BIOGAS PRODUCTION FOR DOMESTIC APPLICATION

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1.0. ABSTRACT

The purpose of this research paper is to investigate biogas production process. This aims to determine the process conditions that maximize biogas generation and the appropriate manure - water mixture that enhances biogas output. This paper also presents a design of biogas digester for backyard or farm use.

Biogas is the product of the digestive actions of anaerobic bacteria during fermentation of organic materials. The environment of the processing microbial bacteria contributes largely to the stimulation of biogas production. The more conducive the process conditions to bacterial growth, the higher is the biogas output. The following fermentation conditions are ideal for maximum biogas production: a.) oxygen – free anaerobic digestion b.) steady temperature inside the digester tank at mesophilic temperature of about 36deg.C c.) pH or degree of acidity of more than 6.5 but less than 7.5 d.) alkalinity of about 3000 milligrams per liter of slurry e.) sufficient amount of nutrients, phosphorous and nitrogen f.) absence of inhibiting salts, heavy metals and excess ammonia g.) constant solids loading rate at 2 to 3 kg/cubic m. of digester volume per day.

Aside from the process conditions, biogas output is also enhanced through the use of appropriate slurry mixture.

The water – manure proportion provides the appropriate acidity as well as the desired ratio of carbon and nitrogen needed by the bacteria to survive. Proper digestion proceeds at an optimum rate when the carbon content of the slurry or materials used are about 25 times the nitrogen content.

Using hog manure, the slurry mixture of 1:1:0.20 (water-manure-starter) and 1:1:0.25 yield the highest volume of biogas. Every kilogram of water requires a kilogram of hog manure and ¼ kilogram of slurry starter to attain the highest production rate of biogas.

As to the working model of biogas digester presented in this paper, it generates 11,427.73 Btu of fuel energy per day out of the digested wastes from 20 pig heads. The total volume of the tank is 5.96 cubic meters and has construction cost of P 21, 036.05.

This paper recommends the formulation of biogas technological and process designs suitable for domestic use. Extensive research and development activities through pilot – plant stage must be undertaken with full support and funding by the government.

Furthermore, national policy should also support extensive research and studies on the wider application of biogas fuel as source of energy. Information on this is basic in commercializing its use.