Anaerobic/aerobic treatment of hazardous waste leachate

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Abstract

In the normal operation of a landfill a liquid effluent, leachate,is generated from incorporated liquids mixed with soluable materials disposed within each trench, and rainwater that infiltrates and percolates through these soluable materials. Because this highly variable composition leachate is frequently resistant to conventional aerobic biological treatment, there is a need to evaluate other biological treatment technologies to develop a process scheme that will use biological processes to treat this leachate. In response to this need, Chemical Waste Management, Port Arthur (CWM-PA), joined with the Gulf Coast Hazardous Substance Research Center (GCHSRC) on a joint project to evaluate anaerobic/aerobic biological treatment of the hazardous waste leachate generated at the CWM-PA closed landfill. In December, 1989, a 10.7 liter upflow anaerobic reactor with granular activated carbon (GAC) as a support media was started up with a synthetic glucose feed. Over the next four months the microorganisms were acclimated to 22 mg/l phenol. Beginning in mid-April 1990, 1% leachate was added to the feed. Over a six month acclimation period the COD was raised to 6000 mg/L by decreasing the glucose and increasing the percent leachate in the feed. In mid-October 1990, glucose was removed from the feed. During the acclimation period the COD removal efficiency dropped from an initial 80% to 70% with a reduction in gas production. A 15-L aerobic batch reactor with a 23 hour aeration period was added in series with the anaerobic reactor in September 1990. Beginning in October the biological removal of ammonia nitrogen (nitrification) in the batch reactor occurred. Although only 50% COD removal occurred, the presence of nitrification, verified by a reduction in alkalinity, indicates that the remaining COD was inert to biological treatment and is not toxic to the sensitive nitrifying microorganisms. As the project continues, the effects of hydraulic detention times, replacement of the GAC in the anaerobic reactor, the maximum COD concentrations that can be treated, identification of inert organic compounds, as well as other areas that appear relevant, will be investigated. The budget for this continuation of $126,928 with $41,240 participation by the GCHSRC. Previous work has been budgeted for $307,000.