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# Pollution Abatement in Milk Dairy Industry.

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## Abstract
The dairy industry involves processing raw milk into products such as consumer milk, butter, cheese, yogurt, condensed milk, dried milk (milk powder), and ice cream, using processes such as chilling, pasteurization, and homogenization. Typical by-products include buttermilk, whey, and their derivatives. The effluents are generated from milk processing through milk spillage, drippings, washing of cans, tankers bottles, utensil, equipments and floors. The dairy industry generate on an average 2.0-2.5 liters of wastewater per liter of milk processed. Generally this wastewater contains large quantities of casein, lactose, fat and inorganic salts, besides detergents, sanitizers etc. used for washing. These all contribute largely towards their high biological oxygen demand (BOD), chemical oxygen demand (COD) and oil and grease much higher than BIS permissible limits. Biological treatment appears to be the most promising technique, since diary effluents have low COD: BOD ratio. The effluents also contain required nutrient for microorganisms in sufficient quantities. Among the biological treatments trickling filter and activated sludge process involve more economy high power requirement, more chemical consumption and large area requirement. Using this as a starting point, we student decided to test the quality of effluent coming out from the dairy industry.

## Key Words
$P^H$, TS, SS, TDS, oil & grease, chlorides, sulphates, COD, BOD.

## Introduction
With increase in the demand for milk and milk products many dairies sizes have come up in different places. These dairies collect the milk from the producers and then either simply bottles it for marketing or produces different milk foods according to their capacities. Large quantity of waste water originates due to their different operations. The organic substances in the wastes come either in the form in which they were present in milk or in a degraded from due to their processing. As such, the dairy wastes though biodegradable are very strong in nature.

**Sources of dairy wastes**

In cheese plant, the milk (whole milk or skimmed milk) is pasteurized and Cooled and placed in a vat, where a starter (lactic acid producing bacterial culture) and rennet are added. This separates the casein of the milk in the form of curd .The whey is then withdrawn and the curd compressed to allow excess whey to drain out .Other ingredients are now added and the cheese blocks are cut and packaged for sale.

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Waste water from this plant includes mainly the discarded whey and the wash water used for cleaning vats, equipments, floors, etc. The soured or spoiled milk and some time the skimmed milk are processed to produce caseins used for preparation of some plastics. The process involves the coagulation and precipitation of the casein by the addition of some minerals acid. The waste from this section includes whey, washing and the chemicals used for preparation. Very large dairies also produce condensed milk and ice-cream. In addition to wastes all the above milk processing units some amount of uncontaminated cooling water comes as wastes; these are very often reticulated. The dairy wastes are very often discharged intermittently; the nature and composition of wastes also depend on the types of products produced and the size of the plants. Table-1 gives the characteristics of the waste (composite) of typical Indian dairy industry, handling about 3,50,000 to 4,50,000 liters of milk in day.

**Waste Characteristics**

Dairy effluents contain dissolved sugars proteins and fats and possibly residues of additives. The key parameters are biochemical oxygen demand (BOD), with an average ranging from 0.8 to 2.5 kilograms per metric ton (kg/t) of milk in the untreated effluent;

chemical oxygen demand (COD), which is normally about 1.5 times the BOD level; total suspended solids, at 100–1,000 milligrams per liter (mg/l); total dissolved solids: phosphorus (10–100 mg/l), and nitrogen (about 6% of the BOD level). Cream, butter, cheese, and whey production are major sources of BOD in wastewater. The waste load equivalents of specific milk constituents are: 1 kg of milk fat = 3 kg COD; 1 kg of lactose = 1.13 kg COD; and 1 kg protein = 1.36 kg COD. The wastewater may contain pathogens from contaminated materials or production processes. A dairy often generates odors and, in some cases, dust, which need to be controlled. Most of the solid wastes can be processed into other products and byproducts[12].

