Efficiency of Wastewater Treatment At Saras Dairy Plant, Kota, Rajasthan

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Abstract- *Saras Dairy Plant Kota is one of the biggest plants in south-east Rajasthan covering districts of Kota and Bundi with daily collection of approximately 92685 LPD of milk. Looking to large plant size, the volume of wastewater generated is also high. Generally, the dairy wastes contain inert, organic or toxic materials and possibly pathogenic bacteria. The effluents from dairy waste are concentrated in nature, and the major contributors to these effluents are carbohydrates, proteins and fats originating from milk. The majority of the wastewater quantity is generated from cleaning of transport lines, tank trucks, washing of milk silos and other cleaning agent which have a significant influence on discharged levels of nutrients. The efficiency of treatment of Saras Dairy Plant, Kota has been evaluated by way of analyzing the effluent characteristics of wastewater at different stages during the treatment. It has been found that most of the effluent parameters are within permissible limits but however still there are some parameters which are not according to the prescribed limits and hence needs improvement.*

Keywords- Dairy wastewater, BOD, COD, physico-chemical parameters, biological parameters

I. INTRODUCTION

A major concern in dairy industry is that it generates a vast amount of wastewaters, approximately 0.2 liter to 10 liter of waste per liter of processed product. In addition, they may be either extremely acid or alkaline in nature and may have high or low concentrations of colored matter. Treatment of dairy effluents has a great significance in recycling water for use in industrial processes. In numerous latest cases, if the effluents from dairy are not treated properly and thrown in the river; they may result in the eutrophication due to phosphorous and nitrogen compounds. Pollutants from dairy wastewater contain a range of organic and inorganic chemicals which are released in the form of solids, slurries and liquid effluents which have very harmful effects on environment. The majority of the wastewater quantity is generated from cleaning of transport lines, tank trucks, washing of milk silos and other cleaning agents which have a significant influence on discharged levels of nutrients. In general the biological treatment is preferred over the chemical treatment as the biological process is more cost effective and much environment friendly as compared to the chemical processes.

II. STUDY AREA

The study has been carried out in Kota city, which is located along the banks of the Chambal River in the southern part of Rajasthan. Rajasthan Cooperative Dairy Federation (RCDF) was set up in 1977 as the implementing agency for dairy development programs in Rajasthan. The district level milk producing unions have, in turn been federated in their apex body popularly known as Rajasthan Cooperative Dairy Federation Limited. The ultimate object of the establishment of dairy federations was to promote the interests of the milk producers through dairy development on co-operative lines. Kota Zila Dugdh Utpadak Sahkari Sangh Limited was established in the year 1972. At present, the production of milk is one lakh liters per day under Kota union while consumption of milk is 73 thousand liters per day. The excess of milk is sent to the other central dairies of Delhi and Gujarat. At present 485 co-operative societies and 347 milk collection centers are functioning under Kota dairy.

III. METHODOLOGY

To study the behavior of the dairy effluents, we selected various important characteristics such as:- pH, BOD (Biochemical Oxygen Demand), COD (Chemical Oxygen Demand), TDS (Total Dissolved Solids), TSS (Total Suspended Solids), DO (Dissolved Oxygen),Total Hardness, Total Alkalinity, Oil and Grease, Kjeldahl Nitrogen, Color and Odor. To determine these characteristics, various methods and instruments have been used such as DO meter, pH meter, BOD Incubator, COD Digester, TDS meter, Titration with various chemicals, acids and indicators. Effluent Treatment Plant (ETP) at Saras Dairy Kota has the following treatment units:-

- Screening and Grit Chamber
- Sedimentation Tank
- Aeration Tank
- Clarifier

The Working of ETP

- First of all, the wastewater enters into the screening and grit chamber where suspended large sized solid particles are removed.
- Then in sedimentation tank, the sediment waste is dragged down with the effect of gravity and also there is addition of calcium carbonate and poly aluminum chloride which further helps in sedimentation and flocculation.
- Aeration tank consist of microorganisms and a agitator which further purifies the water.
- The final stage is the clarifier.

To evaluate the performance of ETP, samples of wastewater have been collected from different units/sections of the ETP during four months from May 2017 to August 2017 and were taken to laboratory for their analysis. The wastewater quality parameters have been measured according to the "Standard Methods for examination of Waters and Wastewaters, American Publication Health Association", 21st Edition, 2005.

