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Impact of Leachate in the Soil Vellalore, Coimbatore

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Abstract: ***As a consequence of increasing urbanisation and industrialization two major effects have occurred. They are resource exploitation and waste generation. In this view, the present work has been undertaken to study problems of open dumping of MSW at Vellalore disposal site of Coimbatore city. The objectives of the present study are monitor and assess the problems of principle solid waste on land and to investigate the feasibility of energy recover from MSW. Physical and chemical characterization of MSW collected from the disposal site showed that the solid waste has 68.95% of biodegradable fraction with relatively higher percentage of moisture content and 72% of volatile solids contents. Hence, methanation process of MSW can be carried out to recover energy. Leachate characterisation study concludes the that the concentration of Total Organic Carbon, Ammonia nitrogen, volatile solids, pH , electrical conductivity were high in fresh leachate and decreased due to the decomposition of MSW. Soil quality study of Vellalore site showed that the soil texture and colour has been altered to a depth of 60cm.To manage the solid waste problem, high solids anaerobic digestion process was carried out in the laboratory in a batch reactor, which showed that the factor pH was found to be significant in the production of biogas. The concentration of volatile solids, Total carbon, Total nitrogen, due to the decomposition of the reactor contents, which has utilized in the production of gas. During the experimental study a cumulative volume of 3.2 litres of gas was obtained in a period of 120 days from 8 litres volume of the initially loaded MSW.***

Keywords: Leachate, Municipal Solid Waste, Total Organic Solids.

I. INTRODUCTION

Being the second largest growing economy within the world, India's garbage generation stands at 0.2 to 0.6 weight unit of garbage per head daily. Waste disposal in India, merely involves misestimating up the waste from totally different elements and merchandising everything in an exceedingly lowland. Once lowland is totally occupied, new landfills square measure discovered at totally different places.

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The Energy analysis Institute estimates that 1400 sq. kilometer of land would be needed in Republic of India by 2047 for municipal waste disposal. The lowland technique is that the one that makes land pollution and in some cases, well water contamination.
The waste isn't subjected to utilization, composting, or the other style of environmental treatment. Unsa Feharmful Wastes lie aspect by aspect with the organic wastes within the lowland. Increased interest within the Setting protection problems, like ground and well water protection, throughout the last decades, cause a rise within the importance of style and maintenance of landfills for waste disposal. The lowland liner construction has developed with the innovation of latest practices like the addition of designed clays, geomembranes, artificial lining materials and introduction of advanced leachate assortment systems etc., over the years. The main objective of such practices is to boost the lowland liner performances as a hydraulic barrier and to reduce or forestall the migration of lowland leachate into close hydro earth science system. One major concern concerning lowland liners is that they'll be attacked by the chemical wastes or leachates they contain. This could cause the escape of leachate from the lowland thereby generating possibilities for pollution of soil and well water.
The literature relevant to the municipal solid waste landfill leachates and its effect on soil is reviewed in this chapter.

Fig. 1 Municipal Solid Waste

II. MATERIALS

A. MUNICIPAL SOLID WASTE

The total quantity of MSW dumped in the Vellalore disposal site during the study period is reported in table- I. For the analysis of refuse characteristics, samples of fresh MSW were collected from the disposal site. The sample was segregated manually to identify and separate fractions of biodegradable matter, plastics, metals, glass, paper and paper products etc. For physical characterization, these fractions were then represented as percentage on wet weight basis. After physical sorting, fractions of non biodegradable contents were removed and the remaining factions were dried and shredded to particles of size 0.2 mm. this was treated as representative sample for chemical analysis using standard techniques (IS 10158 1982) and is expressed as percentage on dry weight basis.

B. LEACHATE SAMPLES

The leachate was collected from the disposal site during the study period. First sampling was done during January 2018. To determine the quality of leachate, analysis was carried out in accordance with the standard methods (APHA 1998).

C. SOIL SAMPLES

To study the soil characteristics at the landfill site, soil samples were collected from the disposal site. Two samples are collected from the south west direction of the disposal site. Each soil is collected from the distance of 2m and 4m from the dump yard. Approximately 4-5 kg of sample was taken in plastic bags for testing and analysis. The parameters selected for the study of soil pollution is based on previous studies on soil pollution.

D. SAMPLING AND SAMPLING LOCATIONS

The samples were collected from 3 locations closure, composting yard & around the dump yard were analyzed for the following parameters like PH, EC, Na, K, Ca, Organic matter, moisture content &sodium Absorption Ratio .16 soil samples were collected from these 3 location at 0.3m and 0.6m depth.

E. PREPARATION OF SAMPLES FOR ANALYSIS

25g of dry samples, which passing through 2.36mm size sieve was taken for analysis. The sieved soil samples is dissolved in 50ml of distilled water and stirred well for 1 hour. Filter the samples solution using what man filter paper No.42 and the filtrate is taken for analysis. The soil samples were analyzed for its various characteristics of soil, pH, Electrical conductivity, organic matter, magnesium, calcium, sodium, and moisture content and sodium absorption ratio.

