

## INTISARI

Amonia adalah senyawa kimia yang sangat penting dalam berbagai industri, termasuk pupuk, tekstil, farmasi, *refrigerany*, dan bahan peledak. Saat ini, amonia juga dianggap sebagai sumber energi ramah lingkungan karena tidak menghasilkan emisi karbon saat digunakan. Dengan target *net-zero* emisi karbon 2050, permintaan amonia diharapkan meningkat, mendorong peningkatan kapasitas produksi global.

Proses produksi amonia menggunakan proses Haber-Bosch dengan modifikasi teknologi KBR *Purifier*. Amonia akan dihasilkan dari mereaksi gas nitrogen dan hidrogen. Nitrogen akan diperoleh dari *supplier* sebanyak 275.012 ton per tahun dan hidrogen akan diperoleh dari pemrosesan *syngas* dari *biomass* sebanyak 922.028 ton per tahun. Pemilihan *syngas* dari *biomass* terkait dengan ketersediaan *biomass* sebagai energi alternatif murah dan melimpah.

Pabrik amonia ini akan didirikan di kecamatan Pusako, kabupaten Siak, provinsi Riau dengan luas 6,05 hektar dan jumlah karyawan 207 orang dengan 62 orang pekerja shift. kebutuhan air untuk keperluan umum sebanyak 4550 kg/jam, air *make up* untuk pembangkitan steam sebanyak 129.371,99 kg/jam, air *make up* untuk pendinginan proses sebanyak 300.875,60 kg/jam. Kebutuhan udara instrument 265,33 kg/jam, kebutuhan listrik yang dibutuhkan sebesar 31.264,97 kW

Pabrik ammonia direncanakan beroperasi pada tahun 2028. Modal tetap yang dibutuhkan adalah \$81.790.082 + Rp220.024.400.000. Modal kerja yang dibutuhkan sebesar \$94.905.767. Biaya produksi sebesar \$298.114.892 + Rp52.640.903.498, biaya umum sebesar \$110.069.581, harga jual produk \$1450/ton, Keuntungan sebelum kena pajak dan setelah kena pajak berturut – turut sebesar \$67.866.007 per tahun dan \$44.112.904 per tahun. Nilai faktor lang sebesar 5,08. *return of investment before tax* (ROI<sub>B</sub>) sebesar 77,70 % dan *return of investment after tax* (ROI<sub>A</sub>) sebesar 45,96 %. *Payback period before tax* (POT<sub>B</sub>) sebesar 1,2 tahun dan *payback period after tax* (POT<sub>A</sub>) sebesar 1,8 tahun. *Discounted cash flow rate of return* (DCFRR) sebesar 24,57%, *break even point* (BEP) sebesar 43,39% dan SDP sebesar 32,02%. Berdasarkan analisis *profitability* dapat disimpulkan pabrik layak didirikan dan dikaji lebih lanjut.

Kata Kunci: *Membrane separator, ammonia, biomass syngas*, Proses Haber-Bosch

## ABSTRACT

*Ammonia is a very important chemical compound in various industries, including fertilizers, textiles, pharmaceuticals, refrigerants, and explosives. Today, ammonia is also considered an environmentally-friendly energy source as it produces no carbon emissions when used. With the 2050 net-zero carbon emission target, demand for ammonia is expected to increase, driving an increase in global production capacity.*

*The ammonia production process utilizes the Haber-Bosch process with modified KBR Purifier technology. Ammonia will be produced by reacting nitrogen and hydrogen gas. Nitrogen will be obtained from suppliers as much as 275,012 tons per year and hydrogen will be obtained from processing syngas from biomass as much as 922,028 tons per year. The selection of syngas from biomass is related to the availability of biomass as a cheap and abundant alternative energy.*

*This ammonia plant will be established in Pusako sub-district, Siak district, Riau province with an area of 6.05 hectares and a total of 207 employees with 62 shift workers. water requirements for general purposes are 4550 kg/hour, make up water for steam generation is 129,371.99 kg/hour, make up water for process cooling is 300,875.60 kg/hour. Instrument air requirements of 265.33 kg / hour, the required electricity needs of 31,264.97 kW*

*The ammonia plant is planned to operate in 2028. The fixed capital required is \$81.790.082 + Rp220.024.400.000. Working capital required is \$94,905,767. Production cost is \$298.114.892 + Rp52.640.903.498, general cost is \$110,069,581, product selling price is \$1450/ton, profit before tax and after tax are \$67,866,007 per year and \$44,112,904 per year respectively. Lang factor value of 5.08. return of investment before tax (ROIB) of 77.70% and return of investment after tax (ROIA) of 45.96%. Payback period before tax (POTB) of 1.2 years and payback period after tax (POTA) of 1.8 years. Discounted cash flow rate of return (MARR) of 24.57%, break even point (BEP) of 43.39% and shutdown point (SDP) of 32.02%. Based on the profitability analysis, it can be concluded that the factory is feasible to establish and study further.*

*Keywords: Membrane separator, ammonia, biomass syngas, Haber-Bosch Process*