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Characterisation and Assessment of Ground Water Pollution near Ambattur MSW Landfill

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Abstract: The leachate is the liquid which drain in the MSW by two form is observed rain water and heat condensation. Leachate and groundwater samples were to be collected from ambattur landfill-site in dunlop area. In these areas to study the possible impact of leachate percolation on groundwater quality. Concentration of various physic-chemical parameters including heavy metal (Cd, Cr, Cu, Fe Ni, Pb and Zn) concentration and microbiological parameters (total coli form and faecal coli form) were determined in groundwater and leachate samples. The presence of TC and FC in groundwater warns for the groundwater quality and thus renders the associated aquifer unreliable for domestic water supply and other uses. The moderately high concentrations of Cl^-, NO_3-, $SO_4$2-, NH_4+, Phenol, Fe, Zn and COD in groundwater, likely indicate that groundwater quality is being significantly affected by leachate percolation . The primary objective of this study to suggest suitable measures to reduce further groundwater contamination by leachate percolation .The first safe measure to cannot be leachate percolation into the groundwater by using of the geo textiles polymer in between to MSW and to soil ,which using of the geo textiles polymer(water proofing material)the leachate percolation cannot enter in the ground(soil porous).the second safe measure is the emission of gases by the waste which effect the atmosphere, the emission of is control by using of green plastic polymer is to be cover in the top of MSW the emission of gases is reduced high level to low level.

Keywords: total coli form (TC), faecal coli form (FC), geo textiles polymer, green plastic polymer, groundwater quality check

I. INTRODUCTION

Landfills have served for many decades as ultimate disposal sites for all types of wastes: residential, commercial and industrial. Physical, chemical, and biological processes interact simultaneously to bring about the overall decomposition of the wastes. One of the by-products of all these mechanisms is chemically laden leachates. The major environmental problem experienced at landfills is the loss of leachates from the site and the subsequent contamination of groundwater. Modern landfills have liners at the base, which act as barriers to leachate migration. However, it is widely acknowledged that such liners deteriorate over time and ultimately fail to prevent the movement of leachates into an aquifer. The aquifer is underground layer which is separated the water table into the multi layer with the distance. The aquifer is which can effect by percolation of leachate. The minerals of aquifer can effect and the water table or groundwater is also polluted by the leachate percolation ,the quality of groundwater is polluted and the oxygen level is reduced. So intake by the human, the animals and the environmental are get effect by the leachate percolation in groundwater .The percolation of the leachate and the emission of gases were stop by the geo textiles polymer and green plastic polymer. The geo textiles polymer is the water proofing materials which is used in the under sheeting to MSW for stopping the percolation of leachate into the groundwater and aquifer. The emission of gases in the waste within the atmosphere which reduced the oxygen so the emission of the gases to control by the green plastic polymer which cover in the top surface of the MSW . The effected groundwater are causes the health issuses and effect environmental cycle . this are the safe measure is used for avoid the leachate percolation and the emission gases.

A. Geo textiles Polymer

Geo textile are permeable fabrics which, when used in association with soil, have the ability to separate, filter, reinforce, protect, or drain. The polymer which are in sheet form in the size of the 1*1, 2*2 (feet) . It is the thin polymer which act as a water proofing material to protect observation of water from into soil properties and in the construction work also is used. Typically made from polypropylene or polyester, geotextile fabrics come in three basic forms: woven{resembling mail bag sacking }, Non woven{resembling felt}, Heat bonded {resembling ironed felt}.

B. Green Plastic Polymer

green polymer is the made up of green waste plastic material into the fibre wire and net into the fabrics , which is main used in the scaffolding method for the outter cover to the scaffolding . The polymer with are the light weight material and easly carried out.

