

# Optimization of Three-Step Method for Biodiesel Production from Waste Cook Oil

Kaniz Ferdous<sup>1\*</sup>, M. Rakib Uddin<sup>1</sup>, M. Rahim Uddin<sup>1</sup>, Maksudur R. Khan<sup>1,2</sup>, M. A. Islam<sup>1</sup>

*1 Department of Chemical Engineering and Polymer Science, Shahjalal University of Science and Technology (SUST), Sylhet 3114, Bangladesh.*

*2 Faculty of Chemical and Natural Resources Engineering, Universiti Malaysia Pahang, 26300 Gambang, Kuantan, Pahang, Malaysia.*

## Abstract

In this paper, production of biodiesel from Waste Cook Oil (WCO) by three-step method and optimization of the process were studied. The properties of raw oil were measured by standard methods. The raw oil containing 1.9 wt% Free Fatty Acid (FFA) and viscosity was 54.53 mm<sup>2</sup>/s. Biodiesel was prepared from WCO by three-step method. In the three-step method, the first step was saponification of the oil followed by acidification to produce FFA and finally esterification of FFA to produce biodiesel. The reaction parameters in saponification, acidification and esterification reaction were optimized. Silica gel was used during esterification reaction to adsorb water produced in the reaction and silica gel to FFA ratio was 1.5:10 wt/wt. Hence the reaction rate was increased and finally the FFA was reduced to 0.98 wt%. A factorial design was studied for esterification reaction to obtain the higher yield of biodiesel. Finally various properties of biodiesel such as FFA, viscosity, specific gravity, cetane index, pour point, flash point etc. were measured and compared with biodiesel and petro-diesel standard.

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