

ABSTRAK

ANALISIS PRODUKSI BIOGAS LIMBAH POME DAN KOTORAN SAPI DENGAN EM-4 PADA DIGESTER TERHADAP NILAI KALOR BIOGAS

(Levia Monica, 2025: 77 Halaman, 11 Tabel, 17 Gambar)

Keterbatasan sumber energi konvensional mendorong eksplorasi terhadap alternatif energi terbarukan. Biogas adalah salah satu energi alternatif yang ramah lingkungan, dengan memanfaatkan limbah organik melalui proses anaerobik hingga menghasilkan gas metana. Tujuan dari penelitian ini untuk menganalisis produksi biogas dengan fokus pada pengaruh waktu retensi terhadap volume biogas, karakteristik komposisi biogas serta nilai kalor biogas yang dihasilkan. Penelitian dilakukan menggunakan digester berkapasitas 250 L dengan bahan baku berupa campuran limbah POME dan kotoran sapi dengan rasio [1:1]. Proses fermentasi dilakukan selama 25 hari dengan variasi waktu retensi 5, 10, 15, 20, dan 25 hari. Volume biogas, komposisi gas (CH_4 , CO_2 , O_2 , dan H_2S), temperatur (digester dan lingkungan), pH slurry, serta tekanan gas menggunakan manometer U diamati secara berkala setiap 5 hari sesuai waktu retensi. Nilai kalor biogas kemudian dihitung berdasarkan persentase kandungan metana yang diperoleh. Hasil penelitian menunjukkan bahwa produksi biogas meningkat seiring waktu retensi, dengan puncak produksi terjadi pada hari ke-25. Kandungan metana (CH_4) maksimum mencapai 58 %Vol dan nilai kalor tertinggi diperoleh sebesar 20,76 MJ/m^3 pada komposisi CH_4 maksimum. Penelitian ini membuktikan bahwa kapasitas digester, volume bahan baku, serta parameter operasional seperti pH, temperatur, tekanan, dan waktu retensi memiliki pengaruh signifikan terhadap kualitas dan kuantitas biogas yang dihasilkan.

Kata Kunci: Biogas, Digester, Limbah POME, Kotoran Sapi, Nilai Kalor Biogas

ABSTRACT

ANALYSIS OF BIOGAS PRODUCTION FROM POME WASTE AND COW DUNG WITH EM-4 IN A DIGESTER ON THE CALORIAL VALUE OF BIOGAS

(Levia Monica, 2025: 77 Pages, 11 Tables, 17 Figures)

The limitations of conventional energy sources encourage exploration of renewable energy alternatives. Biogas is an environmentally friendly alternative energy, utilizing organic waste through an anaerobic process to produce methane gas. The purpose of this study was to analyze biogas production with a focus on the effect of retention time on biogas volume, biogas composition characteristics, and the calorific value of the produced biogas. The study was conducted using a 250 L digester with a raw material consisting of a mixture of POME waste and cow dung with a ratio of [1:1]. The fermentation process was carried out for 25 days with varying retention times of 5, 10, 15, 20, and 25 days. Biogas volume, gas composition (CH_4 , CO_2 , O_2 , and H_2S), temperature (digester and environment), slurry pH, and gas pressure using a U-shaped manometer were monitored periodically every 5 days according to the retention time. The calorific value of the biogas was then calculated based on the percentage of methane content obtained. The results showed that biogas production increased with retention time, with peak production occurring on the 25th day. The maximum methane (CH_4) content reached 58%Vol and the highest calorific value was 20.76 MJ/m³ at the maximum CH_4 composition. This study demonstrated that digester capacity, raw material volume, and operational parameters such as pH, temperature, pressure, and retention time significantly influence the quality and quantity of biogas produced.

Keywords: Biogas, Digester, POME, Cow Manure, Calorific Value