

METHANE PRODUCTION FROM PILOT PLANT ANAEROBIC DIGESTER FED BY FOOD WASTE

FINAL PROJECT

As one of the requirements for completing

The Bachelor's Program

In the Departement of Environmental Engineering

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By:

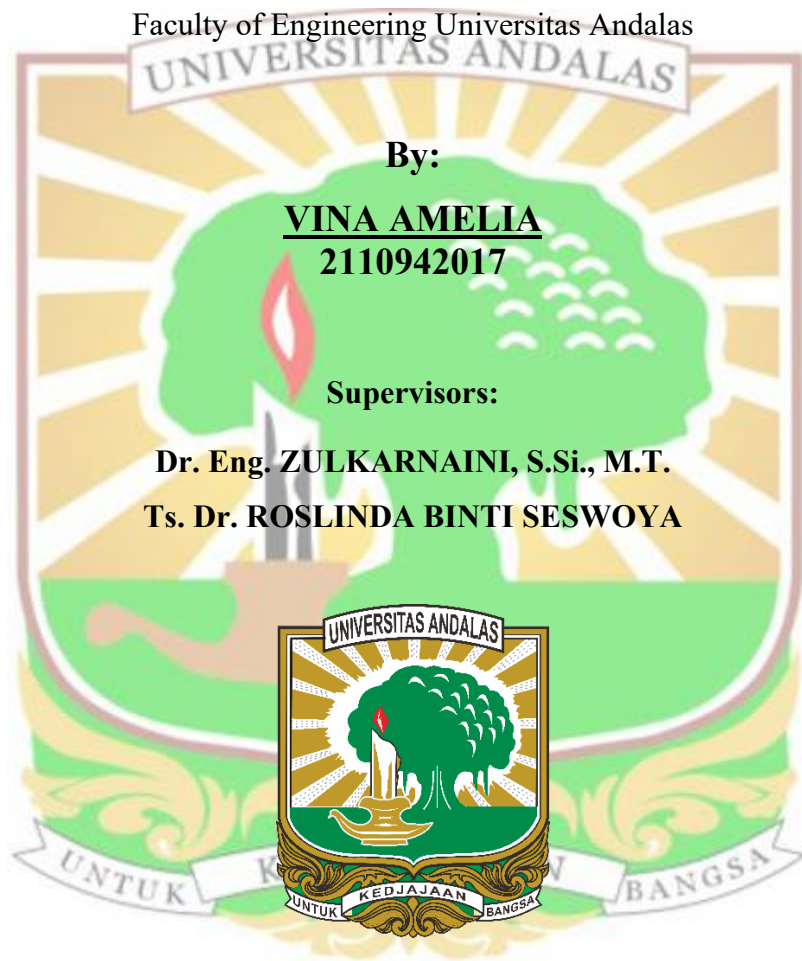
VINA AMELIA

2110942017

Supervisors:

Dr. Eng. ZULKARNAINI, S.Si., M.T.

Ts. Dr. ROSLINDA BINTI SESWOYA



**BACHELOR'S DEGREE PROGRAM IN
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FACULTY OF ENGINEERING – UNIVERSITAS ANDALAS
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ABSTRACT

Food waste is a significant global issue that contributes to environmental pollution and resource waste. In developing countries, food waste is primarily disposed of in landfills, where it decomposes and generates greenhouse gases. Anaerobic digestion converts food waste into methane-rich biogas for energy. This study characterized food waste and the inoculum. It analyzed methane production in batch mode at ambient temperature using a 110 L pilot plant anaerobic digester, mixing at 120 rpm for 15 days. Food waste from a UTHM cafeteria and inoculum from the digestate of a biogas plant treating palm oil mill effluent (POME) were mixed at an inoculum to substrate ratio (ISR) of 2.0 (VS basis). Daily methane production was monitored using water displacement until production nearly ceased. Food waste showed a high organic content, with a VS/TS ratio of 0.94 and a COD of 37.35 g/L, while the inoculum had a near-neutral pH of 7.25. Operation at OLR of 2.51 kg VS/m³·d had no acclimatisation period, with an effluent pH of 7.81. The system achieved a maximum methane production rate of 28.81 mL CH₄/g VS·d on day 1, with a total yield of 173.50 mL CH₄/g VS after 15 days. Organic removal efficiencies reached 65.1% (TS) and 60.3% (COD). Kinetic evaluation showed that both the First-order ($k=0.137 \text{ day}^{-1}$) and Transfer Function ($R_{\text{max}}=27.036 \text{ mL CH}_4/\text{g VS}\cdot\text{d}$) models provided an excellent fit ($R^2=0.999$, RMSE=1.198). These findings support food waste as a biogas feedstock, promoting sustainable waste management and renewable energy through ambient anaerobic digestion.

Keywords: Ambient, food waste, methane, pilot plant, solid.

