

ABSTRAK

OPTIMASI LEACHING TANDAN KOSONG KELAPA SAWIT SEBAGAI BAHAN BAKU BIOPELLET YANG RENDAH MINERAL

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Limbah padat tandan kosong kelapa sawit belum banyak dimanfaatkan, padahal jumlahnya melimpah dan berpotensi diolah menjadi produk yang bernilai ekonomi tinggi. Tandan kosong kelapa sawit dapat diolah yang selanjutnya dijual sebagai bahan bakar padat. Permasalahannya jika dijadikan sebagai bahan bakar, tandan kosong kelapa sawit bersifat hidrofilik, kadar air tinggi, densitas rendah, dan nilai kalor rendah. Selain itu tandan kosong kelapa sawit juga mengandung logam alkali tinggi terutama kalium dan silika. Leaching treatment dapat diterapkan untuk menghilangkan zat anorganik. Pada Penelitian ini menggunakan air sebagai pelarut pada proses leaching. Rancangan percobaan menggunakan response surface metode dengan variabel suhu (30°C, 75°C, dan 120°C), rasio TKKS terhadap pelarut (1:5, 1:10 dan 1:15), dan waktu (15 menit, 37,5 menit dan 60 menit). TKKS sebelum dan setelah leaching dianalisa kandungan kalium dan mineral anorganiknya menggunakan X-ray Fluorescence Spectrometry (XRF). Filtrat dari proses leaching dianalisa menggunakan Atomic Absorption Spectrometer (AAS). Nilai kalor TKKS dianalisa menggunakan bomb calorimeter. Hasil optimasi diperoleh kondisi optimum untuk menghasilkan kalium pada tkks yang rendah, nilai kalor yang tinggi serta kadar abu yang rendah yaitu pada kondisi operasi suhu 39°C, Rasio pelarut 1:15 (TKKS/Pelarut) dan waktu 15 menit dengan kadar kalium pada TKKS sebesar 0,42%, kadar abu sebesar 0,02% dan nilai kalor sebesar 21,19 MJ/Kg. Berdasarkan analisis tekno ekonomi pada kondisi operasi optimum maka prarancangan pabrik biopellet dengan fasilitas leaching layak didirikan. Proyek tersebut layak didirikan dengan nilai return on investment (ROI) sebesar 102%, nilai IRR sebesar 44%, NPV sebesar 22.495.682 \$ dan pay back periode pada 2,22 tahun.

Kata kunci : *leaching, tandan kosong, optimasi, kalium, teknoekonomi*

ABSTRACT

OPTIMIZATION OF LEACHING PALM OIL EMPTY FRUIT BRUNCH AS A LOW MINERAL BIOPELLET RAW MATERIAL

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The solid waste of empty palm oil bunches has not been utilized properly, even though the amount is abundant and has the potential to be processed into products with high economic value. Empty palm fruit bunches can be processed and then sold as solid fuel. However, many problem when used as fuel, due to it's hydrophilic, high moisture content, low density and low calorific value. In addition, empty palm fruit bunches also contain high alkali metals, especially potassium and silica. Leaching treatment can be applied to remove inorganic substances. In this study water use as the solvent in the leaching process. The experimental design used the response surface method with temperature variables (30°C, 75°C, and 120°C), the ratio of OPEFB to solvent (1:5, 1:10 and 1:15), and time (15 minutes, 37, 5 minutes and 60 minutes). OPEFB before and after leaching were analyzed for potassium and inorganic mineral content using X-Ray Fluorescence Spectrometry (XRF). The filtrate from the leaching process was then analyzed using an Atomic Absorption Spectrometer (AAS). The calorific value of OPEFB was analyzed using a bomb calorimeter.

The leached OPFB of optimum conditions has characteristic such as low potassium, high calorific value and low ash content were operating conditions of 39°C, solvent ratio of 1:15 (EFB/solvent) and 15 minutes of time, with potassium content in OPEFB of 0.42%, ash content of 0.02% and a calorific value of 21,3 MJ/Kg. Based on techno-economic analysis the optimum conditions found to the biopellet plant with leaching facility is feasible to build. The project is feasible to build with a return on investment (ROI) value of 102%, an IRR value of 44%, an NPV of \$22.495.682 and a payback period of 2,22 years.

Keywords : leaching, empty bunches, optimization, potassium, technoeconomic.