C. Advantages of polymers Used in Msw Landfill

1) To stop the percolation of leachate into the groundwater and aquifer
2) The emission of gases is reduced by green plastic polymer
3) To protect the environmental cycle
4) To reduce the health hill effect
5) To safe the groundwater table and the soil stability
6) It is cost effective and cheaper

D. Disadvantages of Polymers Used in msw Landfill

1) It is not used in the large quanitites condition
2) More still labour to be present the maintance process for the MSW
3) More equipment are used to damp the MSW in the landfill

E. Objective

1) To reduced the health problem by effected of leachate into groundwater
2) To stop the leachate percolation into the groundwater by using of the geo textiles polymer
3) The emission of gases in the waste which control by the green plastic polymer
4) To safe the groundwater and the atmosphere surface

II. METHODOLOGY

The leachate is located the site of landfill, first select the location of the landfill which in the large quanities of survey in the area to damped. The damping of waste before the geo textilies polymer is to provided in the ground surface for the to stop the leachate percolation into groundwater and the emission of the gases which is control by covering the MSW with the green plastic polymer. The landfill are to drains the leachate with the physical-chemical properties and microbiological properties. The leachate is drain in the landfill with the large quanitites and Leachate samples were collected from the well dug in the center of the site and groundwater samples for laboratory analysis were collected from privately owned well and naturally occurring spring, which are found from the boarder of dumping site respectively.

The equipments used to withdraw samples from leachate, landfill shallow well and one spring were selected based on consideration of the parameters (chemicals) to be analyzed in the sample.

To ensure the sample is representative of groundwater information, it was to keep physical or chemical alterations of the sample to a minimum. Sampling equipments that were used bottles and jar can made of poly venial chloride (PVC). Sample collection equipments were not altering analyzes concentration and composition. To avoid altering sample quality, the samples were transferred from the sampling equipment directly into a prepared container. Storage and shipment of groundwater and leachate samples were performed in manners that maintain sample quality. Samples were cooled to $4^{o}C$ as soon as after samples were collected.

These conditions were maintained until the samples were received at the laboratory. Transportation arrangement was maintain proper storage conditions and provide for effective sample pickup and delivery to the laboratory. Sampling plan was coordinated with the laboratory so that appropriate sample receipt, storage, analysis, and custody arrangements were provided. And the groundwater and leachate is tested for the process to quality check. After testing is done the results is compared with the fresh water.the result is achieved are noted and reported.

III. MATERIALS

The geo textiles polymer and green plastic polymer is the mainly used for to protection of the groundwater and atmosphere surface. The geo textiles polymer is used to for the stopping of leachate percolation and the green plastic polymer is used for to control the emission of the gases from in the waste. The geo textiles polymer general in the size of 1*1, 2*2 (feet) and the green plastic polymer in the size of 30m to 40m length, 3m to 4m is wide.

IV. TESTING AND RESULTS

The leachate and effected groundwater are been tested with the different chemical properties, they are

