

Potential Application of Orange Peel as an Adsorbent for the Polluted Pond Water

M. Gayathri¹ M. Subita Deeneshwari²

^{1,2}Assistant Professor

^{1,2}Department of Civil Engineering

^{1,2}E. G. S. Pillay Engineering College, Nagapattinam, India

Abstract— Organic filtration is a practice to eliminate the colour, chemical oxygen demand (COD) and some heavy metals. In this thesis, orange peel was taken as natural adsorbent for the reduction of COD in river water, nearest to the soap factory. An orange peel, carbon powder, fine and coarse aggregate were taken as a filter media. An influent was allowed to pass through the filter media with a contact period of 45 days. Aggregate were used to remove the suspended particles and carbon powder was used to remove contaminants and impurities using chemical adsorption. An orange peel could be removed the colour and COD in the waste water. The physical and chemical characterisation were analysed for influent effluent. An effluent has achieved in the reduction of COD and other parameter like pH, total solids, turbidity etc. It could be compared with IS standards for waste water. Finally concluded, the effluent can be used for non- portable domestically uses, and also for cooling and washing purposes in industries.

Key words: Effluent- Orange Peel, COD Removed, Non-Domestically Usage, Industrial Usage

I. INTRODUCTION

Water is an indispensable natural resource essential for all living matter. Without water no living matter such as human beings, animals, and plants can survive. Water occupies about 71% of the earth's surface and the amount of water is about 1400 million cubic meters. But 97% of this water is in the oceans and saline lakes which is useless for any purpose. Only 3% of the total water, is fresh water, of this fresh water nearly 80% exists as snow in the polar region and only 20% of this is available for human consumption either for the domestic use or for agricultural purposes. The fresh water is available in rivers lakes, ponds and other sources. It exists as a liquid between 0°C and 100°C. It has very high specific heat and so warms up and cools down slowly. It is a solvent for many nutrients, which are essential for life. Because of high surface tension water is easily absorbed by plants and reaches the top of the trees from the roots. Water freezes into ice, which is lighter than liquid water and so it floats on the surface. The water under the ice remains a liquid enabling millions of aquatic organisms to survive. These are some of the qualities of water which helps all living organisms to survive and grow. Animals and plants have about 60% of water in their bodies. So water is rightly called the "elixir of life". Water pollution has become a serious problem around the world.

A. Effects of Polluted River Water

Water pollution is very harmful to humans, animals and water life. The effects can be catastrophic, depending on the kind of chemicals, concentrations of the pollutants and where there are polluted. The effects of water pollution are varied and depend on what chemicals are dumped and in which location.

Many water bodies near urban areas (cities and towns).Are highly polluted. This is the result of both garbage dumped by individuals and dangerous chemicals legally or illegally dumped by manufacturing industries, health centres, schools and market places.

B. Objectives of the Work

- 1) To examine the COD reduction in a selected textile wastewater by using natural adsorbents, to minimize the treatment cost.
- 2) To removes the TSS present in the waste water.
- 3) To check that it removes the colour of eutrophication in the trial and error method.

II. METHODS AND MATERIALS

A. General

Adsorption is the process of accumulating substances that are in solution on a suitable interface. Adsorption, as noted, is a mass transfer operation in that a constituent in the liquid phase is transferred to the solid phase. The adsorbate is the substance that is being removed from the liquid phase at the interface. The adsorbent is the solid, liquid, or gas phase onto which the adsorbate accumulates. Although adsorption is used at the air-liquid interface in the flotation process, only the case of adsorption at the liquid-solid interface will be considered in this discussion. The adsorption process has not been used extensively in wastewater treatment, but demands for a better quality of treated wastewater effluent, including toxicity reduction, have led to an intensive examination and use of the process of adsorption. An attempt is made in this study to reduce COD concentration of the waste water using natural adsorbents. The materials and the methodology adopted to carry out this study are presented.

Four types of adsorbents are used for reduction of COD present in the waste water are coarse aggregate, fine sand, carbon and orange peel. The waste water is allowed to pass through the tank. The basic characteristics of an influent and effluent were carried out in the experiment.

