INTISARI

Industri manufaktur terus mengalami peningkatan setiap tahunnya. Magnesium menjadi salah satu bahan kimia yang permintaannya diprediksi terus mengalami peningkatan. Magnesium oksida (MgO) umumnya digunakan dalam industri refraktori sebagai pelapis furnace karena sifatnya yang stabil, tahan api, dan tahan abrasi. Magnesium oksida dapat diolah dari beberapa jenis bahan baku, di antaranya menggunakan bittern dan batu kapur.

Bittern diperoleh dari limbah pabrik PT. Garam Indonesia (Persero) yang merupakan salah satu pabrik garam besar di Indonesia. Batu kapur diperoleh dari penambangan batu kapur. Kandungan magnesium di dalam *bittern* direaksikan dengan $Ca(OH)_2$ yang merupakan hasil reaksi CaO dengan air sehingga akan membentuk magnesium hidroksida ($Mg(OH)_2$). Kalsium Oksida (CaO) diperoleh dari proses kalsinasi batu kapur yang dipasok dari PT Putra Lima Jaya di Tuban, Jawa Timur. Magnesium Hidroksida ($Mg(OH)_2$) hasil reaksi kemudian didekomposisi di dalam *Rotary Kiln* sehingga didapatkan produk akhir berupa Magnesium Oksida (MgO).

Pabrik Magnesium Oksida dengan kapasitas 150.000 ton/tahun ini memerlukan bahan baku *bittern* sebanyak 453.921,21 kg/jam dan batu kapur sebanyak 48.166,93 kg/jam. Dalam menjalankan prosesnya, pabrik didukung oleh unit penunjang lain, seperti unit penyedia dan pengolahan air, unit penyedia udara dan listrik, serta unit pengolahan limbah. Kebutuhan air untuk proses, pembangkitan *steam*, refrigerasi, dan lainnya adalah sebanyak 800.770,66 kg/jam dan bersumber dari pengolahan air laut Selat Madura. Total kebutuhan listrik pabrik adalah sebesar 2,25 MW.

Pabrik Magnesium Oksida tergolong dalam *high risk chemical industry*. Pabrik direncanakan untuk dibangun di Kawasan Industri Tuban, Jawa Timur. Nilai *fixed capital dan working capital* sebesar $86.979.090,56 dan $29.130.058,59. Berdasarkan hasil analisis, pabrik menarik untuk dikaji lebih lanjut berdasarkan nilai ROI sebesar 44,74 %, POT sebesar 1,96 tahun, BEP sebesar 41,02%, SDP sebesar 26,71% dan DCFRR sebesar 31,30%. Analisis sensitivitas juga menunjukkan bahwa pabrik ini relatif stabil terhadap perubahan *fixed capital investment*, harga bahan baku dan *operating labor*.

Kata kunci: magnesium oksida, batu kapur, *bittern*

ABSTRACT

The manufacturing industry continues to increase every year. Magnesium is one of the chemicals which demand is predicted to keep increasing. Magnesium oxide (MgO) is generally used in the refractory industry as a furnace lining because of its stable, fire-resistant, and abrasion-resistant properties. Magnesium oxide can be processed from several types of raw materials, including bittern and limestone.

Bittern is obtained from industrial waste from PT. Garam Indonesia (Persero), one of the biggest salt factories in Indonesia. Limestone is obtained from limestone mining. Magnesium in bittern is reacted with $Ca(OH)_2$ from the reaction of CaO with water to form magnesium hydroxide (Mg(OH)2). Calcium Oxide (CaO) is obtained from calcination of limestone supplied by PT Putra Lima Jaya in Tuban, East Java. Magnesium Hydroxide ($Mg(OH)_2$) from the reaction is decomposed in Rotary Kiln to obtain the final product, Magnesium Oxide (MgO).

Magnesium Oxide plant with capacity of 150,000 tons/year requires 453,921.21 kg/hour of bittern and 48,166.93 kg/hour of limestone. During the operation, the plant is supported by other supporting units, such as water supply and treatment units, air and electricity supply units, and waste treatment units. Total water required for the plant is 800,770.66 kg/hour and comes from the desalination of Madura Strait seawater. Total electricity required for the plant is 2.25 MW.

Magnesium Oxide plant is classified as a high-risk chemical industry. The plant is planned to be built in the Tuban Industrial Area, East Java. Fixed capital and working capital value of $86.979.090,56 and $29.130.058,59. Based on the analysis results, the plant is interesting to be studied further based on the ROI value of 44.74%, POT of 1.96 years, BEP of 41.02%, SDP of 26.71% and DCFRR of 31.30%. Sensitivity analysis also shows that this factory is relatively stable to changes in fixed capital investment, raw material prices and operating labor.

Keywords: *magnesium oxide, limestone, bittern*