Analisis Tekno-Ekonomi Produksi Asam Lemak dari Black Soldier Fly Larvae (Hermetia illucens) = Techno-Economic Analysis of Fatty Acid Production from Black Soldier Fly Larvae (Hermetia illucens)

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Abstrak

Asam lemak merupakan salah satu produk yang cukup aplikatif di industri. Produk ini umum didapatkan dengan bahan baku minyak nabati. Metode produksi asam lemak tersebut melibatkan ekstraksi minyak dari BSFL (black soldier fly larvae), yang dapat dilakukan melalui berbagai metode, khususnya ekstraksi cair dengan pelarut organik dan ekstraksi mekanis menggunakan screw pressing. Proses simulasi ini menggunakan perangkat lunak SuperPro Designer v.13 dan AspenPlus v.12.1. BSFL yang telah dibudidayakan akan dijadikan sebagai umpan proses sebesar 10 ton/batch. Produksi asam lemak dan produk samping lainnya berupa produk padatan dan gliserin. Proses dimulai dengan pretreatment dan proses ekstraksi minyak, baik dengan pelarut cair atau screw press. Ekstrak berupa minyak BSFL kemudian akan di-splitting sehingga jumlah asam lemak bebasnya maksimal untuk difraksinasi dengan distilasi. Proses ini bernilai ekonomis dengan mempertimbangkan gate fee sebesar $57,6 USD/ton untuk pengolahan limbah oleh BSFL sebagai salah satu penghasilannya. Adapun dari proses dengan ekstraksi pelarut cair, didapatkan nilai NPV (net present value) sebesar $1.281.065 USD, IRR (internal rate of return) 11,4%, ROI (rate of investment) 5,4%, dan PBP (payback period) 7,5 tahun. Sedangkan untuk ekstraksi dengan screw press, NPV sebesar $3.584.990 USD, IRR 17,5%, ROI 10,7% dan PBP 5,5 tahun. Berdasarkan analisis sensitivitas, gate fee menjadi variabel yang relatif sensitif pada kedua jenis proses.
.....Fatty acids are one of the quite applicable products in the industry. This product is commonly obtained from vegetable oil raw materials. The production method of these fatty acids involves extracting oil from BSFL (black soldier fly larvae), which can be done through various methods, particularly liquid extraction with organic solvents and mechanical extraction using screw pressing. This simulation process uses SuperPro Designer v.13 and AspenPlus v.12.1 software. Cultivated BSFL will be used as the process feed at a rate of 10 tons/batch. The production includes fatty acids and other by-products such as solid products and glycerin. The process starts with pretreatment and oil extraction, either with liquid solvent or screw press. The extracted BSFL oil will then be split so that the amount of free fatty acids is maximized for fractionation by distillation. This process is economically valuable, considering the gate fee of $56,7 USD for waste processing by BSFL as one of its revenue sources. From the liquid solvent extraction process, a NPV (net present value) of $1.281.065 USD, IRR (internal rate of return) of 11,4%, ROI (rate of investment) of 5,4%, and PBP (payback period) of 7,5 years were obtained. Meanwhile, a NPV of screw press extraction is $3.584.990 USD, IRR of 17,5%, ROI of 10,7%, and PBP of 5,5 years were obtained. Based on sensitivity analysis, the gate fee is a relatively sensitive variable in both types of processes.