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Leachate Treatment in Solid Waste Using Low-Cost Adsorbent

Dr.N.Muralimohan[1], K.Monish[2], Sohail Maqbool Bhat[3]
[1]Associate professor, K.S.R College of Engineering, Tiruchengode, Tamilnadu, India.
[2,3] UG Students , K.S.R College of Engineering, Tiruchengode, Tamilnadu, India.

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Abstract: *This paper aims to treat the landfill leachate before disposal. If leachate is directly disposed into environment, it creates serious problems on the surrounding soil, ground water aquifers and nearby surface water. Therefore, great attention has been directed towards new techniques based on physico-chemical process, and heavy metals removal using low-cost materials as filter media with downflow reactor. This paper presents the results of the analyses of leachate treatment from the solid waste landfill. Integrated leachate treatment processes are necessary to deal with the variations of pollutants in leachate. Characterization of microalgae–bacteria consortium cultured in land fill leach ate for carbon fixation and lipid production was carried out. To save the land and improve the energy efficiency for leachate treatment processes, the leachate recirculation process, deep shaft aeration bioreactor, aged refuse biofilter, and hydration reaction are developed and demonstrated. Deep shaft aeration reactor is efficient for the biodegradable pollutants removal,with a high NH3-N, total nitrogen, chemical oxygen demand (COD), total organic carbon (TOC) removals of 66–94%,41–64%,67–87%, 55–92%, at the organic load rate of 1.7–9.4 g COD/L day and hydrauli cretention time of 1–2 day even in the lowest ambient of –3°C, at influent COD ofbelow 7000mg/L.*

Key Word: *Leachates, Municipal solid wastes, Microalgae-bacteria*

I.INTRODUCTION

Sanitary landfill is a process in the solid waste management system. It can be defined as "a method of disposing of refuse on land without creating nuisances or hazards to public health or safety, by utilizing the principles of engineering to confine the refuse to the smallest practical area, to reduce it to the smallest practical volume, and to cover it with a layer of earth at the conclusion of each day's operation or at such more frequent intervals as may be necessary."

Solid waste landfills may cause severe environmental impacts if leachate and gas emissions are not controlled. Leachate generated in municipal landfill contains large amounts of organic and inorganic contaminants. Leachate may also have a high concentration of metals and contain some hazardous organic chemicals. The removal of organic material based on COD, BOD and ammonium from leachate is the usual prerequisite before discharging the leachates into natural waters.

Optimum landfill operation with leachate treatment is the basis for a safe landfill with minimized emissions. Leachate treatment is essential to reduce mainly the organic and nitrogen content in the leachate. Biological processes are widely used as activated sludge plants and aerated lagoons. But the remaining values of COD and BOD are still relatively high. This was the reason to develop physical-chemical treatment steps as alternative or additional treatment methods. Many experiences with these treatment methods have been made in the past so that leachate treatment is state of the art. Although a great number of leachate treatment plants are under operation, there is not only one general solution. The kind of leachate treatment chosen should be based on the specific situation respecting the relevant regulations and costs.

II.METHODOLOGY AND EXPERIMENTAL SET UP

Land fill leach ate is basically originated from in filtrated rainwater fraction in the cell of the landfill and water present in the mass grounded waste. Solid waste landfills may cause severe environmental impacts if leachate and gas emissions are not controlled. Leachate generated in municipal landfill contains large amounts of organic and inorganic contaminants. During treatment adsorbents will remove the heavy metals present in the leachate.

2.1 sample Collection

We have collected the leachate sample at the landfills ite in KATTUPUTHUR. The sample was collected using cans. The can were cleaned by rinsing them with acid initially and then with distilled water. They were dried and taken out to the sampling location. The cans were rinsed once again with the sample and then filled in cans. The sample were immediately brought to the laboratory & using grape sampling method, the sampling cans are 15-liter capacity which are cleaned several times with tap water, then with distilled water and rinsed fully with 1N HNO_3 for removal of living micro-organisms, pathogens, and odour of the sample cans. Preservation agents are added to the samples in situ to minimise any transformation of the compounds before analysing. Samples collected for the analyses of TOC, N-Kjeldahl and P-total are acidified with IO ml/I 4 M sulphuric acid. Samples collected for analysis of metals an do the relements are acidified with 5 ml/I supra pure 65% nitric acid. Extractable aliphatic and aromatic compounds are acidified top H2 with nitric acid.

