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# Dairy Industry and Sewage Wastewater

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**Abstract**
In this paper, it is shortly discussed that what are the units involved in the dairy industry, what processes are involved in it; the work done in these processes; from what processes we can obtain the wastewater and what are the sources of wastewater in these units and the effect of this wastewater on the environment. These industries discharge wastewater which is characterized by high chemical oxygen demand, biological oxygen demand, nutrients, and organic and inorganic contents. Such wastewaters, if discharged without proper treatment, severely pollute receiving water bodies and disrupts complete ecosystem. Moreover, the Indian government has imposed very strict rules and regulations for the effluent discharge to protect the environment. Thus, appropriate treatment methods are required so as to meet the effluent discharge standards.

**Keywords** Dairy, Wastewater, processes, sources, effluent, characteristics, effect

## i. Introduction

Water resource is becoming scarce for agriculture and also for meeting the demand of rapidly growing population and industries. At the same time the quantum of industrial effluent is increasing soil pollution and environmental hazard. Therefore, the proper treatment or recycling of industrial effluents and use of treated waste water in agriculture has become imperative.

Dairy waters fall into two categories one of which may be described as an intrinsic and the other as a conditional waste. All dairy plants experience losses that are intrinsically, a part of plant that received 10,000 gallons milk daily may produce each working day about 1250 gallons wastes with a mild solids concentration of 0.1%. Cheese plants, on the other hand, produce waste as a byproduct of cheese making. Although waste contains half the nutrients of the milk from which it was derived, it must be treated as conditional waste; conditional upon the absence of a suitable market for its use. It has been estimated that 80% of cheese plants have waste disposal problems. The principles elaborated for the aeration of waste are quire general and apply all kinds of dairy wastes. A more detailed discussion on the disposal of dairy wastes can be found in a review by Arbuckle 1970.Soil is the receptor of large quantities of waste products domestic, human, animal, industrial and agricultural. Soils serve not only as a sink for these chemicals/organic wastes but also a viable medium where these molecules are subjected to different physiologic and biochemical processes that help in criminating them from the ecosystem. But, before the mixing of effluents the pesticides must be completely inactivated. These may adversely affect the functioning of non-target microbes and forms of life inhabiting the soil. These may also be taken up by the plants or get trans-located into the aquatic system by reaching or run-off, thus contaminating the plankton, fish, invertebrates and other forms of life using this water.

Thus, it may conclude that the quality of soil has an impact on public health standards the human food chain. The environmental health aspects of soil deserve serious attention in the near future. The pollutants usually associated with dairy effluents are milk products, detergents, organic matter, inorganic dissolved solids, fertilizing materials, suspended solids, microorganisms and pathogenic. The milk processing industry effluents chiefly causes viral and bacterial pollution. Dairy effluent is acidic in nature and contains plant nutrients such as N, P, K which may enhance the growth of plants in alkaline soil in general and calcareous soils in particular. A part from consideration of role of nitrogen and phosphorous, which,

promote Eutrophication in aquatic systems. The dairy effluent is lactose into lactic acid under anaerobic conditions, particularly after complete depletion of oxygen. Disposal of effluent may also cause depletion of natural soil nutrients and finally salt and mineral accumulation from irrigation point of view (Jones 1980). Every water body has its own pollution load bearing capacity, and if within limit, when effluents are discharged, the process of self-purification in the treated water can be restrained and possibly ecological disaster can avoid. Therefore, it would be essential to dilute or treat these effluents to the extent they become harmless of life (Yadav and Kapil, 1990) at present there is much environment awareness in the world. This problem has been taken by number of institutions both in Government and Private sectors. Studies on ecological imbalance, environments degradation, environmental pollution, its control etc. are some of the main aspects to be taken into account (Mohally, 1992).The application of dairy effluents; sewage etc. to land has thus been practiced during recent years as an alternative means of treatment and disposal. The composition of dairy effluent is governed by the nature of the product being manufactured by the dairy. These discharge with chemical species and their continuous application to environment (Gupta et al 1987) Environmental sanitation is seriously affected by the waste water is drained out. The ineffective system of disposal of water as surplus water not only cause for dampness in the surrounding but also serves as good breeding centre for mosquitoes. According to one estimated out of every four hospital beds in occupied with patient who is ill because of polluted water (Seth 1975).

