

INTISARI

Pabrik *Green Ammonia* direncanakan berdiri dengan kapasitas 20,000 ton /tahun dan beroperasi selama 330 hari per tahun. Bahan baku utama pabrik ini adalah H_2O dan N_2 . Produk berupa amonia diperoleh dengan cara mereaksikan N_2 dan H_2 yang diperoleh dari elektrolisis H_2O dengan teknologi Alkaline Water Electrolysis. Proses elektrolisis dijalankan pada suhu $90^\circ C$ dan tekanan 1 atm, sedangkan reaksi pembentukan amonia dijalankan pada suhu $450^\circ C$ dan tekanan 153 atm. Reaktor amonia menggunakan mekanisme pendinginan berupa *adiabatic quench cooling*. Produk keluaran reaktor amonia dipisahkan menggunakan *separator drum* untuk diambil produk amonia dengan kemurnian sebesar 99%. Pabrik *Green ammonia* direncanakan berdiri di atas tanah seluas 8.80 ha dengan luas bangunan sebesar 14.30 ha dengan jumlah karyawan sebanyak 317 orang. Pendirian pabrik *green ammonia* direncanakan berdiri Desa Cilegong, Kecamatan Jatiluhur, Kabupaten Purwakarta, Provinsi Jawa Barat. Dalam mendukung proses produksi diperlukan utilitas berupa *make up water* sebanyak $32.15 \text{ m}^3/\text{jam}$, udara kering sebanyak $672 \text{ m}^3/\text{jam}$, listrik sebesar 61,614 kW. Pendirian pabrik membutuhkan *fixed capital* sebesar \$20,888,497.71 atau sebesar Rp341,156,166,798.20 dan *working capital* sebesar \$5,883,619.64 atau sebesar Rp96,092,746,828.93. Berdasarkan analisis produk dan teknologi, pabrik ini termasuk dalam kategori *medium risk* karena merupakan produk baru pada pasar yang sudah ada. Berdasarkan analisis ekonomi pabrik ini memiliki nilai Faktor Lang sebesar 3.49, *return of investment* (ROI) sebelum pajak sebesar 6.96% dengan batas antara 16-24%, *payout time* (POT) sebelum pajak sebesar 6.27 tahun dengan batas antara 2-5 tahun, *discounted cash flow rate of return* (DCFRR) sebesar 10.35% dengan batas minimum 13.31%, nilai *breakeven point* (BEP) sebesar 73.23%, dan *shutdown point* (SDP) sebesar 30.81%. Berdasarkan hasil analisis tersebut dapat ditarik kesimpulan bahwa rancangan pendirian Pabrik *Green ammonia* dengan kapasitas 20,000 ton/tahun dianggap kurang menarik dan perlu pengkajian ulang.

Kata kunci: *green ammonia*, elektrolisis, *green hydrogen*, energi terbarukan

ABSTRACT

The *Green ammonia* Plant is designed to have a capacity of 20,000 tons per year and will operate for 330 days annually. The main raw materials for this plant are H_2O and N_2 . The product, ammonia, is obtained by reacting N_2 and H_2 , which are derived from the electrolysis of H_2O using Alkaline Water Electrolysis technology. The electrolysis process is conducted at a temperature of $90^{\circ}C$ and a pressure of 1 atm and the ammonia formation reaction is carried out at a temperature of $450^{\circ}C$ and a pressure of 153 atm. The ammonia reactor employs an adiabatic quench cooling mechanism. The *output* from the ammonia reactor is separated using a separator drum to obtain ammonia with a purity of 99%. The *Green ammonia* Plant is planned to be established on a land area of 8.80 hectares with a building area of 14.30 hectares with 317 employees. The plant will be located in Cilegong Village, Jatiluhur Subdistrict, Purwakarta Regency, West Java Province. To support the production process, utilities required include make-up water at $32.15 \text{ m}^3/\text{hour}$, dry air at $672 \text{ m}^3/\text{hour}$, and electricity at 61.614 kW. The plant is established using fixed capital with an amount of \$20888497 or Rp341,156,166,798.20 and working capital with an amount of \$5,883,619.64 or Rp96,092,746,828.93. Based on product and technology analysis, this plant is categorized as a medium-risk plant as it is a new product in an established market. The economic analysis of this plant shows a Lang Factor of 3.49, a pre-tax return on investment (ROI) of 6.96% with a threshold of 16-24%, a pre-tax payout time (POT) of 6.27 years with a threshold of 2-5 years, a discounted cash flow rate of return (DCFRR) of 10.35% with a minimum threshold of 13.31%, a breakeven point (BEP) of 73.23%, and a shutdown point (SDP) of 30.81%. Based on these analysis results, it can be concluded that the preliminary design of the *Green ammonia* Plant with a capacity of 20,000 tons per year is considered less attractive and review back about the process production.

Keyword: green ammonia, electrolysis, green hydrogen, renewable energy