World Academy of Science, Engineering and Technology
International Journal of Environmental and Ecological Engineering
Vol:17, No:10, 2023

A Combinatorial Approach of Treatment for Landfill Leachate

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Abstract : Landfilling is the most familiar and easy way to dispose solid waste. Landfill is generally received via wastes from municipal near to a landfill. The waste collected is from commercial, industrial, and residential areas and many more. Landfill leachate (LFL) is formed when rainwater passes through the waste placed in landfills and consists of several dissolved organic materials, for instance, aquatic humic substances (AHS), volatile fatty acids (VFAs), heavy metals, inorganic macro components, and xenobiotic organic matters, highly toxic to the environment. These components of LFL put a load on it, hence it necessitates the treatment of LFL prior to its discharge into the environment. Various methods have been used to treat LFL over the years, such as physical, chemical, biological, physicochemical, electrical, and advanced oxidation methods. This study focuses on the combination of biological and electrochemical methods- extracellular polymeric substances and electrocoagulation(EC). The coupling of electro-coagulation process with extracellular polymeric substances (EPS) (as flocculant) as pre and\or post treatment strategy provides efficient and economical process for the decontamination of landfill leachate contaminated with suspended matter, metals (e.g., Fe, Mn) and ammonical nitrogen. Electro-coagulation and EPS mediated coagulation approach could be an economically viable for the treatment of landfill leachate, along with possessing several other advantages over several other methods. This study utilised waste substrates such as activated sludge, crude glycerol and waste cooking oil for the production of EPS using fermentation technology. A comparison of different scenarios for the treatment of landfill leachate is presented- such as using EPS alone as bioflocculant, EPS and EC with EPS being the 1st stage, and EPS and EC with EC being the 1st stage. The work establishes the use of crude EPS as a bioflocculant for the treatment of landfill leachate and wastewater from a site near a landfill, along with EC being successful in removal of some major pollutants such as COD, turbidity, total suspended solids. A combination of these two methods is to be explored more for the complete removal of all pollutants from landfill leachate.

Keywords : landfill leachate, extracellular polymeric substances, electrocoagulation, bioflocculant.
Conference Title : ICWRWCTP 2023 : International Conference on Wastewater Treatment, Water Cycle and Treatment Plants
Conference Location : New York, United States
Conference Dates : October 09-10, 2023