**438f Hydrodynamic Study of Gas Recirculation Aerobic Bioreactors Using Radio Active Particle Tracking and Gamma Ray Tomography**

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Animal waste from agricultural sources is a hidden source of unexplored renewable energy (Lusk, 1998). About one billion tons of animal waste is generated in the United States annually. Most of it is discharged untreated, and is a major cause of pollution. Methane generated from the waste due to degradation is a green house gas, can be utilized as a source of energy. Anaerobic bioreactors facilitate the process of generation of methane, and energy source, from such waste in an efficient manner via anaerobic digestion (Ghosh, 1997). . Like all heterogeneous reaction systems, mixing plays an important role in the performance of anaerobic bioreactors. A better understanding of the mixing in such process is required to understand its effect on the performance of such reactors. Hydrodynamic studies have been carried out on gas recirculated six inch diameter, 4.2 liter volume, anaerobic bioreactor with a conical bottom (25o angle). The riser section of the reactor consists of a draft tube with a diameter of 1.5 in (38mm), and the down commer section consists of the annular region between the draft tube and the wall of the reactor. The gas was introduced in the bottom of the draft tube. The effect on mixing of a single orifice sparger (ejector) system versus a multipoint sparger, for the introduction of gas into the system, was studied (Kojima, 1999). The gas phase distribution and the velocity profile and flow pattern studies have been carried out on this system with the synergistic use of single source gamma ray Computer tomography (CT) and Computer Automated Radioactive Particle Tracking (CARPT). The studies have been carried out for the same superficial gas velocity for both, the single point injection system, and multipoint sparger. Hence the effect of mixing for the same energy input using two different types of spargers has been studied.

The studies show that better recirculation is obtained with the aid of a multi orifice sparger versus a single point sparger for a given gas flow rate. The multi orifice sparger enhances the gas distribution with in the riser section of the reactor. This in turn affects the recirculation velocity of the system.

References:

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