OPTIMIZATION OF REACTION PARAMETERS INFLUENCES ON PRODUCTION OF BIO-OIL FROM FAST PYROLYSIS OF OIL PALM EMPTY FRUIT BUNCH BIOMASS IN A FLUIDIZED BED REACTOR

[1]TAWEESAK REUNGPEERAKUL, [2]KYAW THU

[1]Department of Computer Engineering, Faculty of Engineering, Prince of Songkla University, Hat Yai, Songkhla 90110, Thailand
[2]Department of Chemical Engineering, Faculty of Engineering, Prince of Songkla University, Hat Yai, Songkhla 90110, Thailand
E-mail: chayanoot.s@psu.ac.th

Abstract –

According to the demand of oil palm products, oil palm plantation areas are significantly expanded in southern part of Thailand year after year. On the other hand, oil palm mills are also increased in last decade. As a result, huge amount of empty fruit bunch solid waste produced in oil palm mills. It is difficult to dispose land filling process. The conversion of biofuel from biomass is the best way to solve this problem. Thermochemical conversion process is widely used for conversion of biofuel from biomass. Fast pyrolysis is very popular for biofuel production from biomass among thermochemical conversion processes due to the many advantages. Pyrolysis parameters need to control for maximizing desired product yields in biomass fast pyrolysis. In this work, the effects of heat transfer parameters, such as, minimum fluidization velocity, heat transfer coefficient, particle size (300-355 µm), pyrolysis temperature (773 K) and time (less than 2 s) were simulated to optimize on fast pyrolysis of empty fruit bunch biomass in a fluidized bed reactor. Heat diffusion equation applied to study the heat transfer from surface of the particle to its center. Ergun equation and Collier correlations were used to estimate the minimum fluidization velocity and heat transfer coefficient parameters, respectively. The calculated minimum fluidized velocity is 0.15 m/s. The average estimated heat transfer coefficient for particle size ranges of 300-355 µm are 450 W/m^2K at 773 K. The complete heat transfer from surface to center of particle size ranges of 300-355 µm occurred at the reaction temperature of 773 K and at the reaction time of 1.32 s. The simulated results are good in agreement with reported experiment results. The results from heat transfer model simulation can be applied to the experimental work of biomass fast pyrolysis in a fluidized bed reactor.

Keywords - Bio-oil, Fast Pyrolysis, Oil Palm Empty Fruit Bunch, Bed Reactor