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**UJI KOMPARATIF KARAKTERISTIK KUALITAS BIOPELET
DAN *BIOCHAR* DARI FASILITAS *REFUSE DERIVED FUEL*
(RDF) KOMUNAL TEMPAT PEMROSESAN AKHIR (TPA)
KAYU GADANG SAWAHLUNTO**

TESIS

Oleh:

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**PROGRAM STUDI MAGISTER TEKNIK LINGKUNGAN
FAKULTAS TEKNIK UNIVERSITAS ANDALAS
PADANG**

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Sebagai salah satu syarat untuk menyelesaikan
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ABSTRAK

Penelitian ini bertujuan menganalisis dan membandingkan karakteristik kualitas biopelet dan biochar yang berasal dari Fasilitas Refuse Derived Fuel (RDF) Komunal Tempat Pemrosesan Akhir (TPA) Kayu Gadang, Kota Sawahlunto. Biopelet dibuat dari campuran kompos, kulit nanas, dan serbuk gergaji dengan komposisi volume masing-masing 40%, 40%, dan 20%. Kompos yang digunakan merupakan campuran sampah organik berupa daun dan ranting kayu serta sekam padi dengan perbandingan 2:1. Biochar diperoleh melalui karbonisasi biopelet menggunakan tungku biomassa. Karakteristik bahan bakar dianalisis berdasarkan kadar air, kadar abu, kadar zat terbang (volatile matter), kadar karbon terikat (fixed carbon), nilai kalor bersih, kadar sulfur, kadar klorin, dan densitas. Hasil pengujian dibandingkan dengan SNI 8675:2018 dan SNI 8966:2021. Pengaruh karbonisasi dianalisis menggunakan uji Paired Sample t-Test pada taraf signifikansi 5%. Karbonisasi memberikan perbedaan signifikan terhadap kadar air, kadar abu, kadar zat terbang, dan nilai kalor ($p < 0,05$), tetapi tidak terhadap kadar karbon terikat, sulfur, klorin, dan densitas ($p > 0,05$). Karbonisasi menurunkan kadar air dari 7,78% menjadi 5,17%, kadar zat terbang dari 42,97% menjadi 23,08%, dan densitas dari 1,06 menjadi 0,99 g/cm³, serta meningkatkan kadar karbon terikat dari 10,54% menjadi 18,77% dan nilai kalor dari 9,99 menjadi 11,80 MJ/kg. Sebaliknya, kadar abu, sulfur, dan klorin meningkat menjadi 52,98%, 0,60%, dan 0,80%. Biochar memiliki karakteristik lebih baik sebagai bahan bakar padat dibandingkan biopelet pada parameter kadar air, kadar zat terbang, kadar karbon terikat, dan nilai kalor. Namun, kadar abu, sulfur, dan klorin masih melebihi standar akibat heterogenitas bahan baku RDF. Peningkatan kualitas bahan baku dan optimalisasi proses karbonisasi diperlukan agar memenuhi standar mutu.

Kata kunci: Biochar, Biopelet, Karbonisasi, Karakteristik Bahan Bakar, Refuse Derived Fuel (RDF)



ABSTRACT

This study aimed to analyze and compare the quality characteristics of biopellets and biochar produced from the communal Refuse Derived Fuel (RDF) facility at Kayu Gadang Final Disposal Site (TPA), Sawahlunto City. The biopellets were produced from a mixture of compost, pineapple peel, and sawdust with volume proportions of 40%, 40%, and 20%, respectively. The compost used consisted of organic waste, including leaves and twigs, and rice husk at a ratio of 2:1. Biochar was produced through the carbonization of biopellets using a biomass stove. Fuel characteristics were analyzed based on moisture content, ash content, volatile matter, fixed carbon, net calorific value, sulfur content, chlorine content, and density. The test results were compared with SNI 8675:2018 and SNI 8966:2021. The effect of carbonization was analyzed using a Paired Sample t-Test at a significance level of 5%. Carbonization resulted in significant differences in moisture content, ash content, volatile matter, and calorific value ($p < 0.05$), but no significant differences were observed in fixed carbon, sulfur content, chlorine content, and density ($p > 0.05$). Carbonization reduced the moisture content from 7.78% to 5.17%, volatile matter from 42.97% to 23.08%, and density from 1.06 to 0.99 g/cm³, while increasing the fixed carbon content from 10.54% to 18.77% and the net calorific value from 9.99 to 11.80 MJ/kg. Conversely, the ash, sulfur, and chlorine contents increased to 52.98%, 0.60%, and 0.80%, respectively. Biochar exhibited better characteristics as a solid fuel than biopellets in terms of moisture content, volatile matter, fixed carbon, and calorific value. However, the ash, sulfur, and chlorine contents remained above the standard limits due to the heterogeneous nature of the RDF feedstock. Improvements in feedstock quality and optimization of the carbonization process were required to meet the quality standards.

Keywords: Biochar, Biopellets, Carbonization, Fuel Characteristics, Refuse Derived Fuel (RDF)

