



# Landfill leachate treatment using thermophilic membrane bioreactor

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## Abstract

This study was undertaken to investigate the performance of aerobic thermophilic membrane bioreactor (MBR) treating raw landfill leachate from two landfill sites in Thailand (Pathumthani site and Ram Indra site). The leachates from these sites were mixed in different proportions to produce a BOD/COD ratio of 0.39, 0.57, and 0.65, which was investigated in 3 experimental runs. The COD, ammonia, and TKN composition of the mixed leachate was 12,000, 1700 and 1900 mg/L, respectively. BOD was supplemented with glucose and soy protein. The system was operated at 45°C and at a hydraulic retention time (HRT) of 24 hrs. The membrane used was a ceramic membrane with an “outside-in” flow mode and consisted of 22 open fibres with an inner diameter of approximately 2 mm. The COD removal rate increased from an average value of 62–79% while ammonia removal efficiency decreased from 75 to 60% with gradual increase in BOD. Furthermore, a high BOD removal efficiency (97–99%) was also observed. This clearly indicates that thermophilic system is highly suitable for COD and BOD removal especially at elevated organic loading. However, the system does not favor high nitrogen content wastewaters as the ammonia removal efficiency dropped with increasing BOD/COD ratio. Similar trends were found in TKN analysis as well. However, this system could serve as a pretreatment in removing ammonia. The concentrations of soluble and bound extra-cellular polymeric substances (EPS) found in thermophilic MBR were higher when compared to the corresponding concentrations in a mesophilic MBR, which led to a higher rate of fouling in the thermophilic membrane.

**Keywords:** Extra-cellular polymeric substances; Landfill leachate; Membrane bioreactor; Mesophilic; Thermophilic

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