A Study of Fly Ash and Laterite on Municipal Waste Water as a Filtering Media

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Abstract— The present study reports the comparative study of soil-based constructed soil filter system monitored for about 2 months for removal of turbidity of turbid water in which fly ash and laterite is used as filtering media. The samples passed through this arrangement, includes water collected from Wainganga (Wadsa), Gaurav paper mill Bramhapuri, Bhuti-nala (Bramhapuri), Ballarshah paper mill and Thermal power plant (Chandrapur). The result indicates removal of turbidity from these samples ranging from 3 NTU to 21NTU. Various other tests were also performed to check whether the water is potable or not viz., temperature, pH, dissolved solid, hardness of water, BOD & COD. The water passed through this arrangement reduces pH value from 0.1 to 1.3, dissolved solids from l6Oppm to 1528ppm, hardness reduces from 220 to 560, BOD r educes from 8ppm to 67ppm and COD reduces from 23ppm to 90ppm.

Key words: Turbidity, Hardness, Temperature, Oxygen Content, Ph

I. INTRODUCTION

Several monitoring studies of water bodies reveal that the main Source of pollution is the discharge of raw sewage. Due to rapid economic growth and exponential population increase, Mumbai, the commercial capital of India is expected to have a population of around 26.5 million by 2025. It is expected to lead to a water demand of 18,000 million liters per day (MLD) generating almost 14,400MLD wastewater. But most of the available technologies are often found to be unsuitable for applications in developing countries.. As a result such plants can be beyond the reach of the community. Natural systems overcome these disadvantages, viz., land treatment and wetland systems.

II. CHARACTERISTICS OF WASTE WATER

The characteristics of waste water can be classified as,

1) Physical characteristics
2) Chemical characteristics

A. Physical Characteristics

The sewage has the following physical characteristics:

a) Color: Fresh domestic sewage has a soap solution color. With the time of the color of sewage begins to get black as the decomposition starts. The color of the septic sewage is more or less black. The color of the industrial sewage depends on the chemical process used in the industries.
b) Odor: fresh domestic sewage has slightly soapy or oily odor, but the stale sewage has offensive odor of hydrogen sulphate and passes through the sewers, the offensive smell will start after 2 hours , which reaches the climax after six hours .
c) Temperature: Generally the temperature of the sewage as slightly higher than the water supply when the sewage flows in closed conduits its temperature further ridded , resulting in the increase of viscosity and bacterial activity.
d) Turbidity: The turbidity of the sewage directly depends on the quantity of solid matters present in it in supervision state.
e) Solids: The sewage contains more than 99.9 percent of water and only 0.1 percent of solids. These solids are present in sewage in suspended, dissolved and colloidal states. The filtered sewage in evaporated, the residue is dissolved solids, and colloidal solids are non-settle cable suspended solids, which will not settle in sewage.

B. Chemical Characteristics

The chemical characteristics of water can be summarized as:

1) Hardness of water: Hard water is water that has high mineral content (in contrast with "soft water ") It is formed due to water percolation through deposition of calcium and magnesium – containing minerals such as limestone, chalk and dolomite.
2) Chemical oxygen demand: It is the test procedure based on the chemical decomposition of inorganic and organic contaminants, dissolved or suspended in water .the result of the COD test indicates the amount of water dissolved oxygen (expressed as parts/million or milligrams per liter of water) consumed by the contaminant during two hours of the decomposition from a solution of boiling potassium dichromate. Higher the COD, the higher the amount of pollution in the test sample.
3) Biochemical oxygen demand: BOD or biochemical oxygen demand is the amount of dissolved oxygen needed by aerobic biological organism in water.

III. MATERIALS AND METHODOLOGY

A. Materials

1.5L of "contaminated water" (collected from Bhuti-Nala, Wainganga river, Rice mill and thermal power plant), 800gm Laterite, 800gm Fly Ash, 800gm Fine sand, 800gm Coarse sand, 100 ml Beaker, 4 Porcelain Dish, Filter Paper, Measuring Cylinder, Hot Air Oven, Titration Set, Hot Plate, COD Reflux Apparatus, PH Paper, Turbid Meter, 12 Jars of same size with holes on the bottom face.

B. Methodology

For the comparative study of fly ash and laterite as a filtering media, we made to find the effective filtering media. The arrangement was made preparing layers of different soil-based materials .The top-most layers was made using Fly Ash passed through sieve size 600µ in one

arrangement and the other arrangement consisted Laterite passing through sieve size 600µ and retained in 300µ.The below layer was followed by coal, which is used as an adsorbent material and is retained in sieve size 1.13mm.This layer was followed by medium aggregate passed through sieve size of 4.75mm and retained in 2.36mm..To determine the temperature, pH value, turbidity, dissolved solid, hardness chemical oxygen demand (COD) of sample water, Biochemical oxygen demand (BOD).

