

NOTE

## Physico-Chemical Comparison of Different Tanks of Effluent Treatment Plant of Dairy Waste

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Dairy wastes are quite rich in degradable organic matter and exert a high oxygen demand. Waste water from dairy waste normally includes substantial concentration of fats, milk, proteins, lactose, minerals, detergents and sanitizers. The effluent of dairy waste is acidic due to conversion of lactose to lactic acid. This waste water can be treated by conventional and biological methods. Degree of treatment of dairy waste depends on its final mode of disposal. The treatment of dairy waste is quite essential from legislation and pollution point of view.

**Key Words:** Physico-chemical studies, Effluent tanks, Dairy waste.

Waste effluent emanating out of industries poses a serious pollution problem<sup>1</sup>. In majority of cases they are simply discharged into water streams either untreated or partially treated. This leads to the surface and ground water bodies getting severely contaminated.

Rapid industrialization in recent years has led to increased generation of waste water containing hazardous organic compounds, that, if improperly dealt with, can threaten both public health and environment. Some of these organics are toxic, potentially carcinogenic, mutagenic and teratogenic and their presence even at low ppm levels is intolerable.

Dairy wastewater from liquid milk processing plant contains not only milk ingredients, but also contains detergents, chemicals and sanitizers, which are generally used in dairy plants. Another major component is the alkaline wash water from cans, bottles and churns. A major portion of the pollutants is in a dissolved organic and inorganic form not susceptible to plain sedimentation or floatation. The high content of organic matter in the dairy wastewater depletes the oxygen supply while decomposing in water bodies thereby affecting animal and plant life. Thus it is highly essential to treat the wastewater of a dairy before its disposal. When microbial decomposition takes place in the absence of air, the compounds formed are often highly malodorous and may be toxic to aquatic life<sup>2,3</sup>.

In recent years an equation for assessing the harmfulness of effluents has been developed. This equation is to serve as the basis for the regulation on the discharge of effluents<sup>2</sup>:

$$S = Q \left[ 0.45 \frac{A - A_0}{1} + 0.55 \frac{\text{COD} - \text{COD}_0}{80} + 0.1 \frac{G_B + G_F}{2} \right]$$

where

S= Harmfulness in harmfulness units (SE),

Q= Volume of effluents (m<sup>3</sup>/d),

A= Volume of sedimentable material (mL/L),

A<sub>0</sub>= Base value for sedimentable materials (0.1mL/L),

COD = Chemical oxygen demand of effluent after the removal of sedimentable material by sedimentation (mg/L),

COD<sub>0</sub> = Base value of COD, 15 mg/L,

G<sub>B</sub> = Toxicity towards bacteria,

G<sub>F</sub> = Toxicity towards fish.

Based on the daily effluent value, the harmfulness is expressed as sedimentable solids, oxidizable solids and toxicity.

Dairy wastes are most often treated by biological processes (due to the relatively high fraction of readily biodegradable compound), conventional, particularly alternating double filtration and high rate filtration methods<sup>4</sup>.

Tanks of a dairy effluent treatment plant are selected for sampling. The samples were collected from accumulation tanks of effluent treatment plant in the month of Dec. 2004 from Dairy Plant, Bhopal. The samples were collected in 1 L capacity bottle.

Physico-chemical parameters were analyzed as per standard methods (APHA, 19th Edn, 1995)<sup>1</sup> where pH is recorded by pH-meter, temperature, D.O. by Winkler's method, B.O.D. by incubation method, chlorides by titrimetric method and oils and greases were determined by hot air oven method.

Physico-chemical characteristics of dairy effluents of different tanks are presented in Table-1.

TABLE-I  
PHYSICO-CHEMICAL CHARACTERISTICS OF DAIRY EFFLUENTS OF DIFFERENT TANKS

Parameter	Tank-I	Tank-II	Tank-III	Tank-IV
pH	9.0	7.5	9.3	7.8
Temperature (°C)	26	26	26	26
B.O.D. (mg/L)	400	460	370	466
D.O.	7.0	6.6	7.3	7.6
Total dissolved solids (mg/L)	1926	1648	1980	2510
Chlorides	180	180	—	190
Oils and greases	48	30	—	36
Suspended solids	1068	1200	636	780

From the studies the following results are obtained.

1. The pH levels are in the range 7.5–9.3 in all the tanks. The water being alkaline during the study period possesses high value of pH.
2. In Tank-II the wastewater was polluted by organic waste, suffers from decline in the value of D.O. and the value of B.O.D. is high.
3. The highest level of T.D.S. was found in Tank-IV. The higher values were attributed to the heavy influx of dairy waste and also due to the activity of bottom dwelling trash fishes in the tank.
4. The contents of chlorides in Tanks I, II and IV are within the permissible limit of I.S.I. standards.
5. The values of suspended solids in Tanks I, II and IV are comparatively high as compared to I.S.I. standards.

### Conclusion

The values of pH, B.O.D., D.O., total dissolved solids and oils and greases of tank-III are within the permissible limits of I.S.I. standards. Therefore the effluent of tank-III is easily disposed of into the public sewer or any land for irrigation<sup>5</sup>. In tanks I, II and IV the value of B.O.D. is high and should be decreased through aerated lagoons method and activated sludge method.

If the waste effluent in large quantity is fed into a stream, the wastes cause offensive odours and may kill the fishes. It is suggested therefore that the plant operator make every effort to keep the amount of waste to the very minimum and, if possible, utilize the product and all the dairy plants give serious consideration to waste treatment before disposing of the effluent to achieve pollution control<sup>5</sup>.

### REFERENCES

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