The comparative study of waste water and purified water present in sewage treatment plant in Bhusawal city.

Assistant Prof Vikas P Jadhao[1] ,Pratiksha N Ahire[2], Sagar B Bankar[3], Trupti M Chavhan[4], Abhishek S Nagargoje[5], Prachi M Birhade[6].

[1]Assistant Professor Civil Engineering Department ,
[2,3,4,5,6] Fourth year Civil Engineering Department, Government College of Engineering Jalgaon-425001[MS] India

---

Abstract - In early 2022, production of liquid waste water has been increased and management of this bi-product has become a challenge. The management of liquid waste water producing from wastewater treatment plant is difficult and expensive. When the waste water is handled poorly, it may cause dangerous effects on environment and on human life, too. The quantity of waste water produced in wastewater treatment plant and that should be directed in terms of mass and volume. Also it is expressed in the terms of per capita demand. There are different characteristics of this product i.e., thickness, water content, etc.

The development of infrastructure and the steady population increase in Bhusawal city has led to domestic as well as industrial sewage generation at large proportion. This has discharged into the fresh water bodies nearby which causes the unhygienic environmental condition. For the proper management of the waste water and to reduce and prevent the unhygienic occurrence, we need to find whether the waste water is re-usable or not, so we will conduct several laboratory tests on the generated liquid waste water to find there parameters. This paper focuses on determining the waste water is reusable or not and finding their content. It involves checking the quality of liquid waste water produced by determining it's physical and chemical parameters i.e. total suspended solids , pH, alkalinity , chloride content, dissolved oxygen

***Key Words*: Waste water, Management, Maintenance, Laboratory tests, Risk assessment, Population, Purified water**

1. INTRODUCTION

As we know, India is large country ranking 2nd in population. Despite being 2nd largest, due to lack of economical budget and technologies, management of waste water generated from the sewage treatment plant couldn't treated properly and released in surrounding water bodies which raised question on hygiene and sanitary in environment and health of living beings. To prevent rising harmful impact the sewage bi-product which to be released in water sources need to be treated properly. Stepping forward on path, sewage waste water generated from Bhusawal Sewage Treatment Plant will give a chance to improvise the quality of content and also to determine, re-usability to use them in agriculture.

2. Methodology

2.1 Total Suspended solids

We have done the test of TSS for finding dissolve solid in water, and TSS define as solid in water that can be trapped by a filter. This works on the principle of Filter a well-mixed sample through a pre weighed standard glass fiber filter and then dry the filter, and the residue retained on it to a constant weight in a 103-105 °C oven. The increase in filter weight represents TSS Taking a tripod stand we put in on table to each funnel was placed. Taking initial weight of Whatman filter paper as w1.We placed the filter paper three folded on funnel 'After that we poured well mixed sample on filter paper waiting for some time when the overall water got drained out we removed the filter paper At last we took final weight of filter paper along the residue

Fig -3: Instrument used for TSS test

2.2 Determination of Chloride content

To determine the Cl(-) ions, i.e., chloride content present in the given water sample, we have used Mohr's method. In this Mohr's method, titration is performed with solution AgNO3. The principle of this experiment is

$NaCl+AgN_{03} \rightarrow Agcl + NaN_{03}$

$K_2CrO_4+2\ AgNO_3 \rightarrow Ag_2CrO_4+ 2KNO_3$

This experiment was performed in the neutral medium. As there are some limitations for this method. One of them is, the Mohr's method cannot be performed in basic medium as it contains large number of Ag ions than chloride ions. In methodology, for performing titration process, standard solution of silver nitrate, indicator as soluble chromate salt, potassium chromate are used. The aquired water samples were taken in the beaker and titrated against AgNO3 (0.1M) Before that, the indicator was added in the sample solution , K2CrO4 (5%).In this test two times the precipitations were formed. They were AgCl and Ag2CrO4.And during the process, Ag2CrO4 will precipitate out first. At the end point, all Cl ions reacted with AgNO3 and formed AgCl and after that addition of extra drop of AgNO3 led to react with CrO4 ion (from indicator) and if formed reddish brown colored precipitates of Ag2CrO4.

Fig -2: Test Equipment for Chloride Content

2.3 Determination of Ph

We performed pH test on the water sample by using digital ph meter. In this method, we had pH electrode which was dipped into the distilled water, pH meter which had different knobs for adjustment and calibrations, It had one functional knob which had 3 modes , pH , stand by and MV mode. We had to measure the pH, so we rotated in onto the pH mode and during the measurements, we turned it to the standby mode. Originally it was turned to stand by mode in un-used condition. It had temperature knob and one calibration knob which we rotated to set the standard pH values. Firstly we calibrated the pH meter for accurate measurement of the pH of sample, for that we used standard buffer solution of pH 4 and pH 7(we prepared buffer solution according to the instructions). We performed the experiment at 25°c temperature. We dipped the electrode into standard buffer solution of pH 7 and turned the knob to pH mode. We wait till the readings become constant .We started the readings from buffer solution of pH 7 as the electrode has reading as zero so, it is good to start from zero. After taking pH 7 readings, we turned the knob to the standby mode, removing the electrode from solution and clean the electrode with tissue paper, confirming that there are no traces of any chemical on the electrode, rinsing it with distilled water. Then dipping it to buffer solution of pH 4, rotated the knob to pH mode and adjusted the reading to 4. We then wait to get readings stabilized to 4. After calibration of pH mater is done, we dipped the electrode into sample and we set function knob to pH mode and allowed it to display stabilized reading we got reading of Ph of our sample as 6.650