**Effects of wastes on the receiving streams/sewers**

As observed from Table 1 the waste is basically organic in nature. This is also slightly alkaline when fresh. Dairy effluents decompose rapidly and deplete the dissolved oxygen level of the receiving streams immediately resulting in anaerobic conditions and release of strong foul odor due to nuisance conditions. The receiving water becomes breeding place for flies and mosquitoes carring malaria and other dangerous diseases like dengue fever, yellow fever, chicken guinea. It is also reported that higher concentration of dairy wastes are toxic to certain varieties of fish and algae. The casein precipitation from waste which decomposes further into a highly odorous black sludge at certain dilutions the dairy waste is found to be toxic to fish also. Dairy effluent contains soluble organics, suspended, solids, trace organics. They decrease do, promote release of gases, cause taste and odour, impart colour or turbidity, promote eutrophication[4].

**Treatment of the dairy Wastes**

As evident from the low COD: BOD ratio the dairy wastes can be treated efficiently by biological processes. Moreover, these wastes contain sufficient nutrients for bacterial growth. This may be accomplished by (i) the prevention of spills, leakages and dropping of milks from cans, (ii) by reducing the amount of water for washes, (iii) by segregating the uncontaminated cooling water and recycling the same, (iv) by utilizing the butter milk and whey for the production of dairy by products of good market value. Both high rates tricking filters and activated sludge plants can be employed very effectively for complete treatment of dairy waste. But these conventional methods involve much skilled persons and special type of equipments. On the other hand the low cost treatment method like oxidation ditches. Oxidation ditches in India may be designed with a low organic loading (about 0.2kg/kg of MLSS), high biological mass concentration (in the order of 4000 mg/l), and extended period of aeration (in the order of 1.5 days), for BOD reduction of about 95 to 98%. BOD reduction of about 905 may be obtained with retention time 7 days and a depth of in the order of 3m in an anaerobic lagoon. An organic loading in the order of 0.48 kg/$m^3$/day is suggested. Use of dairy waste for irrigation after primary treatment in an aeration lagoon may also be good answer for disposal of Dairy waste.

**Checking of dairy effluent**

- $P^H$: - In chemistry, pH is a measure of the acidity or basicity of a solution. Pure water is said to be neutral, with a pH close to 7.0 at 25 °C (77 °F). Solutions with a pH less than 7 are said to be acidic and solutions with a pH greater than 7 are said to be basic or alkaline[11].

**Procedure to check $P^H$**

An approximate measure of pH may be obtained by using a pH indicator. A pH indicator is a substance that changes color around a particular pH value. It is a weak acid or weak base and the color change occurs around 1 pH unit either side of its acid dissociation constant, or $pK_a$, value. For example, the naturally occurring indicator litmus is red in acidic solutions (pH<7 at 25 °C (77 °F)) and blue in alkaline [pH >7 at 25 °C (77 °F)] solutions. Universal indicator consists of a mixture of indicators such that there is a continuous color change from about pH 2 to pH 10. Universal indicator paper is simple paper that has been impregnated with universal indicator. A solution whose pH is 7 [at 25 °C (77 °F)] is said to be neutral, that is, it is neither acidic nor basic.

- **Chemical oxygen demand (COD):**-It is used as a measure of oxygen requirement of a sample that is susceptible to oxidation by strong chemical oxidant. The dichromate reflux method is preferred over procedures using other oxidants (eg potassium permanganate) because of its superior oxidizing ability, applicability to a wide variety of samples and ease of manipulation on. Oxidation of most organic compounds is 95-100% of the theoretical value[6].

