

The single-tank plug flow system is a simple adaptation of the digester type which has long been used in Asia (Figure 6-6). The feedstock is loaded through the inlet, digested material is removed from the outlet and biogas is taken from the top of the fermentation tank where it collects.

Multitank batch systems consist of a series of tanks which are sealed after being charged with feedstock. When the digestion process is complete the biogas is drawn off and the effluent is emptied. Such systems are well adapted to operations which produce feedstock in batches rather than steadily.

A single-tank complete mix system consists of a fermentation tank which is heated and mixed several times daily. This system may be coupled with a second unmixed, unheated storage tank to form a two-stage digester in which additional degradation takes place and solid wastes are allowed to precipitate. The second tank allows yields of biogas to be improved. This type of reactor is used primarily for sewage treatment.

Experiments are now being carried out with multi-phase digester systems in which successive tanks are regulated to optimize the various steps in the fermentation process. These are complex systems which must be carefully managed and are presently being studied utilizing sewage sludge as the primary feedstock. They may be adaptable to other feedstocks as well and theoretically could achieve high overall efficiencies in biogas generation.

Another variation in reactor design utilizes different types of "beds" to act as a material support for the bacterial populations which bring about the digestion of

the raw organic matter. In this design the feedstock slurry is fed upwards through a vertical column packed with small stones, plastic balls, ceramic chips or other inert materials. The bacteria attach to this column material and degrade the organic matter as it flows past them. The design allows large quantities of slurry to pass through the digester while maintaining a high concentration of bacteria on the support material. This system is best suited to dilute municipal sewage as thicker feedstocks rapidly clog the column.

CONCLUSION

A wide variety of digesters has been described in the literature and a number are available from manufacturers. This type of system can help farmers attain energy self-sufficiency on their farms, and for operators of large feedlots and stockyards it offers the added bonus of reducing pollution problems by treating hazardous wastes. There are other advantages to be gained from anaerobic digestion, including the production of fertilizer and, possibly, animal feed.

RECOMMENDATION

The Committee recommends that the technology of anaerobic digestion should be actively pursued in Canada and that additional biogas reactors should be installed to demonstrate their effectiveness in the Canadian environment.

Figure 6-6: CHINESE DESIGN OF A BIOGAS DIGESTER

