Accelerating Waste Reduction and Biogas Production of Municipal Solid Waste

Engineering Technology
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Introduction

Landfills have limited space and capacity for waste. As people produce more and more waste, landfills can fill up, which leads to cities creating new ones. More landfills means more habitat loss. Murfreesboro's Middle Point Landfill has only about eight years of capacity left (Fig. 1). The waste in landfills also houses bacteria which produce methane gas as they digest the waste.

Figure 1- In 2017, officials announced The Middle Point landfill in Murfreesboro is close to capacity.

The volume of waste decreases as the bacteria digest the waste. The methane gases produced could be collected and used as a renewable energy source, instead of being released into the environment. Accelerating the anaerobic digestion could solve landfill space issues.

Anaerobic Digestion (AD)

Accelerating anaerobic digestion of municipal solid waste (MSW) can theoretically be done by co-digesting MSW with animal manure, which would provide the bacteria needed, or adding elements such as Iron and Nitrogen, which the bacteria need for the biochemical reactions involved in AD.

Research Question

Does adding animal manure and accelerants to municipal solid waste increase the rate of waste reduction and biogas production as bacteria anaerobically digest the waste?

Experiment Design

At optimum Temperature and pH for bacteria growth, we use animal manure and accelerants (Fe, Ni, N, and P) to test four mixtures (Fig.2):

- MSW with only accelerants
- MSW with only animal manure
- MSW with no accelerants or animal manure
- MSW with both accelerants and animal manure

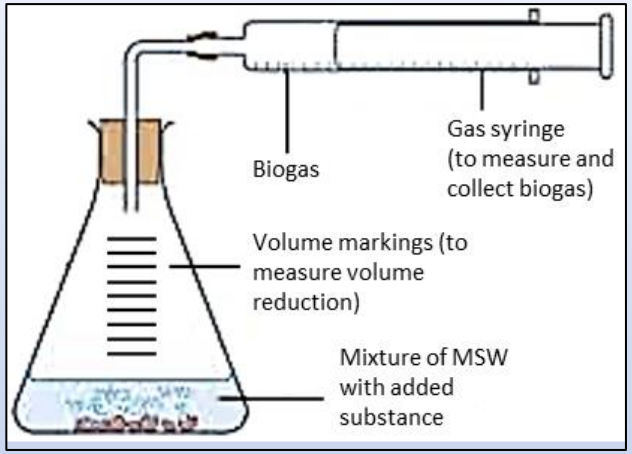

Figure 2- Anaerobic digestion experiment design

Expected Results

The efficiency of AD for four mixes will be compared to find the optimum conditions for MSW volume reduction and biogas production. We expect to see the animal manure and accelerants mixture to show the highest rate.

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