In Hanumangarh scenario, the local people keep cows and buffaloes for selling milk, which is in excess. The Government as well as several private dairies has been setup in city for utilizing surplus milk. The dairy agencies (Sri Ganganagar District Milk Production Cooperative Association Limited, Hanumangarh junction) collect milk, supply it to the local public and remaining milk is converted to milk powder, cheese, butter, ghee etc. Excess milk is transported to adjoining cities in and out of Rajasthan. Seeing the milk production in this place, we can, very well imaging the daily output of effluents let out by the dairy industry.Dairies come under the medium and small range of industries and much attention has not been given to the pollution created by them. No proper care has been taken for its disposal of its wastes and effluents. The effluents are discharged into the open land acquired by the industries of his purpose. Now, a new trend has come up to utilize the wastewater for irrigation of land and supply the fodder to the local market or the farmers from whom the management is collecting milk. The dairy industry effluents consists inorganic matter in the form of cations and anions and organic matter in the residual state and have become a major source of pollution. When this water if used for irrigation of land for growing fodder, the corps are infected and unhealthy which cause many harmful effects on cattle milk production. The milk utilized by human being in one way or the other has become the source of human study has been undertaken to examine the characteristics of effluent and designing of the ETP for the effective utilization off dairy effluents.

**ii. Objective**

Present study deals with the study of the Physico-chemical properties of the effluents discarded by (Sri Ganganagar District Milk Production Cooperative Association Limited, Hanumangarh junction and designing of the cost effective Effluent Treatment Plant for it. For this purpose, it becomes necessary to examine the quality of dairy effluent in comparison to standards and to monitor the alteration in Physico-chemical properties of effluent.

The present study is therefore undertaken with the following objectives:

- To catalogue the type and range of the various Physico-chemical properties, which are present in the effluents of Sri Ganganagar District Milk Production Cooperative Association Limited, Hanumangarh junction?
- To choose, a treatment system in which appropriate treatment technologies are combined with efficient reuse of treatment products.
- To select a cost effective plan for the treatment of effluents, so that it will compliance with the state and central water quality standards.
- To develop the preliminary design of treatment scheme for the effluents treatment plant of Sri Ganganagar District Milk Production Cooperative Association Limited, Hanumangarh junction.

**iii. Observations**

Analysis of the effluents has been done with the composite sample made by taking three replicates.

**Table 1:** showing values of first replicates for various Physical properties of the effluents of Dairy

| | |
|---|---|
| Colour | Brownish |
| Odour | Offensive |
| Temperature | 3o°C |
| Turbidity | 240 NTU |

**Table 2:** showing values of first replicates for various Chemical properties of the effluents of Dairy

| | |
|---|---|
| PH | 8 |
| EC | 5-55 |
| Chlorides | 78 1 |
| Total Solids | 710 |
| Biochemical oxygen Demand | 367 |
| Total Organic Carbon (TOC) | 251 |
| Chemical oxygen demand (COD) | 478 |
| Nitrogen (Total as N) | 41 |
| Organic N | 20 |
| Free Ammonia | 21 |
| Phosphors (Total as P) | 309 |
| Alkalinity (as CaC03) | 125 |
| Oil and Grease | 47 |
| BOD/COD Ratio | 0.767 |
| COD/TOC Ratio | 1.904 |
| $Ca^{+2}$ | 10.9 |
| $Mg^{+2}$ | 17.2 |
| $SO.'^{2}$ | 23.7 |

**Table 3**: showing values of second replicates for various Physical properties of the effluents of Dairy

| | |
|---|---|
| Colour | Brownish |
| Odour | Offensive |
| Temperature | 30°C |
| Turbidity | 240 NTU |

