

INTERNSHIP REPORT

TAMIL NADU CO-OPERATIVE MILK PRODUCERS FEDERATION LIMITED (AAVIN) AT SHOLINGANALLUR,
TAMIL NADU, 600119

Page |
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TRAINING PERIOD (15.09.2023-29.09.2023)

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BENISHA.J

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SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

Jeppiar Nagar, Rajiv Gandhi Salai, Chennai- 600119

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DISCLAIMER

This internship report has been prepared by the author as an intern under Tamil Nadu Co-operative Milk Producers' Federation Limited (AAVIN), Sholinganallur. The views expressed in the report are personal to the intern and do not necessarily reflect the view of the industry where the internship takes place or any of its staff or personnel. This report reflects personnel experience based on the level of interpersonal communication, interaction with the personnel, coordination level and information shared or perceived. There is always a room for improvement. It is not necessary for the readers to agree with the content, findings, conclusion and area of improvement as identified there in.

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I perceive this opportunity as a big milestone in my career development. I will survive to use gained skills and knowledge in the best possible way, and I will continue to work on their improvement, in order to attain desired career objectives.

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INDEX

<u>CHAPTER NO:</u>	<u>TITLE</u>	<u>PAGE NO:</u>
1	INTRODUCTION	5
1.1	ABOUT THE COMPANY	5
1.2	THE PRODUCTION LEVEL OF MILK	5
1.3	DISTRICT UNION OF FEDERATIONS	5
1.4	FUNCTIONS OF CO-OPERATIVE MIX PRODUCERS UNION	6
2	PURPOSE AND SCOPE	6
2.1	INTERNSHIP PURPOSE AND STUDY	6
2.2	SCOPE OF THE STUDY	6
2.3	OBJECTIVES	6
2.4	METHODOLOGY	6
3	DAIRY PROCESS	7
3.1	COLLECTION OF MILK	7
3.2	DAIRY PROCESSING	7
3.3	CIP SECTION	8
3.4	TYPES OF MILK	9
3.5	PROCESS CONTROL ROOM	10
4	SNR DAIRY – QUALITY CONTROL LAB	11
4.1	TESTS INVOLVED IN CHECKING QUALITY OF MILK	11
4.2	ORDER OF CHECKING MILK	11-16
4.3	TESTS IN WATER	16
4.4	INSTRUMENTAL METHODS FOR ANALYSING QUALITY OF MILK	17
4.5	TESTS IN CURD	18
4.6	TESTS IN MILK POWDER	18-19
4.7	TESTS IN BUTTER	19
5	ULTRA HIGH TEMPERATURE (UHT) PLANT	20
5.1	UHT IN BRIEF	20
5.2	STERILIZATION OF MILK	20
5.3	ALCOHOL TEST	21
5.4	TITRINO PLUS	21
6	EFFLUENT TREATMENT PLANT (ETP)	22
6.1	ETP IN BRIEF	22
6.2	STEPS INVOLVED IN ETP	22
6.3	PROCEDURE	23
6.4	SPACE REQUIREMENT FOR ETP	24
6.5	TESTS DONE IN ETP	24

7	CALCULATIONS, RESULTS AND PREPARATIONS	25
7.1	DETERMINATION OF FAT AND SNF	25
7.2	DETERMINATION OF ACIDITY IN MILK	25
7.3	DETERMINATION OF ACIDITY IN CURD	25
7.4	DETERMINATION OF ACIDITY IN BUTTER	26
7.5	DETERMINATION OF ACIDITY IN MILK POWDER	26
7.6	DETERMINATION OF HARDNESS,TDS AND PH OF WATER	26
7.7	DETERMINATION OF MOISTURE IN MILK POWDER AND BUTTER	26
7.8	DETERMINATION OF FAT IN BUTTER	26
7.9	DETERMINATION OF FFA	26
7.10	PREPARATION OF SOLUTIONS	26
8	GLIMPSE OF MY INVOLVEMENT	27

CHAPTER-1

1. INTRODUCTION

1.1 ABOUT THE COMPANY

India is well known as the 'Oyster' of the global industry and the largest producer of milk in the entire globe. The cooperatives contribution is high to this total production. In Tamil Nadu, Aavin is the first cooperative milk society dealing with milk and value added products of milk. Aavin union is a government which was founded in the year 1958. Milk is procured from the village level societies twice a day. The milk cost payment is made on the basis of a quality test which consists of Fat and Solid Non-fat content.

1.2 THE PRODUCTION LEVEL OF MILK

Approximately, the Aavin Dairy Industry produces 5,60,000 liters of milk everyday. The Aavin Dairy industry produces comparatively less liters of milk during the Summer period when compared to that of the Winter period. This happens because during the dry summer months there will be a low availability of green fodder for cattle for the fall of milk production.

1.3 DISTRICT UNION OF FEDERATIONS

There are about 17 district Co-operative Milk Producers Unions functioning in

Tamil Nadu, covering 30 Districts. They are:

- Kancheepuram- Tiruvallur
- Villupuram
- Vellore
- Dharmapuri
- Dharmapuri
- Salem
- Erode
- Coimbatore
- Nilgiris
- Madurai
- Dindigul
- Trichy
- Thanjavur
- Pudukottai
- Sivagangai
- Virudhunagar
- Thirunelveli
- Kanyakumari

1.4 FUNCTIONS OF CO-OPERATIVE MILK PRODUCERS UNION

- a. Establishment of chilling centres.
- b. Formation of new milk routes to collect milk produced by the members of the
- c. societies.
- d. Collection of milk from societies, process, and pack in modern dairy.
- e. Supply of quality milk.
- f. Fixation of procurements and selling price of milk.
- g. Supply of inputs to the members of the societies.

CHAPTER-2

2. PURPOSE AND SCOPE

2.1 INTERNSHIP PURPOSE AND STUDY

The purpose of the internship is to obtain extra knowledge about the dairy center and to know about the function and activities of Aavin. In this internship, I get to know about the milk and milk based processing methods of Aavin situated at Sholinganallur from 15/09/2023 to 29/09/2023 for 15 days. I have attained a lot of information which includes production, products, sales, profit, loss etc. In this project, we also took effect to know about, assessing the quality of the milk via various tests and also I have learned about the waste-water management.

2.2 SCOPE OF THE STUDY

I have started this internship to know about the milk and milk-based processing methods of Aavin situated at Sholinganallur (Chennai). I have attained a lot of informations which include production, products, sales etc. In this training period, I also took effect to know about assessing the quality of the milk via various test and also we have learned about the wastewater management.

2.3 OBJECTIVES

- A. To obtain extra knowledge about the dairy center.
- B. To know about the functioning and activities of Aavin.
- C. To know about the process of a dairy product in the dairy center.
- D. To know about the waste water management in the dairy center.

2.4 METHADODOLOGY

The present report data was obtained from the staff member of Aavin dairy center.



