

ABSTRAK

ANALISIS PENGARUH JENIS FILTER TERHADAP PDODUKSI SYNGAS SEBAGAI SUMBER ENERGI LISTRIK MELALUI GASIFIKASI UPDRAFT MENGGUNAKAN BAHAN BAKU TEMPURUNG KELAPA

(Vivi Tridayanti, 2025: 42 Halaman, 14 Tabel, 13 Gambar)

Energi merupakan kebutuhan utama yang terus meningkat seiring pertumbuhan penduduk dan perkembangan industri. Ketergantungan terhadap bahan bakar fosil mendorong pencarian alternatif energi terbarukan, salah satunya biomassa. Tempurung kelapa, sebagai limbah pertanian yang melimpah di Indonesia, memiliki potensi besar sebagai bahan baku energi. Penelitian ini bertujuan untuk menganalisis pengaruh empat jenis media filter manganes, zeolit, sekam padi, dan arang bambu terhadap komposisi syngas (CH_4 , H_2 , CO , CO_2), nilai kalor rendah (*Lower Heating Value/LHV*), dan efisiensi termal dalam proses gasifikasi tipe updraft. Metode yang digunakan meliputi proses gasifikasi dengan suplai udara terbatas, pemantauan komposisi gas menggunakan alat gas analyzer, serta perhitungan LHV dan efisiensi termal berdasarkan hasil eksperimen. Hasil penelitian menunjukkan bahwa penggunaan filter manganes menghasilkan konsentrasi metana tertinggi sebesar 10000 ppm, nilai LHV maksimal 375 kJ/m^3 , dan efisiensi termal mencapai 21 %, Arang bambu juga menunjukkan konsentrasi metana yang tinggi sebesar 10000 ppm, namun nilai LHV-nya sedikit lebih rendah yaitu 372 kJ/m^3 dengan efisiensi termal sebesar 20 %. yang merupakan performa terbaik di antara keempat filter. Zeolit menghasilkan kadar hidrogen tertinggi (371 ppm), namun nilai LHV dan efisiensinya lebih rendah yaitu 342 kJ/m^3 dan 19 %. Filter sekam padi menunjukan nilai LHV 361 kJ/m^3 dan efisiensi 20%. Temuan ini menunjukkan bahwa jenis media filter memengaruhi kualitas syngas yang dihasilkan, di mana struktur pori dan kemampuan adsorpsi masing-masing filter berperan penting.

Kata Kunci: Gasifikasi, Syngas, Tempurung Kelapa, Filter.

ABSTRACT
**ANALYSIS OF THE EFFECT OF FILTER TYPES ON SYNGAS
PRODUCTION AS AN ELECTRICAL ENERGY SOURCE THROUGH
UPDRAFT GASIFICATION USING COCONUT SHELL FEEDSTOCK**

(Vivi Tridayanti, 2025: 42 Pages, 14 Tables, 13 Figures)

Energy is a fundamental necessity that continues to increase in demand alongside population growth and industrial development. Dependence on fossil fuels has driven the search for renewable energy alternatives, one of which is biomass. Coconut shells, an abundant agricultural waste in Indonesia, hold great potential as a renewable energy source. This study aims to analyze the influence of four types of filter media manganese, zeolite, rice husk, and bamboo charcoal on the composition of syngas (CH_4 , H_2 , CO , CO_2), lower heating value (LHV), and thermal efficiency in an updraft gasification process. The method involved gasification with limited air supply, direct monitoring of gas composition using a gas analyzer, and calculations of LHV and thermal efficiency based on experimental data. The results showed that the use of manganese filter produced the highest methane concentration of 10,000 ppm, with a maximum LHV of 375 kJ/m^3 and the highest thermal efficiency of 21%. Bamboo charcoal also exhibited a high methane concentration of 10,000 ppm, though its LHV was slightly lower at 372 kJ/m^3 , with a thermal efficiency of 20%. These values represent the best performance among the four filters. Zeolite produced the highest hydrogen concentration (371 ppm), but its LHV and thermal efficiency were lower, at 342 kJ/m^3 and 19%, respectively. The rice husk filter showed an LHV of 361 kJ/m^3 and thermal efficiency of 20%. These findings indicate that the type of filter media significantly affects the quality of the resulting syngas, with pore structure and adsorption capacity playing key roles.

Keywords: Gasification, Syngas, Coconut Shell, Filter.