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ANALYSIS AND INVESTIGATION OF SUGAR INDUSTRIAL WASTE WATER

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Abstract: Sugar industries have an important place in Indian Economic Development .However the waste water generates from these industries bear a high degree of pollution load. Waste water from sugar industry, if discharged without treatment, possess pollution problem in both aquatic and terrestrial ecosystems. The rapid growth of the population, the technological and industrial boom has brought enormous problems and degradation of the environment. Effective collection and treatment of urban wastewater is a critical problem in a developing country like India This project work includes Analysis and Investigation of sugar industry waste water by conducting the test such as pH, Temperature, Electrical Conductivity, Turbidity, Dissolve Oxygen (DO), Total Suspended Solid (TSS), Total Dissolve Solid (TDS), Bio Chemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), sulphates . By conducting the following test, we correlate the values of waste water sample. The results of the study showed that the effluents in general exceed the limits specified in CPCB with reference to parameters a such as BOD, COD , total suspended solids. The effluent level found through the analysis can be reduced if suggested recommended measures are worked upon. The present wastewater treatment and management aspects of the city. An attempt has been made to identify the relevant management strategies to improve the wastewater management in the city. The suggestions could be made for utilising the treated wastewater for growing greens, vegetables and for agriculture.

Key words: - Sugar Industrial Waste water, Chemical Analysis, Correlation.

I. INTRODUCTION

Sugar industry is seasonal in nature and operates only for 120-200 days in the season. The industry usages sugar cane as their raw material along with various chemical added during the process to increase the value of final product. During the process the huge amount of water is also used and a result industry generates waste water on larger amount. The waste water from mill house is usually contaminated with oil and grease. The spillage of oil and grease on floor of mill house is washed away during floor washing. The waste water generated from process and mill house is highly contaminated with process chemicals, which are being used at different processing stages. Sugar industry is a larger water consuming industry. Water quantity required can vary due to the application of new technology and quality of raw material used. Sugar cane entering in the industry contains about 70-80 % moisture, as a result, excess water has to be disposed off, even with the water reuse8,9. It has been observed that each ton of cane crushed should produce about 0.73 m3 of water if sugar and water are completely separated. Mostly water is required in the sugar mills as mill floor washing, cooling water for barometric condensers, boiler fed water, lime preparation, for power pumps and evaporators.

According to Indian industry standards, water consumption varies from 1.3 to 4.36 m3. The water generated is about 20% of the water requirement. The sugar industry with crushing capacity of 5000 Tons per day requires 10000 m3 /day of water. The mills generate the waste water in the ratio5 of 1:2. The sugar industry waste water is characterized by its color, temperature of water, low pH, ash, and dissolved organic and inorganic matter of which 50% may present as reducing sugar6. In addition to sugar mill waste water carry the constituents such as Biochemical Oxygen demand, Chemical Oxygen demand, oil and grease in the range which more than the CPCB standards.

The rapid growth of the population, the technological and industrial boom has brought enormous problems and degradation of the environment. Water resource development has taken place all over the world. There is a tremendous amount of pressure in protecting the water resources available in the country. Protecting the surface water resources from wastewater pollution plays a vital role for the development. The disposal of wastewater into the surface water bodies leads to serious problems and affects the people in health aspects. Especially in the urban areas, the pollution of domestic effluent discharges into the nearby surface water bodies created problems for the public. The water quality changes in the surface water bodies created many health problems to the public. The major cities are growing with a daily average addition of 1000 persons. As a result of this tremendous growth, service infrastructure is not able to keep up to provide the city a healthy environment. Ample supplies of clean unused

water can no longer be taken for granted due to population growth, increasing urbanization and industrial water demands. Pollution of fresh water streams and ground water by industrial discharges result in depletion of existing water sources.

III. OBJECTIVES OF PAPER

- To analyse the correlation between pH, COD, BOD, DO, Sulphate, Turbidity, TSS, TDS. Conductivity Tests parameters of sugar industrial waste water.
- To investigate the parameters of sugar industrial waste water.

Materials:-

1) Sugar inlet sample before treatment.
2) Sugar outlet sample after treatment.
3) Actual Lake Site sample.

