

AN ABSTRACT OF A THESIS

IMPACT OF INOCULUM ON STARTUP CHARACTERISTICS OF A SIMULATED, ANAEROBIC BIOREACTOR LANDFILL

Christopher J. Smith

Master of Science in Civil Engineering

Much research has been done on landfill leachate recirculation and how this practice has benefited society. However, little research has been conducted on the impact of different bacterial seed sources on startup characteristics of these bioreactor landfills. Anaerobic digested sludge (ADS) from an anaerobic digester and aerobic waste activated sludge (WAS) from a wastewater treatment plant's oxidation ditch are the two different bacterial seed sources used in this study to evaluate the startup and performance characteristics of two laboratory scaled, simulated, anaerobic bioreactor columns. Environmental parameters such as pH, chemical oxygen demand (COD), dissolved oxygen (DO), gas production, total alkalinity, and leachate temperature were monitored and analyzed every three to four days to check which phase of the anaerobic digestion process each column was currently operating in and to compare and contrast any significant differences between these criteria.

Each column was placed in a constant temperature room (20°C) under a laboratory hood for odor control purposes. Leachate was constantly recirculated at a rate of approximately sixty-seven milliliters per minute, and moisture and baking soda supplements were added to account for biological moisture uptake and pH and alkalinity control. This research showed that there were no significant differences between the environmental parameters between the two bacterial seed sources in initiating the anaerobic digestion process of the simulated municipal solid waste except for alkalinity and gas production. WAS surpassed the ADS in producing more biogas overall and maintaining an optimum alkalinity concentration. Consequently, this research confirmed the possibility of using WAS as a substitute seed source for instituting future laboratory, pilot, and full-scale anaerobic digesters and bioreactor landfills.