

“Qualitative Analysis of Treated Effluent Generated from Effluent Treatment Plant of tyre bead wire industry”

Preeti Sinha¹, Akash Madavi²

¹Research Associate, National River Conservation directorate, Ministry of Water Resources, Delhi, India

²Design Engineer, Pune, India

Abstract - The present study has been undertaken for the qualitative analysis of an effluent treatment plant. The Tyre Bead wire industry considered for study is engaged in manufacturing of tyre bead wire and high quality spring and rope wire. Water quality parameters, such as pH, Total Suspended Solids (TSS), Total Dissolved Solids (TDS), Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOD) and Oil & Grease (O&G) in the water collected at the final treated water tank have been analyzed. The parameters of the treated effluent were observed as pH- 8.5, BOD- 0 mg/l, COD- 208 mg/l, TDS- 2099 mg/l and TSS- 99 mg/l. All the parameters evaluated were in the permissible limits of Madhya Pradesh Pollution Control Board. The treated effluent water is being reused for plantation.

Key Words: Effluent Treatment Plant, BOD, COD, TDS, TSS, Treated effluent water reuse

1. INTRODUCTION

Water is the main process input used for different processes like washing, dilution, formation etc. in all the industries. This leads to effluent water generation, leading to pollution of local environment if not treated, thus this needs urgent attention in treating the effluent before discharged to the natural environment. [1]. During the working hours of this company a huge amount of effluent water is generated which when released on ground without treating would cause/lead to death of the plantation due to its high total dissolved solids (TDS) and pollute the surroundings. So to minimize the effects of effluent water an effluent treatment plant is constructed in the industrial area.

RajRatan Global Wire Limited (RGWL), located in Pithampur Industrial area, Dhar, which is 25 km from Indore, Madhya Pradesh, and a prominent industrial city in Central India. It has one of its branch in Thailand. It is one of the leading manufacturers of High Carbon Steel wire in INDIA – specializing in Automotive Tyre bead wire, High quality spring and rope wires are other speciality products of the company. The quest for quality, excellence and progress driven by the total dedication of a component and professional team is the hallmark of RGWL. RGWL is an ISO TAS 16949 (2019) certified company for its entire range of automotive tyre bead wires. [2] The company is currently employing 450 persons in India branch while 350 persons in

Thailand. The process operation of the tyre bead wire manufacturing is shown in figure [1].

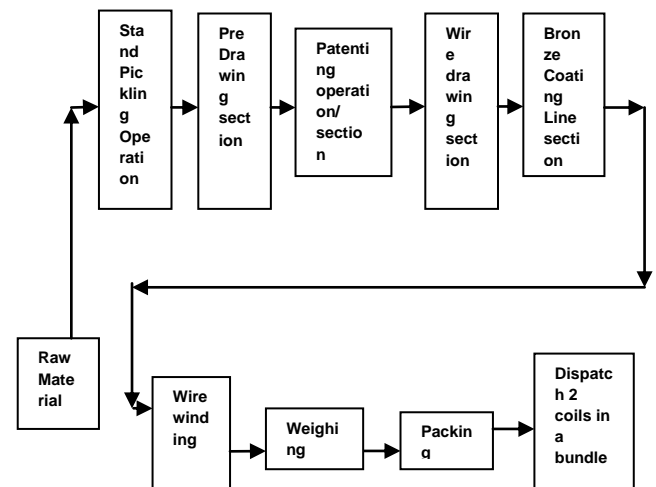


Fig -1: PFD Tyre Bead Wire

Objective

- To meet the consent conditions of MPPCB.
- To prevent pollution caused by industrial effluent.
- To reuse/ recycle the treated effluent water.

