

TRAINING MANUAL

FOOD SAFETY SUPERVISOR COURSE

Special(Level 3)

MANUFACTURING

MILK AND MILK PRODUCT



FOOD SAFETY AND STANDARDS
AUTHORITY OF INDIA

Inspiring Trust, Assuring Safe & Nutritious Food

Ministry of Health and Family Welfare, Government of India



PREFACE

Training of food handlers is a pre-requisite for ensuring food safety and the same is also mandated in the FSS Act, 2006. Food Safety and Standards Authority of India (FSSAI) has set up Food Safety Training & Certification (FoSTaC) ecosystem to ensure widespread and effective delivery of training to food businesses across the value chain. This ecosystem will train and certify the Food Safety Supervisor from each Food Establishment as it is envisaged to make this a regulatory requirement.

The manual is designed to train the personnel that can be designated as Food Safety Supervisors in the manufacturing sector. This manual details the requirements on food safety & hygienic practices to be followed by Food Business Operators engaged in the manufacturing sector. It is based on the Schedule 4 requirements of FSS (Licensing & Regulation of Food Businesses) Regulation, 2011 along with the industry best practices. It has been designed according to the flow of operation in the manufacturing industry for ease of understanding of the Food Safety Supervisors. This one-in-all manual is supplemented by a Tutor Guide along with the visuals, specific to the food industry for facilitating the trainers.

It is hoped that this manual will serve a wider purpose of training to the Food Safety Supervisors and will also be useful to the food handlers in implementing the hygiene requirements in the food production premises.

Pawan Agarwal

Chief Executive Officer

Food Safety & Standards Authority of India



ACKNOWLEDGEMENT

Technical Expert & Writer

Mr. H B Raval
Deputy Manager, MIT, NDDB

Jayamala Kumari
Technical Officer, FSSAI

Technical Contributors & Reviewers

Mr. Sunil Bakshi
Advisor, FSSAI

Dr. G S Rajorhia
Ex Principal Scientist, NDRI

Mr. Kuldeep Sharma
Consultant, Suruchi Consultancy

Mr. Sunil Sinha
Principal, MIT, NDDB

Mrs. Suneeti Tooteja
Director, FSSAI

Mrs. Suneeti Tooteja
Director, FSSAI

CONTENTS

WELCOME TO THE MANUAL LEARNING OUTCOME WHAT THE LAW SAYS

SCHEDULE 4

PART I – INTRODUCTION TO FOOD SAFETY

Milk Safety Hazard
Allergen
Food Quality

PART II – LOCATION, LAYOUT & FACILITIES

Location & surroundings
Layout & design of food establishment premises
Equipment & containers
Facilities

PART III – MILK PROCESSING & PACKAGING

Clean Milk Production at Farm and DCS level
Raw milk Reception at Dairy Plant
Processing
Packaging (Sachet)
Different types of Milk & Milk Products
Packaging requirements for Milk and Milk Products

PART IV – CLEANING & SANITATION AND EQUIPMENT MAINTENANCE

Cleaning & Sanitation
Cleaning-In-Place (CIP)
Sanitation/Disinfection
Hygiene station
Equipment Maintenance
Instrumentation in Dairy Sector

PART V – PERSONAL HYGIENE

Health status,
Behavioural & Personal cleanliness
Safety Systems for Dairy industry

PART VI – TRANSPORTATION, STORAGE & DISTRIBUTION

Storage and Transportation
Global Positioning System
Distribution



CONTENTS

PART VII – MANAGEMENT & SUPERVISION

Standard Operating Procedure (SOP)
Cold Chain Management
Supply chain of Indian Dairy Industry

PART VIII – MILK & MILK PRODUCTS TESTING

Sampling
Quality Testing Parameters
Microbiological standards for Milk & Milk Products
Safety Testing Parameters

