

Attawut Soonhoey 2015: The Study of Operating Condition, Process Design and Cost Calculation of *Jatropha* Kernel Oil Extraction Plants. Master of Engineering (Chemical Engineering), Major Field: Chemical Engineering, Department of Chemical Engineering. Thesis Advisor: Assistant Professor Anusith Thanapimmetha, D.Eng. 167 pages.

This research aimed to investigate the oil extraction condition of *Jatropha* kernel. The study was divided into 3 parts. The first part studied the best size of the kernel for extraction using hexane AR grade. The result showed that the best size was between 40 and 60 mesh giving the highest extraction of 88.21%. The second part, Box-Behnken design was applied to find the best condition of *Jatropha* oil extraction. There were 3 parameters including extraction time (30 – 150 minutes), ratio of hexane to *Jatropha* kernel (10:1 – 60:1) and agitation rate (100 – 300 rpm). The kernel size was fixed between in the range of 40 and 60 mesh. The optimum condition was found at while 82 minutes, 27.17 ml/g and 325 rpm. Then the last part, the optimum condition obtained from previous part was used in Aspen plus to calculate mass balance of plants at the kernel feed rates of 10,000 30,000 and 50,000 kg/day (using commercial hexane at the ratio of 27.17 L/kg). After that, economy analysis was performed to calculate the net present value of each size of plant. Moreover, sensitivity analysis was studied with varying hexane cost, equipment cost, *Jatropha* kernel price and *Jatropha* oil price. The result shoed that pilot plant at the kernel feed rate of 50,000 kg/day gave the highest NPV value at 581,958,755.27 Baht, internal rate of return (IRR) 93.39% and 1.12 years (Payback period). At *Jatropha* oil price was 25.60 Baht/kg (20% price reduction), it also made NPV and IRR positive at 305,920,390.24 Baht and 57%.

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Thesis Advisor's signature