Prarancangan Pabrik 1,1,1-Trikloroetana dari Vinil Klorida secara Hidrokhlorinasi Kapasitas 50.000 Ton/Tahun

INTISARI

Prarancangan pabrik 1,1,1-trikloroetana atau metil kloroform memiliki tujuan sebagai evaluasi kelayakan pendirian pabrik tersebut. Pabrik ini dirancang dengan kapasitas 50.000 ton/tahun yang beroperasi secara kontinu selama 330 hari/tahun dan 24 jam/hari. Produk metil kloroform dengan kemurnian 99,24% diproduksi menggunakan bahan baku HCl 33% sebanyak 67.350,65 ton/tahun, vinil klorida sebanyak 38.377,99 ton.tahun, dan klorin sebanyak 26.828,13 ton/tahun.

Metil kloroform diproduksi melalui hidroklorinasi vinil klorida dengan asam klorida di dalam reactor *fixed bed multitube catalytic* pada suhu 122^{o}C dan tekanan 3,5 atm dan klorinasi antara 1,1-dikloroetana dan klorin dalam *plug flow reactor* pada suhu 400^{o}C dan tekanan 3,5 atm. Produk yang diperoleh kemudian dimurnikan dalam menara distilasi dua tahap yang dilanjutkan penyesuaian kondisi produk. Pabrik direncanakan akan didirikan di Kawasan industri Cilegon, Banten dengan mempekerjakan 212 karyawan. Dalam proses produksi, pabrik membutuhkan energi listrik sebanyak 621,8466 kW, air bersih sebanyak 54750,9251 kg/jam, dan udara instrument tekanan 4 atm sebanyak 150 m^3/jam.

Pendirian pabrik ini membutuhkan modal tetap sejumlah $28.782.924,41 + Rp72.859.374.838,66 dan modal kerja sebesar $50,838,210.03+Rp93.853.553.457. Dalam pengoperasian pabrik, dibutuhkan *total manufacturing cost* sebesar $134,525,275.44 + Rp560.573.260.470 per tahun dan *general expense* sejumlah $27,661,029.27 + Rp16.671.292.829 per tahun. Akan diperoleh keuntungan sebelum pajak sebesar $16,149,288.39, sedangkan keuntungan setelah pajak (50%) adalah $8,074,644.20. Kemudian dilakukan evaluasi ekonomi, *Return on Investment before tax (ROIb)* sebesar 47,64%; *Payout Time before tax (POTb)* selama 1,73 tahun; B*reak-Even Point (BEP)* sebesar 46,72%; S*hut Down Point (SDP)* sebesar 32,18%; dan D*iscounted Cash Flow Rate of Return* (*DCFRR)* sebesar 21,35% per tahun. Berdasarkan hasil evaluasi ekonomi tersebut, pabrik ini dapat dikatakan menarik secara ekonomi dan layak untuk dikaji lebih lanjut.

Kata kunci: 1,1,1-trikloroetana, vinil klorida, asam klorida, klorin

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ABSTRACT

The preliminary design of a 1,1,1-trichloroethane or methyl chloroform plant has the objective to evaluate the feasibility of this plant. The plant is designed with a capacity of 50,000 tons/year which operates continuously for 330 days/year and 24 hours a day. Methyl chloroform products with a purity of 99.24% were produced using HCl 33% of 67,350.65 tons/year, vinyl chloride 38,377.99 tons/year, and chlorine of 26.828.13 tons/year.

Methyl chloroform is produced through hydrochlorination of vinyl chloride with hydrochloric acid which is conducted in a fixed bed multitube catalytic reactor at 122^{o}C and a pressure of 3.5 atm and chlorination between 1,1-dichloroethane and chlorine which is conducted a plug flow reactor at 400^{o}C and pressure of 3.5 atm. The product is then purified in a two-stage distillation tower followed by adjustment of the product conditions. The plant is planned to be set up in the Cilegon, Banten by employing 212 workers. In the production process, the plant requires 621,8466 kW of electricity, 54750,9251 kg/hour of clean water, and 150 m3 / hour of 4 atm air pressure instruments.

This plant requires $28,782,924.41 + Rp72,859,374,838.66 of fixed capital and $50,838,210,03 + Rp93,853,553,457 as working capital. Then for the operation of the plant, requires a manufacturing cost of $134,525,275.44 + Rp560,573,260,470 per year and general expenses of $27,661,029.27 + Rp16,671,292,829 per year. Profit before tax was $ 16,149,288.39, while profit after tax (50%) was $ 8,074,644.20. This plant is considered as hig risk chemical plant with Return on Investment before tax (ROIb) is 47.64%; Payment period before tax (POTb) of 1.73 years; Break-Even Point (BEP) at 46.72%; Shut Down Point (SDP) at 32.18%; and Discounted Cash Flow Rate of Return (DCFRR) of 21.35%. Based on the results of economic evaluation, this crop can be said to be economically attractive and worthy of further study.

Keywords: 1,1,1-trichloroethane, vinyl chloride, hydrochloric acid, chlorine