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Performance Evaluation of Sewage Treatment Plant Relating to Physical Characteristics

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Abstract: ***This paper presents the analysis and evaluation of a sewage treatment plant with respect to the physical characteristics of sewage. This Sewage treatment plant has been installed by the S.E.C.R. (South Eastern Central Railways - Indian Railways) and is located near Railway Colony at Tikrapara, Bilaspur (C.G.) India. In this research or analysis of the STP, first of all the scheme/flowchart of the STP was studied and its effects on the physical characteristics have also been observed. Physical Characteristics consist of important parameters that are considered while diagnosing sewage treatment plant. The physical characteristicsare determined in accordance with the IS:3025– Reaffirmed 2003.The treated sewage water from this STP is being used in landscaping/irrigating a golf course situated near-by the STP.***
Keywords: Temperature, Turbidity, TDS, Physical Characteristics, STP, Re-use of treated sewage.

I. INTRODUCTION

The physical characteristics consist of primary parameters that are considered while diagnosing a sewage treatment plant**.** The physical characteristics are related to the physical properties of sewage are:

1) *Temperature:* It is the most important physical characteristics of sewage and the rate of chemical reaction taking place in the sewage highly depends upon the temperature. The normal temperature of sewage is generally higher than the water supplies due to various domestic and industrial activities involved. Usually warmer temperature aids in the treatment of sewage water and is encouraged to be in the range of 27°C±5. Also, sudden change in the temperature of sewage is to be avoided as the sudden change affects the microbial action which in-turn reduces the STP efficiency.
2) *Colour:* The colour of sewage indicated its organics decomposition stage. Fresh sewage is light brownish grey colour and as the sewage gets old, the colour of the sewage gradually turns darker. The colour of stale sewage is observed to be dark brown or black which indicates that the dissolved oxygen content is very low and the biological decomposition process is slow. Anaerobic decomposition starts after the colour of the sewage turns black as the dissolved oxygen content reaches minimum value. The dark grey/brown and black colour is due to the formation of sulphide (produced under anaerobic conditions) reaction with the metals present in sewage. It is measured by tintometer.
3) *Odour:* The Odour of sewage also indicates its decomposition stage and fresh domestic sewage has a slightly soapy or oil odour. As the dissolved oxygen content of the sewage diminishes and anaerobic condition starts to develop in the sewage (in stale sewage), the odour of sewage gets worse (unpleasant like that of rotten eggs) and irritating mainly because of Hydrogen Sulphide (H_2S) gas. The odour at low concentration causes poor appetite for food, impaired respiration and vomiting etc. It is expressed as TON (Threshold Odour Number).
4) *Turbidity:* Turbidity is a reduction in water clarity because of the presence of suspended matter absorbing or scattering light. Turbidity is a measure of relative clarity of a liquid, it is an optical characteristic of water. The higher the intensity of scattered light, the higher the turbidity. Turbidity is measured by shining a light through the water and is determined in nephelometric turbidity units (NTU). Turbid sewage indicated untreated sewage or stale sewage, the lesser the turbidity, the less sewage treatment is required.
5) *Total Dissolved Solids (TDS):* TDS is defined as total inorganic and organic substances contained in water that can pass through a 2-micron filter. In general, TDS is the sum of cations and anions present in water. TDS is a non-specific, quantitative measure of the amount of dissolved inorganic chemicals but does not tell us anything about its nature.
6) *Electrical Conductivity:* Conductivity is measure of water's capability to pass electrical flow. This ability is directly related to the concentration of ions in the water. These conductive ions come from dissolved salts and inorganic materials such as alkalis, chlorides, sulfides and carbonate compounds. It also gives an indication of TDS content in the sewage.

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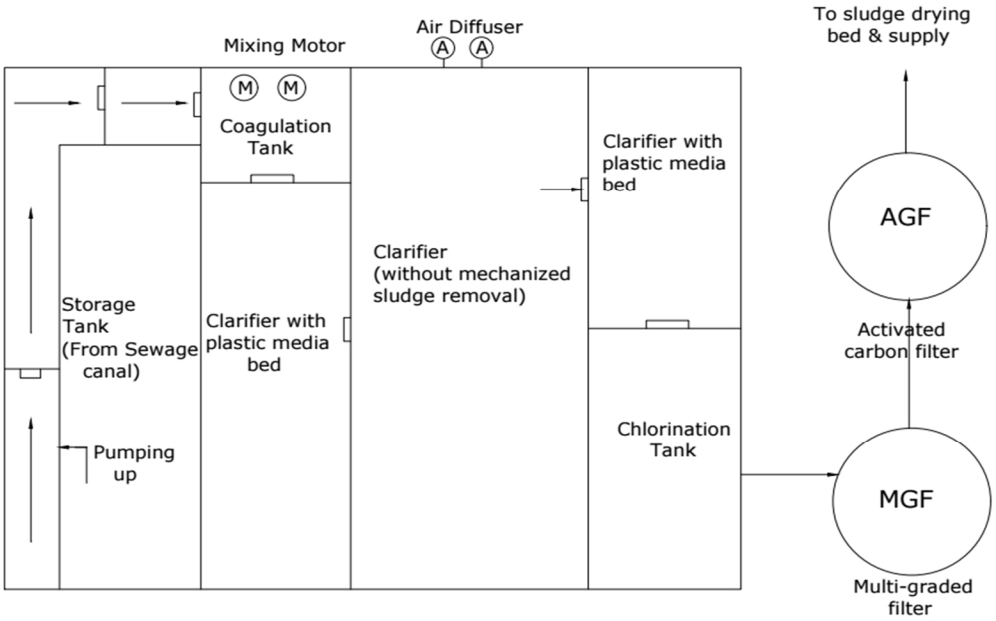
7) *Application Of Treated Sewage:* Much work has to be done in India for popularizing the re-use of sewage/wastewater in industries as well as in agriculture. In present developed world where treated wastewater is being used for drinking purpose, it is highly illogical to show ignorance towards it in India, at-least for the purpose of re-use in agriculture. Much work has already been undertaken towards it from organizations like NEERI and CSIR etc. and suggestions made by them must be implemented on the ground.

