

REMOVAL OF HEAVY METALS FROM WASTEWATER BY USING LOW COST ADSORBENTS

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ABSTRACT

This project is innovative process for Removal Of Heavy Metals From Wastewater Using Low Cost Adsorbents(Plants). Heavy metals are toxic to humans on consumption if disposed with ineffective treatment facilities in water bodies or on land. Such industrial wastewater needs effective treatment before disposal. This study based on using economical with low operational and maintenance cost system for removal of heavy metals from wastewater.

In this project plants used as adsorbent. the adsorption is economically favorable and technically easy to separate. Plants evolved several effective mechanisms for tolerating high concentrations of metals in wastewater. In some species, tolerance is achieved by preventing toxic metals uptake into root cells. In this project used plant as adsorbent. Tests are carried out on different types of soil (cultivated, non-cultivated).

Keywords –Wastewater, Heavy metals, Low cost treatment.

I. INTRODUCTION

Water pollution caused due to addition of heavy metals resulting from the industrial activities is increasing tremendously and is a matter of global concern. Mining, mineral processing and metallurgical operations are generating effluents containing heavy metals., could lead to serious health disorders. In light of the facts, treatment of heavy metals containing industrial effluent becomes quite necessary before being discharged into the environment. The scientists and environmental engineers are therefore facing a tough task of cost effective treatment of wastewater containing heavy metals. The heavy metals present in the wastewater is persistent and non-degradable in nature. Moreover, they are soluble in aquatic environment and thus can be easily absorbed by living cells. Thus, by entering the food chain, they can be bio-accumulated and biomagnified in higher trophic levels also. The heavy metals, if absorbed above the permissible levels. The conventional methods for heavy metal removal from wastewater includes chemical precipitation, chemical oxidation, ion exchange, membrane separation, reverse osmosis, electro dialysis etc. These methods are not very effective, are costly and require

high energy input. They are associated with generation of toxic sludge, disposal of which renders it expensive and non-ecofriendly in nature. In the recent past, number of approaches has been investigated for safe and economical treatment of heavy metal laden wastewater. Adsorption has emerged out to be better alternative treatment methods. It is said to be effective and economical because of its relatively low cost.

Authors have claimed adsorption to be easiest, safest and most cost-effective methods for the treatment of waste effluents containing heavy metals. The key benefit of adsorption method for heavy metal removal is less initial as well as operation cost, unproblematic design and less requirement of control systems. Generally the heavy metals are present in the wastewater at low concentrations and adsorption is suitable even when the metal ions are present at concentrations as low as 1 mg/L. This makes adsorption an economical and favorable technology for heavy metal removal from wastewater. The adsorbent may be of mineral, organic or biological origin. It could be zeolites, industrial byproducts, agricultural waste, biomass and polymeric material. One of the conventional adsorbent, activated carbon has been extensively used in many applications. However, the high cost effectiveness of activation processes limits its usage in wastewater treatment processes. The present research activity aims toward contributing in the search for cost effective or low cost adsorbents of natural origin and their applicability in recovery as well as removal of heavy metals from the industrial wastewater. We use low cost adsorbents for removal of heavy metal.

II. LITERATURE SURVEY

NEED OF LITERATURE SURVEY :

Study of literature is basically done for better understanding of topic. For this various literature is studied. Various articles, papers, journals which has information of removal of heavy metals from wastewater is taken under literature.

STUDY OF LITERATURE :

1) ASHUTOSH TRIPATHI AND MANJU RAVAT RANJAN, HEAVY METAL REMOVAL FROM WASTE WATER

Researchers used various low cost absorbents for removal of heavy metals from the waste water.

These adsorbent includes materials of natural origin like zeolites clay, peat moss and chitin are found to be an effective agent for removal of toxic heavy metals like Pb, Cd, Zn, Cu, Ni, Hg, Cr etc

2) MRS.MEENAKSHI A.KHAPRE, REMOVAL OF HEAVY METAL FROM LANDFILL LEACHATE USING VERTICAL FLOW CONSTRUCTION WETLAND

This paper basically covers information regarding evaluating the efficiency of construction wetland to treat landfill leachate using *Cyperusaltinofalius* plant. This study presents the use of CW to reduce parameters such as

Biological Oxidation Demand (BOD), Chemical Oxidation Demand (COD), Suspended Solids (SS) and heavy metals are examined.

