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Effects of Blending Ethanol with Palm Oil Methyl Esters on low Temperature Flow Properties and Fuel Characteristics

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Abstract

In order to overcome escalating worldwide consumption of fossil fuel and global warming, an alternative fuel that is economically feasible, sustainable and environmental friendly must be developed for large-scale adoption. Alternative fuels like biodiesel, are being used as effective alternative for diesel. The feasibility of biodiesel production from palm oil was investigated with respect to its fuel properties. Though biodiesel can replace diesel satisfactorily, problems related to fuel properties persist. In this study ethanol (E) additive was blended in the ratios of 1%, 2%, 3% and 4% with palm oil biodiesel (POME) and tested for their properties improvement. These blends were tested for energy content and various fuel properties according to ASTM standards. Qualifying of the effect of additive on palm biodiesel fuel properties can serve the researchers who work on biodiesel fuels to indicate the fuel suitability for diesel engines according to fuel standards. Blends of ethanol in POME resulted in an improvement in acid value, viscosity, density and pour point with increasing content of ethanol in the blend. Further improvement in the pour point temperature of the palm oil methyl esters ethanol blends (B-E) at 5^{o}C can be achieved by adding 4% ethanol additive to POME, accompanied by less than 1% decrease in energy content of biodiesel which still within specifications contained in ASTM D6751 and EN 14214 standards, suggesting that ethanol may be the suitable prudent choice as biodiesel additive.

Keywords: *Palm oil biodiesel, Ethanol, Energy Continent, Diesel, Fuel properties*

1. Introduction

Recently, world has been confronted with an energy crisis due to fossil fuel depletion and environmental degradation. Because bioenergy renewability and considered carbon–neutral, the bioenergy utilization can contribute to the carbon dioxide emissions reduction. Therefore, biodiesel has received a great deal of attention because of the advantages associated with its biodegradability and its classification as a resource for renewable energy [1, 2]. Biodiesel is composed of fatty acid methyl esters (FAME) and is synthesized usually via vegetable oils (triacylglycerols) transesterification with low-molecular-weight alcohols [3]. The current mandates regarding the use of biodiesel around the world are mostly based on a biodiesel–diesel blend. The additive is the most visible option to introduce the biodiesel as complete alternative fuel for mineral diesel.

The availability and sustainability of biodiesel feedstocks will be the crucial determinants in the popularization of biodiesel [4]. The oil palm is a tropical perennial plant and grows

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