SI. No	MATERIAL	SIZE (mm)	DEPTH (mm)	USES
1	Coarse Aggregate	20mm	200mm	Filter the coarse suspended particles from waste water
2	Fine Aggregate	4.75mm	200mm	Filter the fine suspended particles from waste water
3	Carbon	2.75mm	200mm	Remove contaminants and impurities, using chemical adsorption.(chlorine)

				, sediment volatile organic compounds (VOCs), taste and odor
4	Orange peel	0.75m m	200mm	Remove colour and COD

Table 1: Material used



Fig. 1: Fabricated treatment tank

SI. No	Description	Purposes
1	PH meter	To measure and adjust the pH of the wastewater.
2	Hot plate	To determine solids present in wastewater.
3	Hot Air Oven	To determine solids present wastewater and for drying the adsorbents.
4	Muffle furnace	To determine volatile solids present in wastewater.
5	COD Digester	To digest the sample during COD determination.
6	Refrigerator	To preserve the samples.
7	Digital weighing	Weighing.

Table 2: Instruments used

III. EXPERIMENTAL STUDIES

A. Characterization of Polluted River Waste Water

The sample of waste water was collected from the "THANDALAR RIVER" located at karaikal. The collected waste water was kept as stock solution and the sample used for the studies was prepared by diluting the stock solution for avoiding fault results. The sample was diluted for 100 times. 1 ml of sample was mixed with 99 ml of distilled water. The waste water used for this study was collected from Karaikal and the same was characterized in terms of pH, Chemical Oxygen Demand (COD), Total Solids, Total dissolved solids, and Total Suspended solids. The characterization studies were carried as per the standard procedures and the results obtained were tabulated in table no 4.1

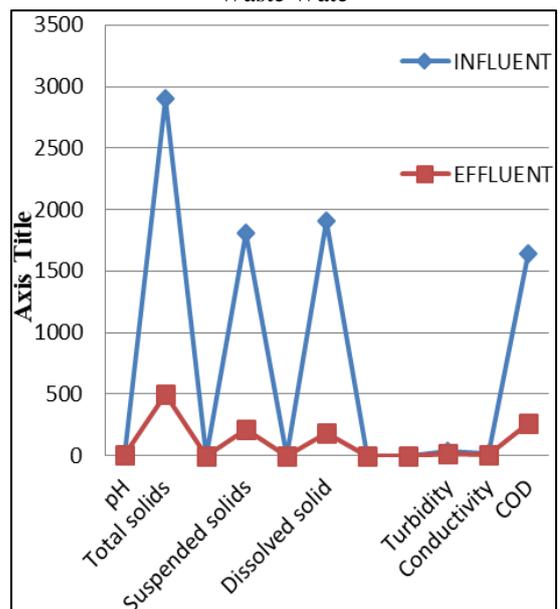
IV. SUMMARY AND CONCLUSION

A. Summary

In this thesis work an attempt is made to study the feasibility of natural adsorbent like Coarse aggregate, Fine aggregate, Carbon and Orange peel. Peel and Carbon is used to reduction of COD of waste water. The sample waste water was collected from the Soap factory located at Nagapattinam. Four different natural adsorbents are selected based on the literature reviewed in the previous chapter. Coarse aggregate, Fine aggregate, Carbon and Orange peel are selected as natural adsorbent for this present study. Batch studies were carried out with the selected adsorbents of Coarse aggregate, Fine aggregate, Carbon and orange peel to analyse the COD reduction of each adsorbent, to determine the effective adsorbent out of the selected four adsorbents second batch study was conducted to investigate the parameters affecting the adsorption process of the selected adsorbent. Third batch study was conducted to study the rate of reaction and to find the mechanisms of adsorption using isotherm studies. Last batch study was carried out to find the desorption characteristics of orange peel.

SI. No	PARAMETER	INFLUENT	EFFLUENT
1	ODOUR	Muddy smell	None
2	COLOUR	Bluish green	90% removed
3	Ph	8.67	7.9
4	Total solids	2900 mg/l	495mg/l
5	Suspended solids	1080 mg/l	210 mg/l
6	Dissolved solids	1910 mg/l	180 mg/l
7	Turbidity	32.3 NTU	12.86 NTU
8	Conductivity	10.9 milli mho	2.3 milli mho
9	COD	1640 mg/l	265 mg/l

Table 3: Characteristic of Sample of Waste Water



Graph 1: Parameter of Influent and Effluent

V. CONCLUSION

Due to the usage of orange peel a colour and COD could be removed in 265mg/l and using filtration process a total solids can be removed into 500 mg/l, within the permissible limit. Even though, due to its turbidity level of 12.86 NTU, it doesn't used for drinking purpose. Hence it is used for non-potable domestic uses such as irrigation purpose, toilet flushing and also for some industrial uses such as cooling, washing etc.

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