3)SAYED AHMED MIRBAGHERI, PILOT PLANT STUDIES FOR THE REMOVAL OF THE HEAVY METAL FROM INDUSTRIAL WASTE WATER USING ADSORBANT.()

Researcher found that, Due to carcinogenic and toxic effects of heavy metals on the environment and living beings, the necessity of proper removal systems for these harmful elements is obvious. Additionally, conventional methods in wastewater treatment are mainly biological; therefore, removal of heavy metals should occur by using adsorbents. In this study, activated carbon along with other cheap and available materials such as sawdust and bentonite in seven different adsorbent mixtures is applied to remove heavy metals from wastewater.

4)GUNATILAKE S.K.(SHRILANKA), METHODS OF REMOVING HEAVY METALS FROM INDUSTRIAL WASTEWATER.

This paper covers mainly, Methods for treating industrial wastewater containing heavy metals often involve technologies for reduction of toxicity in order to meet technology-based treatment standards. This article was focused on the recently developed and newly applicable various treatment processes for the removal of heavy metals from industrial wastewater. Physico-chemical removal processes such as; adsorption on new adsorbents, ion exchange, membrane filtration, electro dialysis, reverse osmosis, ultra filtration and photo catalysis were discussed. Their advantages and drawbacks in application were evaluated. In the processes of biological treatments microorganisms play a role of settling solids in the solution.

5)A.ZAHKIR AND M. MOHAMED SHERIFF, REMOVAL OF HEAVY METALS FROM WASTE WATER BY USING LOW COST ADSORBENTS

This study reveals that the potential of papaya seed, egg shell and coconut leaf powder were used as adsorbent for the removal of heavy metals such as lead, cadmium and chromium from known concentration of waste water was investigated. Hence the present study reveals that the low cost adsorbent of Chicken egg Shell is used for removing 85, 82 and 86 % of chromium, lead and cadmium respectively. Coconut leaf powder used for removing 87, 90 and 85 % of chromium, Lead and Cadmium respectively. Papaya seed powder is used for removing 80, 85 and 79 % Chromium, Lead and Cadmium respectively from wastewater from the initial metal ion concentration of 100 ppm solution. Batch adsorption studies demonstrated that the adsorbents had significant capacity to adsorb the chromium, Lead and Cadmium from aqueous solution. It was found that the adsorption increased with increase in contact time.

III. AIM AND OBJECTIVES

AIM: REMOVAL OF HEAVY METALS FROM WASTEWATER USING LOW COST ADSORBANT(PLANT AND SOIL)

OBJECTIVE: 1)REMOVAL OF HEAVY METALS FROM WASTEWATER.

2)COMPARATIVE STUDY DIFFERENT TYPE OF SOIL AND PLANT FOR REMOVAL OF HEAVY METAL.

3)HOW WASTEWATER FROM INDUSTRY AFFECT THE SOIL CAN BE CALCULATED FROM THE PROJECT

IV. METHODOLOGY

MODEL INFORMATION

A)Dimension-

Thickness of soil 10cm

Sand 10cm

Gravel (15 -20 mm) 10cm

Gravel (35 – 40 mm) 10cm Parameters Unit Value

Height reactor 0.40M

Surface area 0.1256M²

Weight of aggregate 89kg

Weight of sand 35kg

Weight of soil 45kg

B) Adsorbent Use



C) Photos Of Model-



D)Collection Of Wastewater-Industrial wastewater collected from Mechanical Department of B.G.SHIRKE PVT. LTD, MUNDWA for Zinc coating sand filter and carbon filter test.



Figure 10: Waste water sample

E)WORKING PRINCIPLE:

- Inlet is used for intake of waste sample into the model.
- This waste water gets collected in the top most layer of the soil. This water then percolates through the soil, where brassica, egg shell powder and rice husk are used as adsorbents.
- This percolated water then enters the beneath layer of river sand of size 2 - 3mm and thickness of 0.1 m, used as filter media for filtration of water.
- Below this layer, angular aggregate of size 15 – 20mm are used for filtration purpose with thickness 0.1m.
- Boulder aggregate of size 35 – 40mm are used for strong base and filtration.
- Outlet is provided at the bottom of the tank for collection of waste sample.
- Measuring flask is used for measurement of waste sample.

V. CONCLUSION

i)After conduction of test the low cost adsorbent used are able to remove the heavy metal such as lead,zinc,irons.

ii)after the conduction of test we have concluded that the cost of low cost adsorbent is must low as campared to conventional method of treatment throught sand filter and carbon filter good efficiency.

iii)This method can also be used for rural areas and small industries contain heavy metals in there waste water.

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