

INTISARI

Asam adipat merupakan senyawa organik berbentuk kristalin putih yang banyak digunakan pada industri tekstil, terutama sebagai prekursor sintesis poliamida Nylon 6,6. Kebutuhan asam adipat sendiri mengalami peningkatan tiap tahunnya. Melihat tingginya konsumsi asam adipat di Indonesia dan pasar global, maka dirancang pabrik asam adipat dari sikloheksana dan asam nitrat dengan kapasitas 20.000 ton/tahun. Pabrik didirikan pada 2024 di kawasan industri Cilegon, Jawa Barat dengan luas area pabrik sebesar 107,4404 ha.

Pabrik asam adipat ini terdiri atas dua unit sintesis dan satu unit pengeringan dan penyimpanan produk. Unit sintesis pertama merupakan unit yang menyintesis sikloheksanol dan sikloheksanon dari sikloheksana dan udara dengan metode *high peroxide process*. Reaktor yang digunakan pada unit sintesis pertama berupa 1 *Bubble* CSTR dengan jaket pendingin dan 2 CSTR seri. Rangkaian alat pemurnian pada unit sintesis 1 berupa dekanter dan menara ddistilasi. Pada unit sintesis 2, larutan sikloheksanol dan sikloheksanon hasil produksi unit sintesis 1 dioksidasi dengan asam nitrat untuk membentuk asam adipat. Asam adipat cair kemudian dipekatkan dengan evaporator dan dikristalkan dengan kristaliser. Asam adipat yang telah dikristalkan kemudian dipisahkan dari mother liquornya menggunakan centrifuge. Hasil padatan asam adipat dikeringkan dengan rotary dryer di unit pengeringan kemudian disimpan di gudang penyimpanan.

Kebutuhan air utilitas pabrik asam adipat sebanyak 81,01 m³/jam yang disuplai dari Sungai Cidanau. Kebutuhan listrik pabrik asam adipat sebesar 1125,9937 kW disuplai dari PLTGU Cilegon.

Pabrik asam adipat ini telah mengikuti standard process safety management dan environmental management system berdasarkan ISO 14001. Selain itu, telah dilakukan identifikasi hazard terhadap bahan, proses, alat, serta tata letak pabrik. Dengan demikian, safety health and environment pada pabrik asam adipat dapat berjalan dengan baik dan sesuai standard.

Fixed capital untuk pabrik asam adipat ini sebesar \$317.570.377,89 dengan biaya *manufacturing cost* sebesar \$113.760.917,63. Sedangkan *working capital* untuk pabrik asam adipat ini sebesar \$12.844.614,73 dan *general expense* sebesar \$34.043.414,57. Berdasarkan analisis ekonomi didapatkan ROI, POT, dan faktor Lang pabrik asam adipat berturut-turut sebesar 20,28%, 3,42 tahun, dan 38,8453. DCFRR pabrik asam adipat sebesar 21,79%. Nilai BEP dan SDP pabrik asam adipat berturut-turut sebesar 47,09% dan 15,78%. Berdasarkan hasil analisis tersebut, disimpulkan bahwa pabrik asam adipat dari sikloheksana dan asam nitrat dengan kapasitas 20.000 ton/tahun ini menarik secara ekonomi.

ABSTRACT

Adipic acid is an organic crystalline compound in the form of white which is widely used in the textile industry, especially as a precursor for the synthesis of polyamide Nylon 6.6. The need for adipic acid itself increases. Seeing the increase in consumption of adipic acid in Indonesia and the global market, it was designed adipic acid from cyclohexane and nitric acid with a capacity of 20,000 tons / year. The factory is projected to be built in 2024 in the Cilegon industrial area, West Java, with a factory area of 107,4404 ha.

This adipic acid plant consists of two synthesis units and one product consolidation and storage unit. The first synthesis unit is a unit that synthesizes cyclohexanol and cyclohexanone from cyclohexane and air by a high peroxide process method. The reactor used in the first synthesis unit consisted of 1 Bubble CSTR with a cooling jacket and 2 CSTR series. The purification device in synthesis unit 1 consists of decanters and distillation towers. In synthesis unit 2, the solution of cyclohexanol and cyclohexanone produced by synthesis unit 1 is oxidized with nitric acid to form adipic acid. Liquid adipic acid is then concentrated with an evaporator and crystallized with a crystalliser. Adipic acid which has been crystallized and then separated from the mother liquor using a centrifuge. The product of adipic acid solids is dried with a rotary dryer in the unit then stored in a storage warehouse.

Adipic acid plant water needs as much as 81.01 m³ / hour which is supplied from the Cidanau River. The electricity needs of the adipic acid factory of 1125,999 kW are supplied from the Cilegon power plant.

This adipic acid plant has followed safety management process standards and an environmental management system based on ISO 14001. In addition, it has also been carried out related to hazards to materials, processes, tools, and plant layout. Thus, the safety and environmental health of the adipic acid plant can run well and according to standards.

The fixed capital for the adipic acid plant was \$ 317,570,377.89 with a production cost of \$ 113,760,917.63. While the working capital for this adipic acid plant is \$ 12,844,614.73 and the general cost is \$ 34,043,414.57. Based on economic analysis obtained by ROI, POT, and Lang factor of adipic acid factories were 20.28%, 3.42 years, and 38.8453, respectively. DCFRR of adipic acid factories was 21.79%. The combined BEP and SDP value of the adipic acid plant were 47.09% and 15.78%, respectively. Based on the results of the analysis, it was concluded that the adipic acid plant of cyclohexane and nitric acid with a capacity of 20,000 tons / year attracts the economy.