CHAPTER-3

3. DAIRY PROCESS

3.1 COLLECTION OF MILK

Raw milk- Milk reception :- The milk is collected from many villages where milkers give their milk through dairy form situated on their village. Therefore, both societies and milk givers can earn money with some profits. The collection of milk which is directly got from the milk giver is known as "Raw Milk". The milk can be collected in the morning and evening.

3.2 DAIRY PROCESSING

The milk collected from the chilling centers are brought to the dairy and are kept for assessing the quality. Some of the types of milk viz., standard milk, high fat, high protein milk, are being produced for the requirements of the consumers, the surplus fat is converted into ghee. In the dairy, milk, ghee, butter, ice-cream flavored milk, rose milk, butter milk, etc., are being manufactured and marketing. The overall steps for processing of milk is carried out in five sections. They are Milk Reception, Storage Section, Processing Section, Boiler Section and Refrigeration.

Milk chilling

Chilling is a necessary step when dealing with large volumes of milk. Milk leaves the cow's udder of the temperatures above the ambient, which encourages rapid bacterial multiplication that speeds up spoilage. However, reducing temperature to between 2 degree celcius to 5 degree celcius arrests bacterial growth and metabolism. This provides a head start at keeping the quality before proper pasteurization commences.

Pre-heating (regeneration)

After bulking, the chilled milk is heated to about 37degree celcius to facilitate easy separation of butter fat during standardization. The system uses regenerative heating, i.e., it uses the heat of the already pasteurized milk to heat up the incoming chilled milk. The chilled milk, in a counter-current flow, cools down the pasteurized milk. The purpose of standardization is to obtain a product with uniform butter-fat.

Standardization stage

It is important to standardize milk fat to ensure that you end up with a product of consistent quality in the market. Different consumers prefer different products. There are customers who will consumes skim milk, low-fat milk, standardized milk and also prefer high-fat milk. During the process of standardization you get to separate the butterfat that is used for making cream, butter and ghee. This process of cream separation is done in a cream seperator.

Heating section

This section happens in the pasteurizer to reach the required temperature for homogenization. The milk is homogenized and is heated upto 60 degree celcius.

Homogenization

Homogenization reduces the size of the fat globules by forcing pressurized hot milk through small whole causing turbulence, the break up of larger fat globules so that they remain suspended rather than separating in a cream layer at the top. It may be total or partial. Partial homogenization is more economical solution because a small homogenizer can be used. It must always be sufficiently efficient to prevent creaming. This tank comprises 10,000 litre capacity.

Pasteurization

It is a process by which the disease-causing bacteria in the milk are destroyed without losing its nutritive values. The milk, the coloration distinction between pasteurized and raw milk is associated with the homogenization step that takes region prior to pasteurization. Before pasteurization, milk is homogenized to separate the solids (fat) from the

liquid, which ends within the pasteurized milk having a whiter look as compared to raw milk. Pasteurization destroys 100% of pathogenic bacteria, yeast and mold and 95% to 99% of other bacteria.

Holding section

After heating, milk flows into holding tubes whose lengths have been calibrated with the milk flow rate to ensure that milk takes at least 15 seconds in the tubes. All the milk must maintain the required pasteurization temperatures at the end of the tubes. Once the chilled milk has attained the required temperature at the end of the holding tubes, milk flows back to the regeneration section to heat the incoming chilled milk while in itself being cooled down to above 30 degree celcius.

Cooling section

After regenerative cooling os pasteurized milk, it move to the cooling section of the PHE where chilled water/PHE coolant lowers the temperature of pasteurized milk to 4degree celcius. The chilled milk is stored in pasteurized milk storage tank and in specific packets and stored in the cold room (7degree celcius to 8degree celcius). Finally, these packet milk are distributed to various market places for sale.

Boiler Section

A horizontal multi tubular thermo dyne boiler with 1 ton capacity is used for generating steam which serve the purpose of heating in all stages.

Refrigeration system

Vapour adsorption cooling system is used. The milk is cooled with help of the refrigeration compressor, where NH3 is used as strong adsorbent by water. A liquid pump is used to increase the pressure of the strong solution. Finally the ammonia vapour will be condensed and recycled.

3.3 CIP SECTION

Cleaning of dairy equipment and its sanitation are of utmost importance in dairy industry. Cleaning-in-place (CIP) involves circulation or recirculation of appropriate water rinses and chemical cleaning and sanitizing solutions through plants and equipment which is maintained in the assembled state, such that all contaminated contact surfaces cleaned to acceptably high and consistently reproducible standards. It involves usage of hotter, stronger and more soil aggressive chemical solution than manual cleaning. Filters and similar equipment should be taken out during CIP cleaning to prevent their damage. As the operation of CIP cleaning is inherently hazardous and not without danger and leaking and causing harm to men and material, its operation is automated in most of dairy industry including Sholinganallur dairy.

Cleaning Media

Media	Strength	Temperature	Time
Lye	0.8%-1%	70 deg cel - 75 deg cel	15 minutes
Acid	0.3%-0.5%	65 deg cel – 70 deg cel	15 minutes
Hot Water	-	80 deg cel – 85 deg cel	15 minutes

Cleaning Schedule

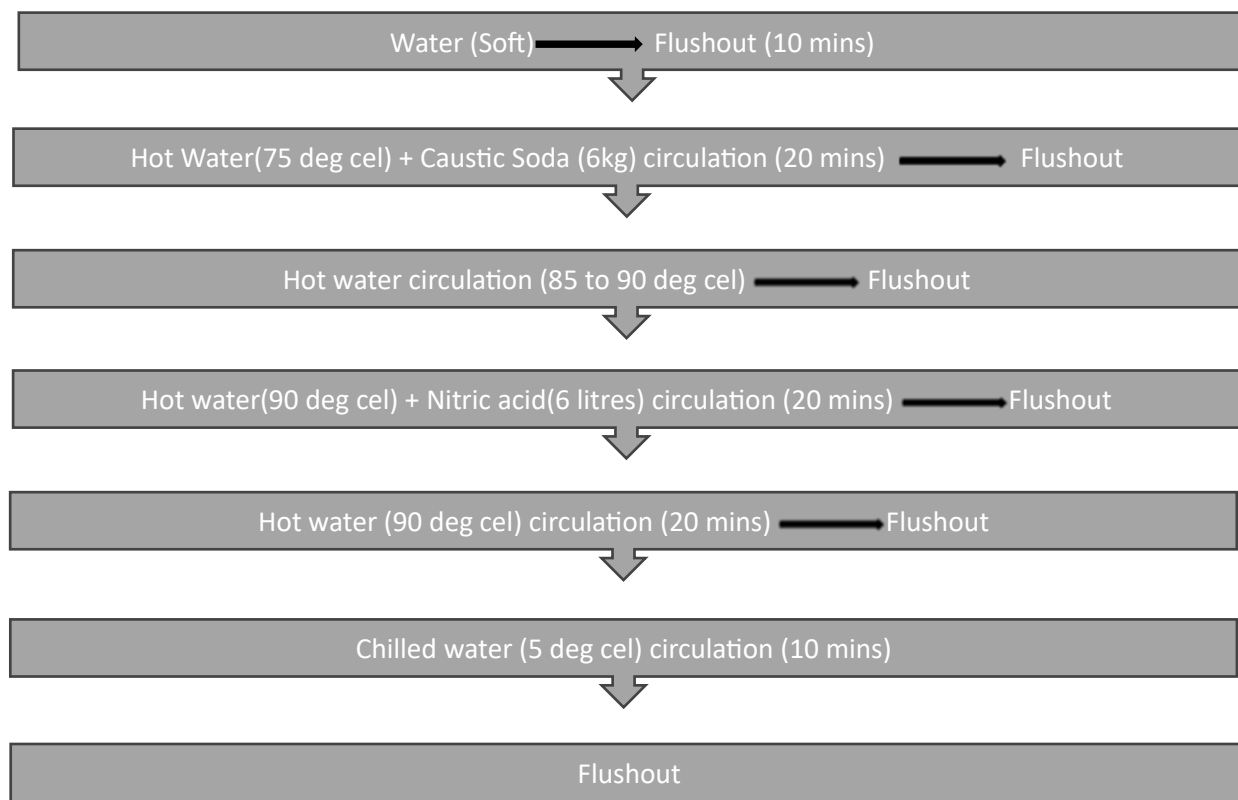
Lye cleaning:

- Reception lines, silos, prepack mini tanks and machines – once in 24 hours
- Dispatch lines- twice in 24 hours

Lye-Acid-lye:

- Reception lines, dispatch lines, silos, prepack mini tanks and machines-once in a month.
- Processing plants- once in six months.

CIP Process



Test for Lye Strength

- Add 8ml of lye solution in a conical flask.
- Add 1ml phenolphthalein indicator.
- Titrate against 0.6% H_2SO_4 .
- End point is the disappearance of pink colour.

Test for Acid Strength

- Add 6ml HNO_3 in a conical flask.
- Add 1ml phenolphthalein indicator.
- Titrate against 0.1N NaOH.
- End point is the appearance of pink colour.

3.4 TYPES OF MILK

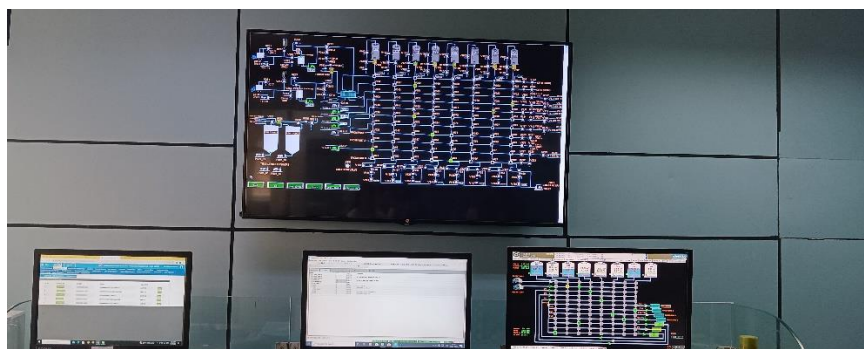


NAME OF THE MILK	FAT %	SNF %
Nice Toned Milk (Blue)	3.0%	8.5%
Standardized Milk (Green)	4.5%	8.5%
Premium Full Cream Milk (Orange)	6.0%	9.0%
Delite Pasteurized Milk (Violet)	3.5%	8.5%
Diet Pasteurized Double Toned Milk (Pink)	1.5%	9.0%



3.5 PROCESS CONTROL ROOM

The process control system facilitates mass production of continuous process such as pasteurization of milk, milk powder, ghee, oil refining, CIP etc. Process control is completely automatic with the requirement of a small number of staff to monitor and operate the complex process in the control room. The sequence and timing of pumping of cleaning solutions are controlled by PLC controller that are programmed. Plate Heat Exchanges are used to maintain the temperatures of the solutions.



