

ANAEROBIC DIGESTION

Fundamentals of Anaerobic Digestion of Dairy Manure

BACKGROUND

Anaerobic digestion is a biological process using microbes not requiring oxygen. This community of microbes converts the degradable solids in manure to biogas, (approximately 60% methane and 40% carbon dioxide, along with a few other trace gases). The daily biogas production varies but normally is between 60 and 80 ft³ per cow per day. The energy value of biogas is approximately 540 Btu's per ft³. Biogas production depends on the temperature and size of the digester and the amount and type of manure. The hydraulic retention time, the time a particle of manure is held in the digester, averages 21 days for conventional plug flow and mixed digesters and as low as 1 to 5 days for fixed film units.

Typical layout: Liquid manure (12% total solids) from the barn is heated and pumped to charge the digester vessel multiple times per day (a digester is like a cow, it works best when fed throughout the day). A digester is generally constructed from concrete or glass-lined steel panels and should be well insulated to minimize heat loss. The manure influent displaces some manure in the digester and the effluent is discharged. Biogas is plumbed from the digester to where it is utilized.

Biogas use: Heat developed by the burning of biogas, either by a boiler or in an engine, is used to heat and maintain the digester at operating temperature. Not all the biogas produced is needed to heat the digester. Extra biogas may be flared off or used in another enterprise. It is very difficult to use biogas for anything but continuous on-site consumption.

Solid-liquid separation of the digester effluent is used by some farms to obtain solids. Although microbes convert some of the manure solids, the digester effluent still has about 8% solids. The separation process also allows the liquids to be more easily pumped. The solids handling options may include further processing on-farm by aerobic (oxygen present) composting, land application, sales, or use as bedding material.

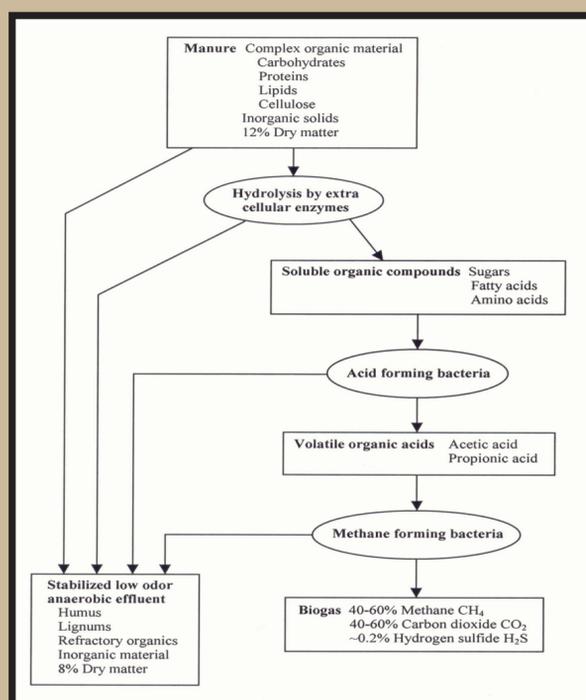
Nutrients in digested effluent do not differ much from that of the raw material. Thus farmers can use the treated manure as an inorganic fertilizer for their field crops. The effluent has very little odor so it can be spread on fields or at times where odors previously prevented spreading.



A horizontal plug flow digester with a flexible top membrane located in Cortland County.



A vertical fixed film digester located on a 100-cow tie stall farm in the Catskill region of New York state.



The anaerobic process turns manure into methane, carbon dioxide and a stabilized low odor effluent.