III. RESULTS AND DISCUSSIONS

A. STATISTICS OF SOIL CHEMISTRY OF VELLALORE DUMP YARD

Table -I Soil Sample from 2 m distance in Standards

Parameters	Maximum value	Minimum value
pH	9.2	8.22
EC mS/cm	1.01	0.83
MC %	7.13	6.61
OM %	3.13	1.6
Ca	100.24	240
Mg	10.72	775
Na	85	1536
K	59	392

Table - II Soil Sample from 4 m distance in Standard

Parameters	Maximum value	Minimum value
pH	9.2	8.65
EC mS/cm	1.01	0.55
MC %	7.13	5.45
OM %	3.13	1.76
Ca	100.24	239.7
Mg	10.72	436
Na	85	970
K	59	248

B. COMPARISON OF SOIL SAMPLE AT 2 M& 4 M DISTANCE

Parameters	Maximum value	@ 2m distance in m	@4m distance in m
pH	9.2	8.22	8.65
EC mS/cm	1.01	0.83	0.55
MC %	7.13	6.61	5.45
OM %	3.13	1.6	1.76
Ca	100.24	240	239.7
Mg	10.72	775	436
Na	85	1536	970
K	59	392	248

C. COMPARISON FOR LEACHATE AND SOIL SAMPLE

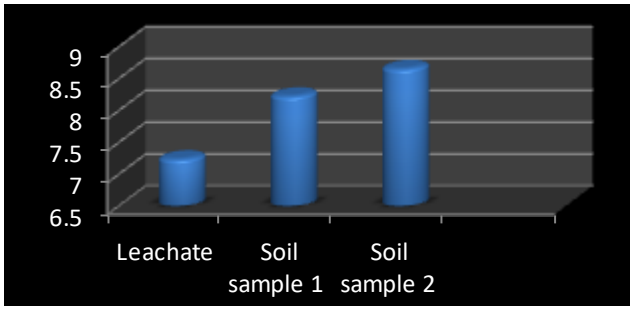

Fig.2 Comparison of pH for Leachate and Soil Sample at 2m & 4m distance

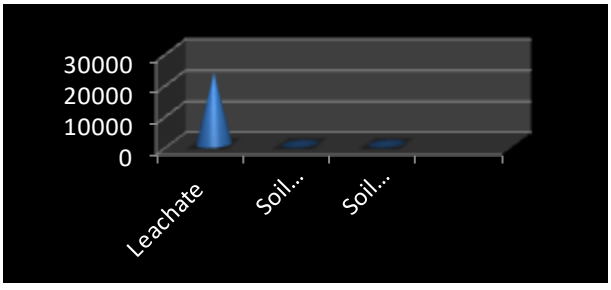

Fig. 3 Comparison of Electrical Conductivity in µmhos/cm for Leachate and Soil Sample at 2m & 4m distance

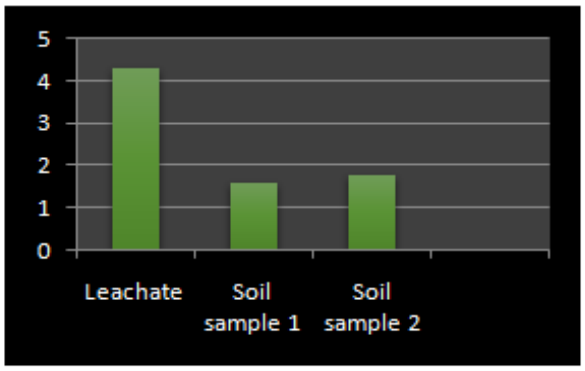

Fig.4 Comparison of Organic matter in mg/L for Leachate and Soil Sample at 2 m & 4 m distance

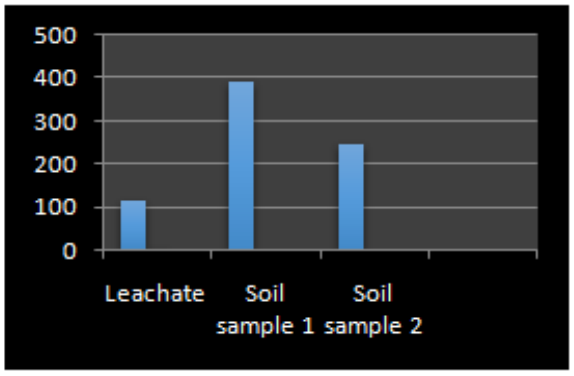

Fig.5 Comparison of Potassium as K in mg/Lfor Leachate and Soil Sample at 2m & 4m distance