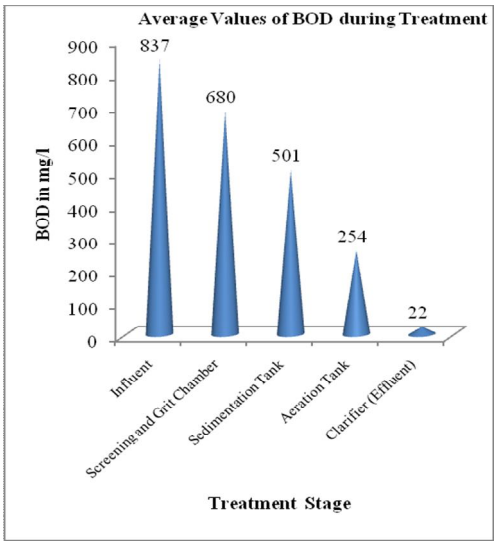
IV. RESULTS AND DISCUSSION

The samples have been collected per month during May, June, July and August 2017 respectively and the findings of parameters have been compared with the standard limits as prescribed by CPCB, New Delhi. The average of parameters has been considered for comparison with standard limits.

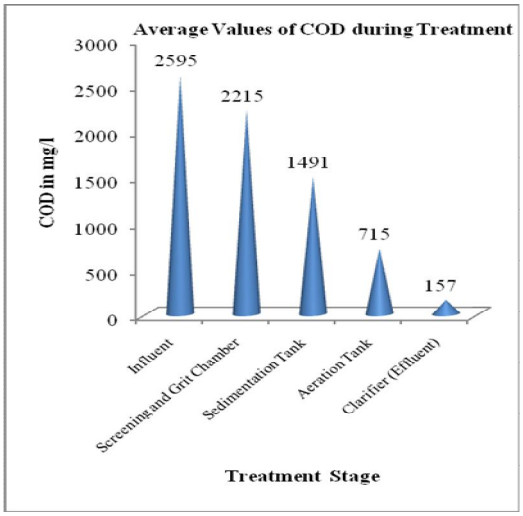
Table 1: Permissible Limits for Wastewater Discharge on Inland Surface Water Prescribed By CPCB, New Delhi

Parameter	Permissible Limits by CPCB (mg/l)
BOD	30
COD	250
Oil and Grease	10
TSS	100
Total Hardness	180
Kjeldahl Nitrogen	20
pH	7.5

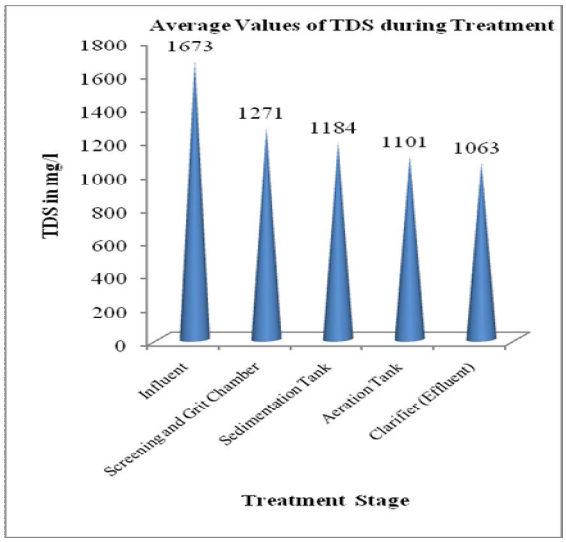
The physico-chemical parameters analyzed for dairy wastewater samples are hereby presented in the form of graphs for better understanding.



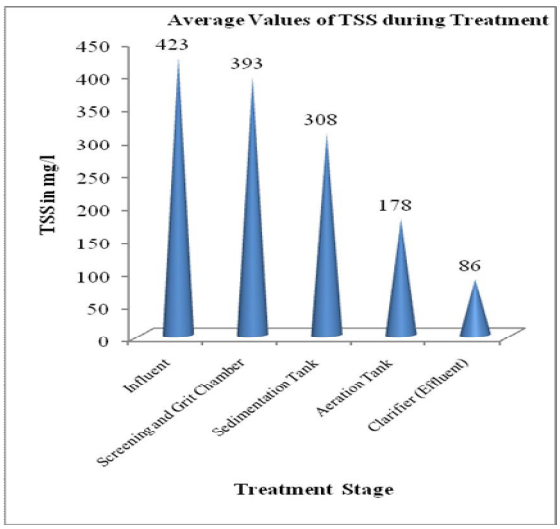
The influent BOD of 837 mg/l is reduced to 22 mg/l, against the requirement of 30 mg/l as per the standards.



