

## Characteristics Of Sugar Industry Waste Water And Performance Evaluation Of Effluent Treatment Plant

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### **Abstract**

*This paper presents about performance evaluation of E T P of Sugar industry wastewater. The large quantity of wastewater generated at all stages of sugar production are highly contaminated because of improper water management. This type of waste water is discharged to surface water or on land. The Karnataka Pollution Control Board (KPCB) has prescribed that the effluent generation in a sugar factory has to be limited to 1000 L/tons of cane crushed. Also as per CREP norms, certain provisions have been made for sugar factory effluent treatment as well.*

*An attempt has been made to evaluate the performance of Effluent treatment plant (ETP) of KPR Sugar Mills Pvt.Ltd in a district of Vijayapur. This factory has provided and managed well equipped effluent treatment plant of capacity 15000 TCD and a distillery of 90KLPD. During this study, the samples were collected in clean polyethylene containers. A total of 6 grab samples were collected at an regular interval of 2 hours [8am, 10am, 12pm, 2pm, 4pm, 6pm] in each shift and mixed to give composite sample. Performance appraisal is been carried out by comparing the concentrations of pollutants at the inlet and outlet of the treatment unit. The grab samples was collected at the inlet and outlet of all the treatment units and analyzed as outlined in the standard methods for the examination of water and wastewater. The samples were analyzed to various parameters like pH, BOD, COD, and TDS depending on the results, performance of each unit were evaluated. The present study shows that treated effluent is clear. Overall COD and BOD removal efficiency of ETP was more than 96% on an average. Average TDS removal efficiency is 90%. And all other parameters are within consented limits stipulated by KPCB.*

**Keywords:** *pH, BOD, COD, TDS, Parameters, Sugar Industry, Waste water, ETP.*

### **Introduction**

Waste water management in sugar industry has developed new innovative ideas throughout the world to implement safe management methods to reduce impurities and reuse portable water for a sustainable industrial treatment. In this context one of the most important techniques adopted to



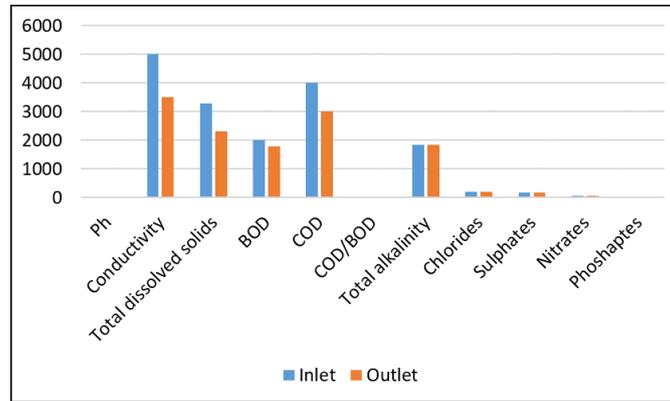
Analytical methods adopted for sugar industry waste water analysis [5].

**Results and Discussion**

In order to check the efficiency of the sugar industry effluent treatment plant to examine the working of each unit and to determine how much pollution load has been removed and hence performance evaluation has been carried out.

Efficiency is calculated using the formula:

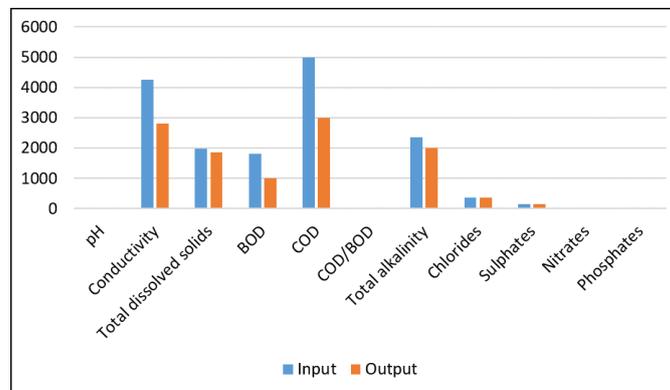
$$\text{Efficiency} = \frac{\text{inlet} - \text{outlet}}{\text{inlet}} * 100$$



**Chart 1: Equalization tank**

Effluent from the collection tank comes to an equalization tank in wastewater treatment. The main target is to act as buffer. To collect the incoming raw effluent that comes at widely fluctuating rates and position to the rest of the ETP at steady flow rate. Equalization basins may be used for temporary storage of diurnal or wet-weather flow peaks.

