

Analysis of performance disparity between Membrane Bioreactor (MBR) and Sequencing Batch Reactor (SBR) technologies in treating landfill leachate

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In solid waste dumps, the production of leachate and pollution of aquatic bodies is a serious problem. Before being released into the environment, the generated leachate must be properly treated. It can be treated using several physicochemical and biological approaches, as well as their combinations. The performance of the membrane bioreactor (MBR) and sequencing batch reactor (SBR) technologies in treating landfill leachate was examined in this study to identify the suitable technology for Sri Lanka. MBR models with a working capacity of 7.5 L and SBR models with a volume of 16.5 L were set up in the lab and fed with landfill leachate collected from the Karadiyana dumpsite. The leachate with a Chemical Oxygen Demand (COD) in the range of 2100 - 2800 mg/L, Biochemical Oxygen Demand (BOD₅) in the range of 260 - 320 mg/L, Total Organic Carbon (TOC) of 651 - 287 mg/L and Total Nitrogen (TN) of 475 ± 127.62 mg/L were fed to above reactors. The two treatment systems were evaluated for 60 days and analyzed for the removal efficiencies of BOD₅, COD, Total Organic Carbon (TOC) and Total Nitrogen (TN). In SBR, the removal efficiencies of BOD₅, COD and TOC were 76%, 65%, and 59%, respectively. Nevertheless, the MBR showed a superior performance with removal efficiencies exceeding 95% for BOD₅, 88% for TOC, and 80% for COD. TN removals were below 60% in both systems. The SBR technology offers flexibility in cycle time and sequence, however, its performance is constrained when considering land fill leachate associated with substantial variations in quality and quantity. The MBR technology improved removal efficiencies considerably.

Keywords: landfill, leachate, membrane bio reactor, sequencing batch reactor, wastewater treatment

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