PART IX – TRAINING

PART X – AUDIT, DOCUMENTATION & RECORDS

PART XI – PRODUCT INFORMATION & CONSUMER AWARENESS

Labelling
Manner of Declaration
Specific Requirements/ Restrictions on manner of labelling
Exemptions from labelling requirements
Notice of addition, admixture or deficiency in food

PART XII – FOOD SAFETY MANAGEMENT SYSTEM PLAN

Structure of the FSMS Program
Flow chart
FSMS Plan

PART XIII – HACCP (Hazard Analysis and Critical Control Point)

HACCP Principles
Purpose & Importance of Hazard Analysis
Hazard Analysis Process, Hazard Identification & Evaluation, Control Measures
Flow Diagram of Liquid Milk & UHT Milk processing

PART XIV – PEST CONTROL

Disclaimer: The content of this handbook/ manual is only for training and capacity building purpose, and is not intended to substitute applicable law, which may be referred separately.

Welcome to the manual –

The manual is designed for small, medium and large scale milk & milk products processors, manufacturers and packers. This manual explains General Requirements on Hygienic and Sanitary Practices to be followed by all Food Business Operators engaged in Dairy establishments, as per Food Safety & Standard Act, 2006. This manual presents bare minimum requirements of Food Safety and Hygiene to be followed by Food Business Operators along with Industry best practices.

Learning Outcome –

The objective of this manual is to train the personnel who can be designated as Food Safety Supervisors in the Milk Processing & Milk Products manufacturing units, about food safety and hygiene requirements which are to be followed in their businesses. The Food Safety Supervisors (FSS) may interpret these requirements according to the size and type of their establishment. The desired outcome of this manual is better understanding of food safety and hygiene requirements and high standards of food safety in the Dairy industry.

What the law says –

The establishment in which food is handled, processed & packed, by the food business operator and the persons handling them should conform to the sanitary and hygienic requirement, food safety measures and other standards as specified below. It shall also be deemed to be the responsibility of the food business operator to ensure adherence to necessary requirements.

In addition to standards requirements by FSSAI, the food business operator shall identify steps in the activities of Food businesses, which are critical to ensure food safety, and ensure that safety procedures are identified, implemented, maintained and reviewed periodically.

In India, the mandatory sanitary & hygiene requirements for food business operators are –

“Part II of Schedule 4” of Food Safety and Standards (Licensing & Registration of Food Businesses) Regulations, 2011 (<http://www.fssai.gov.in/home/fss-legislation/fss-regulations.html>) under Food Safety & Standard Act, 2006 (<http://www.fssai.gov.in/home/fss-legislation/food-safety-and-standards-act.html>)

For the ease of understanding, the relevant sections from Part II & Part V of Schedule 4 of Food Safety & Standards (Licensing & Registration of Food Businesses) Regulation, 2011 has been segregated as per flow of operations in Dairy Sector –

1. LOCATION, LAYOUT & FACILITIES

S. No.	Part of Schedule 4	Relevant Section	Heading
1.1	Part 2	Section 1	Location and Surroundings
	Part 2	Section 2	Layout and design of Food Establishment Premises
	Part 2	Section 3	Equipment & Containers
	Part 2	Section 4	Facilities

2. MATERIAL HANDLING

S. No.	Sub Sections	Part of Schedule 4	Relevant Section	Heading
2.1	Reception of Milk & Raw Material	Part 2	Section 5.1	Food Operations & Control - Procurement of Raw Material
		Part 3	Section 1	Sanitary Requirements
		Part 3	Section 3	Sanitary Requirements for Storage
2.2	Storage	Part 2	Section 5.2	Food Operations & Control - Storage of Raw Material & Food
		Part 3	Section 3	Sanitary Requirements for Storage

3. PROCESSING & PRODUCTION

S. No.	Part of Schedule 4	Relevant Section	Heading
3.1	Part 2	Section 5.3	Food Operations & Control - Food Processing/Preparation, Packaging & Distribution Service
	Part 3	Section 1	Sanitary Requirements
	Part 3	Section 3	Sanitary Requirements for Storage