2.) EFFLUENT STANDARDS SET BY MPPCB/CPCB-

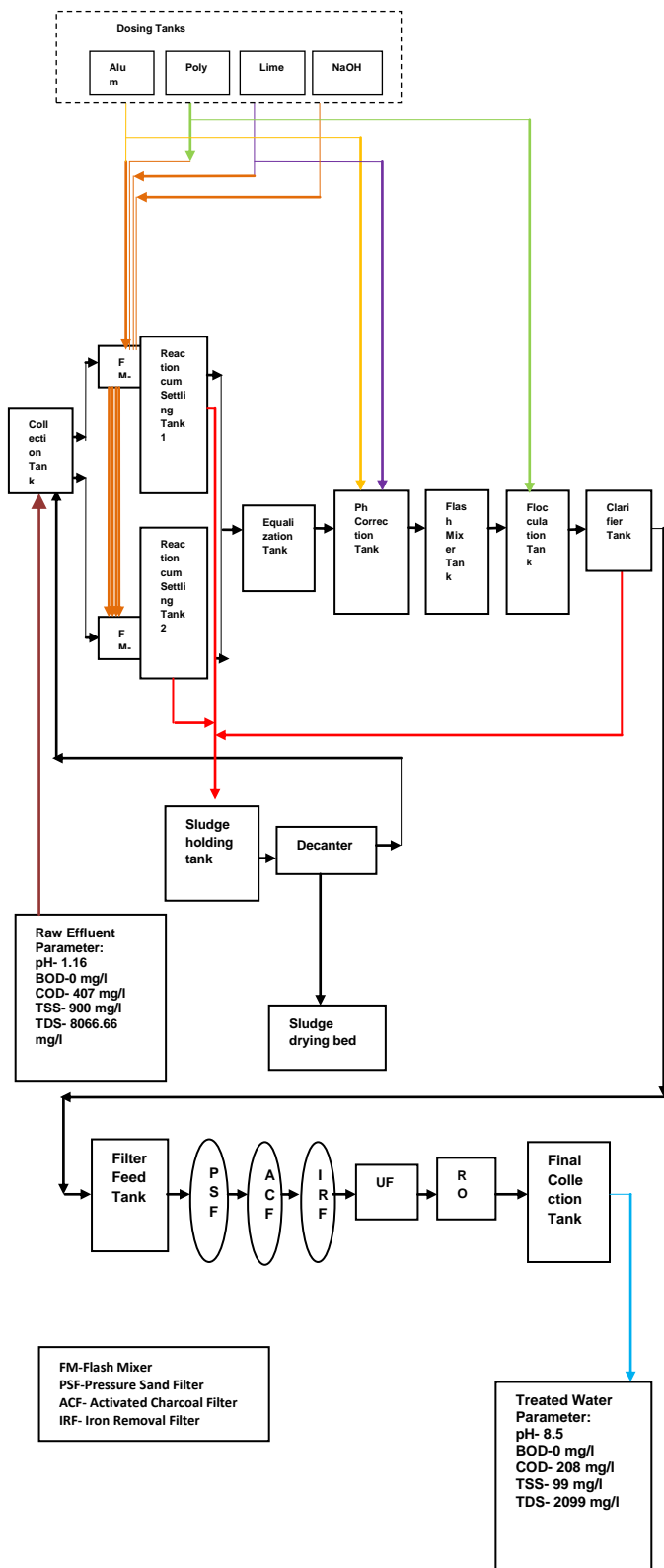
The effluent water is characterized by its colour, odour, temp, BOD, COD, TSS, TDS etc.[3]

The parameters of incoming effluent are pH 1.16, BOD- nil, COD- 407 mg/l, TDS- 8066.66 mg/l, TSS-900 mg/l

As per Madhya Pollution Control Board (as per CPCB report), the treated water quality of effluent should be in limits pH 5.5-9, BOD-30mg/l, COD-250 mg/l, Suspended solids 100 mg/l, Total Dissolved Solids 2100 mg/l. [4]

3.) EFFLUENT TREATMENT PLANT

The effluent generation in the industry is about 300 cmd and sewage generation is about 18000 l/Day.



3.1) Units of ETP-

ETP is made up of following units-

1.) Collection Tank-

The industrial effluent coming from the outlets of different section having varied pH ranges of industry is collected in a common collection cum equalization tank of 165.88 m³ capacity. Effective residence time is provided to the effluents to reside and achieve stable pH conditions. pH of the coming effluent is 1.16.

Designed flow- 300 CMD
Dimension- 7.2 x 7.2 x 3.2 m
Capacity- 165.88 m³

2.) Reaction cum Settling Tank-

A reaction cum settling tank allows some degree of purification by settling of suspended solid particles. A layer of sludge is formed at the bottom of the tank which is periodically removed. In this tank coagulants are added to water to facilitate settling process.

Number of Tanks- 02
Designed flow- 300 CMD
Dimension- 5.0 x 5.0 x 3.2 M
Capacity- 80.0 m³

3.) Chemical dosing Tank-

In further treatment the pH and suspended solid in the effluent are being monitored and controlled as required in the reaction cum settling tank by injecting chemicals such as alum/poly/lime/NaOH from the chemical dosing tank. This is monitored and controlled by adjusting flow controller valve of dosing tank. In order to avoid co-precipitation of the dosing chemicals as well as alum mixing, aeration based agitation shall be provided both in reaction and chemical preparation tanks.

Number of Tanks- 04
Designed flow- 300 CMD
Dimension- 2.0 x 2.0 x 1.25 M
Capacity- 5.0 m³

4.) Equalization tank-

Effluent from reaction cum settling tank is lifted by effluent lifting pumps into the Equalization tank. It collects the effluent at widely fluctuating rates, which will be equalized at equalization tank for further treatment.

Designed flow- 300 CMD
Dimension- 7.2 X 7.2 X 3.2 m
Capacity- 165.88 m³

5.) pH Correction tank-

After the flow rate is maintained in the equalization tank it is transferred in pH correction tank where the effluent is

maintained at neutral pH with the help of alum dosing.

