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Management of Leachate Generated from Long-Term Degradables of Municipal Solid Waste (MSW) in Open Dumps Using Effective Microorganisms (EM) Technology

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Abstract

Open dumping is the most common practice of final disposal of municipal solid waste (MSW) in most of the developing countries including Sri Lanka. Long-term degradables of MSW has been a precursor for leachate of high biological oxygen demand (BOD) and chemical oxygen demand (COD) to be generated due to organic compounds of higher molecular weights and treatment of such leachate seems to be a daunting task in many open dumps. Leachate generated from the Karadiana open dumpsite released to the Bolgoda lake results in many adverse effects on human health and aquatic ecosystem. Most of the organic compounds in the leachate are attributed to long term degradables, not readily biodegradable, and resist conventional treatment methods; hence, a reliable and efficient treatment system has been a long-felt need. In this study, the use of Effective Microorganisms (EM) technology for enhancing the biodegradability of long term degradables and subsequent treatment by advanced oxidation using Fenton oxidation is explored. A solution containing EMs (Lactic acid bacteria- 9×10^7 , photosynthetic bacteria- 4×10^7 , yeast- 2×10^6 CFU/mL) (100 mL at day=1) was applied to the leachate with combinations of 0, 50, 75% dilutions having volumes of 1 L. At the time of application, COD levels of the said combinations were 20,030, 12,672 and 11,090 mg/L respectively. With the application of EMs (100 mL at day=1), COD levels were recorded to be 18,064, 3,951 and 3,002 mg/L respectively, after a retention time of 10 days. Further, Fenton oxidation was carried out subsequently for controls and for the ones added with EMs. The COD levels of controls were 2,400, 1,250 and 905 mg/L for 0, 50 and 75% dilutions respectively. The same treated with EMs were 1,009, 720 and 490 mg/L. Thus, it can be concluded that the application of EM technology is effective in reducing COD levels in the leachate generated from long term degradables.

Keywords: Leachate, Municipal solid waste, Long term degradables, Effective microorganisms, Fenton oxidation, Chemical oxygen demand