

Enhancing Rural Industrial Development in Sri Lanka through Biogas Compression and Storage System: A Sustainable Power Solution

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Biogas, an environmentally friendly power source created from organic waste through anaerobic processing, holds enormous potential for meeting the country's energy needs. However, its low energy density, and ineffective storage options hinder biogas utilisation. Low-pressure gas storage tanks are one of the most common ways to store biogas, although they have shortcomings in safety, transportability, and storage capacity. Biogas is compressed by reducing its volume while raising its pressure, which increases its energy density. This paper analyses the compressing of biogas in LPG cylinders to increase energy generation. Moreover, this paper examines the feasibility of using compressed biogas in rural industries. Firstly, Impurities were removed from the biogas before entering the compression system. Carbon dioxide and moisture were removed using a water scrubber, and the biogas was passed through a Hydrogen sulphide separation unit to extract hydrogen sulphide using the catalyst iron oxide. Then, the purified biogas was compressed in liquefied petroleum gas cylinders weighing 12.5 Kg and 5 kg. Biogas samples from different sources of feed materials, such as pure cow dung and a mix of cow dung and poultry excreta from which the biogas was generated, were used at various cylinder pressures to understand the performance efficiency of internal combustion engines. The average time to run a 3 HP engine is around 40 minutes when using a 12.5 Kg LPG cylinder filled with compressed biogas at 10 Bar. Hence, it is evident that machines powered by compressed biogas can be used for rural industrial activities like coconut oil extraction, brooder houses for chickens, and lifting water for drip and sprinkler irrigation systems. The study reveals that compressed biogas is a viable solution for boosting green rural economic development, and further research is essential to determine the ways and means to run automobiles cost-effectively in Sri Lanka.

Keywords: Compressed biogas, Energy density, Rural industries, Automobiles, Cow dung

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