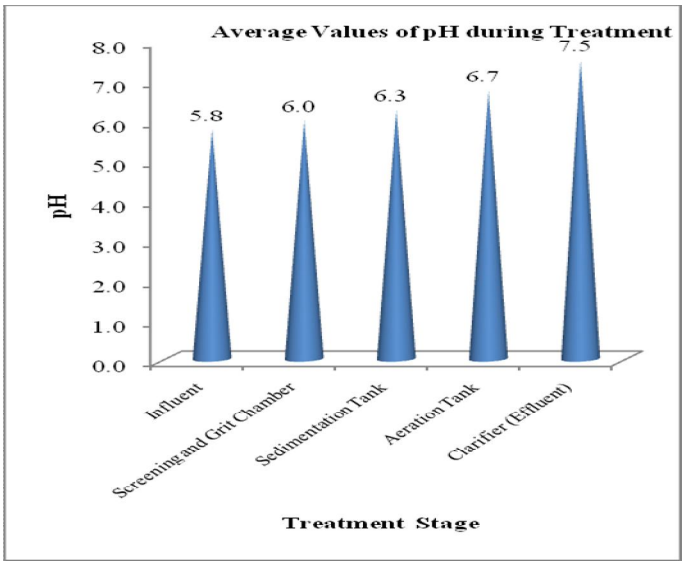
The influent COD of 2595 mg/l is reduced to 157 mg/l, against the requirement of 250 mg/l as per the standards.



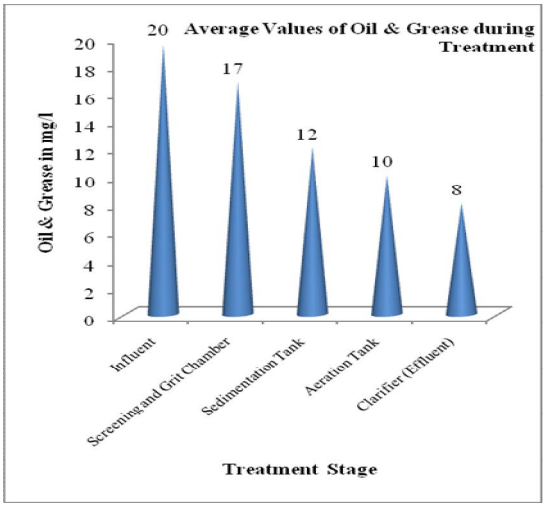
The influent TDS of 1673 mg/l is reduced to 1063 mg/l in the effluent from dairy wastewater treatment plant.



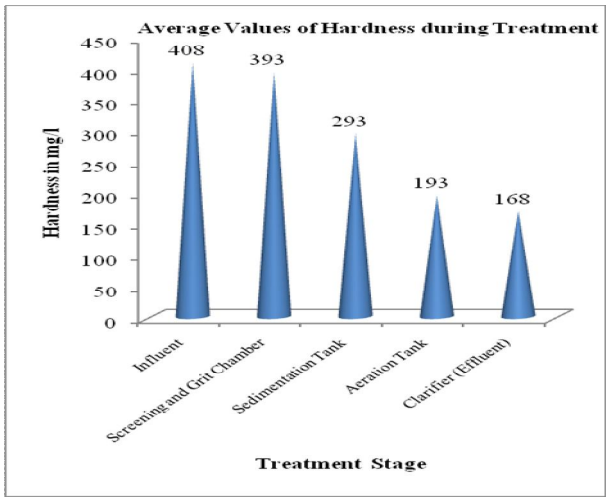
The influent TSS of 423 mg/l is reduced to 86 mg/l, against the requirement of 100 mg/l as per the standards.