**Procedure to check COD**

Place a 50ml sample or an aliquot diluted to 50ml in a 500ml refluxing flask. The blank is prepared using 50ml of distilled water. This is a precise measurement and a 50ml volumetric pipette should be used. Add 5 to 7 glass boiling beads. Add 1g of mercuric sulphate ($HgSO_4$), 5ml of concentrated sulphuric acid / silver sulphate solution, and mix until the $HgSO_4$ is in solution. The function of the mercuric sulphate is to bind or complex chlorides. One gram may not be required if the chloride concentration is low. (Caution: Always add acid slowly down the side of the flask while mixing to avoid overheating. It may be necessary to use gloves because of the heat generated.) Accurately add 25ml of 0.25 N potassium dichromate ($K_2Cr_2O_7$) and mix. Add while mixing, an additional 70ml of concentrated sulphuric acid-silver sulphate solution. After thorough mixing, attach the flask to the reflux condenser, apply heat, and reflux for 2 hours. Refluxing time can be decreased depending on the ease of oxidation of organic materials. This time may be determined by refluxing for periods from 15 minutes to 2 hours and comparing the results. A reagent blank containing 50ml of distilled water treated with the same reagent as the sample should be refluxed with each set of samples. Cool the apparatus to room temperature after the refluxing period. Wash down the interior of the condenser and flask twice with approximately 25ml portions of distilled water. Remove flask from the condenser and dilute to a final volume of approximately 350ml with distilled water. Add 4 to 5 drops of Ferroin indicator and a magnetic stirring bar. Place flask on a magnetic stirrer and rapidly titrate with 0.1 N ferrous ammonium sulphate to the first red-brown endpoint. Use care in titration. The endpoint is very sharp and may be reached rapidly.

- **Biochemical oxygen demand(BOD):-**It is a chemical procedure for determining the amount of dissolved oxygen needed by aerobic biological organisms in a body of water to break down organic material present in a given water sample at certain temperature over a specific time period. It is not a precise quantitative test, although it is widely used as an indication of the organic quality of water. It is most commonly expressed in milligrams of oxygen consumed per litre of sample during 5 days of incubation at 20 C and is often used as a robust surrogate of the degree of organic pollution of water. [7]

**Procedure to check BOD: Dilution method**

To ensure that all other conditions are equal, a very small amount of micro-organism seed is added to each sample being tested. This seed is typically generated by diluting activated sludge with de-ionized water. The BOD test is carried out by diluting the sample with oxygen saturated de-ionized water, inoculating it with a fixed aliquot of seed, measuring the dissolved oxygen (DO) and then sealing the sample to prevent further oxygen dissolving in. The sample is kept at 20 °C in the dark to prevent photosynthesis (and thereby the addition of oxygen) for five days, and the dissolved oxygen is measured again. The difference between the final DO and initial DO is the BOD. The apparent BOD for the control is subtracted from the control result to provide the corrected value. The loss of dissolved oxygen in the sample, once corrections have been made for the degree of dilution, is called the $BOD_5$. For measurement of carbonaceous BOD (cBOD), a nitrification inhibitor is added after the dilution water has been added to the sample. The inhibitor hinders the oxidation of nitrogen.

- **Total Dissolved Solids (TDS):-**It is a measure of the combined content of all inorganic and organic substances contained in a liquid in: molecular, ionized or micro-granular (colloidal sol) suspended form. Generally the operational definition is that the solids must be small enough to survive filtration through a sieve the size of two micrometer. Total dissolved solids are normally discussed only for freshwater systems, as salinity comprises some of the ions constituting the definition of TDS. The principal application of TDS is in the study of water quality for streams, rivers and lakes, although TDS is not generally considered a primary pollutant (e.g. it is not deemed to be associated with health effects) it is used as an indication of aesthetic characteristics of drinking water and as an aggregate indicator of the presence of a broad array of chemical contaminants[8].

**Procedure to check TDS: Gravimetric method**

Gravimetric methods are the most accurate and involve evaporating the liquid solvent to leave a residue that can subsequently be weighed with a precision analytical balance (normally capable of

0.0001 gram accuracy). This method is generally the best, although it is time-consuming and leads to inaccuracies if a high proportion of the TDS consists of low boiling point organic chemicals, which will evaporate along with the water. If inorganic salts comprise the great majority of TDS, gravimetric methods are appropriate.

- **Suspended solids (SS):-**It refers to small solid particles which remain in suspension in water as a colloid or due to the motion of the water. It is used as one indicator of water quality. It is sometimes abbreviated SS, but is not to be confused with settleable solids, also abbreviated SS, which contribute to the blocking of sewer pipes[9].

