Prarancangan Pabrik Disianobutena dari Dikhlorobutena dan Natrium Sianida dengan Kapasitas 72000 ton/tahun

Nama : Dewa Bagus Erwin Maksmartha Putra (11/312733/TK/37615)

Arief Kukuh Raharjo (11/314306/TK/38061)

Dosen Pembimbing : Ir. Sutijan, M.T, P.hD

Jurusan Teknik Kimia, Fakultas Teknik, Universitas Gadjah Mada

INTISARI

Disianobutena, dengan rumus molekul $C_6H_6N_2$ biasanya digunakan sebagai bahan intermediate pada pembuatan polimer nylon 6,6. Nylon 6,6 merupakan serat sintetis yang paling banyak digunakan dalam industri tekstil selain serat poliester.

Pabrik ini direncanakan beroperasi selama 330 hari/tahun dengan kapasitas produksi disianobutena 72.000 ton/tahun. Bahan baku pabrik ini adalah diklorobutena dan natrium sianida dengan bahan pembantu larutan $NaCU(CN)_2$ sebagai katalisator. Reaksi dijalankan di dalam reaktor alir tangki berpengaduk yang dilengkapi koil pendingin. Reaksi pada suhu 80 °C, isothermal, dan tekanan 4,4 atm. Panas yang timbul dari reaksi diambil oleh air pendingin yang dialirkan di dalam koil. Konversi akhir diklorobutena di dalam reaktor mencapai 90%. Untuk membuat disianobutena (99,8%) sebanyak 100.000 ton/tahun, dibutuhkan dikholobutena sebanyak 17.878,13 kg/jam, natrium sianida sebanyak 41.107,53 kg/jam, H2SO4 sebanyak 608,10 kg/jam, NaOH sebanyak 1.215,20 kg/jam, dan H2 sebanyak 95,53 kg/jam.

Pabrik direncanakan berdiri di Cilacap, Jawa Tengah dekat dengan pelabuhan. Luas tanah yang diperlukan 100.000 m2. Pabrik beroperasi secara kontinyu selama 24 jam/hari selama 330 hari/tahun dengan tenaga kerja sebanyak 122 orang. Modal tetap yang diperlukan Rp. 201.645.030.649,46 + 53.463.717,03 $ dengan 1 $ sebesar Rp. 9.595,00. Modal kerja yang diperlukan Rp. 1.224.261.853.437,29 per tahun. Keuntungan sebelum pajak Rp. 232.809.144.469,32 per tahun dan keuntungan setelah dipotong pajak Rp. 116.404.572.234,66 per tahun, Pay Out Time (POT) sebelum pajak 2,27 tahun, Pay Out Time (POT) setelah pajak 3,07 tahun, Break Even Point (BEP) sebesar 52,43%, Shut Down Point (SDP) sebesar 33,60%. Maka dari beberapa analisa di atas, dari segi ekonomi pabrik ini cukup menarik dan layak untuk dipertimbangkan.

ABSTRACT

Disianobutena, with molecular formula C6H6N2, usually used as an intermediate material in the manufacture of nylon 6,6 polymer. Nylon 6.6 is a synthetic fiber that is most widely used in the textile industry besides polyester fiber.

The factory is planned to operate for 330 days / year with disianobutena production capacity of 72,000 tons / year. The raw material of this plant is diklorobutena and sodium cyanide with adjuvant solution Nacu(CN)2 as a catalyst. The reaction is run in a stirred tank reactor equipped flow cooling coil. Reaction at 80 ° C, isothermal, and the pressure of 4.4 atm. The heat resulting from the reaction taken by cooling water that flowed in the coil. Diklorobutena final conversion in the reactor reached 90%. To make disianobutena (99.8%) as much as 72,000 tons / year, as many as needed dikholobutena 12159.04 kg / h, sodium cyanide as much as 54544.55 kg / h, Nacu (CN) 2 as much as 1549.27 kg / hr, and hydrogen cyanide as much as 6600 kg / h. Needs include water utilities as much as 660 773 kg / h, residual fuel oil number 6 (diesel oil for the industry) as much as 55 liters / hour and 770.55 kVA of electrical power.

The factory is planned to stand in Cilacap, Central Java, close to the consideration of transportation of raw materials and products are also close to the river as a water source for the utility unit. Required land area of 40000 m2. Labor needs as much as 216 people. Capital still needed Rp. 103,603,412,373.58 + $ 53,818,379.32 to $ 1 Rp. 13000.00. The necessary working capital of Rp. 379,084,167,334.12 + $ 5,999,005.94 per year. Profit before tax of Rp. 324,311,311,555.67 per year and profit after tax of Rp. 162,155,655,777.84 per year, Pay Out Time (POT) before taxes of 1.68 years, Pay Out Time (POT) after tax of 2.68 years, Break Even Point (BEP) of 33.86%, Shut Down Point (SDP) amounted to 18.38%. Then from some of the above analysis, the economic terms of the factory is quite interesting and worth studying further.