

### Energy consumption of Biodiesel process by Supercritical and Immobilized lipase method

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Biodiesel is a renewable energy which is nontoxic and acting as a replacement for conventional diesel which derived from fossil fuel. Classified biodiesel producing way such as acid, base, supercritical and enzyme methods, this study focused on eco-friendly production of biodiesel using supercritical and immobilized enzyme process. Assuming a plant with a production rate of 10,000 tons a year, a PRO II simulator program was used to simulate the product conversion rate and total energy consume. The product conversion in supercritical process and immobilized enzyme was found to be 91.17% (including 0.9% glycerol) and 93.18% (including 1.0% glycerol) respectively. The result shows that the efficiency of immobilized enzyme process is higher compared to supercritical process but having lower end product purity. From the energy consumption point of view, supercritical process consume about 8.9MW while immobilized enzyme process consume much lower energy which is 3.9MW. Consequently, this study certifies that supercritical process consumes 2.3 times higher of immobilized enzyme process.