Economically and technically feasible treatment for residue-driven leachate of landfills

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Abstract

Sri Lankan government has a policy on land filling along with the implementation of 3R (Reduce, Reuse, Recycle) where landfills are to be used only to dispose residue waste instead of unsorted waste. Sri Lanka, in response to this policy, has planned to have several landfills in the country with a view to managing the residue waste generated following the process of composting.

Residue-waste comprise of long term biodegradable waste or/and non-biodegradable waste where the long term biodegradables account for large amount of tannins, cellulose, hemicelluloses. These tannins can accumulate to a level that is toxic to bacterial degradation. Tannin is characterized with high COD, BOD, TOC and turbidity levels in leachate. There has been an issue of only using biological treatment for residue-driven leachate as it may create a situation where biological treatment alone would not be possible to yield the acceptable level of treatment. Hence, it is of utmost importance to eliminate tannin prior to biological treatment.

This study was carried out to find the most economical and technically feasible method to treat residue-driven leachate. Chemical treatment encompassing coagulation and flocculation chemical process is used to treat tannin in residue-driven leachate with different combinations of coagulants and flocculants at pH 7. Optimum treatment results were observed with a combination of alum and a polyelectrolyte having removal efficiencies for COD, BOD, TOC, turbidity, and tannin to be in the range of 38-40%, 25-28%, 92%, 85% and 80% respectively. It was also noted that the black color changed to colorless indicating higher levels of tannin removal. Further, the sludge arising from chemical treatment that would be easily managed within the landfill is an added advantage. Thus removal of tannin from residue driven leachate with chemical treatment prior to the biological treatment is highly recommended. As chemically treated residue-driven leachate showed BOD and COD levels higher than the proposed leachate emission levels an aerobical treatment using activated sludge can be carried out with the bio reactor.

Keywords: Chemical treatment, Coagulation, Leachate, Residue-waste