A. Testing

1) P^H **:** Connect the P^H electrode to the input socket at the front clean the electrode with distilled water and dry it. Dip the electrode in the 4P^H buffer solution which is provide measure the temperature of the buffer solution. The temperature was keep of the solution push the P^H switch. Adjust the display to 4 P^H with the cal knob. Now the instrument is calibrated wash the electrode. Dry it and put it in the solution whose P^H is to be measured.
2) *Hardness:* To pipette out 20ml of sample water into a clean conical flask. To this 5ml of buffer solution and 2drop of erichrome block-T indicator was added. The solution was titrated against EDTA taken in the burette. The end point was change of colour from wine red to steel blue. The titration was repeated up to concordant value
3) *Turbidity***:** The dung steal filament produces a conversing light beam its then slathered by the suspended particle present in the given sample of water. The slathered light is sauced by a photo cell kept at 90 in light path and the amount of slathered light is direct measured of turbidity of the solution. As table and regulated DC supply is used to exits the lamp. Similarly a high given amplifiers is used to convert to photo cell output in to measurable signal
4) *Chloride:* To be taken as 20ml of sample water pipette out in to a clean conical flask. To be added was indicator one drop of potassium dichromate. The solution turns yellow in colour. The solution was titrated against silver nitrated taken in the burette.The end point was the change of yellow colour in reddish up to its concordant values.
5) *Sulphate:* If the sample consist more than 20ml/lit of silica. Its to removed prior to the analysis for sulphate. Removal of silica evaporator the suitable of sample to dryness in platinum dish on a water bath. Rotating the dish dry to contents again by evaporation and for final drying deep the dish at 180°C in an even. If same organic matter also present. If can be burden over a frame of this stage now add 2ml of drynest on a water bath. Add 2ml of Hcl and transfer it in hot water and filter. Wash the filter paper having silica several times with hot distilled water and collect the combined filtrated. Adjust the volume of the filtrate so that 50mg sulphate should be in 250ml volume. If silica is present is less that 25mg/lit there is no need of sample (100-500ml) can directly be taken for estimated of suitable. Add a few drop of methyl red to the sample and adjust the $P^H$to 4.5-5.0 by addition of Hcl until the colour changes to the orange add additional 1-2ml of Hcl. Boil the solution and add warm $Bacl_2$ solution in excess until the precipitation is complete. Heat the precipitation at 80-90°C for at least 2 hours (or) more. Filter the precipitation through the ash less filter paper for by adding some pulp of the same filter paper as a add of filtration. Wash the precipitation repeatedly with warm distilled water until filtrate free from chloride which can be tested by $AgNO_3$ givens a white turbidity. Dry the filter paper containing precipitate and ignite it in a crucible at 200°C for about one hours cool it in a desicators and weight the precipitate of $Baso_4$.
6) *Fluoride:* If chloride is present in the sample it must be dechlorinated with sodium thiosulphate solution (or) so_2 before cone. It sample contains excess metal, ions is must be approximately diluted. Take 0.1,2.6 2 and 14ml 0f standard sodium fluoride mix thoroughly and compare the colour after standing for one hour. *ALKALINITY*

B. Potentiometric Titration Curve

Follow the procedure for determining acidity, substituting the appropriate normality of standard acid solution for standard NaOH, and continue titration to pH 4.5 or lower. Do not filter, dilute, concentrate, or alter the sample.

C. .Potentiometric Titration To Preselected Ph

Determine the appropriate end-point pH. Prepare sample and titration assembly Titrate to the end-point pH without recording intermediate pH values and without undue delay. As the endpoint is approached make smaller additions of acid and be sure that pH equilibrium is reached before adding more titrate.

D. Potentiometric Titration Of Low Alkalinity

For alkalinities less than 20 mg/L titrate 100 to200 mL according to the procedure above, using a 10-mL micro burette and 0.02*N* standard acid solution. Stop the titration at a pH in the range 4.3 to 4.7 and record volume and exact pH. Carefully add additional titrate to reduce the pH exactly 0.30 pH unit and again record volume.

E. Suspended Solids

Check the fibre glass filter for pinholes particle or other imperfections should not be used. Number the filter and equilibrate the filter in the desiccators for 24hours and weigh to the nearest milligrams. Record takes weight and filter identification numbers. Open the shelter of the high volume sampler loosens the wing nuts and removes the face plate from the filter holder. Install a numbered pre weighed glass fibre filter in position. Replace the face plate without disturbing the filter and fasten securely. A very light application of talcum powder may be used on the rubber face plate gasket to prevent the filter from sticking. Close the roof of the shelter. Set the on-off timber to start sampling for the prescribed time (24hrs) recording the starting time. After 5min not down the flow rate. At the end of sampling period record the length of the sampling period and the flow rate. Fold the filter length wise so that only surface with collected particle are in contact and place in the special folder.

F. Nitrate

Samples are collected in clean glass or plastic containers. Flexi dome and phenol resin (black) caps, or caps with glued plastic liners may contaminate the samples. Polypropylene caps should be used. Samples are preserved by addition of 1 mL of concentrated sulphuric acid per litter of sample. Follow the Lechate Procedural SOP (Typical Daily Operation Section). Remember to establish reagent flow through entire system before diverting flow through cadmium column.

