TUGAS AKHIR

PRARANCANGAN PABRIK ETANOL AMIN

DARI ETILEN OXIDA DAN AMONIA

KAPASITAS 50.000 TON/TAHUN

Oleh:

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KATA PENGANTAR

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Penulis
ABSTRACT

Patriawan Rendra Graha, Oky Ruslan Wijaya, 2015, Preliminary Plant Design of Ethanol Amine from Ethylene Oxide and Ammonia Capacity 50,000 Tons/Year, Department of Chemical Engineering, Faculty of Engineering, Universitas Sebelas Maret, Surakarta.

Reaction between ethylene oxide and ammonia form compound named ethanol amines which are consist of monoethanol amine, diethanol amine and triethanol amine. Ethanol amines are an important agent in the formulation of various products such as cosmetics, detergents, and agricultural products. Ethanol amines are also required in the oil and gas industry. To meet domestic needs and contribute to the fulfillment of world ethanol amine consumption, ethanol amine plant with capacity 50,000 tons/year is to be designed using raw materials ethylene oxide 10,885 tons/year and ammonia 39,115 tons/year. The plant uses the aqueous solution so the resulting product distribution are: 52.6% monoethanol amine (main products), 33.9% diethanol amine, and 13.5% triethanol amine. By paying attention to various aspects such as the provision of raw materials, transportation, labor, and utilities, then the chosen location of the factory will be in Palembang, South Sumatra.

Ethanol amines are produced from seri-parallel reaction between ethylene oxide and ammonia in a multitube plug flow reactor at a temperature of 120 °C - 160 °C with a pressure of 68 atm. Ethanol amines product out from the reactor and passed to a separator, a stripper tower, and 1st distillation tower to purify it from the content of ammonia and water. Ammonia and water then be recycled back to the reactor, while the bottom product of the 1st distillation tower is passed to 2nd distillation tower to separate the main products (monoethanol amine) from byproducts. The top product of 2nd distillation tower (monoethanol amine) is then pumped to a storage tank, while the bottom product of the tower pumped into 3rd distillation tower for further separation. In the 3rd distillation tower, separated byproducts diethanol amine out at the top of the tower and triethanol amine out at the bottom of the tower. Both are then pumped to a storage tank for each product.

Production of one kilogram monoethanol amine requires 34.26 kg of cooling water; 17.13 kg of steam; 1.56 kg of fuel gas; and 0.437 kWh of electricity. Together with one kilogram of main product monoethanol amine, produced also 0.64 kg of diethanol amine and 0.26 kg of triethanol amine. Utility units are set up to support the production process. It consists of water supply unit, electricity supply unit, fuel provision unit, and waste treatment unit. Shape of the companies is Limited Liability Company (PT) with line and staff organization structure. Employees amounted to 152 persons are working based on the division of labor hours that consists of shift and non-shift employees.

From economic analysis obtained Rate of Return (ROI) before tax 57.48% and after tax 40.24%. Meanwhile Pay Out Time (POT) before tax 1.48 years and after tax 1.99 years, Break Even Point (BEP) 50.35%, Shut Down Point (SDP) 39.12% and Discounted Cash Flow (DCF) 14.99%. From the economic analysis, it can be concluded that ethanol amine plant with a capacity of 50,000 tons/year is feasible to set up.