Impact of sewage sludge co-disposal on waste degradation in anaerobic reactors

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The treatment of the water and wastewater results in generation of biosolids which are also known as sewage sludge. Like many other wastes, sewage sludge creates serious disposal problems. Landfilling of sewage sludge has significant advantages such as easier handling, accelerating on at waste stabilization rate and lower capital investment when compared to other disposal techniques. Bioreactor landfills are a modification of conventional landfill systems with the addition of leachate recirculation which promotes optimum moisture content ensuring energy recovery in the form of biogas and sufficient nutrients for the microorganisms during waste stabilization. Previous studies indicated that co-disposal of municipal solid waste and sewage sludge in a single bioreactor landfill offers potential cost savings, dilution of toxic compounds, increased digestion rate, increased load of biodegradable organic matter, improved quality of leachate and enhanced biogas yield.

From this point of view in this study, the impact of co-disposal of sewage sludge with municipal solid waste was evaluated by using batch tests. To accomplish the objectives of the study, aerobically digested sludge cake from Paşaköy Wastewater Plant, anaerobically digested sludge from Fritolay factory and synthetically prepared municipal solid waste were mixed and digested in 10L anaerobic reactors under mesophilic (32 ^{o}C) conditions. In order to understand the effect of sludge addition on waste stabilization process and determine the most promising ratio, the digestion rate of organic matter, the total gas production, methane yield and organic material removal were maintained for various sludge to waste ratios (1:4, 1:7, 1:10 and control reactors).

After 100 days of digestion, 81.3 L of biogas was produced in the sludge only control reactor and 69.1 L of biogas produced in the reactor which had sludge to waste ratio of 1:4. The methane content of the biogas was higher in these two reactors, with concentration of %52.9 and %47.9, respectively. Chemical oxygen demand, heavy metal and TKN removal rates were highest in 1:4 reactor. Besides, volatile fatty acids, sulfate and orthophosphate concentrations were found optimal for this reactor. The results of this study showed that the co-disposal of sewage sludge in bioreactors is a very promising technique and 1:4 sludge to waste ratio is the optimum ratio for waste and sludge stabilization.