ABSTRAK

Pra rancang bangun pabrik garam industri dari garam rakyat dengan kapasitas produksi 300.000 ton/tahun menggunakan proses *Vacuum Pan Crystallizer* telah dirancang untuk beroperasi 24 jam/hari selama 330 hari/tahun di Kabupaten Sumenep, Madura, Jawa Timur, dekat sumber bahan baku. Bahan baku utama adalah garam rakyat (NaCl 85,83%, $CaSO_4$ 0,31%, $MgSO_4$ 1,87%, dll.) dengan bahan penunjang Na_2CO_3, NaOH, $BaCl_2$, dan air. Proses utama meliputi pemurnian (pelarutan, reaksi kimia untuk menghilangkan impurities seperti $CaCO_3$, $Mg(OH)_2$, $BaSO_4$), evaporasi (*double effect evaporator* pada 134°C dan 110°C), kristalisasi vakum (70°C, 0,3 atm, kapasitas 52.000 kg/jam), pemisahan (centrifuge), dan pengeringan (rotary dryer). Neraca massa *Vacuum Pan Crystallizer* balance dengan input 944,4 kg/jam (NaCl 748,8 kg/jam, H_2O 195,6 kg/jam), output kristal NaCl 748,8 kg/jam (100% recovery), uap 112,4 kg/jam, dan mother liquor 83,2 kg/jam. Neraca panas menunjukkan panas net -109.693 kJ/jam. Analisis ekonomi mencakup total investasi Rp 260 miliar (fixed capital Rp 221 miliar, working capital Rp 39 miliar), TPC Rp 1,556 triliun/tahun, POT sebelum pajak 0,03 tahun, ROI 4124%, BEP 1,81 (54.185 ton/tahun), SDP 1,18, dan IRR 18,60%. Pabrik ini layak didirikan untuk mengurangi impor garam industri dan mendukung industri tekstil, CAP, farmasi, serta pengasinan.

Kata Kunci : Garam Industri, *Vacuum Pan Crytallizer* dan NaCl

ABSTRACT

Pre-design of an industrial salt plant from folk salt with a production capacity of 300,000 tons/year using Vacuum Pan Crystallizer process has been developed to operate 24 hours/day for 330 days/year in Sumenep Regency, Madura, East Java, near raw material sources. Main raw material is folk salt (NaCl 85.83%, CaSO4 0.31%, MgSO4 1.87%, etc.) with auxiliaries Na2CO3, NaOH, BaCl2, and water. Key processes include purification (dissolution, chemical reactions to remove impurities like CaCO3, Mg(OH)2, BaSO4), evaporation (double effect evaporator at 134°C and 110°C), vacuum crystallization (70°C, 0.3 atm, 52,000 kg/h capacity), separation (centrifuge), and drying (rotary dryer). Mass balance for Vacuum Pan Crystallizer is balanced: input 944.4 kg/h (NaCl 748.8 kg/h, H2O 195.6 kg/h), output NaCl crystals 748.8 kg/h (100% recovery), vapor 112.4 kg/h, and mother liquor 83.2 kg/h. Heat balance shows net heat -109,693 kJ/h. Economic analysis includes total investment Rp 260 billion (fixed capital Rp 221 billion, working capital Rp 39 billion), TPC Rp 1.556 trillion/year, pre-tax POT 0.03 years, ROI 4124%, BEP 1.81 (54,185 tons/year), SDP 1.18, and IRR 18.60%. The plant is feasible to reduce industrial salt imports and support textile, CAP, pharmaceutical, and salting industries.

Keyword : Sodium Chloride, *Vacuum Pan Crystallizer, NaCl*