CHAPTER-4

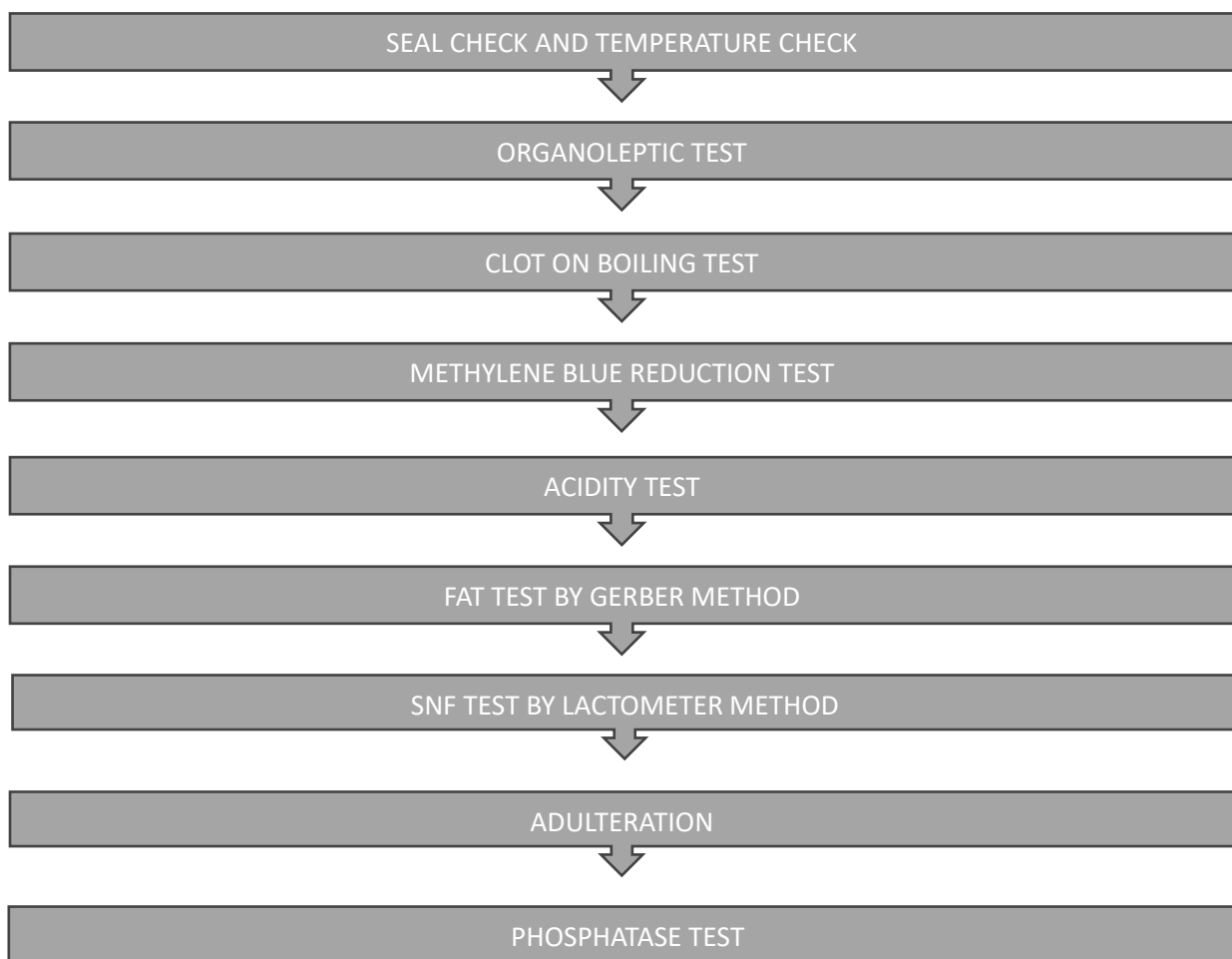
4. SNR DAIRY – QUALITY CONTROL LAB

4.1 TESTS INVOLVED IN CHECKING THE QUALITY OF MILK

There are different kinds of tests involved in checking the quality of milk :-

- Organoleptic test
- Lactometer test
- Clot-on-boiling test
- Fat test
 - i) Gerber method
 - ii) Methylene blue Dye Reduction Test
- Testing Adulterants of milk
- Phosphatase test

4.2 ORDER OF CHECKING MILK:-



1. ORGANOLEPTIC TEST

- The appearance of the surface of the milk and the lid is observed and inspected right away after disposing of the lid of the incoming milk can.
- Any strange coloration of the milk, seen dirt and particles, changes in viscosity etc. are determined.
- Any strange odour, if noticed by way of inhalation of air status above the milk inside the upper part of the milk can also determined. Also milk should not be in unpleasant taste.

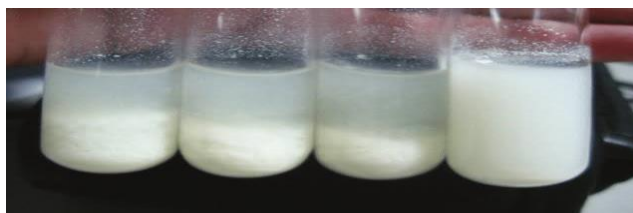
Page |
12



2 . CLOT ON BOILING TEST

This test is used for rapid test of increased acidity of milk. Procedure is as follows :-

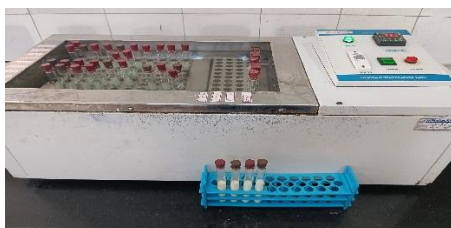
- Take 5ml of milk in a clean test tube.
- Heat it for just boiling and observe clotting on the side of the test tube.
- When whole of the milk clots are seen to be adhering to the sides of the tube, then the result shall be recorded as "POSITIVE".
- If the clots are not present, then the result shall be recorded as "NEGATIVE".



3. METHYLENE BLUE DYE REDUCTION TEST

Methylene blue dye reduction test, known as the MBRT test is used as the quick method to access the microbiological quality of raw and pasteurized milk. This test is based on the fact that the blue color of the dye solution to be added to the milk get decolourised when the oxygen present in the milk get exhausted due to microbial activity. The sooner the decolourisation , more inferior is the bacteriological quality of milk assumed to be. The test has to be done under sterile conditions. Procedure is as follows :-

- Take 10ml of milk in a sterilized test tube.
- Add 1ml Methylene Blue solution to get a concentration of 1 part of dye to 3,00,000 parts of milk.
- Plug with a sterilized cork.
- Invert the tube to mix the contents and incubate at 37 degree celcius in a water bath.
- The colour of the milk in the tube is examined first 10 mins and then after every half an hour and the time required for complete decolourisation is noted.
- The difference between the initial time and the final time is the MBRTtime.



Standard for Raw Milk

S. No:	MBR TIME IN HOURS	MILK QUALITY
1	5 hours and above	Very good
2	3 – 4 hours	Good
3	1 – 2 hours	Fair
4	Half and below hours	Poor
5	Less than 10 minutes	Not accepted

4. ACIDITY TEST

The total titratable acidity is determined by using the titration method. Procedure is as follows :-

- Take 10ml of milk in a conical flask.
- Add 10ml of distilled water.
- Add 1ml of 0.5% phenolphthalein solution.
- Titrate with N/9 (0.11N) NaOH.
- Appearance of pink colour is an end point.

CALCULATION:- % of Acidity of Milk

$$\frac{\text{Vol of NaOH} \times \text{Normality of NaOH} \times \text{Eq.wt of lactic acid} \times 100}{\text{Vol of Milk} \times 1000}$$

$$= \frac{\text{Vol of NaOH} \times N/9(0.11) \times 90 \times 100}{\text{Vol of Milk} \times 1000}$$

$$= \frac{\text{Vol of 0.11N NaOH}}{\text{Vol of Milk}}$$

NOTE :- Acidity of more than 0.18% lactic acid would result in the curdling during heat processing.

Acidity of below 0.16% is fit for processing and for products it should be below 0.14%.



5. FAT TEST BY GERBER METHOD

The Gerber method is a primary and historic chemical test to determine the fat of milk and cream. . Procedure is as follows :-

- Take 10ml of Gerber Acid (90% Sulphuric Acid H_2SO_4) in a Butyrometer.
- Add 10.75ml of milk sample along the sides of Butyrometer.

- Add 1ml of Amyl Alcohol.
- Close the neck with stopper.
- Mix the contents thoroughly until the curd has been dissolved.
- Dry the butyrometer into a centrifuge for centrifugation at 1100rpm for 5 minutes.
- The surface of separation of fat and acid gives the percentage of fat.



6. SNF TEST BY LACTOMETER METHOD

Lactometer test serves as a quick method for determination of adulteration of milk by adding water. The lactometer test is based on the fact that the specific gravity of the whole milk, skim milk and water differ from each other. Procedure is as follows :-

- Adjust the temperature of the milk sample to 84 degree celcius.
- Fill the lactometer cylinder with the milk sample.
- Allow the lactometer to flow freely on the milk without touching the sides of the cylinder. Some milk should overflow.
- Allow the lactometer to come to rest and then take the visible lactometer reading which is the corrected lactometer reading (CLR).

