

# Potensi Pemanfaatan Keseluruhan Shale Oil dan Shale Gas Hasil Oil Shale Retorting dalam Produksi Hidrogen dan Ammonia Menggunakan Chemical Looping = Potential Total Utilization of Shale Oil and Shale Gas Products from Oil Shale Retorting in Hydrogen and Ammonia Production Using Chemical Looping

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## Abstrak

Oil Shale merupakan salah satu bahan bakar non konvensional berbentuk sedimen batuan halus, yang dapat menjadi sumber energi alternatif. Dalam proses retorting, Oil Shale dapat dikonversi menjadi shale oil dan shale gas. Sebelumnya, terdapat beberapa penelitian yang membahas potensi shale gas untuk memproduksi gas hidrogen. Pada penelitian ini, dilakukan pemodelan sistem menggunakan Aspen Plus untuk mengetahui potensi pemanfaatan keseluruhan shale oil beserta shale gas hasil dari retorting untuk memproduksi hidrogen menggunakan teknologi chemical looping. Selain itu, penelitian ini bertujuan untuk mengetahui efisiensi energi dari sistem apabila meneruskan tahapan produksi hidrogen hingga ke tahap produksi ammonia untuk penyimpanan. Berdasarkan hasil simulasi, produk retorting dari 0,126 kg/s bahan baku oil shale komposisi New Albany, yaitu 0,0063 kg/s shale oil dan 0,0024 kg/s shale gas, dapat memproduksi hidrogen sebanyak 0,0037 kg/s. Hidrogen ini dapat dikonversi menjadi ammonia sebanyak 0,012 kg/s dengan sisa hidrogen sebanyak 0,00089kg/s. Berdasarkan analisis energi, didapatkan efisiensi dari keseluruhan proses oil shale retorting hingga produksi ammonia adalah sebesar 55%.

.....Oil shale is one of the non-conventional fuel in the form of fine rock sediments, which can be utilized as an alternative energy resource. In the retorting process, Oil Shale is converted into shale oil and shale gas. Previously, there were several studies that discussed the potential utilization of the shale gas product to produce hydrogen gas. In this study, a simulation was carried out using Aspen Plus to determine the potential of using both shale oil and shale gas products from the retorting process, to produce hydrogen using a chemical looping system. In addition, this study is aimed at analysing the energy efficiency of the system with the additional process of converting hydrogen into ammonia for storage. Based on the simulation results, the retorting product from 0,126 kg/s of oil shale, respectively 0,0063 kg/s and 0,024 kg/s of shale oil and shale gas, could produce 0,0031 kg/s of hydrogen. This amount of hydrogen could be converted into 0,012 kg/s of ammonia, with a remaining hydrogen product of 0,00089 kg/s. Based on the energy analysis, the efficiency of the entire system from the oil shale retorting process up to the ammonia production is 55%.