

ABSTRACT

Expanded Polystyrene Plant with Suspension Polymerization production capacity of 60,000 tonnes/year is planned to be built in Manufacture Area of Cilegon, Banten with 5,2 Ha and employ over 224 people.

This plant will operate 330 days/year. The main components needed are 50.575,55 tonnes/year of styrene monomer, 380 tonnes/year of polyvinyl alcohol, 2.511,93 tonnes/year of pentane, and 250 tonnes/year of benzoyl peroxide. Based on operating condition applied, the selection of main components and kind of products being produced, this plant can be categorized as low-risk operation.

The process of expanded polystyrene production consists of two main steps, the polymerization of styrene monomer become polystyrene and impregnation of polystyrene use pentane become expanded polystyrene. Polymerization of styrene monomer takes place in a stirred tank reactor with batch process at constant temperature 90 °C and pressure 1 atm. Impregnation of polystyrene is carried out in a batch reactor at temperature 90 °C and pressure 7 atm.

The required utilities are process water 63.476,35 tonnes/year, cooling water 109.599,10 tonnes/year, steam 3185,03 tonnes/year, fuel oil 18.272,61, electricity 0,57 MW, and 792.000 m³/year of instrument air.

Fixed capital needed is \$ 11,116,635.28 + Rp 150.848.806.052,38 and working capital of \$ 24.893.060,68 + Rp 5.068.461.085,50. Profit before tax is Rp 57.187.216.884,50 and profit after tax is Rp Rp 39.297.568.398,46. Based on economic analysis, the Return On Investment before tax is 12,34 % and Return On Investment after tax is 6,17 %. Pay Out Time before tax 2,72 year and Pay Out Time after tax 4,28 yea . Break Even Point is 54,34 %, Shut Down Point is 36,70% and Discounted Cash Flow Rate Of Return is 21,11 %. Therefore, further research on Expanded Polystyrene Plant from with production capacity of 60.000 tonnes/year should be carried out.

Keywords : expanded polystyrene, styrene monomer, polystyrene

INTISARI

Pabrik *Expanded Polystyrene* dengan Polimerisasi Suspensi kapasitas 60.000 ton/tahun ini direncanakan didirikan di Kawasan Industri Cilegon, Banten dengan luas tanah 5,2 Ha dan memperkerjakan 224 orang karyawan. Pabrik ini akan beroperasi selama 330 hari/tahun. Bahan baku yang diperlukan berupa *styrene monomer* sebanyak 50.575,55 ton/tahun, *polyvinyl alcohol* sebanyak 380 ton/tahun, *pentane* sebanyak 2.511,93 ton/tahun dan *benzoyl peroxide* sebanyak 250 ton/tahun. Berdasarkan kondisi operasi yang dijalankan, pemilihan bahan baku yang digunakan, dan jenis produk yang dihasilkan, maka pabrik ini tergolong pabrik beresiko rendah.

Proses pembuatan *expanded polystyrene* terdiri atas dua proses utama, yaitu proses polimerisasi *styrene monomer* menjadi *polystyrene* dan impregnasi *polystyrene* menjadi *expanded polystyrene* menggunakan *pentane*. Proses polimerisasi *styrene monomer* terjadi di dalam reaktor berpengaduk dengan proses *batch* yang bekerja pada suhu 90 oC dan tekanan 1 atm, sedangkan proses impregnasi *polystyrene* menggunakan *pentane* terjadi di dalam reaktor *batch* yang bekerja pada suhu 90 oC dan tekanan 7 atm.

Kebutuhan utilitas meliputi air proses sebanyak 63.476,35 ton/tahun, air pendingin sebanyak 109.599,10 ton/tahun, *steam* sebanyak 3185,03 ton/tahun, bahan bakar minyak *fuel oil* sebanyak 18.272,61 ton/tahun, listrik sebanyak 0,57 MW, dan udara instrumentasi sebanyak 792.000 m³/tahun.

Modal tetap yang diperlukan sebesar \$ 11,116,635.28 + Rp 150.848.806.052,38 dan modal kerja sebesar \$ 24.893.060,68 + Rp 5.068.461.085,50. Laba sebelum pajak Rp 57.187.216.884,50 dan laba sesudah pajak Rp Rp 39.297.568.398,46. Dari analisa ekonomi diperoleh *Return on Investment* sebelum pajak 12,34 % dan sesudah pajak 6,17 %. *Pay Out Time* sebelum pajak 2,72 tahun dan sesudah pajak 4,28 tahun. *Break Even Point* 54,34 % , *Shut Down Point* 36,70 % dan *Discounted Cash Flow Rate Of Return* 21,11 %. Dengan demikian, pabrik *expanded polystyrene* dengan kapasitas 60.000 ton/tahun layak untuk dikaji lebih lanjut. Kata kunci : *expanded polystyrene*, *styrene monomer*, *polystyrene*