**Table 4:** showing values of second replicates for various Chemical properties of the effluents of Dairy

| | |
|---|---|
| PH | 8.1 |
| EC | 5-32 |
| Chlorides | 79 |
| Total Solids | 715 |
| Biochemical oxygen Demand | 377 |
| Total Organic Carbon (TOC) | 254 |
| Chemical oxygen demand (COD) | 483 |
| Nitrogen (Total as N) | 44 |
| Organic N | 21 |
| Free Ammonia | 23 |
| Phosphors (Total as P) | 3.11 |
| Alkalinity (as CaC03) | 122 |
| Oil and Grease | 48 |
| BOD/COD Ratio | 0.780538 |
| COD/TOC Ratio | 1.901575 |
| $Ca^{+2}$ | 11.8 |
| $Mg^{+2}$ | 17.2 |
| $SO4^{-2}$ | 23.5 |

**Table 5:** showing values of third replicates for various Physical properties of the effluents of Dairy

| | |
|---|---|
| Colour | Brownish |
| Odour | Offensive |
| Temperature | 30°C |
| Turbidity | 240 NTU |

**Table 6:** showing values of third replicates for various Chemical properties of the effluents of Dairy

| | |
|---|---|
| pH | 8.2 |
| EG | 5.67 |
| Chlorides | 83 |
| Total Solids | 720 |
| Biochemical oxygen Demand | 391 |
| Total Organic Carbon (TOC) | 246 |
| Chemical oxygen demand (COD) | 483 |
| Nitrogen (Total as N) | 45 |
| Organic N | 20 |
| Free Ammonia | 25 |
| Phosphors (Total as P) | 3.12 |
| Alkalinity (as CaC03) | 123 |
| Oil and Grease | 49 |
| BOD/COD Ratio | 0.809524 |
| COD/TOC Ratio | 1.963415 |
| $Ca^{+2}$ | 11.2 |
| $Mg^{+2}$ | 17.2 |
| $So_4^{-2}$ | 23.2 |

**Table 7**: showing mean values of three replicates for various Physical properties of the effluents of Dairy

| | |
|---|---|
| Colour | Brownish |
| Odour | Offensive |
| Temperature | 30°C |
| Turbidity | 240 NTU |

**Table 8**: showing mean values of three replicates for various Chemical properties of the effluents of Dairy

| | |
|---|---|
| PH | 8.1 |
| EC | 5-51 |
| Chlorides | 80 |
| Total Solids | 715 |
| Biochemical oxygen Demand | 378.3 |
| Total Organic Carbon (TOC) | 250.3 |
| Chemical oxygen demand (COD) | 481.3 |
| Nitrogen (Total as N) | 43-3 |
| Organic N | 20.3 |
| Free Ammonia | 23 |
| Phosphors (Total as P) | 3.106 |
| Alkalinity (as CaC03) | 123.3 |
| Oil and Grease | 48 |
| BOD/COD Ratio | 0.785 |
| COD/TOC Ratio | 1.923 |
| $Ca^{+2}$ | 11.3 |
| $Mg^{+2}$ | 17-3 |
| $So_4^{-2}$ | 23.46 |

## Conclusion

The effluent of Sri Ganganagar District Milk Production Cooperative Association Limited, Hanumangarh junction is showing value of pH 8.1 which is due to the presence of alkaline metallic ions. Since the major parts of the dairy effluents are water so water's chemical species play an important role to maintain the pH of effluents. These metallic ions are suspended in water and retained in compound form with other anions such as chlorides, sulphate, and phosphate. If we devise such a method which reduces the cost of treatment and provide some of the byproduct, in line. The owners themselves think of applying the same in the industry, ultimately minimize the losses to be developed to the ecosystem which is helpful in protecting the environment. Thereby I propose of using coir as a media the cheapest and readily available material in a fixed film fixed bed reactor. Any wastewater, having its BOD/COD ratio more than 0.63 can hence, be considered to be quite amenable to biological treatment since, it does not contain non-biodegradable organics. For typical untreated domestic wastewater, the ratio $BOD/COD_3$ is found to vary from 1.25 to 2.5. In this study, BOD/COD is 0.785, which shows that the effluents can be easily treated by biological treatment techniques. A higher value of the ratio indicated, that the wastewater is difficult to biodegrade.

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