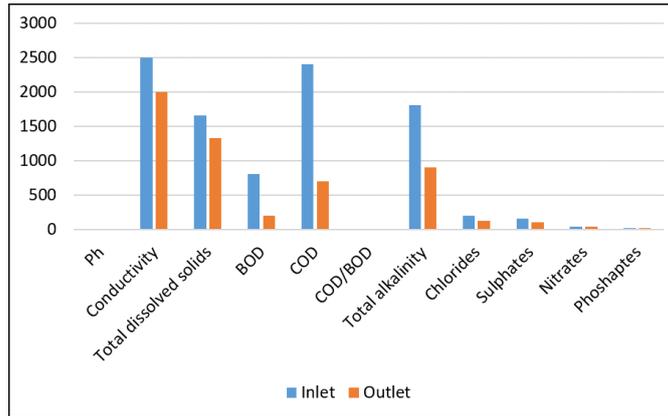
Removal efficiency of Equalization tank for BOD, COD, TDS are 50%, 25% and 30% respectively.



**Chart 2: Neutralization tank**

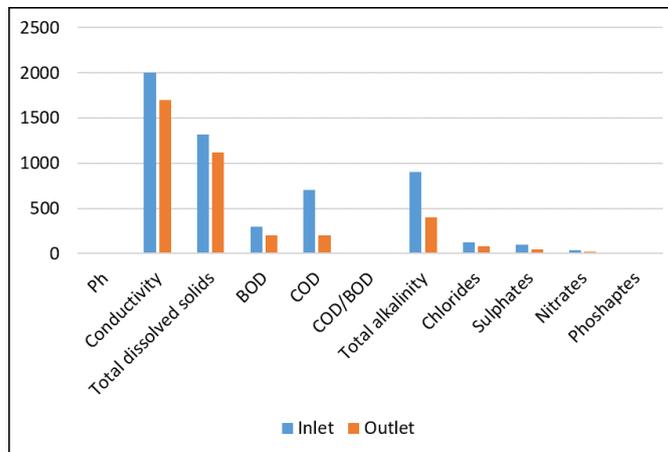
Removal efficiency of Neutralization tank for BOD, COD, TDS are 44.44%, 40% and 6.66% respectively.

Addition of the Caustic soda (NaOH-Sodium Hydroxide) to neutralize the pH.



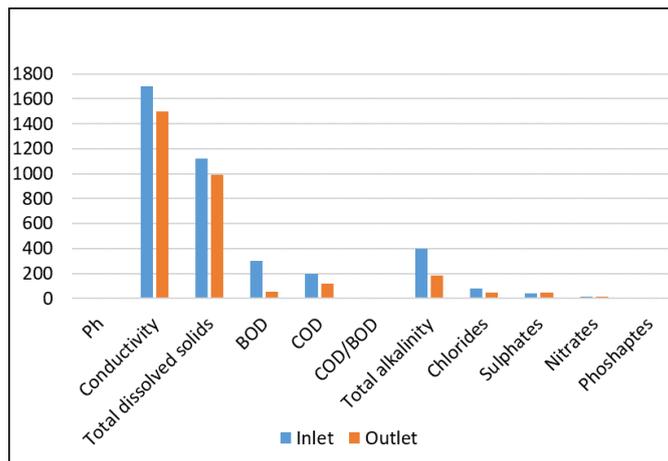
**Chart 3: UASB Reactor (Up-flow Anaerobic Sludge Blanket Reactor)**

Removal efficiency of UASB reactor for BOD, COD, TDS are 62.5%, 70.83% and 20% respectively.



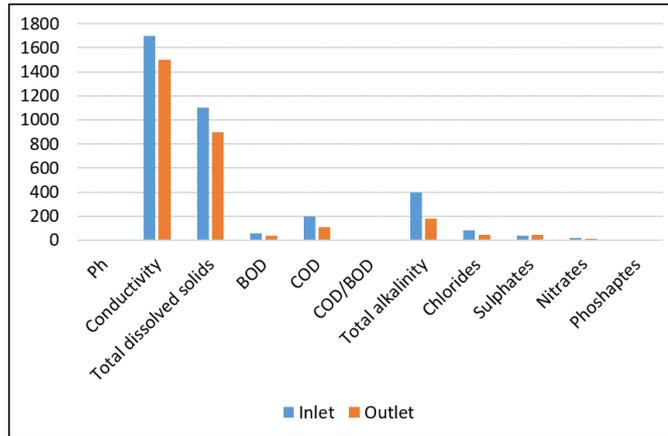
**Chart 4: Aeration tank**

Removal efficiency of BOD, COD, TDS for Aeration tank are 33.33%, 71.42% and 15% respectively



