

Elimination Study of Organic Pollutants from Leachate Technical Landfill; Using Fenton and Photo-Fenton Systems Combined with Biological Treatment

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Abstract : The aim of this study is to evaluate the quality of leachate generated by the Batna landfill site, and to verify the performance of various advanced oxidation processes, in particular the Fenton and Photo-Fenton systems combined with biological treatment to eliminate the recalcitrant organic matter contained in this effluent, and to preserve reverse osmosis membranes used for leachate treatment. The average values obtained are compared with national and international discharge standards. The results of physico-chemical analyses show that the leachate has an alkaline pH =8.26 and a high organic load with a low oxygen content. Mineral pollution is represented by high conductivity (38.3 mS/cm), high Kjeldahl nitrogen content (1266.504 mg/L) and ammoniacal nitrogen (1098.384 mg/L). The average pollution indicator parameters measured were: BOD5 = 1483.333 mg O₂ /L, COD = 99790.244 mg O₂/L, TOC = 22400 mg C/L. These parameters exceed Algerian standards. Hence, there is a necessity to treat this effluent before discharging it into the environment. A comparative study was carried out to estimate the efficiency of two oxidation processes. Under optimum reaction conditions, TOC removal efficiencies of 63.43% and 73.4% were achieved for the Fenton and Photo-Fenton processes, respectively. COD removal rates estimated at 88% and 99.5% for the Fenton and Photo- Fenton processes, respectively. In addition, the Photo-Fenton + bacteria + micro-algae hybrid treatment gave removal efficiencies of around 92.24% for TOC and 99.9% for COD; -0.5 for AOS and 0.01 for CN. The results obtained during this study showed that a hybrid approach combining the PhotoFenton process and biological treatment appears to be a highly effective alternative for achieving satisfactory treatment, which aimed at exploiting the advantages of this method in terms of organic pollutant removal.

Keywords : leachate, landfill, advanced oxidation processes, Fenton and Photo-Fenton systems, biological treatment, organic pollutants

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