



ABSTRACT

Green diesel plant that requires 798.000 tons/year palm empty fruit bunches (TKKS) and hydrogen gas (H₂) of 35.000 tons/year as raw materials operates through several processes to produce main product and by-products. The processes are pyrolysis, hydrotreatment, and hydrocracking. TKKS as raw material is first dried to reduce the water content, then followed by a rapid pyrolysis process using fluidized bed reactor circulation resulting biooil. This reaction uses a heat carrier such as sand with operating condition of 550°C and 1.5 atm. The resulting bio-oil is then reacted in fixed bed reactor with the CoMo/Al₂O₃ catalyst contacted with hydrogen produced from the electrolysis in the nuclear power plant. The hydrotreatment process takes place in 2 stages of fixed bed reactor with operating conditions of each reactor pressure and temperature of 81 atm, 200°C and 81 atm, 300°C adiabatically. The reaction occurred is the hydrodeoxygenation reaction in the gas, liquid, and solid phases. This reaction produces hydrocarbons C₃, C₈ (gasoline), C₁₆ (diesel), C₂₀ (heavy oil) and air with conversion more than 98%. Before becoming product, hydrotreatment products has to be processed through several separation processes and further reaction. Heavy oil that produced is reacted with hydrogen in a fixed bed hydrocracker reactor with NiMo/Al₂O₃ catalyst. In this reactor, hydrocracking reaction occurs which produces hydrocarbon gas C₄H₁₀, gasoline, and diesel. After gasoline and diesel components are separated, both components are stored in liquid form in the storage tank with operating conditions of 1 atm 40°C. The main product of this factory is green diesel with capacity of 240.000 tons/year and the byproduct is gasoline with capacity of 140.000 tons/year.

Energy, fuel, and water for cooling are needed to run this plant. Electricity requirement of this factory is equal to 0.1 kW/kg product which is supplied by PLN or Nuclear Power Plant and gasoline from plant's production as fuel. Energy requirement of 863.443.028 kJ/hour is supplied from the side product of this factory (gasoline) as much as 19.629,57 kg/hour. The water supply is supplied from Java Sea as much as 4.438.115 kg/hour.

An 87.500 m² of land in Tukak, South Bangka is to be prepared to build this plant. The entire production processes at this factory requires 195 people who work in accordance with their respective expertise.

As a raw material, TKKS and hydrogen's prices are Rp. 200.000/ton and \$1.900/ton. Diesel, the main product, will be sold for Rp. 10.000/L and gasoline, the byproduct, will be sold for Rp. 8.000/L This factory has a fixed capital of \$190.506.745,13 + Rp450.271.381.792,38 and working capital of \$21.506.259,62 + Rp406.891.330.047,00. Production cost of \$120.963.988,80+ Rp1.019.027.071.992.. The plant is high risk with POT (before tax) 1,96 years, POT (after tax) 3,13 years, ROI (before tax) 43,91%, ROI (after tax) 21,96 % BEP 35,38%, SDP 16,34 %, and DCFRR 34,80%. For sensitivity analysis , the selling price of products is the most influencing aspects for this company profit. Based on the above values, it can be concluded that the plant is economically attractive and feasible for further study.