© INTERNATIONAL JOURNAL FOR RESEARCH PUBLICATION & SEMINAR
ISSN: 2278-6848 | Volume: 12 Issue: 03 | July - September 2021
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Current Scenario on Urban Solid Waste Management with Respect to Adampur Dump Yard, Bhopal

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ABSTRACT

In all over the world, "Municipal solid waste management" is considered as one of the major environmental issue. Hazards can be caused to people and environment due to improper Municipal solid waste management. Several researchers analyzed that 90% of the solid waste is improperly dumped and landfilled which leads to several issues such as: public health issues and environmental issues. Huge amount of solid waste is generated in Bhopal, Madhya Pradesh due to rapid urbanization and industrialization. And the main reason behind this is lack of awareness among public and masses. The current solid waste management practices are discussed in the present study and the methods used for waste management in Adampur Dump yard, Bhopal. Moreover, literature on solid waste is also reviewed here. The analysis of leachate treatment from "solid waste landfill" is presented in the results section. For Adampur local dumpsite, validation of tool is also performed which indicates that it is useful as decision making tool particularly in dumpsite rehabilitation.

Keywords: Solid Waste Management, environmental inspecting, composting & landfill sites, Municipal Solid Waste Management (MSWM), Leachate.

INTRODUCTION

Waste materials obtained from various activities such as production of gas & oil, exploration, geothermal sources or various other materials which are under the control of local government or federal government are not included in solid waste. [1]

Uncontaminated solid waste is included in solid waste excluding the gasification feed stocks. From various sources uncontaminated solid waste is obtained such as: demolition of roads, buildings, bridges, buildings & re-modelling. Some of the basic materials of solid waste are: concrete, bricks, soil, wood, rock, plasters, roof coverings, drywall, plumbing fixtures, shingles for roofing, and empty buckets of paints, plastic material, wiring and various other components. [2] Only those material are selected which do not have any hazardous material present in them. Unwanted, hydro-carbonaceous and carbon materials which are obtained from various solid substances is defined as solid waste. On the other hand, disposal of various wastes is a major concern today because traditional methods of disposal are used today for landfills which have become a less acceptable way in recent years. The major concern about this waste is the environmental impact of such practices. [3]

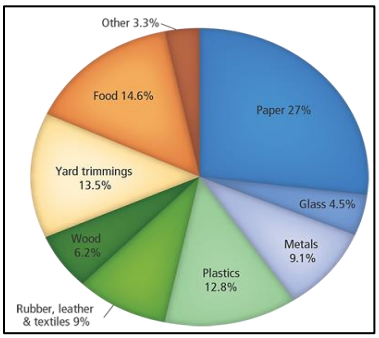

Figure 1: Sources of wastes

Leachate

Contaminated liquid generated from water seeping out from the solid waste creates Leachate. Through rainfall, perforated pipelines, leachate is collected and it increases the volume and concentration of leachate. [4] Leachate is also defined as the liquid which is generated through rain water and natural

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decomposition of solid waste and Leachate also gets filtered from the landfills and transferred to leachate collection system. [5]

To control pollution for leachate, whole world is concerned. It is important to treat the leachates properly before discharging it into water. Additionally, solid waste must be treated with "integrated leachate treatment method". [6] This leachate can travel and contaminate subterranean and ground waters if there is no controlling barrier under or surrounding the trash dumping site. On the basis of amount of rainfall or run-off or the water reaching waste-containing zone decides the volume of leachate generated. Moreover, absorbent capacity and moisture content are the other factor which decides the volume of leachate generated. [7]

In this system, automatic pumping system is used so that leachate can maintain compliance with the required state. An independent technician takes monthly verification measurements to confirm the regulatory limits which must be accomplished and maintained. [8]