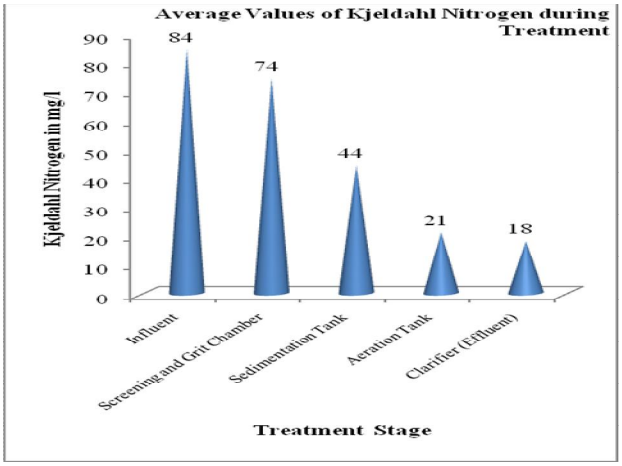
The influent pH of 5.8 is increased to 7.5, against the requirement of 7.5 as per the standards.



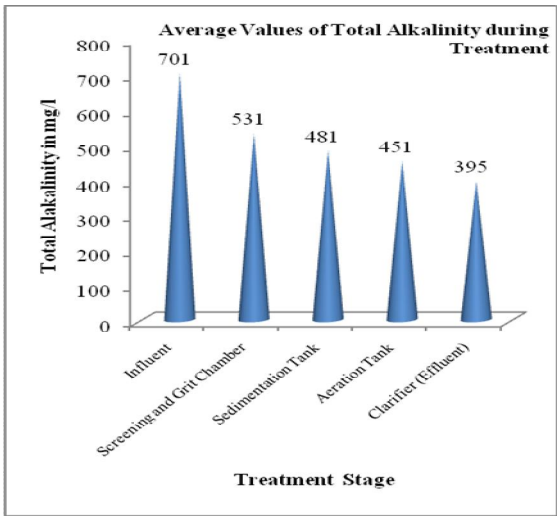
The influent amount of oil and grease 20 mg/l is reduced to 8 mg/l, against the requirement of 10 mg/l as per the standards.



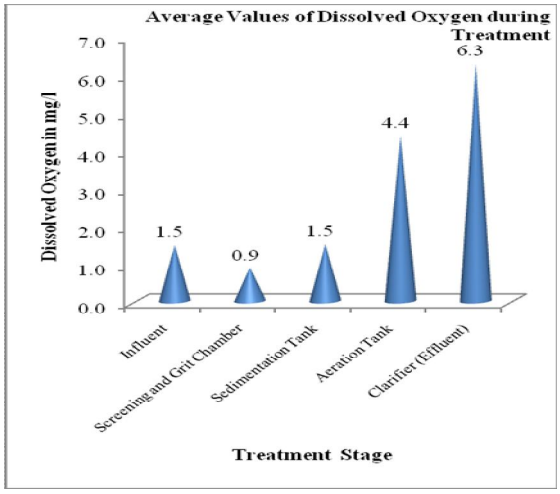
The influent hardness of 408 mg/l is reduced to 168 mg/l, against the requirement of 180 mg/l as per the standards.



The influent kjeldahl nitrogen of 84 mg/l is reduced to 18 mg/l, against the requirement of 20 mg/l as per the standards.



The influent total alkalinity of 701 mg/l is reduced to 395 mg/l in the effluent from dairy wastewater treatment plant.



The influent dissolved oxygen of 1.5 mg/l is increased to 6.3 mg/l in the effluent from dairy wastewater treatment plant.

V. CONCLUSION

Although treated wastewater from Kota dairy is having good quality as per the permissible limits, yet there are some parameters for which the ETP is not efficient such as Total Hardness and Total Alkalinity. So the efficiency of the ETP of the Kota is not up to the mark as per the standards. As such the quality of treated wastewater is suitable for gardening purposes. Therefore it is suggested for Kota dairy to install an ETP as per the norms with proper units such as UASB (Up-flow Anaerobic Sludge Blanket), Equalization Tank, DAF (Dissolved Air Floatation) unit etc. which are required for proper treatment of dairy wastewater. Till then, further treatment of wastewater is required in case of Kota Dairy ETP to lower down the values of all the important parameters.

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