**Procedure to check SS**: Assemble filtering apparatus and filter and begin suction. Wet filter with a small volume of reagent-grade water to seat it. Stir sample with a magnetic stirrer at a speed to shear larger particles, if practical, to obtain a more uniform (preferably homogeneous) particle size. Centrifugal force may separate particles by size and density, resulting in poor precision when point of sample withdrawal is varied. While stirring, pipette out a measured volume onto the seated glass-fiber filter. For homogeneous samples, pipet from the approximate midpoint of container but not in vortex. Choose a point both mid depth and midway between wall and vortex. Wash filter with three successive 10-mL volumes of reagent-grade water, allowing complete drainage between washings, and continue suction for about 3 min after filtration is complete. Samples with high dissolved solids may require additional washings. Carefully remove filter from filtration apparatus and transfer to an aluminum weighing dish as a support. Alternatively, remove the crucible and filter combination from the crucible adapter if a Gooch crucible is used. Dry for at least 1 h at 103 to 105°C in an oven, cool in a dessicator to balance temperature, and weigh. Repeat the cycle of drying, cooling, desiccating, and weighing until a constant weight is obtained or until the weight change is less than 4% of the previous weight or 0.5 mg, whichever is less. Analyze at least 10% of all samples in duplicate. Duplicate determinations should agree within 5% of their average weight[10].

- **OIL AND GREASE**: Dissolved or emulsified oil and grease is extracted from water by intimate contact with an extracting solvent. Some extractable, especially unsaturated fats and fatty acids oxidize readily; hence, special precautions regarding temperature and solvent vapor displacement are included to minimize this effect. Organic solvents shaken with some samples may form an emulsion that is very difficult to break. This method includes a means for handling such emulsions. Recovery of solvents is discussed. Solvent recovery can reduce both vapor emissions to the atmosphere and costs[10].

**Procedure to check OIL AND GREASE:** When a sample is brought into the laboratory, either mark sample bottle at the water meniscus or weigh the bottle, for later determination of sample volume. If sample has not been acidified previously acidify with either 1:1 HCl or 1:1 $H_2SO_4$ to pH 2 or lower (generally, 5 mL is sufficient for 1 L sample). Using liquid funnel, transfer sample to a separatory funnel. Carefully rinse sample bottle with 30 mL extracting solvent (either 100% *n*-hexane, or solvent mixture,) and add solvent washings to separatory funnel. Shake vigorously for 2 min. Let layers separate. Drain aqueous layer and small amount of organic layer into original sample container. Drain solvent layer through a funnel containing a filter paper and 10 g $Na_2SO_4$, both of which have been solvent-rinsed, into a clean, tared distilling flask. If a clear solvent layer cannot be obtained and an emulsion of more than about 5 mL exists, drain emulsion and solvent layers into a glass centrifuge tube and centrifuge for 5 min at approximately 2400 rpm. Transfer centrifuged material to an appropriate separatory funnel and drain solvent layer through a funnel with a filter paper and 10 g $Na_2SO_4$, both of which have been prerinsed, into a clean, tared distilling flask. Recombine aqueous layers and any remaining emulsion or solids in separatory funnel. For samples with <5 mL of emulsion, drain only the clear solvent through a funnel with pre-moistened filter paper and 10 g $Na_2SO_4$. Recombine aqueous layers and any remaining emulsion or solids in separatory funnel. Extract twice more with 30 mL solvent each time, but first rinse sample container with each solvent portion. Repeat centrifugation step if emulsion persists in subsequent extraction steps. Combine extracts in tared distilling flask, and include in flask a final rinsing of filter and $Na_2SO_4$ with an additional 10 to 20 mL solvent. Distill solvent from flask in a water bath at 85°C for either solvent system. To maximize solvent recovery, fit

distillation flask with a distillation adapter equipped with a drip tip and collect solvent in an ice-bath-cooled receiver .When visible solvent condensation stops, remove flask from water bath. Cover water bath and dry flasks on top of cover, with water bath still at 85°C, for 15 min. Draw air through flask with an applied vacuum for the final 1 min. Cool in dessicator for at least 30 min and weigh. To determine initial sample volume, either fill sample bottle to mark with water and then pour water into a 1-L graduated cylinder, or weigh empty container and cap and calculate the sample volume by difference from the initial weight (assuming a sample density of 1.00).