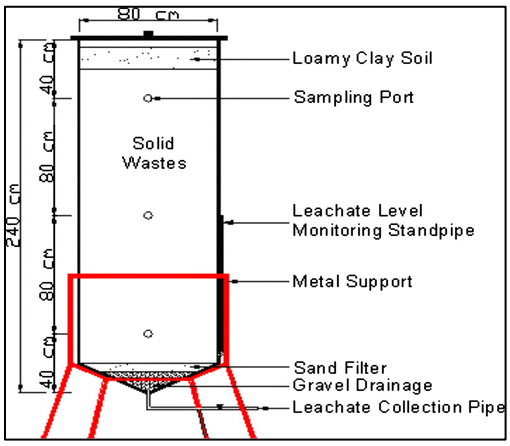

Figure 2: Leachate collection technique

It is not easy to attain an ideal "C/N regulation" by mixing different leachates. For biochemical treatment, it is important to adjust the C/N ratio to appropriate range, so that efficient NH_3-N can be removed from the leachate. [9]
Following are the objectives mentioned below:

- To identify the problem and solution regarding solid waste management.
- To calculate physical characteristic of waste at dump-yard.
- To calculate the Risk Index (RI) of solid waste management over the surrounding.
- To assess the effect of solid waste over environment and humans health.
- To collect and analyze the related data.

METHODOLOGY

Study Area: In Bhopal and around areas, there are 18 different water bodies. The city was developed more than 900 years back and this city is facing the issue of decline in water bodies. The water bodies are declining due to the deposition of solid waste on large extent. The municipal solid waste of Bhopal is disposed at "landfill site of Chhawani Adampur Bhopal" and no scientific treatment method is adopted there which leads to pollution in the same area. [10] Leakages lead to contamination which forms solute fraction as well as soluble product of the waste. These pollutants make water unfit for usage. [11]
Risk Analysis Tools: On the basis of nature of the risk problem, risk assessment tools can be categorised as their main usage is in assessing. The three different categories of risk problem are the main concern of risk analysts which are considered as the part of causal chain of events[12]:

- "Source term risks" are those that are linked to the possibility of an initiating event or a series of events that depart from normal working circumstances and results in a discharge to the environment.

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- Following an initial discharge, route risks address the possibility of an environmental receptors becoming exposed to a risk; and
- The possibility of injury to receptor as a consequence of the stimulation.

Risk Assessment Procedure: There are two important and major areas where risk assessment has been applied such as [13]:

- Due to exposure to hazardous chemicals, it can adversely affect the health and the environment.
- Failure of complex technological systems

The main objective of "risk assessment technique" is to prevent & mitigate the potentially important environmental affects which are caused due to accidental events. So, it becomes important to properly understand and manage the hazards & risks presented by hazardous facilities. Hazardous facility management, economics, administration, hazard management, structural engineering, as well as environmental conservation are all fields that apply the idea of risk.[14]

Therefore, the product of consequences and the probability of product are defined as Risk.

RISK = PROBABILITY x *CONSEQUENCES*

RESULTS AND DISCUSSION

The graph shown below represents the different chemical parameters and their values in different months, such as January, February and March. From the figure given below, it is observed that "Alkalinity" shows the maximum values and the least values are observed in "pH", "Turbidity", "Nitrate" and "Total Phosphorus".

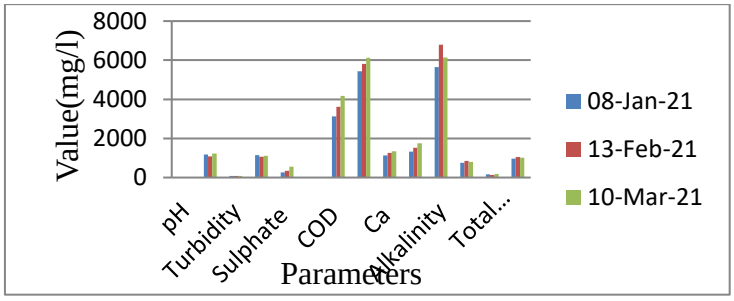

Figure 3: Graphical representation of chemical parameter of leachate sample

The graph shown below represents the different heavy metal parameters and their values in different months, such as January, February and March. From the figure given below, it is observed that "Iron" shows the maximum values in all three months.