G. Calcium And Magnesium

Add approximately 20 ml of deionised water to titration vessel. Add 1 or 2 ml of the water or filtrate to be tested. NOTE: The endpoint is occasionally difficult to see in dark colored filtrates. Reduce the sample size to ½ ml if the endpoint cannot be seen with a 1 ml sample or follow procedure for dark filtrate. Add 1 ml of Strong Buffer Solution. Add 1 ml of Solution No. 1 and stir. Add 1 ml of Solution No. 2 and stir. NOTE: Solution No. 2 is extremely poisonous. Do not pipette with your mouth. Never mix Solution No. 2 with an acid. Add 3 drops of Manver Indicator and mix with a stirring rod. A wine red colour will develop if calcium and/or magnesium are present. Using a pipette, titrate with Standard Versenate Solution, stirring continuously, until the sample turns to a blue (or green for dark colored filtrates) with no under tint of red remaining. Record the number of ml of Standard Versenate Solution used. (If magnesium is to be determined as in Procedure B, this is Value A.)

H. Electrical conductivity

EC meter with built-in temperature compensation:

1) Rinse conductivity cell with three portions of KCl, 0.01M
2) Immerse in the standard KCl solution
3) Adjust temperature compensation dial to 0.0191/ °C
4) Adjust meter to read 1412 µmho/cm

I. Colour

Ignite residue produced by total solids to constant weight in a muffle furnace at a temperature 550°C. Ignite a blank glass fibre filter along with samples usually 15min (or) 20min ignition is required for 200mg residue. However more than one sample and for heavier residue may overtake the furnace and necessitate longer ignition times let dish (or) filter disk cool. Partially in air filter disk cool partially in air until most of the heat has been dissipated.

Transfer to a desieaptor for finals cooling in a dry atmosphere. Do not overload desiccators repeat cycle of igniting cooling desiccating and weigh until a constant weight is obtained or until weight change is less than 4% (or) 0.5mg whichever is less. Analysis at least 10% of all samples in duplicates. Duplicate determination should agree with in 5% of their average weight, weight less of the blank filter is an indication of unsuitability of a particular brand (or) type of filter for this analysis.

J. Pottassium

Fill test tube to line 7 with Potassium Extracting Solution. Use 0.5 g spoon to add four measures of soil sample to test tube. Cap and shake vigorously for one minute. Remove cap and allow soil to settle. Use a clean pipette (dropper with the red bulb) to transfer the clear liquid to another clean test tube. Be careful not to pull up any soil into the dropper tube. Fill a second test tube to line 5 with the liquid. Note that if additional extract is needed to fill the tube to line 5, start with another tube and repeat. Add one potassium indicator tablet to the soil extract in the second tube. Cap and shake to dissolve the tablet.

A purplish colour will appear. Add potassium test solution, two drops at a time. Keep a running count of the drops used. Swirl the test tube after each addition to mix the contents. Stop adding drops when the colour changes from purplish to blue. Record the total number of drops added. Use the potassium end point colour chart as a guide in reading this colour change. Read the test result from this table:

K. Potassium Level

SI.NO	NUMBER OF DROPS ADDED	POTASSIUM LEVEL IN SOIL
1	0.8	Very High
2	10	High
3	12	Medium High
4	14	Medium
5	16	Medium Low
6	18	Low
7	20 or more	Very Low

L. Procedure Of Heavy Metals

PC based double beam spectrophotometer was switched on warned up for 10 minutes. The instrument was set up for particular wavelengths for respective heavy metals . The instrument was calibrated with sample range of 0 to 10mg/L Then the sample was tested and percentage of heavy metals were calculated

