

## **Investigation of Advanced Oxidation Processes in Treating Leachate from Municipal Solid Waste**

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### **Abstract**

Municipal solid waste (MSW) generation in urban areas is becoming a challenge as they may cause contamination to the environment. Leachate is an example of these byproducts which requires treatment before discharging into the environment due to its effects on humans and the aquatic environment. This study evaluated the application of advance oxidation process (AOPs) to treat leachate produced from landfilling sites of Barka region, Oman. Also, the study aimed to reduce the effects of Barka landfill leachate by applying different AOPs including ozone (O<sub>3</sub>), hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) and ultraviolet (UV) in order to improve the leachate treatment efficiency. Efficiency of AOPs were studied in terms of organic compounds such as COD and TOC. Leachate sample was collected from the landfill and the physical and chemical characteristics were analyzed. The results of the study showed that, the raw leachate contained high concentrations of organic and inorganic compounds. COD and TOC concentrations levels were found to be 27200 mg/L and 12904 mg/L, respectively. Moreover, the colour of leachate sample was dark brown and had a strong odour. Applying individual and combined AOPs showed a promising result on leachate treatment in terms of COD, TOC, colour and odour removal. The ozonation for 30 minutes reduced the COD and TOC by 39.71% and 20.21%, respectively. Moreover, leachate treatment with addition of 18 g/L of hydrogen peroxide yielded 16.91% of COD and 14.38% for TOC removal. Ultraviolet removed small percentage of COD and TOC of 7.35% and 15.31%, respectively. Furthermore, the combination of aforementioned methods were evaluated. Four combinations of AOPs used in this research resulted in H<sub>2</sub>O<sub>2</sub>/O<sub>3</sub>/UV > H<sub>2</sub>O<sub>2</sub>/O<sub>3</sub>> O<sub>3</sub>/UV3 > H<sub>2</sub>O<sub>2</sub>/UV order regarding COD removal efficiency. The combination these three AOPs resulted in about 1.5 times increase in COD removal (56.62%) and 1.9 times increase in TOC removal (39.34%) compared to applying Ozone treatment method alone. The study showed the promising impact of combining AOPs to treat the Barka landfill leachate.