

ABSTRAK

PENYERAPAN KARBON DIOKSIDA (CO₂) PADA PROSES PEMURNIAN BIOGAS KOTORAN SAPI MENGGUNAKAN LARUTAN NATRIUM HIDROKSIDA (NaOH) DALAM KOLOM ABSORPSI (Nyayu Nisti Dinda Azzahra, 2026: 40 Halaman, 7 Tabel, 17 Gambar)

Meningkatnya kebutuhan energi global dan ketergantungan terhadap bahan bakar fosil mendorong pengembangan energi terbarukan, salah satunya biogas dari limbah peternakan. Penelitian ini bertujuan untuk mengkaji pengaruh penambahan biochar terhadap produksi biogas dari kotoran sapi melalui proses *anaerobic digestion*, serta mengevaluasi efisiensi penyerapan CO₂ menggunakan larutan Natrium Hidroksida (NaOH) dalam kolom absorpsi ber-*packing Pall ring* dan *Raschig ring*. Proses fermentasi dilakukan selama 25 hari menggunakan sistem *batch* dengan kotoran sapi, biochar dan EM4. Pemurnian biogas dilakukan dengan memvariasikan laju alir absorben (0,1 L/min, 0,15 L/min, 0,19 L/min, 0,25 L/min, 0,28 L/min dan 0,42 L/min). Kualitas biogas dianalisis menggunakan *gas chromatography* untuk mengukur kadar CH₄ dan CO₂, sebelum dan sesudah pemurnian. Parameter bahan baku yang dianalisis meliputi *Total Solid* (TS), *Volatile Solid* (VS), *Chemical Oxygen Demand* (COD), *Biochemical Oxygen Demand* (BOD). Penelitian ini diharapkan dapat menentukan kondisi optimum produksi biogas berbasis biochar dan EM4 serta kondisi operasi terbaik dalam proses penyerapan CO₂ menggunakan NaOH, sehingga dapat meningkatkan kualitas biogas menjadi biometan yang lebih bernilai energi tinggi dan mendukung pemanfaatan limbah peternakan sebagai sumber energi terbarukan yang berkelanjutan.

Kata Kunci: biogas, kotoran sapi, biochar, NaOH, absorpsi CO₂, pemurnian biogas

ABSTRACT

CARBON DIOXIDE (CO₂) ABSORPTION IN THE PURIFICATION OF COW MANURE BIOGAS USING SODIUM HYDROXIDE (NaOH) SOLUTION IN AN ABSORPTION COLUMN

(Nyayu Nisti Dinda Azzahra, 2026: 40 Pages, 7 Tables, 17 Figures)

The increasing global energy demand and dependence on fossil fuels have encouraged the development of renewable energy sources, one of which is biogas produced from livestock waste. This study aimed to investigate the effect of biochar addition on biogas production from cow manure through the anaerobic digestion process and to evaluate the efficiency of carbon dioxide (CO₂) absorption using a sodium hydroxide (NaOH) solution in an absorption column packed with Pall rings and Raschig rings. The fermentation process was carried out for 25 days using a batch system consisting of cow manure, biochar, and Effective Microorganisms 4 (EM4). Biogas purification was conducted by varying the absorbent flow rates at 0.10, 0.15, 0.19, 0.25, 0.28, and 0.42 L/min. The quality of the biogas was analyzed using gas chromatography (GC) to determine the concentrations of methane (CH₄) and carbon dioxide (CO₂) before and after the purification process. The analyzed feedstock parameters included Total Solids (TS), Volatile Solids (VS), Chemical Oxygen Demand (COD), and Biochemical Oxygen Demand (BOD). This study is expected to determine the optimum conditions for biogas production using biochar and EM4, as well as the optimum operating conditions for CO₂ absorption using NaOH, thereby improving biogas quality into biomethane with a higher energy value and supporting the sustainable utilization of livestock waste as a renewable energy source.

Keywords: biogas, cow manure, biochar, sodium hydroxide (NaOH), CO₂ absorption, biogas purification.