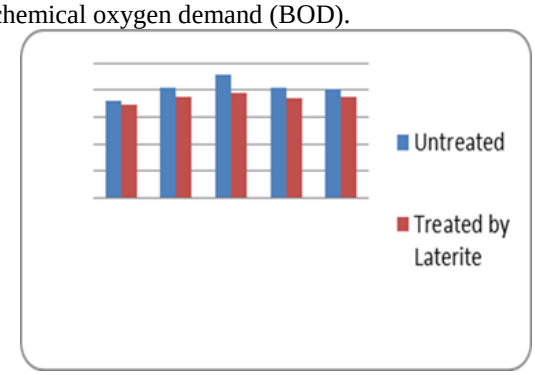

Fig. 4.1: pH

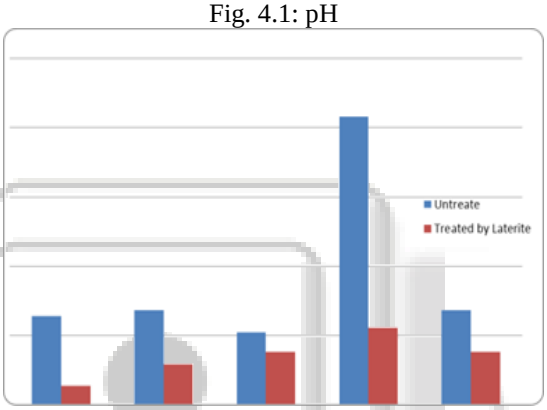

Fig. 4.2: Dissolved Solids

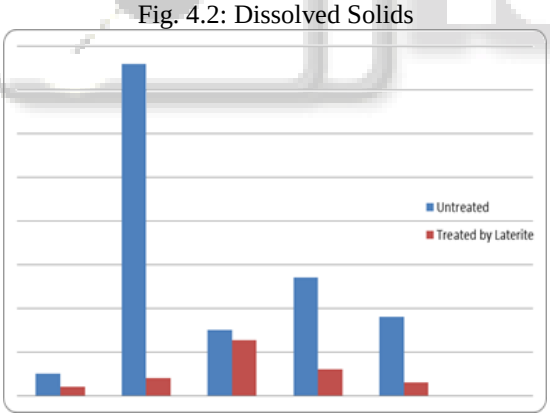

Fig. 4.3: Hardness

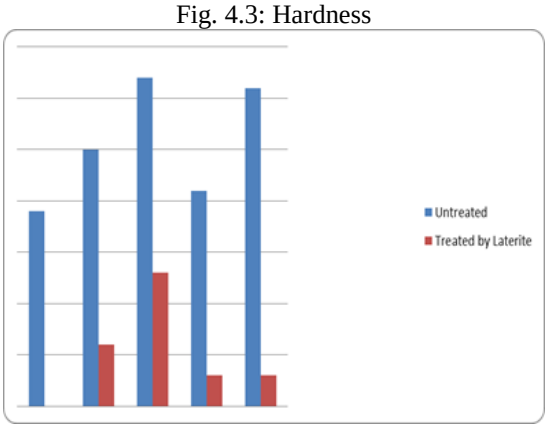

Fig. 4.4: Turbidity

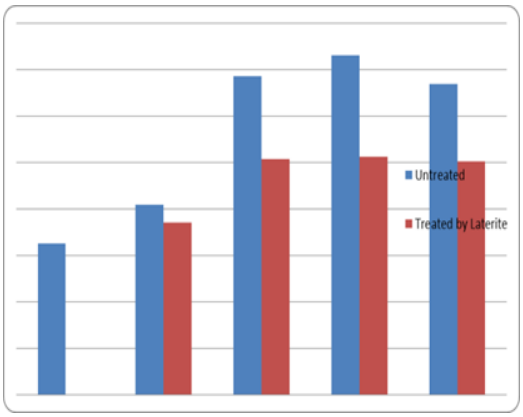

Fig. 4.5: BOD

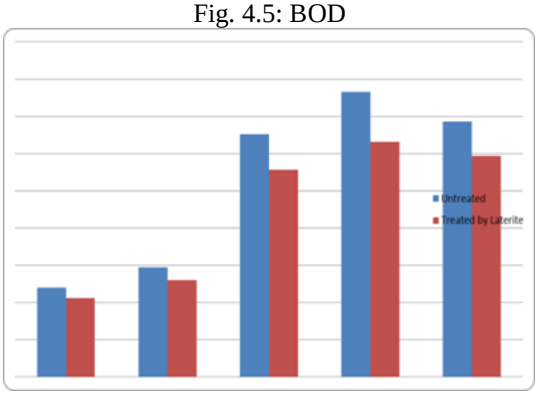

Fig. 4.6: COD

IV. Conclusion

The present study confirms the comparative study of soil-based constructed soil filter system monitored for about 2 months for removal of color of turbid water in which Fly Ash and Laterite is used as a filtering media. The samples water collected from Wainganga (Wadsa), Gaurav paper mill, Bramhapuri, Bhuti-Nala, Bramhapuri, Ballarshah paper mill and thermal power plant (Chandrapur) helps in the removal of color and turbidity ranging from 3 NTU to 21 NTU. Various other tests were also performed to check whether the water is potable or not viz., temperature, pH, dissolved solid, hardness of water, BOD and COD. The water passed through this arrangement reduces pH value from 0.1 to 1.3, dissolved solid from 176 ppm to 1690 ppm, hardness reduces from 160 ppm to 1528 ppm, BOD reduces from 220 ppm to 560 ppm and COD reduces from 23 ppm to 90 ppm. We also concluded from this comparative study that through Fly Ash gives a quick result but not effective as Laterite. Fly Ash can be used for a number of times but not Laterite. After sometimes, when the water is passed through it for a number of times. Water passed through these arrangements removes 60% to 70% of the impurity.

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