LEACHATE TREATMENT OPTIONS FOR SANITARY LANDFILLS

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Abstract: At the dawn of the new millennium, sanitary landfill remains an environmentally sound and cost-effective option for disposing of the debris of modern civilization. It is a technology that can be successfully utilized by both developed and developing countries. Improvements in sanitary landfill design and operation parameters over the last decade have concentrated on lining systems and residuals management (gas, liquids). Improved lining systems have minimized the threat of groundwater contamination while simultaneously resulting in higher leachate recovery. Environmental protection demands that these liquids, typically high in organic content, be treated before discharge. The cost of managing these liquids is substantial in both the active and post-closure period. Numerous schemes have been developed to treat leachate. Most are based on traditional sanitary wastewater treatment technologies, but numerous innovative technologies or new applications of existing technologies, are now available for leachate treatment.
Several of the more promising of these treatment options (biological, physical, chemical, thermal) are described along with the associated advantages and disadvantages. The impetus for finding alternative leachate treatment technologies include:

- Reduced costs of managing leachate and other landfill liquids,
- Utilizing processes that are more amenable to changes in leachate quality over time,
- The ability to remove recalcitrant contaminants such as total dissolved solids (TDS) and,
- The ability to deal with higher ammonia concentrations as recirculation becomes more common.

The paper also addresses the emerging issue of leachate composition changes as a function of recirculation and bioreactor operation techniques. One of the most promising of the advanced landfill operating models is bioreactor, which uses moisture control (via recirculation and other methods) to optimize the degradation of organic compounds in a landfill. One potential concern is the concentration of ammonia in recirculated leachate. Cost effective and efficient ammonia control is one of the key requirements for successful bioreactor operations. The control of ammonia has not traditionally been addressed at on-site leachate treatment systems in the U.S. This is an area where concentrated research effort is required.

A case history of an U.S. East Coast landfill is presented to illustrate one method of on-site ammonia control. This landfill has recirculated leachate for several years. Concentrations of NH_3-N range from 300 to 550 mg/L. An enhanced biological process for the elimination of nitrogen from the landfill MSW and leachate was tested. Preliminary data suggests that the nitrification process was successful during the field trial and would be successful on a full-scale application.

Key Words: ammonia, bioreactor, evaporation, landfill, leachate, membrane treatment, nitrification, recirculation, reverse osmosis, treatment

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