

Application of Flyash-based Filter bed in Domestic Wastewater Treatment

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Abstract— Fly Ash is one of the most plentiful waste materials, its main components make it prospective agent for the filtration of Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD), and Total Solid (TS) in wastewater. The objective of this study was to reduce the impurities from Domestic Wastewater by Fly ash use as filter bed. And low cost Filter media was prepared, characterized and used for the removal of impurities such as Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD) From Wastewater)

Index Terms— Wastewater, Fly Ash, Filter bed, Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD), and Total Solid (TS).

I. INTRODUCTION

Water is mainly polluted by the discharge of various effluents from Domestic waste & Industrial Waste. Water pollution occurs when pollutants are discharged directly or indirectly into water bodies without adequate treatment.

Wastewater with high concentration of conventional pollutants, toxic pollutants (e.g. heavy metals, volatile organic components) from Domestic, and Industrial need specialized and effective treatment system. [1]

A measure of organic water quality contamination is its BOD. Most municipalities have set limits of BOD between 300-350ppm. Undissolved matter, floating or suspended in water imparts a cloudy or turbid appearance to it and is referred to as TSS. High TSS is also responsible for the growth of harmful bacteria and pathogens as they attach themselves to the suspended particles and are not readily disinfected. Therefore treatment of domestic waste water is necessary. [2]

There are various methods available for wastewater treatment, in this study; fly ash is used as a filter media like adsorbent.

Fly ash is one of the residues generated in combustion and comprises of fine particles that rise with the flue gases. Fly ash particles are generally spherical in shape.

They consist mostly of silicon dioxide (SiO₂), Which is present in two forms namely aluminum oxide (Al₂O₃) and iron oxide (Fe₂O₃). As it contains these chemical components. Fly ash act an adsorbent as it contains high carbon content with specific surface area between 2,000 to 6,800 cm² per gram. It was

examined that the fly ash in wastewater treatment is used to remove COD, organic, colour and heavy metals. [2]

A basic problem persists with all these sewage treatment plants and that is their high expertise, high running and maintenance cost. So there is a need for some cost effective substance to treat domestic wastewater at small scales.

In this research work wastewater sample used of Domestic sewage for treatment by Fly ash filter.

II. EFFLUENT AND FLY ASH COLLECTION

A. Effluent collection

Domestic waste water sample collected from Naidu effluent treatment plant in Pune region, the sample were collected only after screening process. 4 sample collected in 4 week, with an interval of 1 week between each.

B. Fly ash collection

Fly ash was collected from cement factory in .Fly ash was taken and sieved in 90µm sieve.

III. PREPARATION OF FLY ASH FILTER

The collected fly ash was sieved in 90 µm sieve. The retained fly ash was taken up and washed with number of times with distilled water. Cleaning and washing is done to remove the adhering organic materials and plant substance. Then the fly ash was dried at the room temperature for 24 hours and kept in a vacuum desiccator. After 24 hours, this dried fly ash can be used for filtering process. Fly ash was made as a filter bed of 5cm and 10cm thick. Two storage container of plastic material collected and fix with fabric material. These two containers are provided in a series, and work as an above container as an inlet and below outlet. In order to prevent the dispersion of fly ash through the pores, a fabric material was kept at the bottom of the filter. Fly ash was made as a bed of 5 cm and 10 cm thick, Fly ash act an adsorbent as it contains high carbon contain. Both containers volume 1m³, height 16 cm

IV. EXPERIMENTAL PROCEDURE FOR TREATMENT OF DOMESTIC WASTE WATER WITH FLYASH AS FILTER BED

First Fly Ash sieved in 90µm sieve and the retained fly ash was taken up and washed with number of times with distilled water. Then the fly ash dried at the room temperature for 24 hours and kept in vacuum desiccator.

After 24 hours left this dried fly ash was filed in 1st container of 10 cm thick. Then waste water sample 1000 ml filed in inlet container. 1000ml sample percolated in fly ash filter bed, it took time to percolate sample was about 1.30 hours. The treated effluent was analyzed for TS (Total Solid), BOD (Biochemical Oxygen Demand), and COD (Chemical Oxygen Demand) parameters and value measured.

V. RESULT ANALYSIS AND DISCUSSION

A. Removal of Total solid(TS), Biochemical Oxy, Alkanity by Using Fly ash as Filter Bed

Fly ash is used as filter bed to remove TS, BOD, and COD from Domestic Waste Water of Naidu Effluent Treatment Plant in Pune region.

B. Total Solid (TS) Removal from the Inlet Effluent of Domestic Sewage Using Fly Ash

TS value decreased in 10 cm thick fly ash filter bed 69.02%.

