

INTISARI

Khloroform merupakan salah satu bahan yang berfungsi sebagai pelarut untuk zat-zat non-polar atau zat yang tidak larut dalam air. Kebutuhan terhadap khloroform di Indonesia pada tahun 2013 mencapai 42.909 kg/tahun dan diperkirakan akan terus meningkat melihat pemanfaatan minyak atsiri untuk keperluan medis dan kosmetik yang berbasis herbal terus meningkat.

Pembuatan khloroform dari natrium hidroksida, khlorin dan aseton berlangsung dalam beberapa tahapan proses. Mula-mula larutan natrium hidroksida dengan konsentrasi rendah di reaksikan dengan gas khlorin di menara absorber menjadi natrium hipoklorit pada suhu 28 °C dan tekanan 5 atm. Selanjutnya natrium hipoklorit di reaksikan dengan aseton di reaktor alir tangki berpengaduk, reaksi ini berlangsung pada suhu 70 °C dan tekanan 2 atm. Produk dari reaktor yang berupa khloroform selanjutnya di pisahkan dari garam-garam hasil samping reaksi dengan menggunakan evaporator, lalu di embunkan kandungan airnya dengan kondenser parsial, serta di pisahkan dari pengotor-pengotor zat organik dengan dekanter.

Pabrik ini dirancang dengan kapasitas 50.000 ton/tahun. Produk khloroform dengan kemurnian 99% di produksi dari bahan baku berupa larutan natrium hidroksida 48% sebanyak 213656,6 ton/tahun; gas klorin 90902,76 ton/tahun; dan aseton sebanyak 24572,01 ton/tahun. Kebutuhan utilitas meliputi air sebanyak 1455829,987 ton/tahun, *steam* sebanyak 171203,7571 ton/tahun, *fuel oil* sebanyak 16071 ton/tahun dan listrik dengan daya 395,9359 kW. Pabrik ini direncanakan untuk didirikan di kota Cilegon, provinsi Banten dengan luas tanah 5 Ha. Total karyawan yang dibutuhkan ialah sebanyak 160 orang.

Dari perhitungan hasil evaluasi ekonomi diperoleh parameter sebagai berikut: *Fixed Capital Investment* (FCI) sebesar Rp. 60.925.159.655,20 dan \$ 10.843.430,55; *Working Capital* (WC) sebesar Rp. 66.070.027.228,84 dan \$ 32.186.472,75; keuntungan sebelum pajak sebesar Rp. 105.728.953.954,28; keuntungan setelah pajak sebesar Rp. 52.864.476.977,14; *Percent Return Of Invesment Before Taxes* = 47,29 %; *Percent Return Of Invesment After Taxes* = 23,64 %; *Pay Out Time Before Taxes* = 1,81 tahun; *Pay Out Time After Taxes* = 3,15 tahun; *Brake Event Point* (BEP) = 38,75%; dan *Discounted Cash Flow Rate of Return* (DCFRR) = 32,68 % .

Berdasarkan data-data di atas, Pabrik khloroform dari sodium hidrokside, khlor, dan aseton dengan kapasitas 50.000 ton/tahun menarik untuk dikaji lebih lanjut.

Kata Kunci : khloroform, proses, evaluasi ekonomi

ABSTRACT

Chloroform is one of substances that is used as solvent for non-polar substances or insoluble substances. In 2013, the need of Chloroform in Indonesia reached 42.909 kg/year and was expected increasing because of the utilization of essential oils for medical and herbal-based cosmetics also increased.

Chloroform that made from sodium hydroxide, chlorine and acetone goes on in several stages of the process. Firstly, a low concentration of sodium hydroxide solution is reacted with chlorine gas in absorber tower. The reaction's result turned into sodium hypochlorite at a temperature of 28 °C and a pressure of 5 atm. Then, sodium hypochlorite is reacted with acetone in stirred tank flow reactor, which goes on at a temperature of 70 °C and a pressure of 2 atm. Chloroform which is product of the reactor separated from the salt reaction product by using an evaporator, and the water supply is condensed with partial condenser, then separated from the impurities of organic substances with a decanter.

This plant is designed with a capacity of 50,000 tons/year. The product of Chloroform which has 99% purity is made from raw materials of 213.656,6 tons/year of 48% sodium hydroxide solution; 90.902,76 tons/year of chlorine gas; and 24.572,01 tons/year of acetone. Utilities needs are consist of 1.455.829,987 tons/ year of water, 171.203,7571 tons/year of steam, 16.071 tons/year of fuel oil, and 395,9359 kW of electric power.

This plant is planned to be established in Cilegon City, Banten Province which has land area of 5 ha. Total employees that required is 160 people.

Based on the calculation of economic evaluation, some parameters are obtained such as: Rp 60.925.159.655,20 and \$ 10.843.430,55 of Fixed Capital Investment (FCI); Rp 66.070.027.228,84 and \$ 32.186.472,75 of Working Capital (WC); Rp 105.728.953.954,28 of profit before tax; Rp 52.864.476.977,14 of profit after tax; Percent Return Of Investment Before Taxes = 47,29%; Percent Return Of Investment After Taxes = 23,64%; Pay Out Time Before Taxes = 1,81 years; Pay Out Time After Taxes = 3,15 years; Brake Event Point (BEP) = 38,75%; and Discounted Cash Flow Rate of Return (DCFRR) = 32,68%.

Based on the data, the Chloroform plant from sodium hydroxide, chlorine, and acetone with a capacity of 50.000 ton/year is interesting to be studied further.

Keywords: chloroform, process, economic evaluation