. A reactor was designed, fabricated and evaluated for bioethanol production from potato wastes. The results showed that increasing the bioethanol content in the blend fuel will decrease the heating value of the blended fuel and increase the octane number. Combustion parameters were evaluated and analyzed at different engine speeds and loads (1000-5000 rpm). Comparative studies of combustion development of bioethanol-gasoline blends at different concentrations have been carried out by analysis of pressure cycles in combustion chamber. The results revealed that increasing bioethanol concentration in blended fuels increases the cylinder pressure and its 1st and 2nd derivatives ($P(\theta)$, $P^{\bullet}(\theta)$ and $P^{\bullet\bullet}(\theta)$) compared to the neat gasoline fuel. The ethanol fuel has a higher volumetric efficiency than gasoline. At the constant engine speed, the cylinder pressure are increased with the improvement of volumetric efficiency. Moreover, using bioethanol-gasoline blends will increase the heat release ($Q\bullet(\theta)$) and worked of the cycle. This improvement was due to the high oxygen percentage in the ethanol. This better combustion parameters and efficiency suggests that using ethanol as fuel can prevent the pre-mature combustion, and thus improve the anti-knock characteristics.

Keywords: Combustion parameters; bioethanol; gasoline; blending; SI engine.

INTRODUCTION

Production of biofuel from biomasses has recycle process to keep the environment green and safe from the reduction of harmful gases (Baeyens et al., 2015). On a small scale, biofuels are currently produced from Lignocelulosic waste and algea with relatively large greenhouse gas savings compared to fossil fuels, of around 70% (Singh & Trivedi, 2014). Bioethanol-gasoline blends present an emerging direction in the attempts to reduce the emissions (Masum et al., 2013). Bioethanol is an ecological fuel that can be produced from various feed stocks like sugar cane, sugar beet, sorghum, grain, switch grass, barely, potatoes, cassava, fruit as well as many types of cellulose wastes and harvests. Bioethanol is more reactive than gasoline fuel (Costa & Sodré, 2010). Among alternative fuels, ethanol is one of fuels employed mostly, because it can