- **SULFATE :** In inorganic chemistry, a sulfate (IUPAC-recommended spelling; also sulphate in British English) is a salt of sulfuric acid. The sulphate ion is a polyatomic anion with the empirical formula $SO2{-}4$ and a molecular mass of 96.06 daltons (96.06g/mol); it consists of a central sulfur atom surrounded by four equivalent oxygen atoms in a tetrahedral arrangement. Many examples of ionic sulfates are known, and many of these are highly soluble in water. Exceptions include calcium sulfate, strontium sulfate, lead (II) sulfate, and barium sulfate, which are poorly soluble[13].
- **CHLORIDE:** The chloride ion is formed when the element chlorine picks up one electron to form an anion (negatively-charged ion) $Cl^-$. The salts of hydrochloric acid HCl contain chloride ions and can also be called chlorides. The word chloride can also refer to a chemical compound in which one or more chlorine atoms are covalently bonded in the molecule. This means that chlorides can be either inorganic or organic compounds. The simplest example of an inorganic covalently-bonded chloride is hydrogen chloride, HCl. A simple example of an organic covalently-bonded (an organochloride) chloride is chloromethane ($CH_3Cl$), often called methyl chloride[14].

## Results and Discussion

**Standard Norms of Maharashtra Pollution Control Board for Milk Dairy Effluents[5]**

The applicant shall provide comprehensive treatment system consisting of primary or secondary and/or tertiary treatment as is warranted with reference to influent quality and operate and maintained the same continuously so as to achieve the quality of the treated effluent to the standard as shown in Table-2.

"SIDDHARTHA MILK FOODS (I) PVT. LTD, YADRAV (ICHALKARANJI)"

After visiting the "SIDDHARTHA MILK DAIRY" we know that the total raw milk coming per day is 1.7 lacs litres as shown in Table-3 and after making different products like butter/ghee-10ton,milk powder-15ton ,the effluent generated daily is 3.5 lacs litres per day. This analysis of effluent (as shown in Table-4) is carried out in P.G. Chemistry lab of DKTE, Ichalkaranji.

"SHREE HANUMAN SAHAKARI DUDH VYAVSAIK & KRISHIPURAK SEVA SANSTHAN MARYADIT, YALGUD"

After visiting the "YALGUD MILK DAIRY" we know that the total raw milk coming per day is 10,000 litres. After making different products like flavored milk, peda, burfi, ghee, shrikhand, amrakhand, and basundi. The effluent generated daily is 20,000litres per day. This analysis of effluent (as shown in Table-5) is carried out in P.G. Chemistry lab of DKTE, Ichalkaranji.

**Quality of raw milk:**

Initially collected raw milk contains 100 every 2 Minutes 0/1200 bacteria per ml. It doubles for every 20 minutes after collecting the raw milk finally when it reaches to do it surprisingly contains much more number of bacteria i.e. 1cc=80 lakh bacteria's steroids, antibiotics. Bacteria spoil the milk, so milk can't be stored for long time. The quality of milk should be in such a way that the initial bacteria count must be less. Bacteria release enzymes which is harmful for human being. Acid forming bacteria consumes sugar in the milk and forms acid and gases. In short they decompose the milk within very few time, so total quality of milk depends upon the number of initial bacterial count.

**Causes of large number of initial bacteria**:

1. The main cause of growth of bacteria is lack of awareness about the cleanliness.
2. Most of the times, people collecting raw milk do not care about hygiene.
3. The pots used for collection of milk are not clean.

4. If the animals are suffering from diseases like T.B, Ranikhet give milk containing more number of bacterial.

So, we have to take care about it. We should try to remove the bacterial as minimum as possible.