2.2 Reactor Design

- Landfill leachate is collected from municipal solid waste landfill site at KATTUPUTHUR. Reactor body:-pre fabricated PVC pipe material: laterite soil, brick bat sand sugarcane bagasse
- PVC pipe having 57.15 mm internal diameter and 1067 mm height is used.
- Each reactor is provided with 100 mm free board at the top; distance of 957 mm is maintained between inlet and outlet ports which were kept constant in all reactors. Flow reactors R1, R2, R3 are used for study purpose.
- R1-consisting of laterite soil as filter media, R2-consisting of brick bats,R3-consisting of sugarcane bagasse, combination of all filter media in layers. Reactors are filled with filter media with light compaction.
- Taking in to after than filter media of wastewater do to testing process chemical content by (Ph, BOD, COD, TURBIDITY, TDS, HEAVY METALSREMOVAL) testing result of the treatment. The filter media of proposed study is shown in Figure 1.

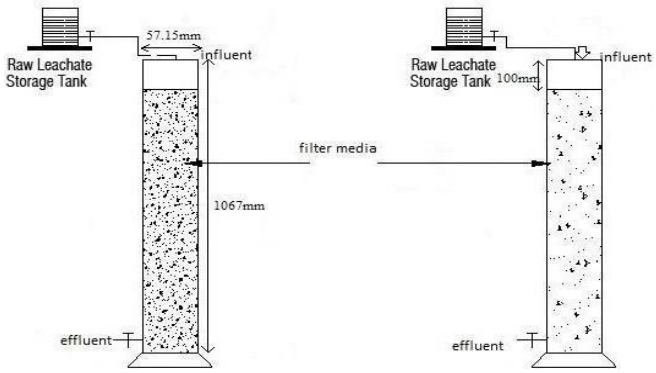

Figure 1: Filter media

III. RESULT AND DISCUSSION

3.1 P_H Result

Determination of pH plays an important role in the wastewater treatment process. Extreme levels, presence of particulate matters, accumulation of toxic chemicals and increasing alkalinity levels are common problems in waste water. The pH observed with various adsorbents of proposed study is shown in Table1.

Table1: pH observed with various adsorbents.

Adsorbents	**pH**
Sugar cane bagasse	5.5
Lateritesoil	7.6
Brickbats	6.0

3.2. Results after Treatment

The leachate sample was collected from landfill site using cans. we have used sugarcane bagasse, lateritesoil, brickbats as filter media for leachate treatment. The above results from the pH indicate that laterite soil removes the contaminants in the leachate when compared with other adsorbents.

3.3. Turbidity Results

Turbidity in waste water is caused by suspended matter, such as clay, silt, finely divided organic and inorganic matter, soluble coloured organic compounds, and plank ton and other microscopic organisms. Turbid water has muddy or cloudy appearance, and it is aesthetically unattractive. Because for micine is a stable synthetic material with uniform particle size it is commonly used as a standard to calibrate turbidimeters and to control the reproducibility of their measurements. The turbidity observed for various adsorbents of proposed study is shown in table2.

Table2 Turbidity observed for various adsorbents.

ADSORBENTS	**TURBIDITY(mg/l)**
Sugarcane bagasse	2
Lateritesoil	5
Brickbats	2.5

3.4. Results After Treatment

The leachate sample was collected from landfill site using cans. we have used sugarcane bagasse, lateritesoil, brickbats as filter media for leachate treatment. The above results from the Turbidity indicate that laterite soil removes the contaminants in the leachate when compared with other adsorbents.

3.5. Comparison of Results

The comparison theory for differential equations. This theory is useful in continuation of solutions, in establishing estimates on bounds of solutions, and, as we will see later, instability theory. Before we can present some of the main results of this theory, we need to introduce a few concepts.

After treatment of landfill leachate using sugarcane bagasse, laterite soil, brick bats as filter media in PVC pipe, the effluent obtained from laterite soil as filter media contains less toxicity when compared with other adsorbents.

Lateritesoil >Sugarcane bagasse>Brickbats.

Hence lateritesoil, sugarcane bagasse is easily available, the process can be done for the treatment of land fill leachate which has been proven successfully.

IV.CONCLUSION

There actor R1which is filled with later iteas filter media is more efficient than compared to other reactors in removal of both heavy metals and physico-chemical parameters. Sugarcane bagasse and brick bats filter medias which contains high amount of dissolved organic matter which increases the dissolved solid content and Electrical conductivity. The removal of heavy metals is observed in both laterite and other filter media. The percentage of toxic content removed by lateritesoil was 82% when compared to other filter medias. Sugarcane bagasse can reduce the toxic content up to 60% which is higher when compared to brick bats 44%. Thus, sugarcane bagasse, laterite soil is the best one to reduce toxic content in leachate. Leachate control is a very important step to receive the long-term functionality of the drainage system, to reduce treatment costs and to render possible high-tech treatment systems. Nowadays more than 100 leachate treatment plants are under operation in Germany, so there are many experiences concerning the technology, costs, the effluent quality, and associated problems. In some cases, the treatment of leachate resulted in increasing operation problems in opposite to the treatment of other waste waters. The selection of the adequate treatment process should not only include the compliance with the effluent limit values and maintenance but also the production of residuals which must be further treated or disposed.

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