IV.METHODS

1. PH Test:-

Determination of pH plays an important role in the waste water treatment process. Extreme pH levels, presence of perticulates matters, accumulation of toxic chemicals and increasing alkalinity levels are common problem in waste water. This becomes a serious environmental concern in recent year and hence municipal and industrial waste water treatments are critical before it enters to lakes, rivers, canal, and other water bodies.the pH analysis re important for neutralization, precipitation, coagulation, and other biological treatment process. pH analysis are probably the most recommended method for waste water treatment .

The term “pH” refers to the measurement of hydrogen ion activity in the solution. Since the direct measurement of the pH is very difficult, specific electrodes are needed for quick and accurate determination.

2. Determination of Conductivity:-

Electrical conductivity measurements are often employed to monitor desalination plants. It is useful to assess the source of pollution. In coastal regions, conductivity data can be used to decide the extent of intrusion of sea water into ground water. Conductivity data is useful in determining the suitability of water and wastewater for disposal on land. Irrigation waters up to 2 millisiemens / cm conductance have been found to be suitable for irrigation depending on soils and climatic characteristics. It is also used indirectly to fine out inorganic dissolved solids.

3. Determination of Turbidity:-

When the turbid water in a small, transparent container such as drinking glass is held up to the light, an aesthetically displeasing opaqueness or milky coloration is apparent. The colloidal material which exerts turbidity provides adsorption sites for chemicals and for biological organism that may notbe harmful. They may be harmful or cause undesirable tastes and odours. Disinfection of turbid water is difficult because of the adsorptive characteristics of some colloids and because the solids may partially shield organisms from disinfectant. In natural water bodies, turbidity may impart a brown or other colour to water and may interfere with light penetration and photosynthetic reaction in streams and lakes. Turbidity increases the load on slow sand filters. The filter may go out of operation, if excess turbidity exists. Knowledge of the turbidity variation in raw water supplies is useful to determine whether a supply requires special treatment by chemical coagulation and filtration before it may be used for a public water supply.

4. Determination of DO: -

Drinking water should be rich in dissolved oxygen for good taste. DO test is used to evaluate the pollution strength of domestic and industrial waste. Higher values of DO may cause corrosion of Iron and Steel. Algae growth in water may release oxygen during its photosynthesis and DO may even shoot up to 30 mg/L. Oxygen is poorly soluble in water. Its solubility is about 14.6 for pure water at 0°C under normal atmospheric pressure and it drops to 7 mg/l at 35°C. Higher temperature, biological impurities, Ammonia, Nitrates, ferrous iron, chemicals such as hydrogen sulphide and organic matter reduce DO values. Aerobic bacteria thrive when oxygen is available in plenty. Aerobic conditions do prevail when sufficient DO is available within water. End products of aerobiosis are stable and are not foulsmelling.

5. Determination of TSS and TS:-

Dissolved minerals, gases and organic constituents may produce aesthetically displeasing colour, taste and odour.
Some dissolved organic chemicals may deplete the dissolved oxygen in the receiving waters and some may be inert to biological oxidation, yet others have been identified as carcinogens.
Water with higher solids content often has a laxative and sometimes the reverse effect upon people whose bodies are not adjusted to them.
High concentration of dissolved solids about 3000 mg/L may also produce distress in livestock. In industries, the use of water with high amount of dissolved solids may lead to scaling in boilers, corrosion and degraded quality of the product.

6. Determination of BOD:-

BOD is the principle test to give an idea of the biodegradability of any sample and strength of the waste. Hence the amount of pollution can be easily measured by it. Efficiency of any treatment plant can be judged by considering influent BOD and the effluent BOD and so also the organic loading on the unit.
Application of the test to organic waste discharges allows calculation of the effect of the discharges on the oxygen resources of the receiving water. Data from BOD tests are used for the development of engineering criteria for the design of wastewater treatment plants. Ordinary domestic sewage may have a BOD of 200 mg/L. Any effluent to be discharged into natural bodies of water should have BOD less than 30 mg/L. This is important parameter to assess the pollution of surface waters and ground waters where contamination occurred due to disposal of domestic and industrial effluents. Drinking water usually has a BOD of less than 1 mg/L. But, when BOD value reaches 5 mg/L, the water is doubtful in purity.

7. Determination of COD:-

COD values are particularly important in the surveys designed to determine and control the losses to sewer systems. The ratio of BOD to COD is useful to assess the amenability of waste for biological treatment. Ratio of BOD to COD greater

than or equal to 0.8 indicates that wastewater highly polluted and amenable to the biological treatment. It is useful to assess strength of wastes, which contain toxins and biologically resistant organic substances. COD can be related to TOC, however, does not account for oxidation state of the organic matter. BOD value is always lower than COD value. For domestic and some industrial wastewater, COD value is about 2.5 times BOD value.

