

INTISARI

Pabrik Metanol dari *Syngas* ini dirancang dengan kapasitas 800.000 ton/tahun dan beroperasi secara kontinyu selama 330 hari/tahun dan 24 jam/hari. Untuk memperoleh produk metanol yang sesuai kapasitas, dibutuhkan gas CO sebanyak 1.319.970 ton/tahun dan gas H₂ sebanyak 899.959 ton/tahun. Bahan baku *syngas* dibeli dari PT. Bukit Asam. Proses yang digunakan pada pembuatan metanol adalah hidrogenasi CO₂ dengan bantuan katalis Cu/ZnO/Al₂O₃. Reaksi dijalankan dalam reaktor *fixed bed multitube* dengan suhu masuk gas sebesar 225°C dan tekanan 80,5 bar. Sebelum diumpankan ke reaktor, gas sintesis diatur rasio gas CO dan H₂ nya terlebih dahulu dalam reaktor *water gas shift*. Setelah itu *syngas* dimurnikan dari pengotor H₂S dan CO₂ di dalam absorber menggunakan solven MDEA dan DEPG sebelum diumpankan ke reaktor. Produk metanol yang dihasilkan dimurnikan secara bertingkat yaitu menggunakan separator drum tekanan tinggi, separator drum tekanan rendah dan menara distilasi. Hasil produk metanol mempunyai kemurnian 99,86% wt. disimpan dalam tangki metanol bersuhu 30°C dan tekanan atmosferis. Pabrik metanol ini direncanakan akan dibangun di Tanjung Enim, Lawang Kidul, Sumatera Selatan dengan memperkerjakan 319 orang karyawan. Untuk keperluan utilitas, diperlukan air sebanyak 2138 m³/jam yang disuplai dari sungai Lematang, *steam* sebanyak 1.043.192 kg/jam, udara instrumen sebanyak 150 m³/jam, dan energi sebanyak 3.122.426.692 kJ/jam. Sementara itu kebutuhan listrik total sebesar 95 MW/tahun yang dipenuhi oleh PLN. Dalam menjalankan produksi, pabrik metanol ini membutuhkan modal tetap sebesar \$ 295,389,571.42 + Rp 168.678.200.531,36 dan modal kerja sebesar \$ 88,067,201.48 + Rp 199.975.391.273,66. Pabrik metanol ini digolongkan pabrik yang *high risk* dikarenakan kesulitan *startup* pada bagian *heat integration*. Berdasarkan analisis kelayakan yang dilakukan, diperoleh nilai ROI_b 44,32%, POT_b 1,84 tahun, BEP 40,07%, SDP 23,93%, dan DCFRR 33,27%. Berdasarkan nilai-nilai tersebut, dapat disimpulkan bahwa pabrik ini menarik dan layak untuk didirikan.

Kata kunci: Hidrogenasi, metanol, Sumatera Selatan, *syngas*

ABSTRACT

Methanol from syngas plant is designed with a capacity of 800,000 tonnes/year and operated continuously for 330 days/year and 24 hours/day. To obtain a product according to the capacity, CO gas is needed as much as 1,319,970 tonnes/year and H₂ gas as much as 899,959 tonnes/year. Raw material purchased from PT. Bukit Asam. The process used in the manufacture of methanol is CO hydrogenation with the aid of a catalyst Cu/ZnO/Al₂O₃. The reaction is run in multitube fixed bed reactor with gas inlet temperature 225°C and a pressure 80.5 bar. Before being fed into the reactor, the ratio of CO and H₂ gas is set in water gas shift reactor. After that, the syngas is purified from impurities like H₂S and CO₂ in the absorber using the MDEA and DEPG solvent before being fed into the reactor. The product of methanol is purified using high-pressure separator drum, low pressure separator drum and distillation tower. Methanol product having a purity of 99.86% wt. stored in methanol tank which has temperature 30°C and atmospheric pressure. The methanol plant planned to be built in Tanjung Enim, Lawang Kidul, South Sumatra with 319 employees. For the purposes of utilities, water is needed as much as 2138 m³/h supplied from Lematang river, steam as much as 1.043.192 kg/jam, instrument air 150 m³/jam, and energy as much as 3.122.426.692 kJ/jam. Meanwhile, electricity is needed as much as 95 MW/year were fulfilled by PLN. To run the production, methanol plant requires a fixed capital of \$ 295,389,571.42 + Rp 168.678.200.531,36 and working capital of \$ 88,067,201.48 + Rp 199.975.391.273,66. Methanol plant classified as a high risk plant based on the advanced startup on heat integration. Based on the analysis of feasibility, methanol from syngas plant has ROI_b value of 44.32%, POT_b 1.84 year, BEP 40.07%, SDP 23.93%, and DCFRR 33.27%. Based on these values, it can be concluded that the plant is interesting and feasible to set up.

Keywords: Hydrogenation, methanol, South Sumatra, syngas