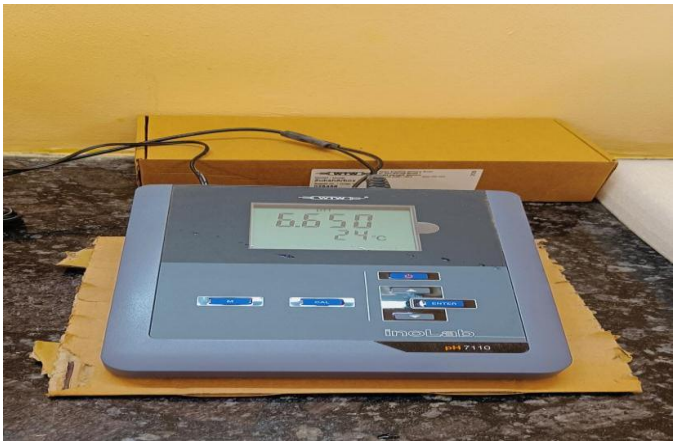

Fig -3: PH Testing Equipment

2.4 Determination of Dissolved Oxygen

We have determined the oxygen in the given sample. the principle on which this test is based is that the amount of oxygen present in the water. Water bodies receive oxygen from the atmosphere and aquatic plants. DO rapidly oxidizes the divalent manganous to its higher valency which forms a brown hydrated oxide precipitate after addition of NaOH and Kl. In the presence of iodide ions in an acidic solution the oxidized manganese reverts to the divalent state and liberates iodine from Kl equivalent to the original DO content. The liberated iodine is then titrated against Sodium Thiosulphate solution with starch as an indicator, MnSO4 reacts with alkali to form white precipitate Mn(OH)2 thus indicating absence of oxygen in the sample.

The reactions of DO are "$Mn^{++} + 2(OH) \rightarrow Mn(OH)^2$ (white)", "$Mn^{++} +2(OH)+ 1/2\ O_2 \rightarrow MnO_2$ (brown)$+H_20$", "$MnO_2 + 2I+ 4H \rightarrow Mn^{+++}\ I2+ 2H_2O$".

ROD bottles (capacity 300 ml), burette, pipettes, conical flask, burette stands, tile, measuring cylinder, weight balance, glass rod, beakers were used for the test. The reagents used in the DO test are Winkler's A, Winkler's B, starch indicator, concentrated sulphuric acid, standard sodium thiosulphate solution. For performing the test, first we collected all the samples in 300 ml BOD bottle. Then we

added 2 ml Winkler's A solution and 2 ml of Winkler's solution well below the surface through the walls interfered with the stopper immediately to avoid bubble formation in the solution and mixed it carefully by inverting the bottle up and down . Allowing the brown precipitates settle down leaving clear supernatant. Then we added sulphuric acid to digest these precipitates. After this we mixed the mixture by inverting the bottle several times up and down till yellow coloured solution appeared . Then we took 50 ml of this yellow solution and titrated it against Na2S2O3 (0.025N) by adding starch solution as indicator.

Fig - 4: Dissolved Oxygen Testing Kit

3. Observation

Parameter	Inlet	Outlet
Total suspended solids	220	7
Chloride content	260	159.95
Potential of hydrogen	5.8	6.65
DO	0.1	7.9

Table -1

Fig - 5: Initial Condition of Sewage Water

Fig - 6: Final Condition of Sewage Water

4. Results

1. The amount of chloride content present in the water sample is [Initial] = 220 mg/l.
2. The amount of chloride content present in the water sample is [final] = 7 mg/l.
3. The amount of dissolved oxygen determined from the given sample is [initial]=260 mg/l
4. The amount of dissolved oxygen determined from the given sample is [final] = 159.95 mg/l
5. The amount of total suspended solids determined from the given sample is[initial]= 6.8mg/l
6. The amount of total suspended solids determined from the given sample is [final] =7065mg/l
7. The initial p H was = 0.1. After the pH test, the observed final p H is = 7.9