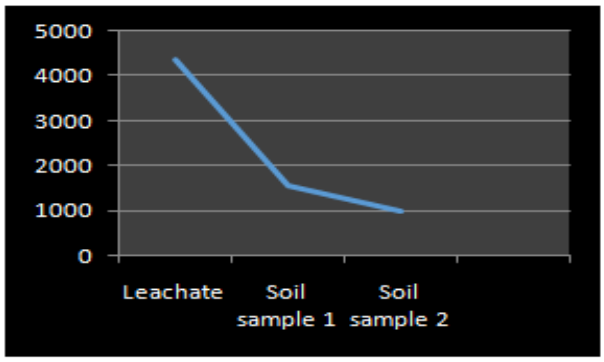

Fig.6 Comparison of Sodium as Na in mg/L for Leachate and Soil Sample at 2m & 4m distance

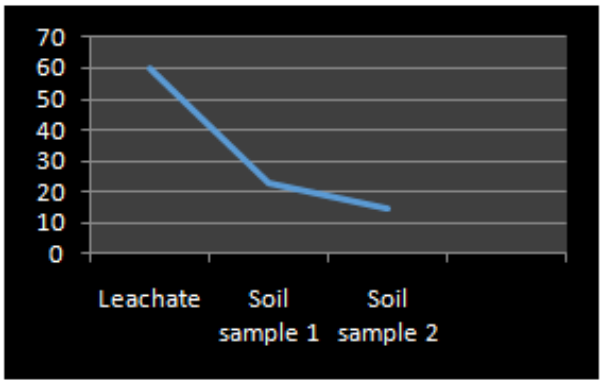

Fig.7 Comparison of Sodium Absorption Ratio for Leachate and Soil Sample at &4mdistance

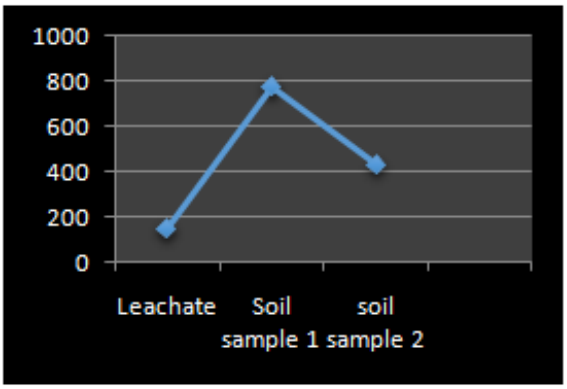

Fig.8 Comparison of Calcium in mg/Lfor Leachate and Soil Sample at 2m & 4m distance

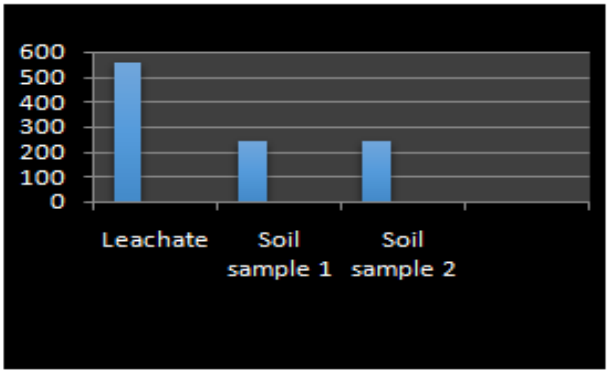

Fig.9 Comparison of Magnesium in mg/Lfor Leachate and Soil Sample at 2m & 4m distance

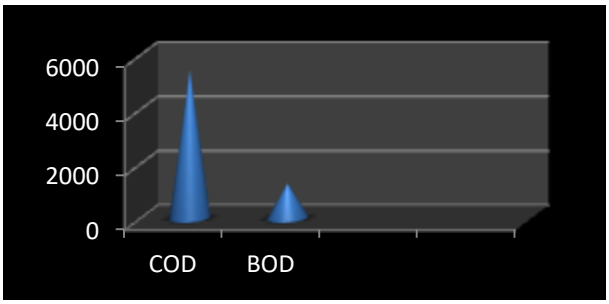

Fig.10 COD and BOD of leachate sample in mg/L

IV. CONCLUSIONS

The leachate generated from a municipal solid waste landfill is a mixture of several chemicals and to identify the effect of these chemicals on soil, a case study on an unlined municipal solid waste landfill at vellalore has been done. Soil samples and water samples were collected from the site and analysed to identify the pollutants and its effect on soil characteristics. Laboratory experiments were formulated to model the field around a municipal solid waste landfill and studied the pollutant transport pattern through the soil using synthetic leachate. Experiments were also conducted to study the effect of pollutants on engineering properties of soil The major conclusions were brought up from a study which concludes the applications of environmental engineering are listed below.

1) Identification of Chemicals in Soil near a Typical MSW Landfill is ammonia, chloride, nitrate, iron, nickel, cadmium, chromium, etc..

2) Soil sample from the different depth and distance were influenced by engineering properties of soil due to chemicals present in landfill.

3) The flow of leachate pattern into soil depends upon the type of soil, density of soil, layers of soil, cracks and fissures in the soil, ground water flow etc.. Landfill site condition varies from place to place so the flow pattern of leachate through landfill cannot be generalized.

4) The leachate contains different toxic parameters due to mixed effects of contaminants. The variation of soil in a landfill is examined by cation and anion concentration of the soil.

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