8. Determination Of Sulphate:-

Sulphates are of considerable concern because they are indirectly responsible for two serious problems often associated with the handling and treatment of wastewater. They are odour and sewer corrosion problem result from the reduction of sulphates to hydrogen sulphide under anaerobic conditions. The amount of sulphates wastewater is a factor of concern in determining the magnitude of problems that can arise from reduction of sulphates to hydrogen sulphide. For example knowledge of the sulphates content of the sludge or waste fed to digestion units provides a means of estimating the hydrogen sulphide content of the gas produced. From this information, the design engineer can determine whether scrubbing facilities will be needed to remove hydrogen sulphide and size of the units required.

V. METHODOLOGY

Correlation is the mutual relationship between two variables. Direct correlation exists when increase or decrease in the value of one parameter is associated with a corresponding increase or decrease in the value of other parameter. Inter relationship between two parameters is quantified by a numerical measure, call as coefficient of linear correlation. The correlation coefficient measures the degree of association or correlation that exists between two variables, one taken as dependent variable. The correlation is said to be positive when rise in one parameter causes the rise in other parameter and it is negative when rise in the one parameter causes the fall in other parameter.

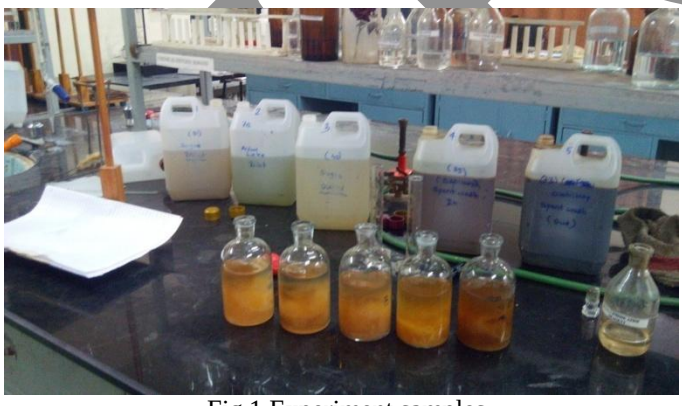

Fig.1 Experiment samples .

VI.RESULT AND DISCUSSION:

The final conclusions are made with the help of this table reading.

sample	TEMP	pH	DO	BOD	COD	TDS	TS	TSS	TR	EC
BT	29.9	5.17	6.88	3.04	0.072	27.7	2.6	0.45	219	110.5
AT	28	8.13	7.28	6.16	0.07	25	2	1	45.86	45.5
AL	27.4	7.94	7.36	7.04	0.07	30.5	1.25	-0.8	40	60.1

Correlations:-

sample	TEMP	pH	DO	BOD	COD	TDS	TS	TSS	TR	EC
TEMP	1									
pH	-0.95844	1								
DO	-0.99713	0.977285	1							
BOD	-0.99978	0.964233	0.998504	1						
COD	0.973223	-0.99835	-0.98783	-0.97784	1					
TDS	-0.24007	-0.04686	0.165903	0.219583	-0.0105	1				
TS	0.937395	-0.79908	-0.90835	-0.92986	0.83224	-0.56312	1			
TSS	0.437486	-0.16277	-0.36817	-0.41846	0.219071	-0.97795	0.723268	1		
TR	0.979441	-0.99629	-0.9919	-0.98347	0.999585	-0.0393	0.847868	0.247092	1	
EC	0.901462	-0.98749	-0.93164	-0.91037	0.976822	0.203789	0.694275	0.005139	0.970249	1

VI.CONCLUSION

With the help of above correlations we finally concluded that the relation between any two parameters greater or equal to 0.6 is very strong.

Therefore,

- Relation between temperature and COD, temperature and total solid, temperature and turbidity, temperature and electrical conductivity are very strong.
- Relation between pH and dissolved oxygen, pH and BOD are very strong.
- Relation between dissolved oxygen and BOD is very strong.
- Relation between COD and total solid, COD and turbidity, COD and electrical conductivity are very strong.
- Relation between total solid and total suspended solid, total solid and turbidity, total solid and electrical conductivity are very strong.
- Relation between turbidity and electrical conductivity is strong.

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