Designed flow- 300 CMD
Dimension- 2.5 x 2.0 x 2.2 m
Capacity- 11.0 m³

6.) Flash Mixer-

After pH is made neutral it is then transferred to Flash mixer tank where coagulants are added to the tank in order to further remove the suspended solid (don't settle easily) from the effluent. Here the mixture is agitated quickly and thoroughly, resulting into larger heavier formations called flocs.

Designed flow- 300 CMD
Dimension- 2.5 x 2.0 x 2.2 m
Capacity- 11.0 m³

7.) Flocculation Tank-

After the formation of flocs in the flash mixer tank effluent is transferred to Flocculation tank where polymer is added to assemble the small flocs formed in the flash mixer into larger aggregates so that they can be more easily separated from the water.

Designed flow- 300 CMD
Dimension- 2.5 x 2.0 x 2.2 m
Capacity- 11.0 m³

8.) Clarifier Tank-

After flocculants are formed in flocculation tank it is transferred to clarifier tank for settling down or sedimentation of these flocculants as sediment. The sludge is then sent to sludge holding tank.

Dimension- ϕ 5.6 x 3.2 (ht)
Capacity- 80.00 m³

9.) Filter feed Tank-

The clarified water is then passed to the filter feed tank. From here the treated water is passed through pressure sand filter (PSF), activated charcoal filter (ACF) & Iron removal filter (IRF), where the remaining traces of suspended solids, iron content, colour and odour are removed.

Designed flow- 300 CMD
Dimension- 4.0 x 6.0 x 3.0 m
Capacity- 72.0 m³

9.) Sludge Holding Tank-

Sludge from reaction cum settling tank and clarifier tank is removed and sent to sludge holding tank where it is stored for sometime after which it is further passed through decanter for water removal and then the remaining sludge is sent to sludge drying bed.

Designed flow- 300 CMD
Dimension- 5.0 x 5.0 x 3.2 m
Capacity- 80.0 m³

10.) Final Treated Water Tank-

To ensure full treatment and its compliance with MPPCB set standards the effluent is further passed through Ultra Filtration (UF) and Reverse Osmosis (RO) system. Treated water after tertiary and polishing treatment will be collected into the Final treated water tank and will be reused as per requirement.

Designed flow- 300 CMD
Dimension- 4.0 X 12.0 X 3.0 m
Capacity- 144.0 m³

Quality parameter of the environment is monitored regularly and is maintained through a well equipped chemical laboratory. An effluent treatment plant must ensure that the treated effluent meets the limits of MPPCB.

To check/illustrate/exhibit our treated water quality, a small area was selected where plantations of different species was done and these plants are surviving since last 2 years.

4.) Result and Discussion

Table No -1: Treated Water Parameters

S. No	Parameter	Raw Effluent	Treated Effluent	MPPCB limits for treated Effluents [5]
1	pH	1.16	8.5	5.5-9
2	BOD	0 mg/l	0 mg/l	≤30 mg/l
3	COD	407mg/l	208 mg/l	≤250 mg/l
4	TDS	8066.66 mg/l	2099 mg/l	≤2100 mg/l
5	TSS	900 mg/l	99 mg/l	≤100 mg/l
6	Oil & grease	0 mg/l	0 mg/l	≤10 mg/l

From the above study it has been observed that the parameters of the treated effluent is having a pH of 8.5, BOD, COD, TDS and TSS as nil, 208, 2099 and 99 mg/l respectively., which are within the permissible limits specified by MPPCB.

5. CONCLUSIONS

The treatment process involved in the existing ETP installed in RGWL, Pithampur, Madhya Pradesh is found to be efficient in treating the industrial effluent, complying to the standards specified by MPPCB. Following this treatment process the above mentioned parameter has been made in permissible limits. And is considered suitable for reuse/

plantation.

Hence, the same treatment process adopted in RGWL may be recommended/ suggested for treatment of effluent waste generated from industries of the same kind to encourage recycling and reuse of water and prevent pollution.

REFERENCES

- [1] D. Devi Sahithya and m. V. V. Chandana lakshmi "Performance Evaluation study of an effluent treatment plant in pharmaceutical industry," IRJET, volume: 03 issue: 08, august 2016, pp. 67-77
- [2] <http://www.rajratan.co.in/>
- [3] M. Tariq*, M. Ali, "Characteristics of industrial effluents and their possible impacts on quality of underground water," Soil & Environ. 25(1): 2006, pp. 64-69
- [4] M. Young, The Technical Writer's Handbook. Mill Valley, CA: University Science, 1989.
- [5] <https://cpcb.nic.in/effluent-emission/>
- [6] <https://cpcb.nic.in/effluent-emission/>
- [7] CPHEEO Manual