CALCULATION:- For SNF (Solid non fat)

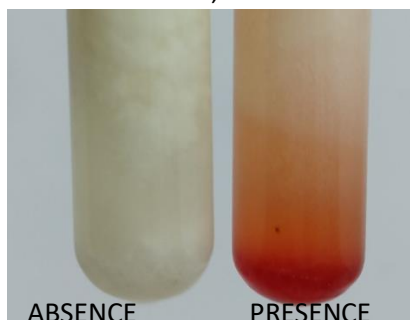
$$\text{CLR}/4 + (0.2 \times \text{Fat}) + 0.36$$



7. ADULTERATION TEST

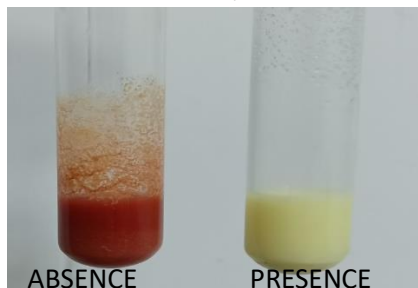
I. SUGAR TEST

- In test tube add 10ml milk.
- Add 1ml concentrated hydrochloric acid.
- Add 0.1g Resorcinol.
- Keep in boiling water bath for 10minutes.
- PRESENCE :- Red , ABSENCE :- White (no change)



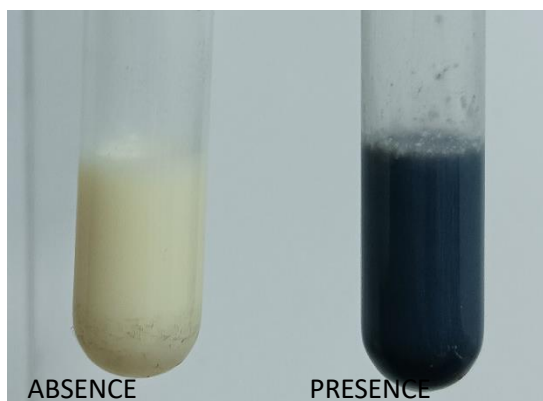
II. SALT TEST

- In test tube add 5ml AgNO_3 solution.
- Add 1ml $\text{K}_2\text{Cr}_2\text{O}_7$ indicator.
- Add 1ml of milk.
- PRESENCE :- Yellow, ABSENCE :- Brown(no change)



III. STARCH TEST

- In test tube add 3ml milk.
- Add 1ml iodine solution.
- PRESENCE :-Intensive blue, ABSENCE :- White (no change)



IV. NEUTRALIZER TEST

- In test tube add 10ml milk.
- Add 5ml ethanol.
- Add 1ml rosolic acid.
- PRESENCE :-Pink/Rose red, ABSENCE :- Orange(no change)



V. UREA TEST

- In test tube add 5ml milk.
- Add 5ml of p-dimethylamino benzaldehyde.
- PRESENCE :- Yellow , ABSENCE :- White(no change)



PRESENCE

ABSENCE

8. PHOSPHATASE TEST

- Weigh 3.5g of Sodium Carbonate and 1.5g of Sodium Bicarbonate.
- Dissolve in 1litre of distilled water and sterilize which is served as buffer.
- With this buffer add 1.5g of p-nitrophenyl disodium ortho phosphate and used as substrate.



4.3 TESTS IN WATER

1) TOTAL HARDNESS (TH):- Hardness in water is due to the presence of dissolved salts of calcium and magnesium. It is unfit for drinking, bathing, washing and it also forms scales in boilers. Hence it is necessary to estimate the amount of hardness producing substances present in the water sample. As water plays a major role in dairy industry, hardness of water will be checked every 6 hours of softening process. Samples like raw water, RO water, sump water etc., will be taken for analysis. Procedure is as follows :-

- Take 100ml sample water in conical flask.
- Add 1ml Ammonia buffer followed by 1 to 2 times tap of Erichrome black dye indicator. The solution turns into pink colour.
- Note the initial reading then titrate the content against EDTA solution.
- End point is the colour change from pink to blue colour.
- Note the final reading and multiply by 10.



2) TOTAL DISSOLVED SOLID(TDS) :- TDS of water can be found with the help of TDS Meter.



3) pH of Water :- It can be found with the help of pH meter.



4.4 INSTRUMENTAL METHODS TO ANALYZE THE QUALITY OF MILK

There are instruments that can be used to determine the quality of milk or milk products instead of doing it in a manual method. It has time consumption and also avoid several errors.

Milkoscreen

It analyses the product using FTIR technology, assessing milk constituents, using absorption at different wavelengths in the infrared spectrum to detect the presence of specific parameters in milk like SNF, Fat and Protein. Accuracy and repeatability of results are comparable with the chemical methods, but with Milkoscreen, it takes far less time than conventional chemical methods. Results from MilkoScreen are accurate, direct and not calculated, unlike some contemporary techniques.



Moisture Analyser

Moisture analyzers (moisture balances), are used to measure the moisture content in solids, liquids, and gases. It is used to find the moisture content in butter and milk powder in dairy industry. It analyses the product using FTIR technology, assessing milk constituents, using absorption at different wavelengths in the infrared spectrum to detect the presence of specific parameters in milk like SNF, Fat and Protein.



Lactoscope

The Lactoscope is our most versatile mid-infrared analyzer capable of testing a wide range of dairy product: milks, creams, whey, concentrates, ice-creams and yogurt mixes. The latest hardware innovations allow to easily test the most challenging dairy products, such as creams with up to 55% fat and other viscous products. With a typical accuracy under 1% CV, a measuring time of 30 seconds, low cost of ownership and minimal downtime, this instrument is the preferred choice of the large processors and dairy laboratories. LactoScope tests raw and processed milk, cream and whey for fat, protein, lactose, solids and solids non-fat. It screens raw milk for abnormal content and can detect 18 adulterants such as urea, ammonium sulphate, maltodextrin, sucrose and water.



4.5 TESTS IN CURD

1) Acidity Test

- Add 10g of curd in conical flask.
- Add 10ml distilled water to it.
- Add 1ml phenolphthalein indicator.
- Titrate against 0.1N NaOH.
- End point is the appearance of pale pink colour.
- **Calculation :-**



$$\text{Vol of NaOH} \times \text{Normality of NaOH} \times \text{Eq.wt of lactic acid} \times 100$$

$$\text{Weight of curd} \times 1000$$

$$= \text{Vol of NaOH} \times N/10(0.1) \times 90 \times 100$$

$$\text{Weight of curd} \times 1000$$

$$= \text{Vol of NaOH} \times 0.1 \times 9$$

$$\text{Weight of curd}$$

- 2) pH test:- pH can found with the help of pH meter.

