Modification and Evaluation of Reactor

3.1 Introduction

Reactor in the workshop production used edible oil for the production of biodiesel. In this reactor motor with power 1/4 horse mixes oil with methoxide in the oil tank. There is shock in the motor due to the shaft and the stirrer.

This reactor contains two tanks one for water and the other for oil, these two reservoirs are large compared to the power of the motor it must minimized even are be appropriate.

Water tank loses heat during the reaction and this reduces the efficiency of the reaction so it needs to thermal insulation.

3.2 Minimize the tank of water

The tank water has been scaled down from height 98 cm to 76 cm for the following reasons:

- In order to facilitate the mobilization of material in the tank
- In order to facilitate moving the reactor

Figure (3-1) A prototype of the reactor before modification

Figure (3-2) Aprototype of the reactor after modification

3.3 Minimize the tank of oil

The tank water has been scaled down from volume 130 liter to 81 liter for the following reasons:

- Even appropriate for the size of motor.
- So can use its case of simple experiments.

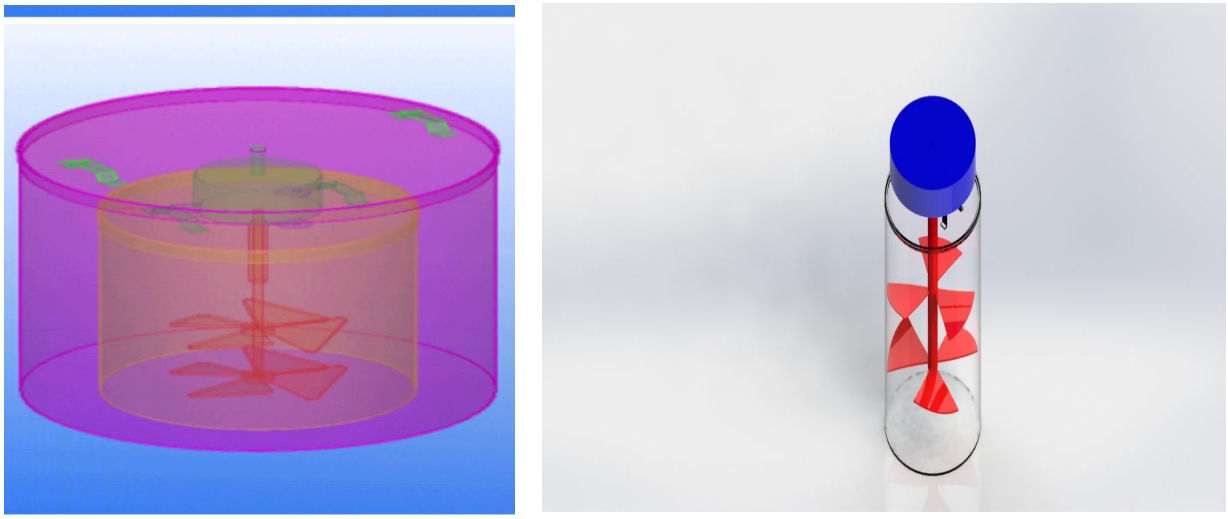

Figure (3-3) Tank oil after modification

3.4 The installation of a thermal insulator

Have installed thermal insulator (with thickness 3 mm):

- To maintain temperature of the reaction.
- To provide standard reaction conditions.
- To reduce heat loss during the reaction.

Figure (3-4) Reactor after installation of thermal insulator

3.5 Shaft coupling and stirrers

To prevent the vibration of the stirrer:

Been repairing the shaft coupling and installing new stirrer.

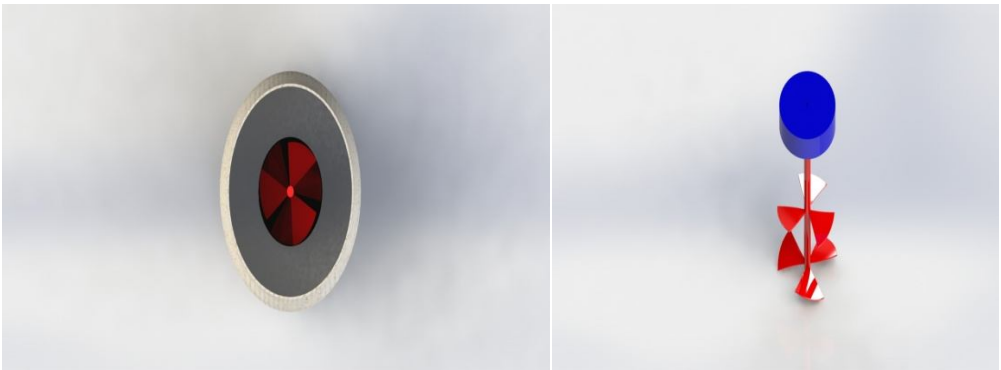

Figure (3-5) Shaft of coupling and stirrer

3.6 Reactor Operating Procedure

Producing biodiesel using this developed reactor is obtained by following these steps;

1. Analyze acid value for standard reaction of oil the acid value of oil must be below 1%, otherwise the excess of NaOH must be added by thy same number of the increase of acid value.
2. Analyze the water content of oil the water content in the oil must be below 500 ppm, in order to prevent saponification that is unfavorable for the next washing process.
3. Prepare the mixture of catalyst and methanol
4. Fill the oil to transeterfication vessel.
5. For starting the reaction;
    a. Turn on stirrer
    b. Fill in all the of the methoxide to the mixture tank
    c. Heat up the reaction components to 60c
    d. Let the reaction conducted between one to two hours
6. Wait for settling of glycerol for 15 to 30 minutes.
7. By using sight investigate the glycerin layer, open the valve of the vessel and let the glycerin phase following down to container.
8. Introduce the water (approx. 30-40%volume of crude biodiesel) for washing process and power the stirrer not that heavy for three or four times, then let the mixture separate naturally.(it is possible to takes more time , wait for 15 to 30 minutes for the first wash).
9. After the layer appeared, drain the water and repeat washing gain using new water and start steering for longer time; however it has to make sure that no emulsion is formed .If it tends to form the emulsion, then stop stirrer. Washing can be repeated for three times until the PH of water drained is less than 8.

10. After washing step the product is purified by:

a. Power on the stirrer.
b. Heating the mixture and set to 70 °c.
c. Wait and watch until the mixture become transparent, not the milky appearance.
d. After make sure that the transparent appearance is readily confirmed, turn off the heater.

11. Open the valve of mixture tank and let the product flow to outer tank.