Fig - 7: Sewage Treatment Plant Inlet and outlet Water Sample

5. CONCLUSIONS

Fig - 8: Treated Water Discharge In Near Water Bodies

We designed sewage treatment plant for Bhusawal city. We took sample of waste water generated from Bhusawal city. During the process of design we got to know the population of Bhusawal city is 187421(according to senses department 2011). We collected samples of inlet and outlet. As the purpose was performing comparison study on the condition of collected waste water before treatment and after treatment, we performed some tests to calibrate parameters and contents present in both condition. We found out that the collected waste water in the plant was very harmful for consumption and would be creating a hazardous impact on environment if released as it is in the water bodies and other resources. We found out that the pH of the inlet water sample was very high comparing to the treated water sample. Also we found out that dissolved oxygen level was quite low and total suspended solids were greater in quantity as measured in milligram per litres, chloride content was also higher following the sequence. So by performing tests on the treated water, we got to know and could see the difference as how the treated water was consumable and reusable for human and other living things. Also was perfect to release in the water sources and water bodies in surrounding. Hence, concluding the results and values of the required parameters by the tests we have performed on the collected waste water sample from the sewage water treatment plant. They are mentioned as follows;

The amount of chloride content detected in the sample was 7 Mg/l. The sample have 159.95mg/l level of oxygen dissolved in it. There are 7.65mg/l of total suspended solids in the sample. And lastly is 7.9 pH was of the sample being purified and tested in the pH meter.

REFERENCES

[1] Dr. Buddharana 1 Godbole et al. "Design of Sewage Treatment Plant for Vi Virar Region", International Journal of Engineering Research, (2020)[2] Shrikant Dhage "Design of Sewage Treatment Plant for Parbhani city", IRJET Journal 2019

[3] Pramod Sambhaji Patil et al. "Design of Sewage Treatment Plant for Dhule City" International Journal of Engineering Research, 2016

[4] Gaurav C. Nagpurkar et.al. "Design of Wastewater Treatment plant in Nagpur City By Adopting SBR Techniques". International Research Journal of Engineering and Technology (IRJET), 2020

[5] Komal Ajabrao Gadekar et al." Case Study of 161 MLD Sewage Treatment Plant Kanchanwadhi, Aurangabad, Maharashtra", URASET, 2020

[6] A. P. Hangargekar and P. K. Takpere. "A case study on waste water treatment plant. CETP (Common effluent treatment plant) International journal of innovative research in advanced engineering (UJIRAE) ISSN 2349-2163 Issue 11, volume 2 November 2015

[7] Prachi N. Wakode, Sameer U Sayyad. "Performance Evaluation of 25MLD Sewage Treatment Plant (STP) at Kalyan". American Journal of Engineering Research (AJER) eISSN 2320-0847 p-ISSN: 2320-0936 Volume 03, Issue-03, pp-310-316.

[8] N. Muthukumaran and Dr. N. K. Ambujam. "Wastewater treatment andmanagement in urban areas- A case study of Tiruchirappalli city. Tamilnadu, India", Proceedings of the Third International Conference on Environment and Health.Chennai, India, 15-17 December, 2003

[9] Sanjeev Kumar Sinha. Vikas Kumar Sinha, Samir Kr. Pandey, Anup Tiwari, "A Study on the Waste Water Treatment Technology for Steel Industry Recycle And Rese, American Journal of Engineering Research (AJER) e-ISSN 2320-0847 p ISSN 2320-0936 Volume 3, Issue-04, pp-309-115

[10] 1.5 Lambe and R. S. Chougule, "Grey water treatment and reuse". IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE)- ISSN: 2278-1884, PP 20-26

[11] Belchior, C., Araújo, R., Landeck, J.: Dissolved oxygen control ofthe activated sludge wastewater treatment process using stableadaptive fuzzy control, Computers & Chemical Engineering (2011)

[12] Ionescu, C., De Keyser, R.: Relations between Fractional Order Model Parameters and Lung Pathology in Chronic Obstructive Pulmonary Disease. IEEE Trans. Biomed. Eng., vol.56, pp. 978-987,2009

[13] Mainardi, F.: Fractional calculus and waves in linear viscoelasticity: An introduction to mathematical models. ImperialCollege Press, London, (2010)

[14] Cao, J.-Y, Cao, B.-G.: Design of Fractional Order Controller Based on Particle Swarm Optimization.

International Journal of Control, Automation, and Systems, vol. 4, no. 6, pp.775-781,(2006)

[15] Luo, Y., Chen, Y. Q., Wang, C. Y., Pi, Y. G.: Tuning fractional order proportional integral controllers for fractional order systems. Journal of Process Control, vol. 20, pp. 823–831, (2010)

[16] Monje, C.A., Chen, Y.Q., Vinagre, B.M., Xue, D., Feliu, V.Fractional order Systems and Controls: Fundamentals and Applications. Springer-Verlag, London, (2010)

[17]Determination of Chloride content https://youtu.be/3aDuuYMjTUg

[18] Determination of chloride content image reference https://youtu.be/cWzRf-ycvbs

[19] Determination of dissolved oxygen content reference image https://youtu.be/m9XGsEs55Qo