4. Packaging & Distribution

S. No.	Part of Schedule 4	Relevant Section	Heading
4.1	Part 2	Section 5.4	Food Operations & Control – Food Packaging
	Part 2	Section 5.5	Food Operations & Control – Food Distribution/Service
	Part 3	Section 4	Wrapping and Packaging

5. TRANSPORTATION

S. No.	Part of Schedule 4	Relevant Section	Heading
5.1	Part 2	Section 5.3	Food Operations & Control - Food Processing/Preparation, Packaging & Distribution Service
	Part 2	Section 5.4	Food Operations & Control - Food Packaging
	Part 2	Section 5.5	Food Operations & Control - Food Distribution/Service

6. PERSONAL HYGIENE

S. No.	Part of Schedule 4	Relevant Section	Heading
6.1	Part 2	Section 10	Personal Hygiene
	Part 3	Section 2	Personal Hygiene Requirements

7. SUPPORT SERVICES

S. No.	Sub Sections	Part of Schedule 4	Relevant Section	Heading
7.1	Management & Supervision	Part 2	Section 6	Food Operations & Control – Food Packaging
7.2	Food Testing Facilities	Part 2	Section 7	Food Testing Facilities
7.3	Pest Control	Part 2	Section 9.2	Sanitation and Maintenance of Establishment Premises - Pest Control System
7.4	Cleaning & Maintenance	Part 2	Section 9.1	Sanitation and Maintenance of Establishment Premises - Cleaning and Maintenance
		Part 3	Section 1	Sanitary Requirements
7.5	Waste Handling	Part 2	Section 4.5	Facilities - Drainage and waste disposal
7.7	Training	Part 2	Section 12	Training
7.8	Record Keeping	Part 2	Section 8	Audit, Documentation and Records



PART-1

INTRODUCTION TO FOOD SAFETY

Food Safety and Food Safety Hazards

Dairy industry has the largest share in Food based industry. For young mammals, including human infants, milk is the first food ingested and in most cases, it continues to be the sole constituent of the diet for considerable period of time. Milk is a complex biological fluid and highly perishable commodity.

Milk is highly perishable food product as it is an excellent growth medium for many microorganisms, which have multiple growth range based on surrounding temperature. Many types of bacteria survive and thrive in milk because of its good nutritional quality and it may result in higher bacterial counts and amount of toxins produced by pathogenic organisms, making it unsafe for human consumption.

1.1 Factors influencing milk hazards

Production of safe and quality milk is a primary requirement for consumers. Milk safety must be controlled at each step from beginning of production to final consumption. Once it is found that any milk is unfit or unsafe for consumption, whether from chemical or physical contamination or microbiological testing, it should be rejected before despatch to market. Removal of chemical hazards and impurity is very difficult through processing and storage of milk at ambient temperature leads to growth of pathogens and spoilage organism and adversely affect the consumers on consumption.

1.2 Milk Safety Hazard:

There are mainly three types of Hazards in Food, Physical, Chemical and Microbiological Hazard and in similar way Milk hazards are also divided in the same categories and these maybe introduced in to milk from various stages. Sources of initial milk hazards may come at primary stage of milk secretion/ milking process from milch animal, through interior of udder, udder and teat surfaces. Second source of hazard could be from process of milking, through milking equipment, reception, storage and transport. Other source of hazard could be milking environment, air, water and personal hygiene. In addition to these, chemical hazards might be come through cleaning and sanitising stages. Presence of any of these food hazards shows poor results of milk processing and hygienic practices.