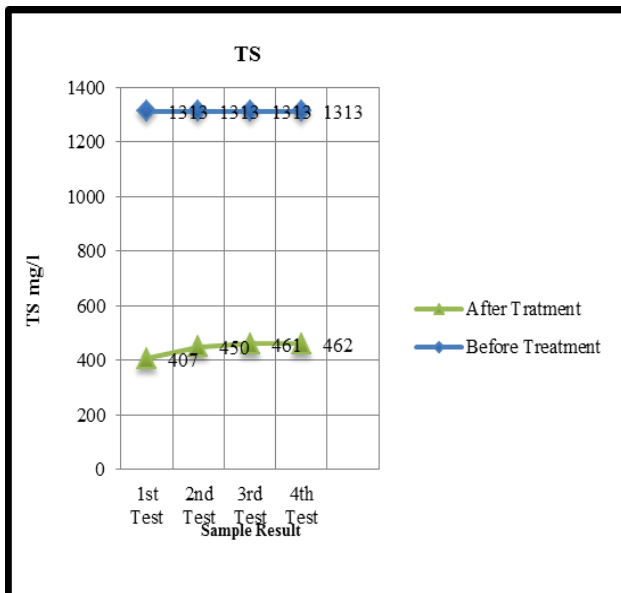


Fig.1.Total Solids value before and after.

C. Removal of BOD from the Domestic Sewage

Before treatment value of BOD is above than permissible limit 280 mg/l. After treatment the BOD value decreased 71.48% in 10cm thick. As shown in figure 5.3.1 below.

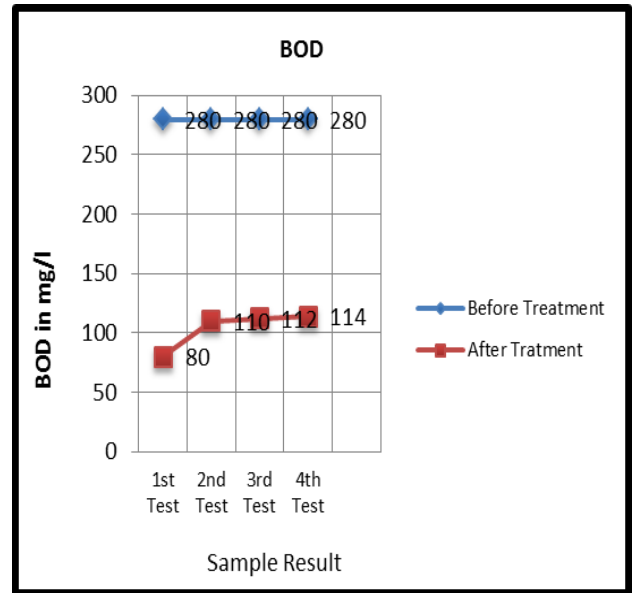


Figure 5.3 BOD value before and after.

D. Removal of COD from the Domestic Sewage

Before treatment value of COD is above than permissible limit 440 mg/l. After treatment the COD value decreased 66.59% in 10cm thick.

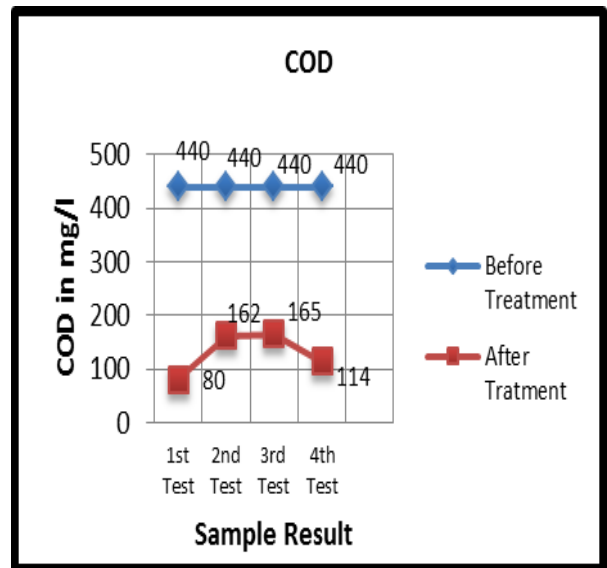


Fig.3.COD value before and after

VI. CONCLUSION

Fly ash which is available in abundance at the coal fed electric power plants can be efficiently used for the treatment of domestic waste water. When Fly ash is used as filter bed of 10cm thick, the parameter value reduced down to more than 60% from the initial value.

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