

# ASSESSMENT OF BIO MECHANICAL FILTER USING WATER QUALITY INDEX

Mahadhir Mohammed R<sup>1</sup>, Suganthapriya K<sup>2</sup>

<sup>1</sup>B.E Agriculture Engineering & Trichy

<sup>2</sup>M.E Structural Engineering & Trichy

\*\*\*

**Abstract:-** An increase in the demand of water wiggles on treating the waste water and utilize it for other necessary purposes. An effort was taken to treat the waste water and identifying the water quality index which are suitable for irrigation and other purposes. Industries are releasing many toxic pollutants into the environment which affects the soil and human health. There is an urge to treat the industrial effluents in an effective manner. Filtration by bio mechanical filter reduces the chance of toxic pollutants releasing into the Environment.

**Keywords:** waste water, water quality index, bio mechanical filter, effluents

## INTRODUCTION:

Water remains the elixir of all forms and walks of life. Rainfall is the single most primary source supplying the global water needs in multifarious secondary storage sources such as tanks, ponds, lakes and wells. However the emerging trends for coping up with the technological developments, intensive industrial growth and extensive urbanization, the demands for water are increasing in an exponential proportion. Simultaneously all these developmental activities culminate into the production of a significant quantum of effluents that are just disposed of into the natural water resources resulting in environmental degradation by way of contamination and pollution. Further around the water sources like the streams or rivers domestic industrial effluents are discharged serouplously without any treatment by point source pollution or through pipe outlets. Also, during monsoonic rains the storm runoff generated will also washed away the hazardous contaminants and dump into river courses and lakes or ponds has a distributed pollution more the contamination of water resources lead to deoxygenation along the river courses and eutrophication in the lakes or ponds. Hence before joining the water resources it is imperative to segregate the contaminants from the effluents and transform the solid contaminants into possible agricultural manures or substitute material in concrete. By the same token the filtered effluents waters should also be subjected to further treatment process to get an irrigable quality waters or replacement waters in concrete production. The water quality index helps to determine the usage of water in agriculture.

## REVIEW OF LITERATURE:

**D. Senthilkumar et al.,(2011)** studied on "Ground water quality assessment in paper mill effluent irrigated area". This paper represented the Characteristics of ground water quality and the effect of paper mill effluent, which is using recycled water for irrigation and domestic purposes. This paper reported that high pollution loads was observed in the ground water bodies due to continuous flow of effluent near the ground water resources. This paper concluded that the high EC in water creates a saline soil and higher salt content in irrigation water affecting the growth of plants indirectly and also affect the soil structure.

**Atif Mustafa (2013)** carried out a case study on "Constructed wet and for the waste water treatment and reuse". This paper examined the efficiency of constructed wet land used for the removal of BOD, COD and TSS and other organic pollutants. The experiment was conducted for a period of 8 months and revealed that the concentration of BOD, COD and other organic pollutants were reduced to half the percentage. The treated water can be used for the landscape irrigation. The author concluded that the waste water can be treated through constructed wetland; it is one of the efficient methods in the developing countries

**Sharma et al.,(2014)** studied on Physico chemical analysis of paper industry effluents in Jammu city. This paper examined the physical and chemical properties of paper mill effluents. In this study the author analyzed the BOD, COD, TDS content present in the paper effluents, and the results shown that the pH, turbidity, and ion content present in the effluents were higher than the prescribed limit which leads to the environmental pollution. It was concluded that the effluents from the paper industry were not treated in an effective manner hence it causes a severe environmental pollution in the preferred location.

**Richasharma et al.,(2014)** studied on Degradation of pulp and paper mill effluents. This paper reveals that Effective Microorganisms (EM) was used to decolorize and degrade the toxic materials. The author suggested various techniques such as microbial remediation, phyto remediation and photo remediation to degrade the toxic material present in the paper plant effluents. Therefore it was concluded that there were no negative impacts on the environment while using the microbial degradation for the treatment of paper plant effluents.

**RajKumar (2016)** studied on An evaluation of biological approach for the effluent treatment of paper boards industry. This paper suggested that the biological oxidation method is an effective method in treating the paper board industry waste water, there is a high reduction in the BOD, COD, and TSS. It is concluded that the biological waste water treatment is efficient in removing the organic solvents present in the paper plant effluents in addition to that RO is used to remove the TDS in an effective manner.

#### **MATERIALS AND METHODS:**

As regards the effluents discharge from any processing unit or industry, the physical chemical and biological properties of the solid, liquid, the gaseous elements of these effluents will show variations. Accordingly the hydraulic and structural designs of either vertical or horizontal filtration systems will also be varying. The effluent was treated using bio mechanical filter.

