

INTISARI

Melamin formaldehid (MF) merupakan material *thermoset*, yaitu material yang tidak dapat balik lagi ke bentuk semula saat sudah terjadi pengerasan. MF banyak digunakan sebagai bahan perekat pada industri furniture dalam bentuk resin. Pasar resin MF dunia diperkirakan meningkat hingga 8% pada tahun 2030. Pabrik Resin MF direncanakan mencukupi kebutuhan dalam negeri dan meningkatkan ekspor dengan kapasitas total 40.000 ton/tahun. Kebutuhan bahan baku melamin sebanyak 23.665,27 ton/tahun, formaldehid 37% sebanyak 45.223,50 ton/tahun, dan NaOH 50% sebanyak 19,96 ton/tahun. Rencana Lokasi pendirian pabrik di Kota Cilegon karena terletak di Pulau Jawa yang merupakan pasar resin terbesar di Indonesia dan mudahnya akses ekspor-impor.

Proses produksi dilakukan dengan proses batch. Bahan baku direaksikan dalam reaktor batch. Setiap siklus produksi berlangsung selama satu jam dengan tekanan atmosfer, suhu operasi antara 45-55°C, dan pH sekitar 9,5-10,2. Hasil dari reaktor berupa *slurry* yang kemudian dipekatkan menggunakan evaporator untuk mengurangi kadar metanol dan air. *Slurry* tersebut kemudian diumpankan ke dalam *Spray dryer* untuk menghasilkan produk berbentuk serbuk dan mengurangi kadar *impurities* hingga mencapai kemurnian di atas 99%. Produk dari *Spray dryer* kemudian dikecilkan ukurannya menggunakan roller mill sehingga mencapai spesifikasi ukuran 100 mesh.

Dalam proses ini, dibutuhkan air sebanyak 120.635,24 ton/tahun yang diambil dari laut Pantai Cilegon. Sedangkan kebutuhan udara untuk produksi sebanyak 114.200,83 kg/jam. Total kebutuhan listrik yang dibutuhkan adalah 0,103 MWatt, yang diperoleh dari PLN dengan generator disel sebagai sumber cadangan listrik.

Total investasi modal sebesar US\$58.431.935,29 dan Rp738.644.745.643,42 dengan *fixed capital* sebesar US\$41.771.156,95 dan Rp712.181.839.401,54 dan *working capital* sebesar US\$16.660.778,34 dan Rp26.462.906.241,88. *Manufacturing cost* sebesar US\$36.727.351,09 dan Rp143.159.984.587,19 dan *general expense* sebesar US\$13.388.031,76 dan Rp112.336.854.198,42 sehingga total biaya produksi sebesar US\$50.115.382,84 dan Rp255.496.838.786,61. Produk dijual seharga US\$2.160,00/ton. Total penjualan produk sebesar US\$86.400.000,00/tahun. Keuntungan sebelum pajak US\$18.907.246,10/tahun dan keuntungan setelah pajak sebesar US\$9.453.623,05/tahun. Pabrik Resin MF termasuk pabrik beresiko rendah. Analisis kelayakan ekonomi memperoleh faktor lang sebesar 5,20. Nilai *rate of return* (ROI) sebelum pajak 20,80%, lebih tinggi dari batasan sebesar 11%. Nilai *payout time* (POT) selama 3,25 tahun memenuhi batasan selama 5 tahun. Nilai titik impas (BEP) pada 51,33%, berada dalam rentang 40% - 60% serta *shutdown point* (SDP) pada 20,98%. Nilai *discounted cash flow rate of return* (DCFRR) sebesar 21,11%, dan sudah melebihi 1,5 kali suku bunga investasi bank, yaitu 13,8%. Dengan demikian, Pabrik Resin Melamin Formaldehid dapat dikatakan menarik secara ekonomi dan layak untuk dikaji lebih lanjut.

Kata Kunci : Resin Melamin Formaldehid, Melamin, Formaldehid

ABSTRACT

Melamine formaldehyde is a thermoset material, which is a material that can't return to its original shape after hardening has occurred. Melamine formaldehyde is widely used as an adhesive in the furniture industry. Melamine formaldehyde resin market is expected to increase by 8% by 2030 worldwide. Melamine Formaldehyde Resin Factory is planned to meet domestic needs and increase exports with a total capacity of 40,000 tons/year. The raw material requirement for melamine is 23,665.27 tons/year, 37% formaldehyde is 45,223.50 tons/year, and 50% NaOH is 19.96 tons/year. The factory location will be located in Cilegon City because it is located on the island of Java, which is the largest resin market in Indonesia and easy export-import access.

Production process is run through a batch process. Raw materials are reacted in a batch reactor, a stirred tank reactor. Time for one batch cycle is one hour at atmospheric pressure, temperature is maintained around 45-55°C, and pH is around 9.5 – 10.2. Reactor's product was then concentrated using an evaporator to reduce concentration of methanol and water in the slurry. Slurry product then feed to spray dryer. Spray dryers are used to obtain powder products while reducing concentration of product impurities so that products with a purity above 99%. Spray dryer's products need to be reduced in size using a roller mill in order to obtain a product size specification of 100 mesh.

Process water is needed at 120,635.24 tons/year. Raw material for water treatment is taken from Cilegon sea which is processed through a reverse osmosis process and a one's through cooling water system. Air requirement for production process is 904.471 tons/year. Total electricity requirement is 0.103 MWatt which is obtained from PLN with a diesel generator as a backup electricity supplier.

Total capital investment of US\$58.431.935,29 and Rp738.644.745.643,42 with fixed capital of US\$41.771.156,95 and Rp712.181.839.401,54 and working capital of US\$16.660.778,34 and Rp26.462.906.241,88. Manufacturing cost of US\$36.727.351,09 and Rp143.159.984.587,19 and general expense of US\$13.388.031,76 and Rp112.336.854.198,42. Product sells for US\$2,160.00/ton. Total product sales is US\$86,400,000.00/year. Profit before tax was US\$18.907.246,10/year and profit after tax was US\$9.453.623,05/year. Melamine Formaldehyde Resin Factory is a low risk factory. Economic feasibility analysis obtained a lang factor of 5.20. Rate of return (ROI) before tax is 20,80% higher than limit of 11%. Payout time (POT) value of 3,25 year complies with 5 year limit. Break even point (BEP) at 51,33% is within the limits, between 40% to 60%, and shutdown point (SDP) at 20,98%. Value of the discounted cash flow rate of return (DCFRR) of 21.11% is higher than 1.5 times bank's investment interest rate, which is 13.80%. Thus, Melamine Formaldehyde Resin Factory can be said to be economically attractive and worth of further study.

Keywords: Melamine Formaldehyde Resin, Melamine, Formaldehyde