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# Bottling biogas into cylinders as an alternative, sustainable energy source to mitigate climate change

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Biogas is widely used in rural and peri-urban areas in Uganda and Africa at large for cooking and lighting. But its commercial use has never been realized due to difficulties in its storage and transportation. The solution identified to the problem is to increase the energy density of the gas through the removal of incombustible and corrosive gas and consequent compression which was experimented on a lab-scale model. Biogas generation and subsequent bottling will cater the energy needs of rural industries in villages, supply enriched manure and maintain village sanitation. The bottling system will work as a decentralized source of power with uninterrupted supply using local resources, generate ample opportunities for employment in rural areas and income of the people through a set of rural industries It should be replicated at mass scale for the development of villages. Further, still, Biogas is becoming an increasingly important source of energy for rural areas in developing countries due to readily available organic wastes like kitchen wastes. Biogas has an advantage in terms of low-cost sustainable energy. Biogas is an appropriate alternative to the traditional solid and gaseous cooking fuels used by developing rural communities. A biogas digester is used to collect kitchen wastes and convert it to biogas through anaerobic digestion processes. Biogas is a clean-burning, renewable fuel that contains 50-60% methane and can be used in household cooking applications without an appropriate method of compression, the gas remains of a large volume and it is difficult for transport and storage. This paper presents studies that show the possible commercialization of bottled biogas in cylinders. That can be an alternative sustainable energy source yet keeping quantity and quality; if at all improvements in technological and financial support are availed. The case studies presented in this paper illustrate, compression of biogas carried out by methane refrigerant compressor and bottled into normal LPG cylinder. Compression of biogas was carried out under near Isothermal and Adiabatic conditions up to 11bar absolute pressure. The energy efficiency of compression was determined to be 98.71% and if the gas used for generation of electricity using a generator with an efficiency of 30%, the net energy efficiency turned out to be 95.72%. Later, a boiling test was conducted whereby the combustibility of the compressed biogas from the cylinder in normal biogas-stove was tested to validate its use in cooking.

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