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Capital Cost Comparison of Heat Energy obtained from Glycerine Fuel and Cooking gas used for Bio-diesel Production Process

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Abstract

We present the used cooking oil passed into the transesterification process with heat to accelerate the reaction that can result the product in bio-diesel form and the wastes in form of glycerine with alcoholic residues. Such glycerine can be reused as the fuel to the production process again. Therefore this project has objectives to compare the capital cost of the heat energy in the bio-diesel production process between the glycerine which normally is the waste from the bio-diesel production process and cooking gas as the process fuels. The results show that, the production of bio-diesel with glycerine as the fuel could gain average bio-diesel quantity 19.16 liters with the capital cost for the fuel in the production process equivalent to 11.66 baht, the time taken for the average production equalled to 2.19 hours per time or batch of production and when the cooking gas was used in the bio-diesel production process, the quantity of produced bio-diesel equalled to 19.1 liters, consumed the capital cost in the average production process equivalent to 12.66 baht, time taken for the average production was 3.18 hours per time of production. Hence, usage of glycerine as the fuel in the production process of bio-diesel of 20 liters batch time could enable lower capital cost for fuel that usage of cooking gas as the fuel with statistically significant level at 0.05.

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1. Introduction

Glycerin is a by-product from biodiesel production which biodiesel is an fuel that is produced from renewable resources like vegetable oils [1], animal fats or algae. Biodiesel is an alternative diesel fuel. It has burning property like diesel and can be replaced diesel.

Glycerin is a Polyhydric alcohol, a chemical formula is $C_3H_8O_3$ [2-3]. Since it has the structure of hydroxyl groups which can dissolve in water and alcohol. It is sweet, smooth and stable in normal use and storage. Glycerin has been used in many industries like medicine products, healthcare products, foods, cosmetics, tobacco, paper etc. In this experiment, glycerin is used as a fuel for producing of biodiesel to increase the value of the glycerin and reduce the production cost of biodiesel.

Supachai [4] produced small biodiesel and developed glycerin oven using for boiling biodiesel. So there is no need to use LPG or other fuels. It can apply to be used as renewable energy in industries or communities to reduce outgoings on energy.

2. Theory and Background

2.1. Equipments and Energy

The thermal component of glycerin as the Fig. 1. Glycerin furnace.

1. Glycerin tank
2. Nautilus fan
3. Valve1 using for controlling glycerin
4. Valve 2 using for controlling air
5. Combustion chamber
6. 200-liter fuel tank and
7. Cleaning oil set



Fig. 1. Glycerin furnace

2.2. Glycerin

Glycerin used in this study is a glycerin from the furnace that using for producing biodiesel at Rajamangala University of Technology Isan, Sakon Nakhon Campus and Rajamangala University of Technology Isan, Khon Kaen Campus. The production of biodiesel using used vegetable oil or animal fats

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