EFFLUENT OF DAIRY TECHNOLOGY

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The rural areas were identified for milk production; the urban centers were collected for the location of milk processing plants and product manufacturing factories. Out of the total water consumed by human being, more than 50% of it is consumed for industrial activity and only small proportion is used for drinking purpose. The water after use emerging out of industry is better termed as waste water or industrial effluent (Sukumar De, 2002).

DAIRY TECHNOLOGY-As the rapid industrialization taking place all over the country, the number of dairies and allied industries are sharply rising.

I.Product and process involved in dairy-Many dairies restrict themselves bottling pasteurized milk and making ghee from scoured milk. In few dairies where supply of milk is larger, butte condensed milk, powered milk, ice cream cheese etc are also produced.

However the production of skimmed and toned milk and cheese making has the increasing demand in India.

II.Milk Processes-1.Milk Receiving Station : The milk cans are unloaded at the receiving station and emptied into a receiving tank, after testing for fitness and freshness. 2.Pasteurization : Pasteurization is accomplished by heating either to 62^0C for 30 min. of at 71^0 C for 15 seconds, followed by chilling to 4^0C. The milk is then bottled for distribution. 3.Cheese Making: Cheese is made from milk in which fat to protein ratio is adjusted when the proper degree of settling of curd has been reached, it is cut into pieces and after further adjustment to temperature, is then allowed to settle. 4.Butter, Butter Milk, Skim Milk: Milk is first passed through centrifugal machines to separate cream and skim milk. Cream is then churned until butter separates from the liquid and butter milk is left over. Ghee is prepared from the butter, sour milk is separated to remove fat and skim milk thus obtained is fed into large vats and treated with the acid to precipitate casein which is washed and dehydrated.

MILK-The milk is one of the most important commodity entering trade and it is required in every day life as an article of food. Since the milk is highly perishable, basic public health and economic consideration is required that consumer should be provided with the product which is of good quality, pure, free from pathogenic bacteria. To maintain quality standard, quality control operation have to be performed at all the stages of production of milk which includes maintenances of sanitary conditions at milking place, storage, transportation and handling the milk at reception docks, processing and packing etc. till the milk is delivered to consumer.

PRODUCTS OF MILK-Mainly dairies restrict themselves to pasteurizing of milk and packing the pasteurized milk and making ghee from scoured milk. In some dairy where the milk supply is in larger quantity the butter cream, cheese, ice cream panner, shrikhand, milk powder, yoghart etc. are also prepared.

MILK PROCESS TECHNIQUE: Milk treatment is the preparation of raw milk including heat treatment as a precondition for milk processing. The treatment of milk is done in the preparation room. It is a first process in any dairy plant.

The milk processing is the quality oriented activity of manufacturing, packing of dairy based products on the basis of treated milk.

RAW MILK STORAGE: Storage is an activity in whcih milk is kept between reception and processing. Storage helps in balancing the different capacities and timings between reception and processing.The total volume of storage silos can

The average composition of Nutrient in the milk and milk product.

Sr. No.	Dairy Product	FAT	Protein	Carbo Hydrate	Total Solids	Chloride mg	Calcium mg
1	Flavoured milk	4.5	3.8	11.00	20.00	100.00	118.00
2	Skimmed Milk						
2.1	Buffalo	0.1	4.2	5.4	10.5	39.00	150.00
2.2	Cow	0.1	3.6	5.0	9.4	35.00	130.00
3	Butter 2% salt	81.0	0.6	0.4	84.5	780.0	20.0
4	Ghee	99.5	0.1	0.0	99.7	896.0	—
5	Ice-Cream	10.0	5.0	17.6	23.4	180.0	150.00

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be very different and can vary from 20 to 100% of the dairy reception volume, usually storage vessles are installed individually one the outside of the buildings, are made of stainless steel or fibre glass and may have a volume of 20,000 to 2,00,000 L.

RAW MILK CLARIFICATION-The purpose of clarification is to remove, all the foreign materials from the milk (which may have entered in mlk during milking treatment or transport). This process removes the organic or inorganic material (animal hair dust particle etc.) Somatic cells as well as microorganisms and their protein agglomerates. The level of foreign material is constantly reduced by an imprroved hygiene, during milking however the classification process in the dairy is absolutely necessary and is even required by low during classification.

DECREAMING-It based on the fact that fat exists in a poly disperse system in an emulsified state and that the specific density difference between the milk fat and skim milk is fairly large.

During the processing milk fat is partially or completely removed in order to–

A) Obtain a fat reduce or fat free milk.

B) Concentrate milk fat for the production or high fat products.

C) Standerdize the fat content of milk and decreaming is the mechanical separation of milk into cream and skim milk by means of centrifugal forces.

HOMOGENIZATION OF MILK- Homogenization is the disintegration of in which uniformly or non uniformly or non uniformly distributes PHases of liquid rich in a higher level of mixing and the distribution level stabilizes. The main purpose of homogenization in the dairy industry is to reduce the size of the fat globules and achieve its uniform diameter of 0.5 - 1. This results in both desirable and non desirable changes.