4.6 TESTS IN MILK POWDER

1) Acidity Test

- Add 5.2g of milk powder in a conical flask.
- Add 50ml distilled water and mix well.
- Add 1ml phenolphthalein indicator.
- Titrate against 0.11N NaOH.
- End point is the appearance of pale pink colour.
- Calculation :- $\text{VALUE} \times 2$



2) Moisture Test

- Weigh 1g of milk powder.
- Test its moisture using moisture balance.

4.7 TESTS IN BUTTER

1) Acidity Test

- Weigh 5g of butter in a conical flask.
- Add 22.5ml of distilled water to it.
- With the help of oven dissolve all the contents thoroughly.
- Add 1ml phenolphthalein indicator.
- Titrate it against 0.02N NaOH.
- End point is the appearance of pale pink colour.



Calculation :-

$$\frac{\text{Vol of NaOH} \times \text{Normality of NaOH} \times \text{Eq.wt of lactic acid} \times 100}{\text{Weight of butter} \times 1000}$$

$$= \frac{\text{Vol of NaOH} \times 0.02N \times 90 \times 100}{\text{Weight of butter} \times 1000}$$

$$= \frac{\text{Vol of NaOH} \times 0.02 \times 9}{\text{Weight of butter}}$$

2) Determination of Free Fatty Acids (FFA)

- Weigh 10g of butter and melt it in a burner until it comes to a slight ghee stage.
- In a conical flask, add 25ml of ethanol and add few drops phenolphthalein indicator to it.
- Titrate it against 0.1N NaOH with few drops of NaOH to check whether ethanol is neutralized.
- Then add 5.6ml of melted butter to ethanol and add 2 drops of phenolphthalein and titrate against 0.1N NaOH.
- End point is the appearance of pink colour.



CHAPTER-5

ULTRA HIGH TEMPERATURE (UHT) PLANT

5.1 UHT IN BRIEF

UHT stands for “Ultra High Temperature processing,” which is just another way of heating milk to kill bacterial spores. In the pasteurization process, the milk is heated to 72°C (161.6°F) for at least 15 minutes, whereas the UHT process heats the milk at 140°C for one to two seconds. This flash of extreme heat is said to kill off any spores in the milk, and is currently a process that is being used for other products such as fruit juices, cream, yogurt, wine, and soups. In the UHT milk processing plant, the milk procured from the farmers would be boiled at 140 degrees Celsius to ensure it is zero bacteria milk. The processed milk would be packed in tetra packs of 200 ml, 500 ml and one litre. It consists of 16 types of information at the back of the packet. The processed milk has a shelf life of 90 days and the packets need not be preserved in refrigerators. The UHT plant has the capacity to process one lakh litres per day initially and would be expanded in the future to cater the growing needs, said the officials of dairy department.



5.2 STERILIZATION OF MILK

Milk is allowed to flow to silo capacity of 10,000 litres. This milk is pumped to Sterilizer. Here the milk is heated to 140°C and cooled to 30°C. This sterilizer consists of a Balance Tank capacity of 500litre. It is always maintained to 60% when the level is above 250litre. Procedure is as follows :-

1. Milk is pumped to REGENERATION 1 where the temperature is set to be 140°C.
2. This milk undergoes a process called as HOMOGENATION.
3. Then this milk flows to REGENERATION 2.
4. Then it goes to MAIN HEATER where the milk is being hold for 2 seconds.
5. Then the temperature of the milk is reduced from 140°C to 138°C in MINI COOLER.
6. As a reverse the milk flows to REGENERATION 2 where the temperature of the milk is still reduced.
7. And finally it arrives at REGENERATION 1 where it is at 30°C.
8. For cleaning purpose Nitric acid is used and Caustic soda is used for acid dosage.



5.3 ALCOHOL TEST

A. FOR 75% ALCOHOL TEST

- Add 7ml ethanol and 3ml distilled water in a beaker.
- Add 5ml of milk in a petridish.
- To the same petridish add 5ml of the dissolved ethanol solution to it and mix well.
- Observe for first few seconds if clumps are formed.
- Here no clumps are formed so this can be used for the production.



B. FOR 99.9% ALCOHOL TEST

- Add 5ml of milk in a petridish.
- To the same petridish add 5ml of ethanol solution to it and mix well.
- Observe for first few seconds if clumps are formed.
- Here clumps are formed so this cannot be used for the production.



5.4 TITRINO PLUS

The 848 Titrino plus range is Metrohm's entry class in potentiometric titration. Its price-performance ratio borders on the incredible. The Titrino plus range of instruments offers significantly more than what we would expect from this price segment: large live display with titration curve, Plug & Play functionality of Exchange Unit, stirrer and USB printer, high-resolution measuring interface, operation via mouse-click. The instrument dialog is tailored for routine users and makes operation of the Titrino plus instruments so easy that the familiarization period is very short. Add to this their robustness, which makes them the ideal titrators for daily routine determinations. It is an advanced technique used for determining acidity and pH in UHT milk and also used for the standardization of NaOH. On the day of production, milk packets from every 15 minutes are kept in two incubation units at 37°C and 55°C for 7 days. On the 7th day acidity and pH of these milks are determined using Titrino Plus. After the results of these tests only it will be decided whether to dispatch these milk packets or not.



CHAPTER-6

EFFLUENT TREATMENT PLANT (ETP)

