DESIGN, FABRICATION, AND PERFORMANCE EVALUATION OF A TWO-STAGE GAS CLEANING SYSTEM FOR BIOGAS DIGESTER

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ABSTRACT

SOLLANO, RENDELL IAN A., Department of Agricultural and Biosystems Engineering, College of Engineering, Central Luzon State University, Science City of Muñoz, Nueva Ecija, Philippines, **July 2023**, **DESIGN, FABRICATION, AND PERFORMANCE EVALUATION OF A TWO-STAGE GAS CLEANING SYSTEM BIOGAS DIGESTER**

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Biogas is a renewable energy source produced through Anaerobic Digestion (AD) and is considered as sustainable compared to traditional fossil fuels. However, impurities in biogas can reduce its energy content, which can be addressed by removing the impurities and incombustible gases. This has driven the study to design, fabricate, and evaluate a two-stage gas cleaning system for anaerobic biogas digester. The gas cleaning system for anaerobic biogas digestion was designed focusing on water scrubbing absorption technique and was fabricated using locally available materials. The experiment involved using pig manure as substrate for biogas production and conducting tests on the system's gas yield using IRCD4 biogas analyzer. Six sets of trials were carried out to determine CH_4 increase and removal efficiency of CO_2 and H_2S after passing through the gas cleaning system. T-test for two dependent samples was done to analyze the gathered data.

Based on the analysis of the study, increase in methane concentrations after the biogas passed through the gas cleaning system were 9.30%, 4.76%, and 7.14%, 4.87%, 2.44%, and 4.87%, respectively. The average removal efficiency level of H_2S and CO_2 across six (6) trials was 88.88% and 11.95%, respectively. T-test for two dependent samples revealed there is a significant difference ($p<0.05$) between the concentration of

CH_4 and H_2S before and after the gas cleaning/upgrading process while there is no significant difference ($p>0.05$) between the concentration of CO_2.

Keywords: biogas; gas cleaning; water scrubbing; methane

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