M. Bod

Determine dissolved oxygen in the given samples of water by following the sample procedure as in the previous experiment let dissolved oxygen content of original water sample be “DOS”. Dilute the waste water sample to the rigid dilution factor. The dilution factor depends upon the range of BOD of a given sample.i.e. from

1) 4-14 the dilutions factor is 2
2) 10-35 the dilution factor is 4.5
3) 40-70 the dilution factor is 10
4) 70-140 the dilution factor is 20
5) 100-700 the dilution factor is 100

The 50ml of waste water sample in a measuring flask a capacity 1000ml fill the remaining portion with the water sample to make the volume as 1000ml. After filtration fill one BOD bottle with the diluted sample and another BOD bottle with the sample of water. This is called blank with the BOD has to be determined. The dissolved oxygen of in cabated dilute sample. Let this be denoted by DOI similarly for incubated blank solution for BOD for the waste.

N. Chemical Oxygen Demand

Take 20ml of sample in a 250-300ml COD flask [Round bottom (or) conical flask with ground joint for lie big reflux condenser]. If the sample in expected to have one (or) more then 50mg/l add 10ml of 0.25N $K_2Cr_2O_7$ solution. Extreme care should be taken in case of low COD sample. A sample take organic matter in glass ware may contribute an signification. Add a pinch of Ag_2SO_4 and H_2SO_4 is added in the ratio of 10:1 to the chloride COD cannot be determine accurately if the sample contains more than 2000mg/l of chloride. Add 30ml of sulphuric acid. Reflux at least for 2hrs on a water bath (or) a hot plate. The reflux assembly remove the flask cool add distilled water to make the final volume to about 140ml. Add 2-3 drops of ferroin indicator mix through and titrated with 0.1N ferrous ammonium sulphate. Run a blank with distilled water swing same quantity of the chemical.

O. Result

SI.NO	PARAMETER	DRINKING WATER (BIS:10500-1991)		SAMPLE 1	SAMPLE 2
		DESIRABLE LIMITS	MAXIMUM LIMITS		
1	E.Cmicroms/cm @25℃	Nil	Nil	5160	3980
2	P^H	6.5-8.5	No relaxation	7.6	7.0
3	Calcium(Ca) mg/l	75	200	48	176
4	Magnesium(mg) mg/l	50	150	175	146
5	Sodium(Na) mg/l	Nil	Nil	768	403
6	Potassium(K) mg/l	Nil	Nil	68	63
7	Bio carbonate (HCO_3)mg/l	200	600	958	622
8	Carbonate (CO_3)mg/l	Nil	Nil	0	0
9	Sulphate(SO_4)mg/l	200	400	197	48
10	Chloride (Cl)mg/l	250	1050	1035	922
11	Nitrate (NO_3)mg/l	50	No relaxation	178	182
12	Fluoride (F)mg/l	1	1.5	0.81	0.4
13	Total Dissolved Solids(TDS)mg/l	500	2000	2943	2251
14	Total Hardness As CaCO3 (TH)mg/l	300	600	840	1040
15	Alkality as CaCO3	200	600	785	510
16	Colour Hazen Units	5	25	Colourless	Colourless
17	Odour	Un objection -able	No relaxation	Un objection -able	Un objection -able
18	Temperature ℃	Nil	Nil	33.0	33.0
19	Turbidity	5	25	3	2
20	Suspended solids mg/l	Nil	Nil	4	4
21	Faecal coliforms	Nil	Nil	Nil	Nil
22	BOD	-	-	36	25
23	COD	-	-	230	148

Physicochemical characteristics of and groundwater samples

SI.NO	PARAMETER	LEACHATERESULTS (mg/l)
1	P^H	9.25
2	Total Dissolved solids	6658
3	Alkinity (HCO_3)	5364
4	Chloride (Cl)	420
5	Sulphate	602
6	BOD	160
7	COD	210
8	Conductivity ($\mu sc/cm$)	2126
9	Suspended solids	29