Following are remedies for removal of bacteria-

1. More importance should be given for hygiene.
2. People collecting milk should use hang owe.
3. Milk collecting pots must be properly washed and dried.
4. Milk collecting centers must be clean and tidy.
5. Confirmation about animal health is necessary.

**Method for counting bacterial growth:**

There are many chemical and electrical methods for counting initial bacterial growth.

❖ **Chemical Method**

1. SPC Method(Standard plate count)
2. Litmus Paper Test
3. MBRT Test(Methyl Blue Reduction Time)

❖ **Electrical Method**

1. Milk Batyrometer
2. Online system

**Waste characteristics:**

Dairy effluents contain dissolved sugar, protein, fats and possibly residue of additives. The key parameters are biochemical oxygen demand (BOD) with an average ranging from 0.8 to 2.5 kg per metric ton of milk in the untreated effluent; chemical oxygen demand (COD) which is normally about 1.5 times of BOD level; total suspended solids at 100-1000 mg/lit, total dissolved solids, Phosphorus and Nitrogen. Cream, butter, cheese and whey production are major sources of BOD in waste water. The waste load equivalents of specific milk constituents are; 1kg of milk fat=3kg COD; 1kg of lactose=1.13kg of COD; and 1kg protein=1.36Kg COD. The waste water may contain pathogens from contaminated material or production process. A dairy often Generates odors and in some cases dust which need to be controlled. Most of the solid wastes can be processed in to other products and byproducts.

**Treatment technology:**

Pretreatment of effluents consists of screening flow equalization, neutralization and air floatation**.** It is normally followed by biological treatment. If space is available, land treatment or pond system are potential treatments. Other possible biological treatment systems include trickling filters, rotating Biological contactors, activated sludge treatment. Pretreated dairy effluents can be discharged to the municipal sewage system, if capacity exists with the approval of relevant authority. Odor can be controlled by ventilation and scrubbing may be required where cheese is stored or melted. Fabric filters should be used to control dust from milk powder production to below 50 milligrams per normal cubic meter (mg/Nm3).

**Characteristics of Effluent**

Dairy effluents are milky in color, slightly alkaline in nature. The effluents become acidic quite rapidly due to fermentation of milk sugar to lactic acid.

**1. Raw effluent tank**: - First of all raw materials comes in the raw effluent tank .Volumetric capacity of this tank is 100 CC. As shown in **Fig. No.:-1.**

**2. Fat removal unit:-** By pump action all fats can be removed.

**3. Equalizer: -** Equalizer is a rotating device which separates clean water from the waste water. In this unit during running of equalizer the clear water goes down and it comes in pH tester and waste water comes above the equalizer. As shown in **Fig. No.:- 2.**

**4. Uproot anaerobic Blanket: -** Volumetric capacity of this tank is 500 CC. By pump action the waste water from equalizer tank comes in UASB tank.

**5. Aeration Tank: -** In aeration tank there are two types of aeration takes place:

(a) Mechanical aeration, and (b) Bubble aeration.

In Siddhartha Milk Dairy Mechanical aeration tank is used. In that tank water is continuously aerated. The color of water must be Chocolate colour. It indicates that the bacteria are present in that tank. Volumetric capacity of this tank is 615 CC. In this tank aeration process takes place.

**6. Clarifier: -** In this tank sludge recirculation takes place. As shown in Fig. No.:- 3.

**7. Treated Effluent Tank:-**All clean water comes in treated effluent tank. This clean water again reused for gardening and agriculture.

## Conclusion

In conclusion it may be stated that effluent treatment need to be done chiefly due to this reason

1. To avoid the ill effect of discharged untreated effluent into the environment.

2. To satisfy the statutory requirements of the state pollution control board and central pollution control board.
3. In realization of our commitment to the future generations to provide clean pollution free environment.