STANDARDIZATION OF MILK -Fat and protein contents are subject to significant seasonal variations, with the fat content having widest fluctuations. The milk components must be standardized in raw milk of many different applications.

PROTEIN STANDARDIZATION-Protein standardization permits a constant protein level. When the required filtration process is utilized; This can be advantageous in cheese manufacturing. Where fluctuations in protein level can have negative effects on the process and finished products.

BACTOFUGATION OF MILK-Bactofugation is a special form of separation in which specific types of microorganisms. (Mainly spore forming bacilli) are removed from milk and inactivated. Generally allactivated microorganisms are inactivated by pasteurization to such an extent that both the hygienic and technological requirements are met, however the highly heat resistant spores are surviving in the pasteurization process as precausers of spore forming bacilli and clostridia. Spores can form new vegetative cells by growing under favorable conditions and propagating very rapidly. They can lead to significant quality defects in hard cheese, semi hard cheese or long life products due to proteolysis, lipolysis and gas formation. Therefore bactofugation is done.

HEAT TREATMENT OF MILK-Thermal treatment is an energy transfer of heat into milk heat treatment is often to referred as heating. The objective of heat treatment is to completely inactivate all microorganisms which are present in the milk. The results, however, whether desired or not in a modification of the natural milk components. Pasteurization is the thermal inactivation of microorganisms at temperatures below 100^0C , which is required for the hygienic quality of food and to achieve a certain level of preservation. The main objective is to inactivate pathogens in order to avoid a health hazard for human beings and animals.

COOLING OF MILK-Cooling is done immediately after the heating process. Temperature is reduced below the heating temperature. This reduces the thermal risks for the milk. The final temperature is selected as a function of the frozen utilization of the cooled milk. Milk is processed immediately. There after can be kept at 10-25^0C. Fresh milk and milk mix drinks require cooling to $<6^0$C. This prevents or reduces significantly growth and possible recontamination and thus preserving the milk.

PACKING : After homogenization of milk, the milk passed to packing unit under the action of gravity. The packing of milk is done in polythene bags are tested for it's standardization. Generally milk is packed in half litre bag. The milk is then stored in A.C. room and transported to consumer.

SOURCES OF EFFLUENTS : Following are some of the sources of effluents. (Khopkar, 2005)

I) Effluent from milk receiving station.

II) Empty cans are washed mechanically in an automatic milk can washer.

III) Effluent from pasteurization plant. Effluent from these sections consists of waste water by washings of equipment containing acids, alkalies, and detergents and floor washings, speels and leaks.

It is an accepted practice to wash the entire unit after each shift of batch. A part from the above sources large amount of effluent is formed from various following sections.

IV) Milk processing section

V) Fill and packing section

VI) Compressor and refrigeration section

VII) Boiler section.

VIII) Washing tubs, crates section

A) Manufacturing of Butter and Ghee -

It consists of waste water of butter and floor washings, which consists of mainly butter milk, cream and a small percent of whole milk.

B) Manufacture of Cheese

C) Manufacture of Casein.

D) Effluent form bottle washing plant –

Bottles and crates are thoroughly washed using the detergents or caustic Soda in solution. The effluents are discharged intermittently, uncontaminated cooling water is utilized in the pasteurization of milk. The spent water through hot can be reused after cooling.

VOLUME OF THE EFFLUENT-The volume of effluent may vary from 1-10lit of milk processed depending upon the product manufactured, house keeping and available quantity of water. The maximum discharge may be up to 5 times than the average discharge.

CHARACTERISTICS OF THE EFFLUENT-The characteristics of a dairy effluent contain Temperature, Colour, PH (6.5-8.0), DO, BOD, COD, Dissloved solids suspended soilds, chlorids sulphate, oil & grease. It depend largely on the quantity of milk processed and type of product manufactured.

Dairy wastes are white in colour and usually slightly alkaline in nature and become acidic quite rapidly due to the fermentation of milk sugar to lactic acid. All the liquors mentioned above have a high BOD as they contain appreciable concentration of carbohydrates. The suspended matter content of milk waste is considerable mainly due to fine curd found in cheese waste. The pollution effect of dairy waste are attributed to the immediate and high oxygen demand. Decomposition of casein leading to the formation of heavy black sludges and strong butyric – acid odours and characterize milk waste pollution.

EFFECTS OF EFFLUENTS : The waste water of dairy contains large quantities of milk constituents such as casein, inorganic salts, besides detergents and sanitizers used for washing. All these components contribute largely towards their high biological oxygen demand (BODS) and chemical oxygen demand (COD). Which is much higher than the specified limits of Indian standard institute (ISI), now Bureau of Indian standard (BIS), for the discharge of industrial effluents; As these wastes are generally released to the near by stream or land without any prior treatment are reported to cause serious pollution problems (Sethi. et.al., 1981).

Dairy effluents decompose rapidly and deplete the dissolved oxygen level of the receiving streams immediately resulting in anaerobic conditions and release of strong foul odours due to nuisance conditions. The receiving water becomes breeding place for files and mosquitoes carring malaria and other dangerous diseases like dengue fever, yello fever, chicken guniya. 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 decompose 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.

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