

Impact on Ground Water Quality Due to Solid Waste

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Abstract: - Solid waste is being produced since the beginning of civilization. The management of solid waste is on area of universal concern for both the developed & developing world. Municipal solid waste is a term usually applied to heterogeneous urban waste mixture of paper, plastic, cloth, metal, glass, organic matter, etc. generated from household, commercial establishment markets. The nature of which varies from region to region. In India, unmanaged & uncontrolled solid waste openly dumped on the land generates liquid & gaseous emissions that pollute the environment and represent the breeding ground for disease bearing animals & microorganism. The composition of municipal solid waste typically in India has about 40-45% organics & about 40% construction waste. (The leachate produced by waste disposal sites contains a large amount of substances which are likely to contaminate ground water). Solid waste have potential for using serious adverse impact on the environment. Leachate is a toxic liquid that seeps through solid waste in a landfill. The water which already present in the waste, generates with the biodegradable waste or due to the waste infiltration of water by rainfall. This water which generates or occurs due to that process pours in the soil & causes contamination with ground water & that contamination causes the water pollution & changes the parameters of the ground water.

The current study is carried out to investigate the "Impact on ground water quality due to solid waste" in Kamptee (Ajani) Dist. Nagpur. In order to investigate the solid waste disposal effect on ground water quality, we selected an area of dumping yard (3 hectare) near Ajani, Kamptee. Groundwater is the major source of drinking water. Therefore, water sample have been collected at a distance of 500 m from the dumping yard site and analysed for various parameters of water quality. Three samples are collected, Well water (250 m distance), Surface water (lake=300 m distance) & Tube well water (320 m distance), also perform soil testing & water testing. Soil testing include permeability testing of soil & water testing includes parameters of water such as pH, Conductivity, TDS, Total hardness (calcium hardness & magnesium hardness), Chlorides, Dissolved oxygen & COD. The current study concluded that concentration of some parameters of ground water was present in dump site surrounding samples indicate the poor water quality which is not fit for drinking purpose.

Keywords- Solid Waste, Leachate, TDS, COD.

I. Introduction

In India, water comes from different sources such as rivers, lakes, ponds, wells and tube-wells. This water is consumed for a number of purposes namely domestic, industrial, utilization, gardening and agricultural irrigation. In all these consumptions the quality of water is a very important since entire economics with respect to water procurement, its treatment and supply depends on the quality of water. In cities and towns water is mainly taken from rivers and other surface water bodies and is supplied to the population after a suitable treatment. However, in rural areas, the water needs of people are catered mainly by open and tube wells. These wells are classified as shallow, medium and deep wells and fetch water from aquifers occurring in the geological formation of permeable zones of rocks, sand and gravels. The quality of ground water mainly depends on the soil strata, through which it percolates and nature of aquifers where it gets stored. The water is becomes unfit for consumption if it gets polluted by one or the other reason. Disposal of solid waste, leachate formation and its subsequent percolation can contaminate the groundwater. The rapid industrialization, urbanization increased rate of population growth, changing life styles and standard of living have put more pressure on water sources to satisfy water consumption requirements of respective areas. Both the quality and quantity of water have become prime concern To tackle the supply and demand statistics is really a challenging task.

Rapid growth of population, changing life style, and developing industrialisation are the root causes of increasing solid waste generation in developing countries. In most cities in developing countries, the municipal solid waste is dump in open dumps without proper lining which affects the environment. Due to unprecedented growth of population and urbanization, the generation of solid waste has increased that lead to environmental problems such as air, water & land pollution. In previous year, diseases like jaundice and hepatitis causing health hazards in Delhi due to presence of excess amount of chlorides and hardness. Waste is by-product of life. High standards of living and ever increasing population have resulted in an increase in the quantity of wastes

generated. Municipal solid waste is generally combination of house hold and commercial refuse which is generated from the living community. The site is situated at a distance of 2.5 km from the college. It covers an area of 3 acre and only 1.5 acre is used.