## Acknowledgement

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**Table 1:** Composition of waste water of a typical dairy**.**

| Sr. No. | Item | Values |
|---|---|---|
| 1. | PH | 7.2 |
| 2. | Alkalinity(mg/l) | 1060 |
| 3. | Total dissolved solid(mg/l) | 760 |
| 4. | Suspended solid(mg/l) | 84 |
| 5. | BOD(mg/l) | 84 |
| 6. | COD(mg/l) | 11.7 |
| 7. | Total nitrogen(mg/l) | 290 |

**Table 2:** Standard Norms of "Maharashtra Pollution Control Board" For Milk Dairy Effluents.

| Sr. No. | Details | Value |
|---|---|---|
| 1. | $P^H$ | 5.5-9.0 |
| 2. | Total Solids(mg/l) | Not to exceed 2200 |
| 3. | Total Dissolved Solids(mg/l) | Not to exceed 2100 |
| 4. | Suspended Solids(mg/l) | Not to exceed 100 |
| 5. | Total Chlorides(as Cl) (mg/l) | Not to exceed 600 |
| 6. | Sulfates(mg/l) | Not to exceed 1000 |
| 7. | Chemical Oxygen Demand (mg/l) | Not to exceed 250 |
| 8. | Biological Oxygen Demand(mg/l) ($27^0$c for 3 days) | Not to exceed 30 |
| 9. | Oil & Grease(mg/l) | Not to exceed 10 |

**Table 3:** Raw Milk of "SIDDHARTHA MILK FOODS PVT. LTD".

| Sr. No. | Type Of Milk | Quantity (lacs lit/day) |
|---|---|---|
| 1 | Cow Milk | 1.2 |
| 2 | Buffalo Milk | 0.5 |

**Table 4:** Analysis of Effluent of "SIDDHARTHA MILK FOODS (I) PVT. LTD"

| Sr. No. | Details | Value |
|---|---|---|
| 1. | $P^H$ | 7.5 |
| 2. | Total Solids(mg/l) | 2640 |
| 3. | Total Dissolved Solids(mg/l) | 2400 |
| 4. | Suspended Solids(mg/l) | 240 |
| 5. | Total Chlorides(as Cl) (mg/l) | 73 |
| 6. | Chemical Oxygen Demand (mg/l) | 300 |
| 7. | Biological Oxygen Demand(mg/l) ($27^0$c for 3 days) | 50 |
| 8. | Oil & Grease(mg/l) | 40 |

**Table 5:** Analysis of Effluent of **"YALGUD MILK DAIRY"**

| Sr. No. | DETAILS | VALUE |
|---|---|---|
| 1. | $P^H$ | 6-7 |
| 2. | Total Solids(mg/l) | 1281 |
| 3. | Total Dissolved Solids(mg/l) | 1205 |
| 4. | Suspended Solids(mg/l) | 76 |
| 5. | Chemical Oxygen Demand(mg/l) | 192 |
| 6. | Biological Oxygen Demand(mg/l) ($27^0$c for 3 days) | 87 |
| 7. | Oil & Grease(mg/l) | 5 |

**Fig. 1:-** Raw Effluent Tank.


**Fig. 2:-** Equalizer.

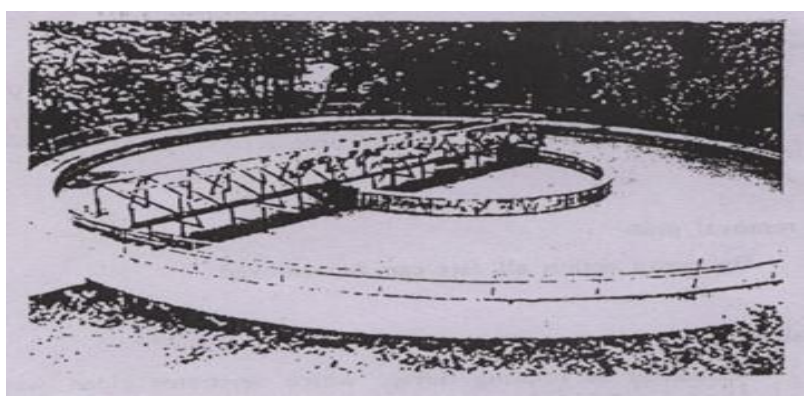

**Fig. 3:-** Clarifier.