Comparison of Properties of Biodiesel Produced from Different Mixing Ratios of Used Coconut Oil, Sunflower Oil and Palm Olein

H.C. Ambawatte*, S.H.I. Hameed, K.D.L.S. Kumara and A.K.C.I. Kodithuwakku

Department of Mechanical and Manufacturing Engineering, Faculty of Engineering, University of Ruhuna, Hapugala, Sri Lanka

Abstract

Waste vegetable oil is considered as one of the renewable energy sources and can be used as a feedstock for biodiesel production. Biodiesel is sustainable, non- toxic and biodegradable fuel which can be considered as an alternative fuel for petroleum diesel and solution for the energy crisis. For that, trans-esterification, pyrolysis, micro-emulsion, and direct use and blending are the biodiesel production methods. Nevertheless, trans-esterification is the most common method in the world. It consists of such steps; preheating the oil sample, free fatty acid calculation, trans-esterification, separation, washing and drying processes. Furthermore, reusing used oil can cause several health hazards to human beings; especially cancers. In Sri Lanka, reusing used cooking oil is a very common situation due to the lack of knowledge and to gain more profit. Besides, dumping the waste vegetable oil into the river or land can create negative environmental impacts. Therefore using waste vegetable oil as a feedstock for biodiesel production helps to be economically feasible, healthful and environmentally friendly. In Sri Lanka, coconut oil, sunflower oil, and palm oil/olein are mostly utilised for edible purposes. It is essential to investigate the chemical and physical properties of biodiesel before using it as a fuel. In this research, the main objective is investigating biodiesel properties such as viscosity, flash point, density and yield produced from used coconut oil, sunflower oil and palm olein mixture with various percentages. It's observed that the majority of the results are within the expected range as a fuel. Here, all properties were compared with the EN14214 standard. The viscosity of every sample lied between 6-7 mm^2/s at 40 ^0C. Furthermore, all samples had a density range of 0.86-0.9 g/ml and at the preferable range. But the flashpoint of the samples with 100% sunflower oil and palm olein deviated from the standard (flash point < 136 ^0C). The rest of the samples were following the standard. The maximum yield 83% could be gained in the sample with 75% coconut oil and 25% palm olein and others were between 70-80%. Finally, compare with all observed results, the properties of produced biodiesel are comparable with the fossil diesel for different ratios of used cooking oil and 80-83% yield can be achieved.

Keywords: Biodiesel, Biodegradable, Environmental-friendly, Trans-esterification, Waste vegetable oil

Corresponding Author: chithral@mme.ruh.ac.lk