1973 - 1974

Success Story

METHANE PRODUCTION FROM ANIMAL WASTE WITH A SOLAR REACTOR

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A senior design project in the Biological and Agricultural Engineering Department was initiated to investigate energy conservation potentials associated with the anaerobic degradation of animal waste. The initial goal was to develop a reactor that would combine the basic principles of a solar still and a sewage sludge digestor to facilitate anaerobic treatment of animal waste with emphasis on energy recovery in the form of methane gas. Since the initiation of this project, waste treatment and energy conservation have become unanticipated synonyms which are gaining accelerated attention by both the general public and trained professionals.

The two forms of energy-rich materials in animal waste are nitrogenous and carbonaceous compounds. The utilization of animal manure as a fertilizer for crop production is well known and widely practiced throughout the world. Individual septic tanks for methane production from waste, particularly cow manure, in India are very common for obtaining methane gas to provide low grade energy requirements for lighting and cooking.

Experiments from the prototype study justified the construction of a larger reactor with more flexible operating capabilities for continued research investigation. This 500-gallon solar still type reactor has a transparent top section which slopes at 20° with respect to horizontal for better sun penetration. The glass and plexiglass top materials have not become visibly deteriorated during the current 9-month operational period. Generally the reactor fluid remains about 20° F. above the average daily temperature during the winter months, and thus this year's average has been between 65° to 75° F. During warmer periods solar heating is sufficient to produce and maintain temperatures above 98° F. which is specified

as the optimum temperature for the biological production of methane gas. Thus a shield is used to restrict solar radiation and the insulation maintained around the total reactor results in reduced nocturnal heat loss for continuous temperature control between about 90 to 95° F. At present the reactor is loaded three times per week with 50 gallons of swine waste representing the equivalent input from about ten 100-lb hogs. The liquid in the reactor is mixed by a 5-horsepower pump for approximately 15 seconds every 15 minutes.

Maximum methane gas production recorded to date when the reactor fluid temperature was about 85° F. has been about 25 cubic feet. Assuming that the average person in the United States uses about 60 cubic feet of natural gas per day and that this reactor could produce 25 cubic feet of methane per day continuously in conjunction with methods to conserve all of this energy, the investigated reactor which receives waste from ten 100-lb hogs could provide about 40% of the daily natural gas requirement of an average United States citizen.

At present this methane generator is being operated as high rate digestor which requires additional unit processes to render total treatment. Thus this reactor is envisioned as a preliminary treatment device for energy conservation prior to lagoon discharge with terminal land application of excess liquid. Although the energy value of the methane gas is not as large as some high energy materials such as gasoline or wood, long range availability and production rates may make this waste energy conservation scheme more attractive and technically feasible in the future.

1973 - 1974

Success Story

SWINE HOUSING

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The revolution in swine housing has been nothing short of phenomenal. A major factor in the changing style has been the development and acceptance of a ventilation system as an integral component of the house design. This ventilation system provides a continuous variable air flow rate which in addition to producing the optimum environment practically eliminates odors because they are exhausted from the building before appreciably entering the pig atmosphere. Demonstration facilities at the Upper Coastal Plain Research Station and on the farms of North Carolina producers have been most effective in enhancing acceptance because it affords a prospective builder the opportunity to visit an operating commercial unit that is similar to his planned facility. Also, national publicity arising from the success and subsequent acceptance of under slat ventilation has focused attention on this concept and correspondingly generated enthusiasm for proper ventilation. Thus, millions of dollars have been invested in new swine housing recently.

Through its applied research activities, Extension has been most effective in studying and then influencing construction in this commodity area through its many educational programs. As a result of acceptance into the Cooperative Plan Exchange, several of our plans featuring the North Carolina system of under slat ventilation are now available to every state for distribution. Additionally, many requests for subject matter information and building plans from out-of-staters have been received following widespread coverage in national publications.