

THE ANAEROBIC DIGESTION OF ORGANIC SOLID WASTES

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ABSTRACT

Anaerobic digestion offers many advantages in the processing of organic solid wastes, using a closed system to convert the waste to combustible gas and a stabilized organic residue. Odors are contained while digestion removes their source and gas is collected for energy recovery as heat or electricity. The stabilized residue is less than the starting waste by the mass of gas produced, and it can be disposed of by land application, land filling, incineration or composting.

The stimulation of digesters and the phenomenon of co-digestion are two ways the performance of anaerobic digesters can be enhanced. Data from farm digesters and municipal wastewater treatment plants illustrate the present venue of the process; laboratory studies of the anaerobic digestion of a variety of solid wastes show that the process can be applied to these materials as well. About two thirds of municipal solid waste is shown to be amenable to anaerobic digestion in a substrate from an active municipal sewage plant digester.

BACKGROUND

Anaerobic digestion is a process which converts organic matter into a gas and a stabilized residue, by microorganisms in

the absence of oxygen. Many microorganisms thrive in anaerobic environments such as swamps, peat bogs, soils, aquatic deposits, forest litter, the digestive tracts of animals, for example. Anaerobic digestion was an essential step in laying down fossil fuels like coal, oil, lignite and natural gas. The process occurs inadvertently in many places where organic matter is kept in a way that generally excludes oxygen, such as land fills, sewer lines, etc; gas is evolved and undesirable components which are odorous or toxic may be released to the environment from these uncontrolled sources.

The largest intentional application of anaerobic digestion by man has been in the stabilization of municipal wastewater sludges. From here, the practice has begun to spread to the treatment of animal wastes [Robinson, 1980], waste streams from food processing plants [Price and Cheremisinoff, 1981a] and to the digestion of organic wastes from chemical plants [Torpy, 1988]. For these applications, digesters are built which exclude air so that anaerobic processes can take place. Most digesters also provide temperature control [commonly 95-100F], and at least enough mixing to distribute the raw feed and to release the gas generated so that