

## **Anaerobic Digestion of Municipal Solid Waste: A Review of Operational Issues**

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Anaerobic digestion of municipal solid waste (MSW) has two-fold advantages: a feasible solution for environmental pollution control and a source of low-cost energy. Nevertheless, it has not yet gained as much attention as aerobic digestion, mainly because of the high capital expenditure and difficulties in stabilizing the reactor operations. The aim of this study is to find out the operational issues especially behind solid waste anaerobic digestion. In comparison to liquid phase anaerobic digestion, solid waste anaerobic digestion requires a larger amount of inoculum and much longer retention time. Poor mixing of solid substrate in the bioreactor negatively impacts on mass and heat transfer, and thereby on reaction kinetics. The intermediate volatile fatty acid (VFA) accumulation is one of the major issues in solid waste digestion. The VFA accumulation occurs because of biochemical reactions of complex and heterogeneous molecules in the substrate. The substrate is a mixture of different molecules belonging to four main categories: carbohydrate, protein, lipids and cellulose. The VFA is formed at different rates as a result of the hydrolysis and acetogenesis of vastly different components in the substrate at different rates. The highly soluble substrate increases the VFA concentration rapidly, and as a result the pH is dropped suddenly to create an inhibitory environment for acetogenic and methanogenic reactions. Another serious problem with the substrate is the presence of organically bound nitrogen compounds. Inhibitory products such as ammonia, ammonium, nitrites and nitrate that enters the system during the metabolic activities of these compounds and make the process unstable. Particle size of the substrates too determines contact surface area of microbes and then the rate of reaction. Finally, it is concluded that though the municipal solid waste is a sound substrate for anaerobic digestion, there are several issues to be addressed further.

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