DEVELOPMENT OF A LOW COST PLUG FLOW ANAEROBIC DIGESTER FOR FARM WASTE TREATMENT AND BIOGAS PRODUCTION

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ABSTRACT

This project is proposed to meet the direct request from the Prime Minister of Malaysia who encourages research activities based on biotechnology and environmental protection in Malaysia. The Malaysian government has placed the sustainable, renewable and biotechnology based research and development as the highest priority in its National Research and Development Strategy. Currently, farm wastes such as swine, poultry manure and cattle dungs are directly disposed or discharged in to the open channels and river systems. These problems are clearly evident among the small scale farmers who are cannot affort to have a sophisticated and costly waste treatment plants. It causes an alarming rate of enviromental pollution, expecially water pollution. Thus, a new methodology for the treatment farm waste namely 'plug-flow anaerobic digester' is proposed. At the same time this system also designed to produce biogas for domestic use. The research started by designing a trial anaerobic digester where we found that the trial digester successfully yielded gas. Hence, the research was expanded by testing the digesters with different scenarios (open and controlled environment). The research was also conducted with different waste concentration to demonstrate the use of several animal waste to be used in the anaerobic digester to yield methane gas to propose optimum configuration of the plug flow digester. It is found that the digesters are affected by several crucial factors such as the solid concentration, solid retention time and temperature. From the study it is recommended that the best performing digesters are the digesters that are exposed to high temperature and contained higher solid concentrations. It was concluded that further study need to be carry out with advanced equipment to test the composition of biogas. Odour control, renewable energy production, pathogen reduction, greenhouse reduction, reduction in total oxygen demand of the treated manure are some of the key expected benefits of an anaerobic digester. The system suggest if implemented at the field scale may help the farmers, reduce pollution and even more give profit to farmers. This project demonstrate the bridge of bioengineering knowledge that it can be apply in various sector and will be the pioneer idea to others future or present civil engineers.