INTISARI

Pabrik formaldehid dari gas alam ini dirancang dengan kapasitas sebesar 50.000 ton/tahun dan beroperasi secara kontinyu selama 320 hari/tahun dan 24 jam/hari. Untuk memperoleh produk yang sesuai kapasitas, dibutuhkan 1858,91 kg/jam CH4, 8946,344 kg/jam H2O dan 7210 kg/jam udara. Pabrik formaldehid ini terdiri dari 2 proses, yaitu proses gas alam menjadi metanol dan proses metanol menjadi formaldehid. Pada proses pembuatan metanol, gas alam dan *steam* (air) direaksikan dalam *steam reformer* berbentuk *multitube fixed bed reactor* pada suhu 900^0C dan tekanan 20 atm dengan bantuan katalis Ni/Al_2O_3 membentuk *syngas*. *Syngas* kemudian didinginkan, dikompresi, dan direaksikan pada reaktor metanol berbentuk *fixed bed reactor* pada suhu 240^0C dan tekanan 80 atm dengan bantuan katalis Topsoe. Metanol yang terbentuk dipisahkan dari *non-condensable gas* menggunakan separator drum serta dimurnikan dengan menara distilasi sehingga diperoleh metanol kemurnian 99,73%. *Non-condensable gas* (sisa reaktan) kemudian dikompresi dan di*recycle* ke reaktor metanol. Metanol yang diperoleh selanjutnya dioksidasi menjadi formaldehid dengan mereaksikan uap metanol dan udara dalam reaktor formaldehid berbentuk *multitube fixed bed reactor* pada suhu 230^0C dan tekanan 1,5 atm. Formaldehid kemudian dijerap pada absorber menggunakan air sehingga diperoleh produk berupa formaldehid kemurnian 37%.

Pabrik ini direncanakan didirikan di Bontang, Kalimantan Timur dengan luas tanah sebesar 30.000.000 m^2 dan memperkerjakan 219 karyawan. Adapun kebutuhan air pabrik ini sebesar 74.830,13 kg/jam, kebutuhan gas alam (bahan bakar) sebesar 7911,7268 lb/jam, dan kebutuhan udara instrumen sebesar 300 m^3/jam.

Pendirian pabrik formaldehid memiliki *fixed capital cost* sebesar $ 27.803.493,36 + Rp 65.216.360.091,50 dan *total production cost* $ 15.045.452,37 + Rp 41.817.681.128. Berdasarkan analisa kelayakan, pabrik formaldehid dari gas alam ini tergolong *low risk* dengan nilai parameter kelayakan ROI (*Return on Investment*) sebesar 21,40%, POT (*Pay Out Time*) sebesar 3,29 tahun, BEP (*Break Even Point*) sebesar 46,89%, SDP (*Shut Down Point*) sebesar 19,59% dan DCFRR sebesar 24,99%. Berdasarkan nilai-nilai diatas, dapat disimpulkan bahwa pabrik ini menarik secara ekonomi dan layak untuk dikaji lebih lanjut.

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SUMMARY

This formaldehyde plant from natural gas is designed with a capacity of 50,000 tons/year and operates continuously for 320 days/year and 24 hours/day. In order to gain the product as designed capacity, as much as 1858.91 kg/hour CH_4, 8946,344 kg/hour H_2O and 7210 kg/ hour air are needed as the main raw materials. This formaldehyde plant consists of 2 main processes, i.e. natural gas into methanol process and methanol into formaldehyde process. In the methanol production process, natural gas and steam (water) are reacted in a steam reformer in the form of multitube fixed bed reactor at 900^0C and 20 atm with Ni/Al2O3 catalyst to form syngas. Syngas is then cooled, compressed and reacted to methanol reactor in the form of fixed bed reactor at 240^0C and 80 atm with Topsoe catalyst. The formed methanol was separated from non-condensable gas using a drum separator and then purified by a distillation tower to obtain 99.73% purity methanol. The non-condensable gases are then compressed and recycled back to the methanol reactor. The methanol obtained is then oxidized to formaldehyde by reacting the methanol vapor and air in the formaldehyde reactor in the form of multitube fixed bed reactor at 230^0C and 1.5 atm. Formaldehyde is then absorbed in the absorber using water to obtain the product formaldehyde purity of 37%.

The plant is planned to be built at Bontang, East Kalimantan with 30,000,000 m2 land area and employ 219 employees. The water requirement of this plant is 74,830.13 kg/hour, the gas fuel requirement is 7911,7268 lb/hour, and the instrument air requirement is 300 m^3/hour.

The project of formaldehyde plant has fixed capital cost of $27,803,493,36 + Rp65,216,360,091,50 and total production cost $15,045,452,37 + Rp41,817,681,128. Based on feasibility analysis, the formaldehyde plant from natural gas is classified as low risk with ROI (Return on Investment) value of 21.40%, POT (Pay Out Time) of 3.29 years, BEP (Break Even Point) of 46, 89%, SDP (Shut Down Point) of 19.59% and DCFRR of 24.99%. Based on those values, it can be concluded that this preliminary design for the Formaldehyde from Natural Gas is economically attractive and appealing for further study.

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