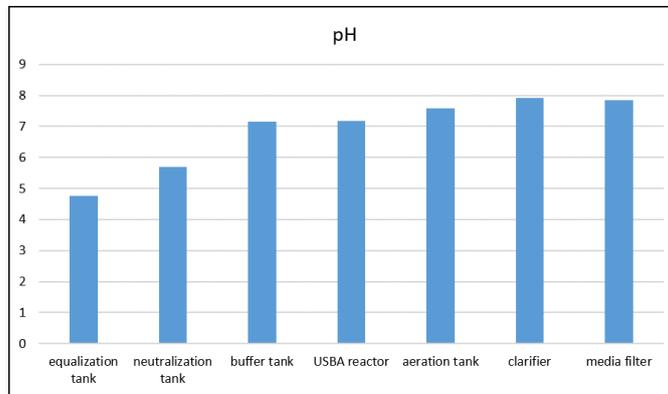
**Chart 5: Clarifier**

Removal efficiency of Clarifier for BOD, COD, TDS are 81.5%, 40% and 11.76% respectively



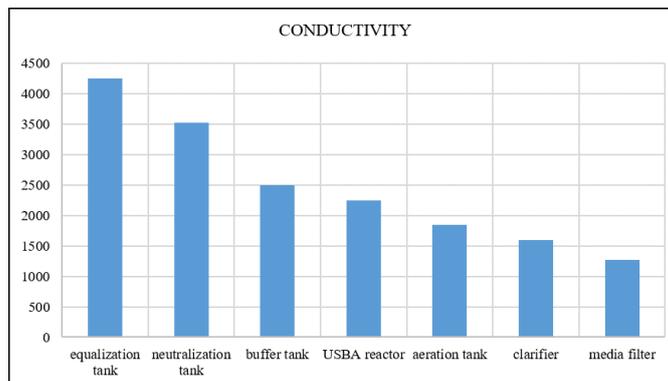
**Chart 6: Media filter**

Removal efficiency of Media filter for BOD, COD, TDS are 27.77%, 44.75% and 15.65% respectively



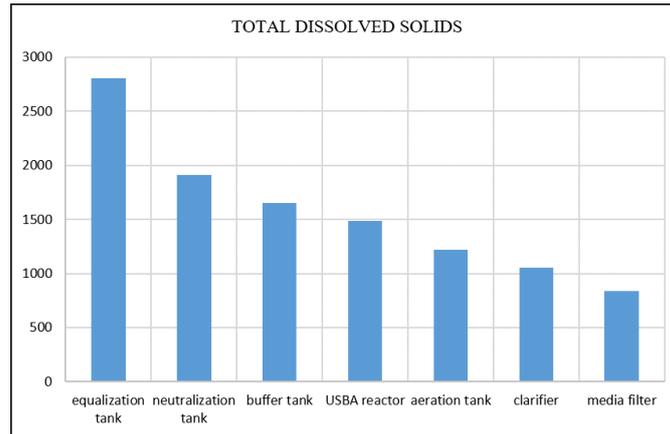
**Chart 7: p<sup>H</sup> of each unit**

PH value changed from 4.75 which is acidic in nature to 7.85 neutral pH.

