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## LANDFILL LEACHATE RECIRCULATION. PART I: SOLID WASTE DEGRADATION AND BIOGAS PRODUCTION

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### Abstract

Anaerobic degradation (AD) of municipal solid waste (MSW) depends on the moisture and nutrient distribution within the bioreactor; these factors are affected by leachate recirculation. In this work, the effects of leachate recirculation of 15 to 120 by volume percentage (%V) on AD were studied. The objectives of this study are as follows: a) to determine which recirculation rate provides the best conditions for accelerated anaerobic degradation (AD) and b) to determine the optimal range of recirculation rates for methane (CH<sub>4</sub>) generation. In the first group of experiments, denoted as the exploratory range, laboratory-scale bioreactors (LSBs) were operated at leachate recirculation rates of 15, 30, 60 and 120% V. In a second group of experiments (denoted as narrowed range), a group of seven LSBs were operated at rates of 40, 60 and 80% V, and seven were employed as control, without recirculation. In this stage, LSBs were periodically dismantled to allow testing of the digested MSW. The AD rate was monitored for 201 days along with other variables, including the total volatile solids, holocellulose, lignin, organic carbon, total nitrogen and pH of the MSW matrix, the characteristics of the produced and recirculated leachates and CH<sub>4</sub> production rates. The results indicated that methane production during the methanogenic fermentation stage is directly correlated with the recycling rates. The 120% V recirculation rate was observed to cause washout in the waste matrix. The suggested range on the basis of CH<sub>4</sub> generation per liter of recirculated leachate was 30 to 40% V.

*Key words:* biomethanation, leachate recirculation, municipal solid waste

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