Result of leachate sample

SI.NO	PARAMETER	SAMPLE 1	SAMPLE 2
1	Nickel	Nil	Nil
2	Copper	Nil	Nil
3	Zinc (mg/l)	0.005	0.002
4	Cadmium	0.001	Nil
5	Lead	0.03	Nil
6	Iron	0.2	Nil

Results of Heavy metals of site

On site measurement were conducted for the temperature, DO, conductivity and P^H of leachate and ground waters using standard devices and the result obtained from the measurement for leachate was 24.4^OC that is similar with the ambient temperature and the temperature of well water and bore samples were 24.3^OC and 24.7^OC respectively. The P^H value of the leachate, well water and bore water in the onsite were 7.6, 7,7.2, and 7.9 respectively.

V. CONCLUSION

The release of leachate to the environment is one of the major environmental impacts related to disposal of waste. Disposed waste in landfills undergoes a series of phases where the waste is decomposed. During the decomposition leachate is generated by excess rainwater infiltrating the waste. The leachate contains four groups of pollutants: dissolved organic matter, inorganic macro components, Heavy metals, and xenobiotic organic compounds. Which the uses of geo textiles polymer to stop the percolation of leachate into the groundwater and the emission of gases is control by the covering of green plastic polymer. Which the results of the using the polymer groundwater is the safe in nature and the environmental impacts is to be reduced. And then the groundwater is taken as sample for checking quality, the quality of the groundwater in under the landfill after process with the polymer the groundwater quality is to be improved.

REFERENCES

[1] Aderemi Adeolu O.1*, Oriaku Ada V.2 , Adewumi Gbenga A.2 and Otitoloju Adebayo A.1.," Assessment of groundwater contamination by leachate near a municipal solid waste landfill " October, 2011.

[2] Dr. Fiona Nicholson, Dr Alison Rollett and Prof. Brian Chambers ADAS Gleadthorpe, Meden Vale, Mansfield Nottinghamshire. "Review of Pollutant from solid manures stored in temporary field heaps"., (8 march 2011).

[3] Dolk H, Vrijheid M, Armstrong B, Abramsky L, Bianchi F, Garne E, Nelen V, Robert E, Scott JE, Stone D and Tenconi R (1998). "Risk of congenital anomalies near hazardous-waste landfill sites in Europ" the EUROHAZCON study.

[4] Esmail Al Sabahi, S. Abdul Rahim, W.Y. Wan Zuhairi, Fadhl Al Nozaily and 2Fares Alshaebi "Characteristics of Leachate and Groundwater Pollution at Municipal Solid Waste Landfill"(june 2009)

[5] Elliott P, Briggs D, Morris S, de Hoogh C, Hurt C, Jensen TK, Maitland I, Richardson S, Wakefield J and Jarup L (2001). "Risk of adverse birth outcomes in populations living near landfill site".

[6] Elliott P, Richardson S, Abellan JJ, Thomson A, de Hoogh C, Jarup L and Briggs DJ (2009). "Geographical density oflandfill sites and risk of congenital anomalies in England" (2008 Dec 5).

[7] Jarup L, Briggs D, de Hoogh C, Morris S, Hurt C, Lewin A, Maitland I, Richardson S, Wakefield J and Elliott P (2002). "Cancer risks in populations living near landfill sites in Great Britain". Br J Cancer,.

[8] Jarup L, Morris S, Richardson S, Briggs D, Cobley N, de Hoogh C, Gorog K and Elliott P (2007). "Down syndrome in births near landfill sites". Prenat Diagn,

[9] Morgan OW, Vrijheid M and Dolk H (2004).' Risk of low birth weight near the hazardous waste landfill sites in England". Arch Environ Health",

[10] Peter Kjeldsen,I* Morton A. Barlaz,2 Alix P. Rooker,2 AndersBaun,' Anna Ledin,' and Thomas H. Christensen'.," Present and Long-Term Composition of MSW Landfill Leachate" (2002).