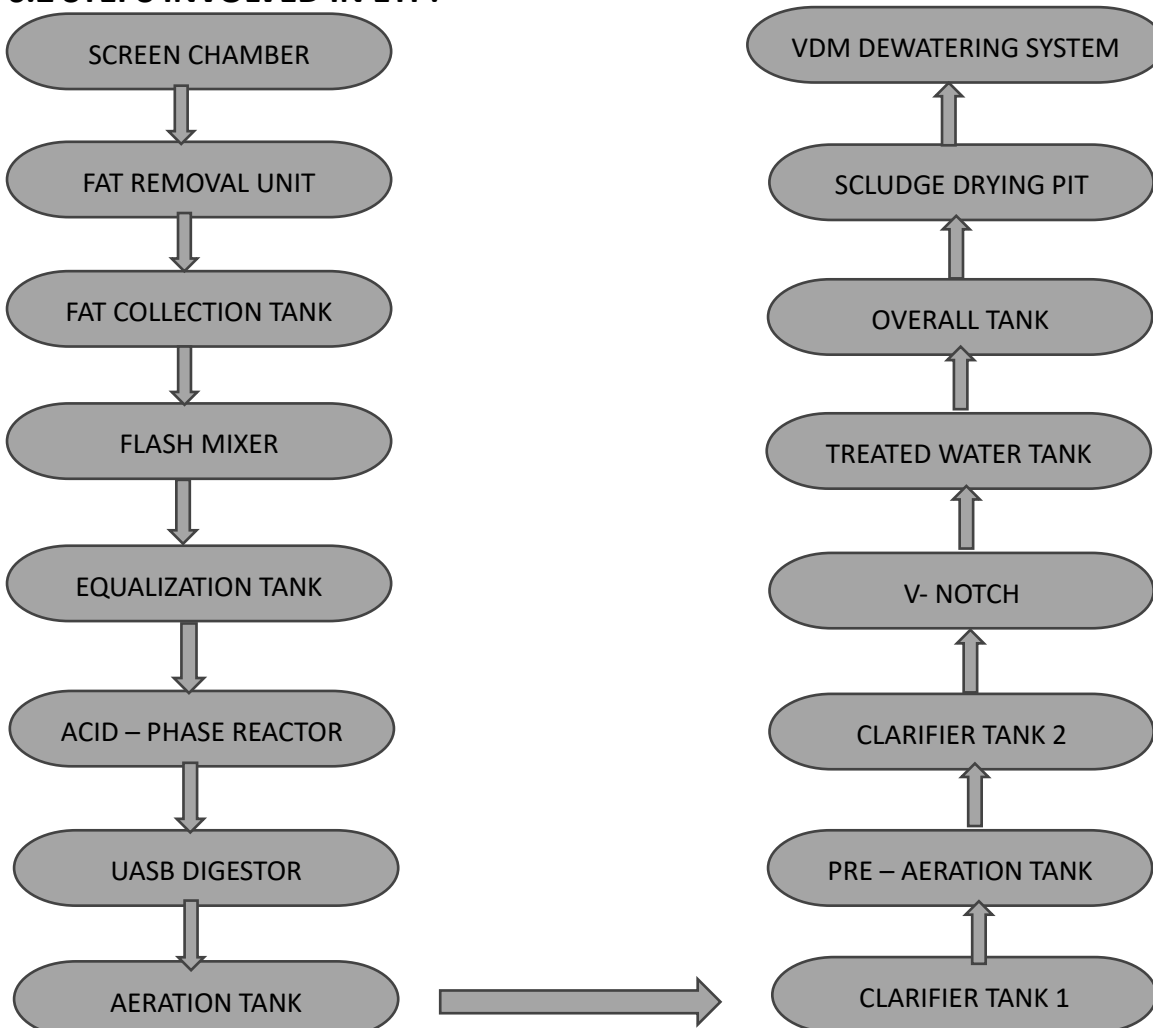
6.1 ETP IN BRIEF

ETP is the process that is used to treat waste water or recycle the waste water obtained from the plant. The treated water can be reused for gardening purposes and tray washing. The waste water comes from UHT, Refrigeration, Pre-pack section, Tub washing, Butter room, Powder room, PLC, Silo – 8, Lye room. The effluent treatment plant studies shows that how the Aavin industry is recycling the waste water for further use. Effluent from the collection tank comes to the equalization tank in waste water treatment. The main function is to act as a buffer. To collect the incoming raw effluent that comes at widely fluctuating rates and position to the rest of the ETP at a steady flow rate. During the peak hours, ETP comes at a high flow rate. The equalization tank stores this effluent and lets it out during the peak time when there is no incoming effluent. The inlet pipe of equalization tank carries filtered effluent from cooling tower. The raw effluent in the industry includes the washing of some instruments, milk tubs, gardening etc.

Page |
22



6.2 STEPS INVOLVED IN ETP:-



6.3 PROCEDURE:-

- Waste water comes through gravity force through three chamber into **SCREEN CHAMBER**. Manual cleaning takes place to remove unwanted waste. In **FAT REMOVAL UNIT** it removes fat from the water coming from screen chamber with the help of a machine which consists of a skimmer. The removal fat is collected in **FAT COLLECTION TANK**. Remaining water is collected in **FLASH MIXER**. Here lye acid is dosed for neutralization.
- Then everything arrives at **EQUALIZATION TANK** which consists of two tanks which can be used alternatively. This uses air blower to even pH & etc (temperature). Now everything is collected in **ACID – PHASE REACTOR** where pH is permanently maintained between 6.8 – 7.2/3. Now comes **UASB DIGESTOR** (upflow anaerobic sludge blanket) where outlet is towards up and inlet is towards down. Flow is maintained at 30m³/min. It does anaerobic process as acetogenics, acetonegenics, hydrolysis and methanogenics(gas and CO₂ is formed). Here digestion also happens where 80% is dissolved.
- Now everything is collected in **AERATION TANK** is of two types. Type 1 happens at 20m³/min. Type 2 proceeds with recirculation and goes to acid – phase reactor which happens at 10m³/min. This is aerobic process where air blower works at 40Hp which is continuously running. Aeration colour is brown as the oxygen is continuously pumping. It is attached with several **DIFFUSION LINE** which is T-shaped from bottom and to give air from air blower.
- CLARIFIERS** are settling tanks built with a mechanical approach for non-stop removal of solids being deposited with the aid of sedimentation. A clarifier is commonly used to cast off strong particulates or suspended solids from the liquid for explanation or thickening. Concentrated impurities, discharged from the lowest the tank are referred to as sludge, whilst the particles that waft to the surface of the liquid are referred to as scum.
- CLARIFIER TANK 1** - Primary waste water treatment systems may include both clarification and physical-chemical treatment equipment, depending on the components in the wastewater. Clarification, through the process of sedimentation, is the separation of suspended particles by gravitational setting. This operation can be used for grit and solids removal of chemically treated solids when the chemical coagulation process is used or solid concentrations in the sludge thickeners. Primary clarifiers reduce the content of suspended solids. Because of the huge quantity of reagent necessary to treat home wastewater, preliminary chemical coagulation and flocculation are generally no longer used, last suspended solids being reduced through following ranges of the machine. However, coagulation and flocculation can be used for constructing a compact treatment plant (also called as “package deal treatment plant”), or for further polishing of the handled water.
- CLARIFIER TANK 2** - Secondary treatment is a treatment process for wastewater (or sewage) to achieve a certain degree of effluent quality by using a sewage treatment plant with physical phase separation to remove settleable solids and a biological process to remove dissolved and suspended organic compounds. After this kind of treatment, the wastewater may be called as secondary-treated wastewater. Secondary treatment is the part of a sewage treatment series disposing of dissolved and colloidal compounds measured as biochemical oxygen demand (BOD). The secondary remedy is traditionally implemented to the liquid portion of sewage after number one treatment has removed settleable solids and floating solids. Overflow water arrives at **PRE-AERATION TANK** which is attached with an Agitator Fan.
- Overall water from clarifier tank 2 arrives at **V-NOTCH** and the treated water from here arrives at **TREATED WATER TANK**. In **OVERALL TANK**, filtration occurs in two types with sand filter and carbon filter. Pure water is collected here. These water are used for tub wash, garden purpose and cloth wash. But we cannot drink this water. Sludge from aeration tank comes here. If the sludge from clarifier is in right amount then it goes to aeration tank but if its in more amount it goes to **SLUDGE DRYING PIT**. In **VDM – DEWATERING SYSTEM**, it separates sludge and water in one hour which is recirculated and goes to Equalization Tank. When the sludge dries in 2 hours it is used in garden and in burner.
- OUTLET WASTE WATER** :- The water which is expelled from the industry is considered as non-toxic and purified from harmful bacteria. The water from the outlet is used up for the various purposes like washing or even as helpful for studying the basic parameter. The pollution control board officers will come there for the analysis of the inlet and outlet water sample. This is how wastewater is recycled and managed.



