

ANALISIS ENERGI DAN EKSERGI PADA PABRIK UREA IA PT. PETROKIMIA GRESIK

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ABSTRAK

Industri pupuk di Indonesia menggunakan gas alam sebagai bahan bakar utama. Berdasarkan data Kementerian Energi dan Sumber Mineral tahun 2013, Industri pupuk menempati urutan ketiga konsumsi energi terbesar. PT. Petrokimia Gresik merupakan salah satu produsen pupuk terbesar di Indonesia. Pada proses produksi, penggunaan gas alam sebagai bahan bakar masih cukup besar. Berdasarkan laporan Tahun 2018 PT Petrokimia Gresik, tercatat bahwa konsumsi energi yang bersumber dari gas alam sebesar 13.021.386 GJ. Gas alam merupakan salah satu bahan bakar utama dengan jumlah konsumsi terbesar. Untuk menunjang keberlangsungan proses produksi urea IA PT. Petrokimia Gresik, diperlukan upaya optimasi energi. Salah satu upaya untuk mengatasi permasalahan tersebut yaitu analisis energi dan eksersi. Analisis tersebut bertujuan untuk (a) mengetahui neraca massa, neraca energi, entalpi, entropi, dan eksersi; (b) memperoleh nilai efisiensi energi dan eksersi; serta (c) memperoleh nilai irreversibilitas. Penelitian ini dilakukan pada unit-unit *Stripper*, *Decomposer*, *Final Concentrator*, *Absorber*, dan *Process Condensat Stripper* Pabrik Urea IA PT. Petrokimia Gresik. Analisis dilakukan dengan menggunakan variabel laju alir *Steam*, yakni basis laju alir *Steam*, +10% basis, +20% basis, -10% basis, dan -20%. Berdasarkan hasil penelitian efisiensi energi pada alat *Stripper*, *Decomposer*, *Final Concentrator*, *Absorber*, dan *Process Condensat Stripper* masing-masing sebesar 90%, 90%, 90%, 99,98%, dan 50%. Efisiensi eksersi pada alat *Stripper*, *Decomposer*, *Final Concentrator*, *Absorber*, dan *Process Condensat*

Stripper masing-masing 68,9%, 88,3%, 68,9%, 98,9%, dan 18,6%. Laju alir *Steam* berpengaruh terhadap efisiensi energi dan eksersi. Semakin tinggi laju alir *Steam* maka efisiensi semakin rendah.

Kata Kunci: Energi, Eksersi, Urea



ENERGY AND EXERGY ANALYSIS

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ABSTRACT

The fertilizer industry in Indonesia uses natural gas as the main fuel. Based on data from the Ministry of Energy and Mineral Resources in 2013, the fertilizer industry ranks third in the largest energy consumption. PT. Petrokimia Gresik is one of the largest fertilizer producers in Indonesia. In the production process, the use of natural gas as fuel is still quite large. Based on PT Petrokimia Gresik's 2018 report, it was noted that energy consumption sourced from natural gas was 13,021,386 GJ. Natural gas is one of the main fuels with the largest consumption. To support the sustainability of the IA urea production process, PT. Petrokimia Gresik, energy optimization efforts are needed. One of the efforts to overcome these problems is energy analysis and exergy. The analysis aims to (a) determine the mass balance, energy balance, enthalpy, entropy, and exergy; (b) obtaining energy efficiency and exergy values; and (c) obtain irreversibility value. This research was conducted at Stripper, Decomposer, Final Concentrator, Absorber, and Process Condensate Stripper units at Urea IA Factory, PT. Petrokimia Gresik. The analysis was performed using variable *Steam* flow rates, namely the basis of the *Steam* flow rate, + 10% basis, + 20% basis, -10% basis, and -20%. Based on the results of energy efficiency research on the Stripper, Decomposer, Final Concentrator, Absorber, and Process Condensate Stripper device, each was 90%, 90%, 90%, 99.98%, and 50%. The exergy efficiency of the Stripper, Decomposer, Final Concentrator, Absorber, and Process Condensat

Stripper equipment was 68.9%, 88.3%, 68.9%, 98.9%, and 18.6%, respectively.

Steam flow rate affects energy efficiency and exergy. The higher the *Steam* flow rate, the lower the efficiency.

Keywords: Energy, Exergy, Urea