**Table-1: Water quality Parameters**

<b>PARAMETERS</b>	<b>BEFORE TREATMENT</b>	<b>BIO MECHANICALLY FILTERED WATER</b>	<b>ACCORDING TO GENERAL STANDARDS OF ENVIRONMENTAL ACT</b>
pH	7.8	7.64	5.5-9.0
EC	7	3.66	
TSS	1400	538	100-600
TDS	4200	2380	<500
DO	37	12	>18
BOD	1050	149	100-350
COD	789	753	250
Cu	7.7	4.2	3.0
Cd	1.44	1.26	1.0-2.0
Pb	1.54	1.03	0.1-2.0
Zn	2.95	1.98	5.0-15
Ar	0.15	0.06	<0.2
Cl	76.29	53.39	NA

**Table-2: Parametric quality gradation of water quality indicators:**

INDICATORS/ PARAMETERS	HARMLESS (GROUP-1) <1	SLIGHTLY HARMFUL (GROUP-2) 1-3	MODERATELY HARMFUL (GROUP-3) 3-4	HARMFUL (GROUP-4) 4-5	SEVERLY HARMFUL (GROUP-5) >5
Color (Hazen unit)	White ( 1)	Light yellow( 2)	Yellow ( 3)	Brown (4)	Dark brown(5)
pH	<1	1-5	5-7	7-9	9-14
TSS(mg/l)	<100	100-300	300-600	600-900	>900
BOD(mg/l)	<100	100-200	200-400	400-800	>800
COD(mg/l)	<250	250-500	500-750	750-900	>900
TDS(mg/l)	<500	500-1000	1000-2000	2000-3000	>3000
EC(µs/m)	0-5	5-7	7-10	10-13	>18
DO	<0.05	0.10	0.15	0.20	>0.25
Heavy metals Arsenic	<0.05	0.10	0.15	0.20	>0.25
Chloride	<200	200-400	400-600	600-900	>1000
Lead	<0.05	0.05-0.40	0.40-0.80	0.80-1.5	>2
Cadmium	<0.01	0.01-0.50	0.50-1.2	1.2-1.5	>2
Copper	<0.05	0.05-0.10	0.10-0.50	0.50-1.25	>1.5
Zinc	<1	1-2	2-3	3-4	>5

All the Physico chemical parameters quantitatively measured in their respective units where brought under these five categories depending on the Indian standard recommendations:

**Evaluation of Water quality index**

This follows the standard five grade quality indicator ranges irrespective of the water quality parameter assessed in its respective unit of measurement

$$WQI = \frac{P_1G_1 + P_2G_2 + P_3G_3 + \dots + P_{14}G_{14}}{P_1 + P_2 + P_3 + \dots + P_{14}}$$

$$WQI = \frac{7.64*4 + 2380*4 + 538*3 + 149*2 + 753*3 + 4 + 0.72 + 30 + 0.10*2 + 53.39 + 4.12 + 5.04 + 4.2*4}{7.64 + 2380 + 538 + 149 + 75 + 2 + 0.36 + 10 + 0.10 + 53.39 + 1.03 + 1.26 + 4.2}$$

$$= \frac{13752.08}{3899.94}$$

$$= 3.52$$

WQI (Water quality index) = 3.52

Hence according to this water quality index the value is nearing the 3-4 grades which indicates moderately harmful for the purpose intended.

**CONCLUSION:**

The experimental results leading to the assessment of water quality index indicates that the filtration system developed satisfactory in bringing down the harmful nature of the contaminated water to a medium and moderately harmful or relatively safer status. Hence the bio mechanical filter kit at this stage has proved in converting harmful quality water towards harmless quality even as some more sequential and logical unit operations are incorporated to the available filter. Treated water can be utilized for gardening and growing several crops in the agriculture land.

**REFERENCE:**

- [1] Arshad Ali (2013) "Treatment of Paper mill effluent-A review"- International journal of engineering (ISSN 1584-2673).
- [2] Rajkumar (2016) "Evaluation of biological approach for the effluent treatment of paper board industry"- international journal of bio remediation and bio degradation(ISSN 2155-6191).
- [3] Angelika Sharma(2014) "Physio chemical analyses of paper industry effluents in Jammu city"- International journal of science and research publication(ISSN 2250-3153).
- [4] Richa Sharma (2014) "Degradation of pulp and paper mill effluents" – Institute of integrative omics and applied bio technology journal (ISSN 0976-3104)
- [5] Senthil kumar (2011) "Ground water quality assessment in paper mill effluent irrigated area- International digital organization of scientific information research journal(ISSN 1818-4952).
- [6] Patel (2013) "Impact of paper mill treated effluent on the yield of certain agricultural crops" - International digital organization of scientific information research journal(ISSN 1818-6769).
- [7] VK Garg (2007) "Influence of textile mill waste water irrigation on the growth of sorghum cultivars"- Applied ecology and environmental research (ISSN 1589-1623).
- [8] Sajid ali (2015) "Effects of industrial effluents on crop plants" - International journal of research in engineering.(ISSN 2250-0588).
- [9] Ameen ragrh (2014) "Impacts assessment of treated waste water use in agriculture irrigation in amran area"- International journal of environment and sustainability(ISSN 1927-9566).
- [10] Payam najafi (2008) "Effects of SDI filtration on waste water quality for irrigation" –International water technology and conference.
- [11] A.capra (2001) "Waste water reuse by drip irrigation" – Transaction on bio medicine and health- ISSN (1743-3525).
- [12] Todd trooien (2010) "Drip irrigation with biological effluent"- applied engineering in agriculture.
- [13] Atif musthafa (2013) "Constructed wetland for waste water treatment and reuse- a case study of developing country"- International journal of environmental science and development vol.4.
- [14] Kaizer hossain and Noril Ismail(2015) "Bioremediation and Detoxification of pulp and paper mill Effluent
- [15] M. priyanka, A.Kasthuri (2016) "Anaerobic treatment of pulp and paper mill waste water using up flow anaerobic sludge blanket reactor (UASBR)"- International journal of innovative science and research, engineering and technology Vol. 5, Issue 10.