Latitude of kamptee = 21°12'27.9684'N

Longitude of kamptee = 79°11'2.5872'E

II. Test Adopted

2.1. Soil Testing

- .Permeability testing of soil.

2.2. Water Sample Testing

- Dissolved Oxygen of Sample
- Ph of Sample
- TDS of Sample
- Hardness of Sample (Total hardness=Calcium Hardness+ Magnesium Hardness)
- COD of Sample
- Chlorides
- Electrical Conductivity

Table No. 1= Result of water sample (February)

Parameter	Well water	Bore well water	Surface water	IS – specification (IS-10500)
pH	7.2	7.1	8.2	6.5-8.5
Conductivity	1421	2029	1628	1000-2000µS/cm
TDS	1137mg/lit	1822mg/lit	1465mg/lit	1000-2000mg/lit
Total Hardness	544 mg/lit	840 mg/lit	600 mg/lit	300-600mg/lit
Calcium Hardness	364 mg/lit	640 mg/lit	312 mg/lit	75-200mg/lit
Magnesium Hardness	180 mg/lit	200 mg/lit	288 mg/lit	30-100mg/lit
Chlorides	210 mg/lit	433mg/lit	527mg/lit	250mg/lit
Dissolved Oxygen	4.3 mg/lit	3.5 mg/lit	7.2 mg/lit	6-8mg/lit
) COD	65 mg/lit	52 mg/lit	116 mg/lit	100-200mg/lit

Table No...2 = Result of water sample (March)

Parameter	Well water	Bore well water	Surface water	IS – specification (IS-10500)
pH	7	7.1	8.2	6.5-8.5
Conductivity	1421	2040	1979	1000-2000µS/cm
TDS	799 mg/lit	1836mg/lit	1781mg/lit	1000-2000mg/lit
4) Total Hardness	574 mg/lit	588 mg/lit	610 mg/lit	300-600mg/lit
5) Calcium Hardness	310 mg/lit	488 mg/lit	530 mg/lit	75-200mg/lit

6) Magnesium Hardness	260 mg/lit	100 mg/lit	80 mg/lit	30-100mg/lit
7) Chlorides	178.92 mg/lit	382.69 mg/lit	443 mg/lit	250mg/lit
8) Dissolved Oxygen	4 mg/lit	3.2 mg/lit	12.6mg/lit	6-8mg/lit
9) COD	40 mg/lit	80 mg/lit	88 mg/lit	100-200mg/lit

The values are differing from the I.S Specification .Some parameters are in the range of the I.S Standards and others are not. So, the water is unfit for drinking purpose.

III. Conclusion

As we can see from all the above results, there is a significant effect on pH, Chlorides, COD, Total Hardness, Calcium Hardness and other chemical as well as biological properties are severely affected. The surface water or rainwater percolating in the ground through the open landfill sites which may also be known as non-engineered landfills absorbs harmful chemicals and heavy metals which when join the water table greatly affects the quality due to addition of Hg, Cd, As, Zn, Ni, Cr, etc. and other harmful compounds present in wastes. Now, when this water is consumed it poses severe health hazards and there are very high chances that consumption of such water is responsible for deaths. However in some results, the concentrations of some compounds in groundwater samples do not exceed drinking water standards. The increase in concentration of TDS, EC, chlorides, total hardness, pH, etc. Highly affects the water quality and thereby makes it unfit for drinking or household purposes. Now when it comes to dumping of wastes, a properly designed engineered landfill should be constructed with impermeable linings or geomembranes on bottom and sides with proper provision of sand/gravel layers for draining leachate to perforated pipes and pumps should be provided for pumping the leachate and conveying it to waste water treatment plants, retention ponds or any other method of disposal. The top layer of landfill should be provided with geomembranes or thick plastic layer which may be high density polyethylene (HDP) and may be covered with vegetation also to prevent excess precipitation from entering the landfill known as cover soil. This cover soil or top soil maintains the vegetation on the surface of the landfill. By strictly adopting engineered landfills instead of dumping them in open grounds we can tackle the problem of leachate impact on groundwater.

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