6.4 THE SPACE REQUIREMENT FOR ETP :- This space requirement to treat the wastewater from milk processing upto 65000 litres per day in a dairy plant.

- Equalization tank- 4m x 3m x 1.3m
- Primary setting tank- 4m x 4m x 2.7m
- Secondary setting tank- 1.6m x 1.6m x 2.5m
- Aeration tank- 5.7m x 5.7m x 4m
- Anaerobic tank- 4m x 4m x 4.4m
- Sludge drying beds(4)- 3m x 2m x 2m

6.5 TESTS DONE IN ETP

Samples are pH, Raw, Fat removal, Digesting in out, Aeration 1 & 2, Clarifier 1, Final outlet.

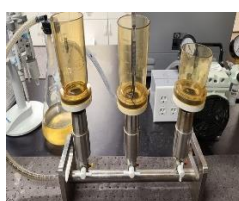
1. Aeration Sludge Settlement
2. Dissolved Oxygen
3. VFA - Bio Alkanity Volatile Fatty Acid
4. COD – Chemical Oxygen Demand
5. BOD – Bio-chemical Oxygen Demand
6. Oil Increase – Oil content in water.
7. TSS – Total Suspended Solid
8. TDS – Total Dissolved Solid
9. MLSS – Mixed Liquid Suspended Solid
10. SVI – Sludge Volume Index



COD



BOD



MLSS



TSS



SVI

CHAPTER-7

CALCULATIONS, RESULTS AND PREPARATIONS

7.1 Determination of FAT and SNF

FORMULA :- $SNF = CLR/4 + (FAT \times 0.2) + 0.36$

Page |
25

- Standard Milk (SM):

Fat- 4.5%

Correct Lactometer Reading(CLR)- 28.5°C

$$SNF = 7.125 + 4.5 \times 0.2 + 0.36$$

SNF = 8.385%

- Toned Milk (TM):

Fat- 3%

Correct Lactometer Reading(CLR)- 30°C

$$SNF = 7.5 + 3 \times 0.2 + 0.36$$

SNF = 8.46%

- Full Cream Milk (FCM):

Fat- 6%

Correct Lactometer Reading(CLR)- 29.8°C

$$SNF = 7.45 + 6 \times 0.2 + 0.36$$

SNF = 9.03%

7.2 Determination of Acidity in Milk

FORMULA :- $\frac{\text{Molecular weight of NaOH} \times \text{Normality of NaOH} \times \text{Volume of Titrant}}{\text{Weight of the sample}}$

$$ACIDITY = (9 \times 0.1 \times 1.4) / 10$$

Acidity of Milk = 0.126%

7.3 Determination of Acidity in Curd

FORMULA :- $\frac{\text{Volume of NaOH} \times 0.1 \times 9}{\text{Weight of Curd}}$

Weight of Curd

$$ACIDITY = (9 \times 0.1 \times 8.0) / 10.1342 \longrightarrow \text{Acidity of Curd} = 0.71\%$$

7.4 Determination of Acidity in Butter

FORMULA :- $\text{Volume of NaOH} \times 0.02 \times 9$

Weight of Butter

$$\text{ACIDITY} = (9 \times 0.02 \times 1.7) / 5.034$$

Acidity of Butter = 0.0607%

7.5 Determination of Acidity in Milk Powder

FORMULA :- $\text{Volume of NaOH} \times 2$

$$\text{ACIDITY} = 8.3 \times 2 = 16.6$$

7.6 Determination of Hardness, TDS and pH of Water

S. NO:	TYPE OF WATER	TOTAL HARDNESS	TDS	pH
1	Raw Water	84ppm	660	7.62
2	Sump-1 Water	76ppm	630	7.60
3	Sump-2 Water	76ppm	620	7.58
4	RO Water	40ppm	400	6.45
5	Blow Down	-	1500	9.51

7.7 Determination of Moisture in Milk Powder and Butter

Moisture content in butter – 14.65%

Moisture content in milk powder – 5.04%

7.8 Determination of Fat in Butter

The butter which is taken for the fat estimation contains 80% of fat.

7.9 Determination of FFA

FORMULA :- $\text{Titant value} \times 0.6$

Titant value=0.1ml

$$\text{FFA\%} = 0.6 \times 0.1 \longrightarrow \text{FFA\%} = 0.06\%$$

7.10 PREPARATION OF SOLUTIONS

1. Methylene blue solution – 1 methylene blue tablet in 800ml water.
2. 1N NaOH Mother Solution – 40g of NaOH in 1000 ml distilled water.
3. 0.1N NaOH solution – 100 ml of mother solution in 900ml of distilled water.
4. 2% phenolphthalein indicator – 2g of phenolphthalein powder in 100ml of ethanol.
5. 0.5% oxalic acid – 0.2g in 100ml distilled water

8. GLIMPSE OF MY INVOLVEMENT



CONCLUSION

On the whole, this internship was a useful experience. I have gained new knowledge, skills and met many new people. Page |
I achieved several of my learning goals and got insight into professional practices currently advocated in the industry. 28
Related to our study I learned more about the manufacturing of milk.

Furthermore, I have experienced that it is of importance that education is objective and we have to be aware of the industrial aspect of the topics I study. This internship program was not one sided, but it was a way of sharing knowledge, ideas and opinions. The internship was also good to find out what our strengths and weakness are. This helped us to define what skills and knowledge we have to improve in the coming time. I can confidently assert that the knowledge gained through this internship is sufficient to contribute towards our future endeavours. At last, this internship has given us new insights and motivation to pursue a career in core Dairy technology.



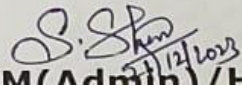
TAMILNADU CO-OPERATIVE MILK PRODUCERS' FEDERATION LIMITED,
Joint Managing Directors' Office
29 & 30 Industrial Estate, Ambattur, Chennai - 600 098.

Ref.No.1277/HRD/2021

Date:21.12.2023

CERTIFICATE

This is to certify that Ms.J.BENISHA, II year M.Sc (Chemistry) Student of Sathyabama Institute of Science and Technology, Jeppiaar Nagar, Rajivgandhi Salai, Ch-119 has done Internship Training in Tamil Nadu Cooperative Milk Producer's Federation Limited at Sholinganalur Dairy, Chennai-600119 from 15.09.2023 to 29.09.2023 (15days) and completed the same satisfactorily.


AGM(Admin)/HRD