# UJI KINERJA TUNGKU BIOMASSA BERBAHAN BAKAR PELET KULIT UBI KAYU BERDASARKAN STANDAR NASIONAL INDONESIA (SNI) 7926:2013

## TUGAS AKHIR

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# ABSTRAK

*Penggunaan tungku Top-Lit Up Draft (TLUD) gasifier merupakan salah satu teknologi pemanfaatan energi biomassa yang melimpah di Indonesia secara efisien dan ramah lingkungan. Penelitian ini bertujuan untuk menganalisis kualitas biopelet kulit ubi kayu sesuai SNI 8675:2018, menghitung faktor emisi $PM_{2.5}$, CO dan $CO_2$ dari proses pembakaran biopelet kulit ubi kayu pada tungku TLUD gasifier, dan mengevaluasi kinerja tungku TLUD gasifier berbahan bakar biopelet kulit ubi kayu berdasarkan SNI 7926:2013 serta membandingkannya dengan penelitian terkait. Kulit ubi dikonversi menjadi biopelet melalui proses peletisasi tanpa penambahan perekat. Uji kualitas biopelet dilakukan terhadap parameter densitas, kadar air, kadar zat terbang, kadar abu, kadar karbon tetap, kadar sulfur, dan nilai kalor. Kinerja tungku biomassa diuji melalui parameter efisiensi pembakaran, efisiensi termal, laju konsumsi bahan bakar, CO dan $PM_{2.5}$ menggunakan prosedur pengujian berdasarkan SNI 7926:2013. Nilai CO dan $PM_{2.5}$ diperoleh dengan perhitungan faktor emisi. Hasil menunjukkan bahwa biopelet memenuhi persyaratan SNI 8675:2018 dengan nilai kalor 16,87 MJ/kg (4.033 kkal/kg). Faktor emisi CO 6,141 ± 0,402 g/kg, $CO_2$ 160,990 ± 3,803 g/kg dan $PM_{2.5}$ 407,840 ± 31,133 mg/kg. Konsumsi spesifik bahan bakar 0,799 ± 0,014 kg/jam, efisiensi pembakaran 0,962± 0,002 dan efisiensi termal 25,360 ± 0,219% yang telah memenuhi standar acuan pada SNI 7926:2013. Secara keseluruhan, penggunaan tungku biomassa TLUD gasifier berbahan bakar biopelet kulit ubi kayu memiliki potensi sebagai teknologi pembakaran berbahan bakar alternatif ramah lingkungan dengan kinerja tungku yang memenuhi standar nasional.*

***Kata kunci**: kulit ubi kayu, biopelet, TLUD, SNI 7926:2013, faktor emisi*

# *ABSTRACT*

*The use of Top-Lit Up Draft (TLUD) gasifier stoves represents one of the efficient and environmentally friendly technologies for utilizing abundant biomass energy in Indonesia. This study aims to analyze the quality of cassava peel biopellets based on SNI 8675:2018, calculate the emission factors of $PM_{2.5}$, CO, and $CO_2$ generated from the combustion process in a TLUD gasifier stove, and evaluate the stove's performance according to SNI 7926:2013 as well as compare it with related research. Cassava peels were converted into biopellets through a pelletization process without the use of binders. The quality of the biopellets was tested by measuring the density, moisture content, volatile matter, ash content, fixed carbon, sulfur content, and calorific value. The performance of the biomass stove was assessed based on combustion efficiency, thermal efficiency, specific fuel consumption, CO, and $PM_{2.5}$ using testing procedures outlined in SNI 7926:2013. The emission values of CO and $PM_{2.5}$ were obtained through emission factor calculations. The results indicated that the biopellets met the requirements of SNI 8675:2018, with a calorific value of 16.87 MJ/kg (4,033 kcal/kg). The emission factor of CO was 6.141 ± 0.402 g/kg, $CO_2$ was 160.990 ± 3.803 g/kg, and $PM_{2.5}$ was 407.840 ± 31.133 mg/kg. The specific fuel consumption was 0.799 ± 0.014 kg/hour, the combustion efficiency was 0.962 ± 0.002, and the thermal efficiency reached 25.360 ± 0.219%, all of which complied with the minimum standards in SNI 7926:2013. Overall, the use of a TLUD gasifier biomass stove fueled by cassava peel biopellets demonstrates strong potential as an environmentally friendly alternative combustion technology, with stove performance fulfilling national standards.*



***Keywords**: cassava peel, biopellets, TLUD, SNI 7926:2013, emission factor*