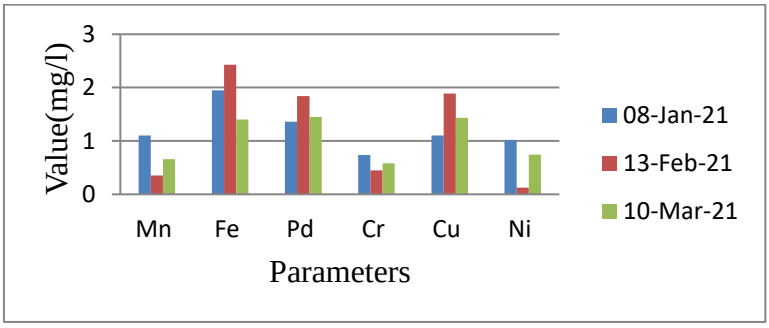

Figure 4: Graphical representation of heavy metal analysis of leachate sample

Criteria for Hazard Evaluation Based on the Risk Index

On the basis of overall score, the hazard potential of the site is evaluated in detail as mentioned in the table given below. On the basis of criteria, the classification is performed as recommended by "Ministry of Environment and Forests, Government of India". It is done for the classification of abandoned hazardous waste dumps.

Table 1: Table representing criteria for hazard evaluation based on the Risk Index

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Sl. No.	Risk Index	Hazard Potential	Recommended Action
1.	750-1000	Very High	Close the dump with no more land filling in the area. Take Remedial action to mitigate the impacts
2.	600-749	High	Close the dump with no more land filling in the area. Remediation is optional.
3.	450-599	Moderate	Immediate Rehabilitation of the dumpsite into Sustainable Landfill
4.	300-449	Low	Rehabilitate the dumpsite into Sustainable Landfill in a phased manner
5.	<300	Very Low	Potential Site for future Landfill

High score of the site indicates higher risk to human health and environmental hazards. For that immediate remedial measures are needed at the site. With the reduction in total score for the dumpsite, the priority also decreases. Low sensitivity as well as insignificant environmental impacts was indicated with the least score of dumpsite.

The present experimentation performed at Adampur Dump yard indicated the value of Risk Index which is 529. This value lies between the ranges of 450-599 which shows "Moderate hazard potential".

Recent Innovations and Interventions taken by Bhopal Municipal Corporation

In 2014, the present government of India started various programmes such as: *"Swachh Bharat Abhiyan"- "Clean India Mission"*. The main objective of this is to make a significant impact upon the public health and also to protect the income of poor which will ultimately safeguard the national economy of India.

For better solid waste management, several steps and measures are taken by "Bhopal Municipal Corporation" as a part of this movement. Number of garbage bins has been increased in different regions of Bhopal. In FY 2015-16, the Municipal Corporation of Bhopal also sanctioned for buying new trucks, dumpers and containers. Moreover, proposal of new dump sites is also passed by Municipal Corporation of Bhopal as the dumpsites which are used today are too old. New landfills will have proper leachate management and gas collection facilities. For ground water resources, landfill is considered as the threat. Contamination of ground water sources can be minimized in Bhopal and all over India if proper collecting and monitoring devices of leachate and gases are implemented at the new disposal sites.

CONCLUSION

For waste disposal, landfills are one of the significant methods but it is highly potential to pollute the environment. So, for identification and defining landfill hazards for the environment, risk assessment is needed. The present study provided the present situation of Adampur dumping yard. On the basis of "Risk Index measurement", the hazard potential of the site is calculated. As per the "Ministry of Environment and Forests, Government of India", the classification is done accordingly for risk potential of abandoned hazardous waste dumps. From the results obtained, it can be concluded that the value of risk index is 529 which indicates that Adampur dump yard have moderate hazard potential and it needs rehabilitation as early as possible.

Despite dumpsites, there are various other polluted sites which need to be rehabilitated as early as possible so that it does not destroy more of the scarce groundwater and surface water resources which are available. In future, land rehabilitation will be more common in several countries and in future waste dumping will be used as "waste handling method".

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