

Comparative Study Of Solid Waste Management By Chemophytostabilization Technique

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Abstract: The industrialization and globalization of India has contribute to the increase rate of solid waste generation. Out of the total solid waste generated only 32%is treated and the rest is dumped. This waste includes various harmful heavy metals and toxic content which are to be removed in order to prevent their entrance into environmental cycle. Various remedies have been adopted for overcoming this situation. Chemophytostabilisation is an advance technique which offer relief and solution to this problem. Remediation activities that are applied to large scale areas contaminated with heavy metals should mainly focus on decreasing the degree of metal mobility in soil profile and metal bioavailability to levels that are not phototoxic. Chemophytostabilisation is the process in which soil amendment and plants used to immobilize metals. The aim of this project is to reduced the level of heavy metals from solid waste. For this different type of accumulator has been used like brassica, juncea, sunflower, papaya, poplar plant, etc. and chemical accumulator used.

Keywords: Chemophytostabilization, Remediation, Phytotoxic, Amendments

I. INTRODUCTION

GENERAL

Solid waste means any garbage, refuse, sludge from waste water treatment plant, water supply treatment plant, air pollution control facility & other discarded materials including solid, liquid, semi-solid or contaminated gaseous material, resulting from industrial, commercial, mining & agricultural activities.

In the other words, we can say that solid waste is the unwanted or useless solid material generated from human activities in residential, industrial, commercial areas. It may be categorized in three ways.

Origin (domestic, industrial, commercial, constructional or institutional)

Contents (organic materials, glass, metal, plastic, paper, etc)

Hazard potential (toxic, non toxic, flammable, radioactive, infectious, etc)

The metro cities in India, an individual produces an average of 0.8kgwaste/person daily. The generation of municipal solid waste is 23,449.66 MT/day & the treatment of municipal solid waste is only 7543.10MT/day (i.e. almost 32.17%). The rest of the waste is dumped or either used for land filling.

MSW typically contains 51% organic waste, 17% recyclables, 11% hazardous & 21% inert waste. However about 40% solid waste is not collected at all and hence lies littered in the city/town and finds its way to nearby drains and water bodies, causing choking as well as pollution of surface water. Un-segregated waste collection and transportation leads

to dumping in open, which generates leachate and gaseous emission besides causing nuisance in the surrounding environment and increase global warming.

The following are the treatment method for solid waste:-

Thermal treatment (incineration)

It is the combustion of waste in the presence of oxygen, so that the waste is converted into carbon dioxide, water vapour & ash.

Pyrolysis and gasification

In this method, the thermal processing is complete absence of oxygen or less amount of air.

Biological treatment method

Micro organisms are used to decompose the biodegradable components of waste.

AEROBIC DIGESTION

This needs the presence of oxygen and includes window composting, aerated static pile composting and in vessel composting, vermiculture, etc.

ANAEROBIC DIGESTION

This process is takes place in absence of oxygen.

Landfills and open dumping

It is uncontrolled disposal of waste on land where waste is dumped exposing to natural elements, stray animals and birds.

II. LITERATURE REVIEW

Anna Grabelak, Anna Napora, (2015) have done a intensive work and published a research article on "The chemophytostabilization process on heavy metal polluted soil." The main objective of this study was to investigate the effect of soil organics & inorganic amendment of Cl, Pb, Zn conducted with fescue grass. The practical aim of this research is to limit the migration of micropollutant (metal) into the ground water in large areas that are contaminated with heavy metals The fertilizing effect of sewage sludge from the food industry acts as a substantial improvement in the scorpion capacity of soil, as a week as enrichments of N, P and organic matter.

Shagun, Ashwini Kush and Anupam Arora, (2013) have discovered the proposed solution to E-waste Management. In this paper the authors have highlighted the major reasons of E-waste generation. The proposed solutions given are recycling with take back product; adopt consultative process, disposal fee for manufacturers and consumers. The paper concludes that the customer should move for upgrading their electronic device to latest version rather than buying new equipments.

A Rumyantseva, M. Berezyuk, N. Savchenka and E. Rumyantseva, (2017) had done a experimental work and publish a research article on "Modern technology of processing municipal solid waste". The problem of effective municipal solid waste (MSW) management is known to all the municipal entities of Russian federation. The problem is multifactor and complex. The author of paper suggests a project of a plant for processing municipal solid waste into combustible gas with the help of high temperature pyrolysis.

Pyrolysis is process of decomposition of the substance into simpler components, which is implemented under high temperature stress with the lack of air. During gasification process residue transforms into gas under the effluence of atmospheric oxygen or steam. The inorganic residue received after the gasification should be disposal in special landfills.

Matt Limme and Joel Burken, (2016) have published a research article on "Phytovolatilization of Organic Contaminants." Research into phytovolatilization of contaminants has elucidated the pathways through which many contaminants volatilize from plants. Studies of direct phytovolatilization and presents the region of physicochemical space where direct phytovolatilization is most likely. Earnings can be applied to alter fate in beneficial manners either to enhance transport in remediation of subsurface settings or to limit transport if undesired. Increasing our knowledge of plant mediated transport will help us to better understand the connectivity between the atmosphere and the obscure subsurface.

Lee A Newman and Charles M Reynolds (2004) had done a intensive work and published a research article on "Phytodegradation of organic compound." The main finding of this study was the process of phytodegradation of organic compound can take place inside the plant or within the rhizosphere of plants. Many different compounds and classes of compound can be removed from the environment by this method including solvent in groundwater, petroleum and aromatic compound in soil and volatile compounds in the air. The aim of paper is to reduce contaminants by using various plants such as Poplar, Brassica, Canna etc by various process such as metabolism, volatilization, rhizosphere effect and increased greenery by phytoremediation.

