INTISARI

Pabrik n-butil asetat dirancang dengan kapasitas 70.000 ton/tahun dan beroperasi secara kontinyu selama 330 hari per tahun, berlokasi di Kota Bontang, Kalimantan Timur. Bahan baku utama dalam proses produksi adalah propilen dari PT Pertamina RU IV Cilacap dan gas sintesis dari PT Kaltim Methanol Industri, sedangkan bahan baku tambahan berupa asam asetat dari PT Indo Acidatama, asam sulfat dari PT Asahimas Chemical, dan gas hidrogen dari PT Pupuk Kalimantan Timur. Produk n-butil asetat diperoleh melalui tiga tahap proses utama, yaitu reaksi hidroformilasi untuk membentuk n-butiraldehid, dilanjutkan dengan reaksi hidrogenasi menjadi n-butanol, dan diakhiri dengan reaksi esterifikasi antara n-butanol dan asam asetat untuk menghasilkan n-butil asetat. Selanjutnya, produk diproses melalui tahap netralisasi menggunakan larutan natrium hidroksida untuk menetralkan sisa katalis asam sulfat, serta dimurnikan dengan distilasi hingga diperoleh produk akhir n-butil asetat dengan kemurnian 99,80%. Reaksi hidroformilasi dijalankan pada suhu 120°C dan tekanan 49,3 atm, reaksi hidrogenasi pada suhu 210°C dan tekanan 5,72 atm, reaksi esterifikasi pada suhu 70°C dan tekanan 1 atm, serta proses netralisasi pada suhu 50°C dan tekanan 1 atm. Reaktor hidroformilasi, reaktor esterifikasi, dan *neutralizer* dijalankan secara isotermal, sedangkan reaktor hidrogenasi bersifat non-isotermal. Produk samping yang dihasilkan berupa n-butiraldehid dan n-butil asetat *low grade*, yang juga dapat dijual. Pabrik ini direncanakan mempekerjakan karyawan sebanyak 211 orang. Kebutuhan utilitas pabrik mencakup *make-up water* sebesar 742,93 m^3/jam, udara kering sebesar 766,7467 m^3/jam, dan daya listrik sebesar 1,2 MW. Pendirian pabrik n-butil asetat ini membutuhkan modal tetap (*fixed capital investment*) sebesar $132.700.453,02 dan modal kerja (*working capital*) sebesar $37.030.649,96. Secara ekonomi, pabrik ini termasuk kategori *low risk* karena proses produksi telah banyak diaplikasikan secara komersial. Analisis kelayakan menunjukkan nilai *Return on Investment* (ROI) sebelum pajak sebesar 18,45%, *Pay Out Time* (POT) sebelum pajak sebesar 3,32 tahun, *Discounted Cash Flow Rate of Return* (DCFRR) sebesar 14,35%, *Break Even Point* (BEP) sebesar 45,67%, dan *Shutdown Point* (SDP) sebesar 13,39%. Hasil analisis tersebut menunjukkan bahwa pendirian pabrik n-butil asetat dengan kapasitas 70.000 ton/tahun layak untuk dikaji lebih lanjut.

Kata kunci: n-Butil asetat, Hidroformilasi, Hidrogenasi, Esterifikasi, Netralisasi, Propilen

ABSTRACT

The n-butyl acetate plant is designed with a capacity of 70,000 tons/year and operates continuously for 330 days per year, located in Bontang City, East Kalimantan. The main raw materials used in the production process are propylene from PT Pertamina RU IV Cilacap and synthesis gas from PT Kaltim Methanol Industri, while additional materials include acetic acid from PT Indo Acidatama, sulfuric acid from PT Asahimas Chemical, and hydrogen gas from PT Pupuk Kalimantan Timur. N-butyl acetate is produced through three main stages: hydroformylation to form n-butyraldehyde, followed by hydrogenation to produce n-butanol, and concluded with esterification between n-butanol and acetic acid to produce n-butyl acetate. The product is then processed through neutralization using sodium hydroxide solution to remove residual sulfuric acid catalyst, and further purified with distillation to obtain n-butyl acetate with 99.80% purity. The hydroformylation reaction is carried out at 120°C and 49.3 atm, hydrogenation at 210°C and 5.72 atm, the esterification reaction at 70°C and 1 atm, and neutralization at 50°C and 1 atm. The hydroformylation, esterification, and neutralizer reactors operate isothermally, while the hydrogenation reactor is non-isothermal. All reactors are equipped with cooling systems to maintain stable temperatures. Besides the main product, this plant also produces side products such as n-butyraldehyde and low-grade n-butyl acetate. This plant is planned to employ 211 employees. To supply the utility purpose, the make-up water needed is 742,93 m^3/h, dry air needed is 766.7467 m^3/h, and electricity power needed is 1.2 MW. The n-butyl acetate plant is established using fixed capital invesment with an amount of $132,700,453.02 and working capital of $37,030,649.96. Economically, the plant is categorized as a low-risk plant because the production process is already established and commercially used. According to economic analysis, the factory design has a Return on Investment (ROI) before tax of 18.45%, Pay Out Time (POT) before tax of 3.32 years, Discounted Cash Flow Rate of Return (DCFRR) of 14.35%, Break Even Point (BEP) of 45.67%, and Shutdown Point (SDP) of 13.39%. These results indicate that the construction of an n-butyl acetate plant with a capacity of 70,000 tons/year is feasible for further study.

Keywords: *n-Butyl acetate, Hydroformylation, Hydrogenation, Esterification, Neutralization, Propylene*