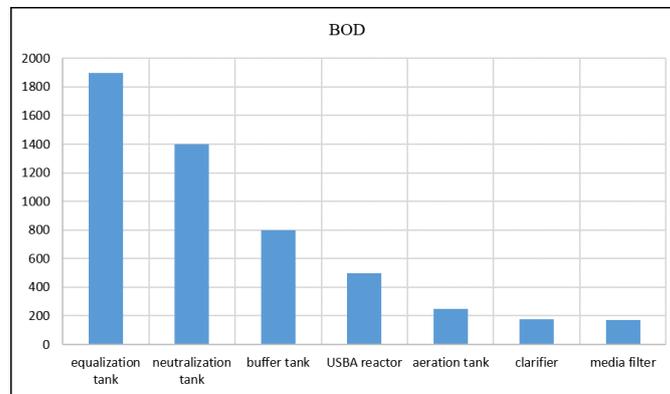


**Chart 8: Conductivity**

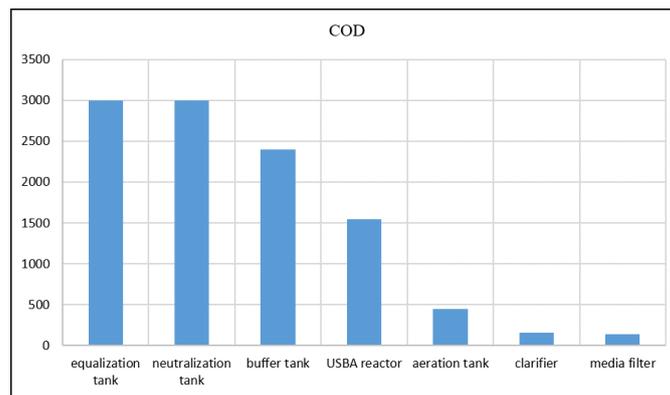
Conductivity of wastewater from equalization tank to media filter reduced to 62.35%.



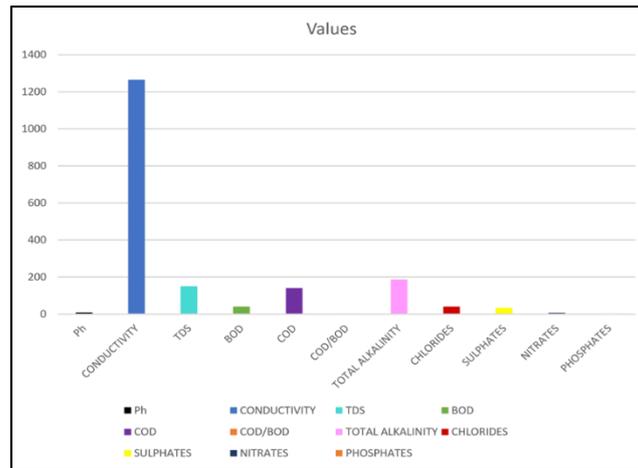
**Chart 9: Total dissolved solids**  
Overall removal efficiency of TDS is 70.23%.



**Chart 10: BOD**  
Removal efficiency of BOD is 91.05%



**Chart 11: COD**  
Removal efficiency of COD is 94.825%



**Chart 12: Treated water analysis result**

- $P^H$  value changed from 4.75 to 7.75, which states that the treated water is in neutral  $p^H$
- The BOD value changed from 1000 mg/l to 40 mg/l which conclude that the removal efficiency of 96%.
- The COD value changed from 3000mg/l to 140mg/l which means treated water has removal efficiency of 95.33%
- Removal efficiency of Total dissolved solids is 96.4%.
- Removal efficiency of Total alkalinity is 90%.
- Removal efficiency of Chlorides is 79.85%.
- Removal efficiency of Sulphates is 80.12%.
- Removal efficiency of Nitrates is 90.4%.
- Removal efficiency of Phosphates is 80%.

### Conclusion

Since the sugar industry operates on a seasonal basis, wastewater production is also obviously seasonal. A large variation is observed in the quality and quantity of wastewater generated in various sugar mills. The wastewater has a high COD, BOD, Suspended Solids and also most acidic pH. Equalization and lime treatment is needed prior to further treatment. Sufficient flexibility becomes essential in framing up a methodology for proper treatment and disposal of sugar industry Effluent as there is considerable variation in the size and scale of the industry.

Removal efficiency of Equalization tank for BOD, COD, TDS are 10%, 25% and 30% respectively. Removal efficiency of Neutralization tank for BOD, COD, TDS are 44.44%, 40% and 6.66% respectively. Removal efficiency of USBA Reactor for BOD, COD, TDS are 62.5%, 70.83% and 20% respectively. Removal efficiency of Aeration tank for BOD, COD and TDS are 33.33%, 71.42% and 15% respectively. Removal efficiency of Media filter for BOD, COD, TDS are 81.53%, 44.75% and 15.65% respectively. Removal efficiency of Clarifier for BOD, COD, TDS are 81.5%, 40% and 11.76% respectively. Overall removal efficiency of Treated water for BOD, COD, TDS, Alkalinity, Chlorides, Sulphates, Nitrates and Phosphates are 96%, 95.33%, 96.4%, 90%, 85%, 80.12%, 90.4% and 80% respectively. And all the parameters are within consented limits stipulated by Karnataka state pollution control board (KSPCB).

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