Nanthi S. Balan, Jin Hee park, Brett Robinson, Ravi Naidu and Keun Young Hub in (2011) had done intensive work "Phytostabilisation: A green approach to contaminant containment." The finding of this paper, phytostabilisation involves the establishment of plant on the surface of the contaminated site with the aim of reducing the mobility of contamination by roots or immobilization within vadose zone through accumulation by root or immobilization within rhizosphere, thereby reducing off site contamination. This process includes transpiration and root growth that immobilize contaminant by reducing leaching, controlling erosion, creating an aerobic environment in root zone and adding organic to the substrate that bind the contaminant and micro bioactivity assisted with the plants may accelerate.

C. Madera & Vivian Valencia-Zuluaga, (2011) has done an intensive work & publish a research paper on "landfill leachate treatment: one of the bigger and underestimated problems of the urban water management in developing countries". The main objective of this study was to investigate the effect of leachate on developing countries. Leachate stored in artificial ponds or discharged directly into water bodies, causing damage in the eco system and human health treatment selection is hard due to variability of this liquid. Since it depends on several factors like the dump location & waste age, composition, researchers indicate the effective treatment for younger leachate are biological technologies and for old leachate are the physicochemical .

Brajesh Kumar, Kumari Smita, Luis Cumbal Flores (2013) had done research work on "Plant mediated detoxification of mercury and lead." In their research paper their major focused on detoxification of metal poisoning. They have investigated in order to find an eco friendly and recyclable techniques for the removal of heavy metal (Pb, Hg) contamination from the natural resources. One of the most considered method is removal of (Pb, Hg) using green plant waste. This review phytoremediation and biosorption have many advantageous feature that make it an appropriate and successful technology giving valuable option for remediation. They features make it to become environmentally friendly method of choice because it is non polluting, low cost does not require soil excavation.

Bieby Voijant Tangahu, Siti Rozaimah Sheikh Abdullah, Hassan Basri, Nurina Anuar, (2011) has done a great work & publish a review article on "A review on heavy metals(As, Pb, Hg) uptake by plants through phytoremediation". The main aim of this study is to compile some information about heavy metals of lead, arsenic, mercury (As, Pb, Hg) sources, effects & their treatment. Also about phytoremediation technology, including heavy metals uptake mechanism & several research study about their topic. They have instigated that prolong research needs to be conducted to minimized its limitation.

M. S. Kadam, S. S. Sarawade, (2012) had publish a research paper on "Study and analysis of solidwaste management challenges and action for treatment (Indian villages)"

Portable solution for solid waste management at village level:

- Collection and storage of solid waste
- Segregation of solid waste
- Treatment and disposal of solid waste
- To create public awareness

So after above study following option are very beneficial for the village solid waste treatment aerobic composting is the traditional method. Anaerobic composting is not well in practice due to initial cost waste to energy (WTE) is the better option in this energy crises. WTE fulfills the need of electricity of vilage and steam generation

Jil Tushar Shet, Kinara Patel, Prof. Dipsha Shah, (2016) had investigated on "Solid Waste Management: A Case Study of Ahmedabad" Based on our analysis it can be deduced that a radical paradigm shift is need of the hour to boost this waste management scenario in Ahmedabad, and to position its future as a contemporary, clean, enticing and live able city. Decentralization and segregation at source can be beneficial as compared to current cost of INR1000 per ton for solid waste management, cost can reduce to Rs. 418 per ton and also can lead to better standard of living of society. Out of 4000 MT generated daily only 800 MT would be needed to dispose daily which would lead to 80% volume reduction then current scenario. As only 800MT tones would be disposed, it would further lead to reduction in GHGs emission and thus would lower carbon footprint. Henceforth, adopting segregation at source can thus lead to cleaner and better environment.

Sukeshni Jadhav, (2013) has done a influence work on E-waste and submitted a paper on Electronic waste, a growing concern in today's environment sustainability. This paper is based on the study of waste composition, Global and Indian E-

waste scenario and different hazardous material found in E-waste. There is a strong need to adopt sustainability practice to tackle the growing threat to E-waste.

Vipin Upadhyay, Jethoo A. S, Poonia M. P, (2012) has published a research paper on "solid waste collection and segregation - A case study of MNIT campus Jaipur." Solid waste management is a worldwide phenomenon. Improper management of solid waste causes hazardous to inhabitants. The main objective of this study was to investigate the problems & prospects of solid waste MNIT, Jaipur. A detailed investigation was made regarding the methods of practices associated with sources, quantity generation, collection, transportation, storage, treatment and disposal of solid waste.

M solhi I, M.A Hajabbasi, H. shareatmadari (2005) had done intensive work on "Heavy metals exteaction potential of sunflower (*Heliathusannus*) and canola (*Brassica napus*)". In this journal they are found out phytoextraction is a remediation technology that use plants to remove heavy metals from soil. The success of phytoextraction process depend on adequate plants yeild and high metals concentrations in plant shoots. They was pot experiment conducted to investigate the combination effect of plant sunflower and canola with soil treatment. This study was launched to evaluate the effect of different level of DTPA, sulfuric acid manure and control biomass production and Zn and Pb accumulation in plant tissue.

III. CONCLUSION

After reviewing and surveying various literature paper, the following conclusions were drawn:-

Chemophytostabilisation technique improves the physical and chemical soil parameter.

Phyto-stabilisation technique is suitable for contaminated sandy soil.

Immobilization within the root zone of plants prevents the offsite contamination.

Researchers indicate the effective treatment for younger leachate is biological technologies and for old leachate are the physicochemical.

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