In this paper the determination of the efficiency with which the sewage treatment plant is able to improve the physical characteristics is found out by using the general IS method to calculate it. Test procedures are in accordance to IS:3025 – Reaffirmed 2003.

II. SCHEME OF SEWAGE TREATMENT PLANT



III. RESULT

S.NO	PARAMETER	INLET	OUTLET
1.	TEMPERATURE	29^0C	29^0C
2.	COLOUR	Dark Brown	Low Turbid Water
3.	ODOUR	3	1
4.	TURBIDITY	56.4 NTU	10.02 NTU
5.	TOTAL DISSOLVED SOLIDS	1628.9 mg/l	1162.85 mg/l
6.	ELECTRICAL CONDUCTIVITY	2506 mmhos/cm	1788 mmhos/cm

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IV. CONCLUSION & SUGGESTION

The Physical Characteristics improvement efficiency is found to be satisfactory and the objective of the sewage treatment is attained along with other chemical and biological parameters. Although the B.O.D. removal efficiency was found to be satisfactory (≈70%), It was largely due to the fact that the sewage had large volume of fresh water (rain water). Also, for odour minimization, an atomizer could be used. And for achieving satisfactory efficiency in seasons other than rainy season, the STP shall have to be well maintained i.e. the sedimentation tank and clarifiers will have to be cleaned at regular interval and chlorine dosage must be adequate along with regular inspection of the multi graded filter and activated carbon filter so that the used material could be changed after completion of the life cycle.

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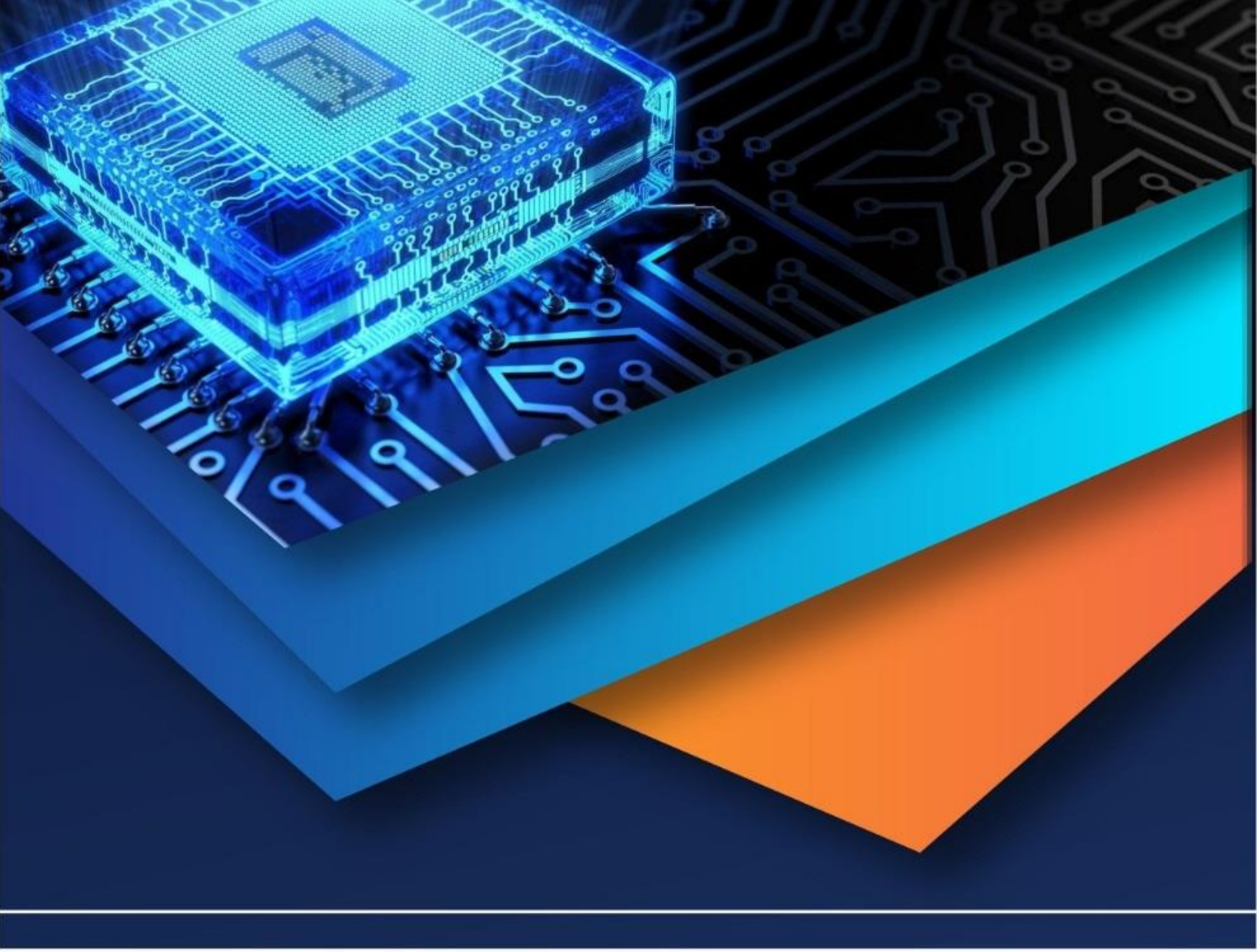

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