

EFFECT OF AERATION ON FRESH AND AGED MUNICIPAL SOLID WASTE

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ABSTRACT

Under the anaerobic conditions of conventional sanitary landfill, entombed municipal solid waste (MSW) is slow to stabilize necessitating long-term monitoring and pollution control. Although anaerobic conditions can provide revenue through energy generation, aerobic stabilization may offer several advantages including reduced fugitive greenhouse gas emissions, accelerated landfill stabilization, and increased landfill airspace recovery.

Air injection was applied to bench-scale bioreactor landfills in order to determine the potential for active aeration to accelerate municipal solid waste stabilization and settlement in both new and pre-existing landfills. Fresh and aged wastes were used to represent newly constructed and existing landfill matrices over 130 days.

In the fresh MSW bioreactors, aeration reduced the time to stabilization of leachate pH by 44%, TSS by 25%, TDS by 54%, BOD₅ by 38% and COD by 59%. Ammonia concentrations stabilized after 129 days of aeration, but remained problematic in the anaerobic bioreactors at the study conclusion. Final leachate concentrations were consistently lower in the aerobic bioreactors than in their anaerobic counterparts. Physical settlement also improved, resulting in a 21.5% recovery of landfill airspace in the aerobic fresh waste bioreactors. Aeration had a similar but reduced influence in the aged waste bioreactors since they were near stabilization at the study inception.

The results of this study indicate that aeration significantly accelerates stabilization of MSW with greatest influence on fresh waste with a high biodegradable organic fraction.