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REDUCING ENVIRONMENTAL RISK OF LANDFILLS: LEACHATE TREATMENT BY REVERSE OSMOSIS

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Abstract

Sanitary landfilling is nowadays the most common way to eliminate municipal solid wastes, although waste management hierarchy considers landfilling as a last option. The resultant leachate produced due to waste transformation and rainfall can be identified by specific characteristics and variables, corresponding to high-strength wastewaters, which generate impacts and risks in the environment. This situation imposes stringently leachate treatment by appropriate and efficient methods and processes.

This research analyzes the performance of a municipal waste landfill leachate treatment system applying a membrane process - reverse osmosis (RO), for almost a year of operation. The system equipped with disc-tube (DT) membrane modules, and located in the sanitary landfill of the city of Iasi, Romania includes two stages: LEACHATE stage and PERMEATE stage, preceded by a pre-treatment module consisting of sand and cartridge filters. A storage system is included in the flow-sheet, for cleaning agents and various chemicals. Pumping stations provide the necessary operating pressure in the system.

A removal efficiency of contaminants (COD, NH₄⁺, electrical conductivity etc.) exceeding 90% was achieved. Any variation in permeate flux (14-22 L/m²h) and separation efficiency (94-100%) was due to increasing osmotic pressure and fouling, scaling and polarization of concentration.

The RO process demonstrated a high rejection rate for both organic and inorganic contaminants dissolved in the leachate, together with a high flexibility alongside the changes in the leachate composition, depending on pressure, temperature, pH feeding flow rate of leachate.

Key words: disc-tube system, landfill, membrane, pressure, permeate

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