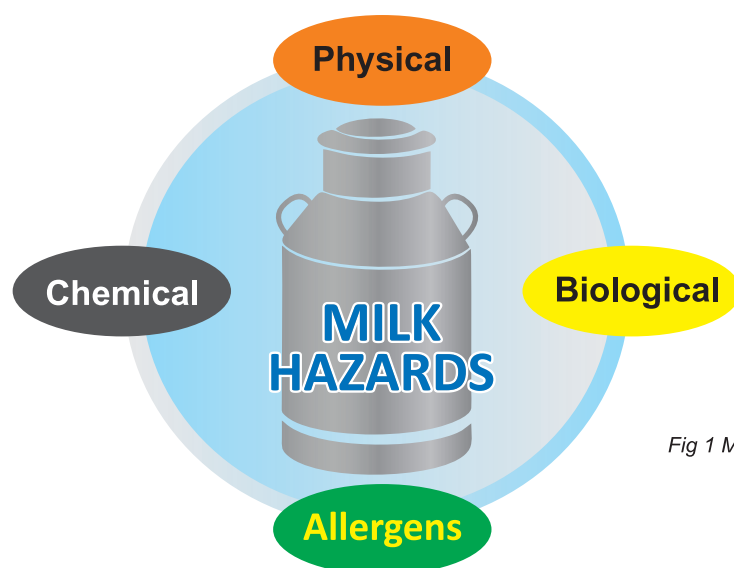


Fig 1 Milk Safety Hazards

1.2.1 Physical Hazard:

In milk production system, chances of contamination of milk with various types of foreign material or other particle could be hazardous and result as physical hazard to milk consumers.

Common physical hazard includes:

- Broken pieces of glass or tiny metals
- Chipped pieces from equipment
- Metal shavings from cans and foils
- Plastic or chipped pieces of disposables
- Lint and threads
- Hair
- Finger nails

These types of impurities have greater chance to come in to milk, which is neither processed nor passed through screening and filtration process. Severity of these particles noted greater in raw and unprocessed milk.

1.2.2 Chemical Hazard:

Usage of chemicals in milk farms and Dairy plants leads to chemical hazards. Chemical were found in milk samples because of poor milk handling practices and fraudulent practices done at the farm/handling during transport.

1.2.2.1 Wilful additives

Common Chemical/Adulterants are:

- Detergents
- Urea
- Starch
- Sugars
- Vegetable fats
- Neutralizer

1.2.2.2 Naturally occurring contaminants

Chemical hazards are not limited to added substances but also include certain process-induced contamination, which includes

- Pesticides, Colourants
- Antimicrobial Drugs
- Antibiotic Residue

- Hormones
- Sanitizers and Disinfectants
- Heavy Metals
- Mycotoxins

1.2.2.3 Possible contaminants from Process

Usage of chemicals in milk farms and Dairy plants leads to chemical hazards. Chemicals were found in milk samples because of poor milk handling practices and fraudulent practices done at the farm/handling during transport.

- Sanitizers and Disinfectants
- Colourants
- Equipment Lubricants
- Food Additives and Preservatives
- Packaging materials-migration of residues from packaging material to milk

1.2.3 Biological Hazards

Microbiological hazards are a major food safety concern in the Dairy sector because milk is an ideal medium for the growth of bacteria. These can be introduced into the milk from the environment or from the Milchanimals themselves. Milk can contain harmful microorganisms such as Salmonella, Escherichia coli, Listeria monocytogenes, Staphylococcus aureus, Yersinia enterocolitica, Bacillus cereus, Clostridium botulinum, Mycobacterium bovis, Brucella abortus and Brucella melitensis.

Chances of growth and survival of these pathogens are mostly temperature and time dependent, for which milk been handled as unprocessed during supply chain.

Sources of Bacteria in Raw Milk:

- Bacteria from teats
- Flora of mastitis animals
- Exterior of animal
- Dairy barn environment
- Milk contact surfaces
- Dirty equipment
- Inappropriate milk storage time/temperature

1.2.3.1 Biological Hazards causes -

a. Food Borne Infections– This result when a person consumes food containing pathogens; which grow in the human intestine and cause discomfort or disease. Typical symptoms of a 'food borne

Infections' do not appear immediately.

b. Food Borne Intoxications - This result when a person consumes food containing toxins in it; that cause discomfort or disease. Typical symptoms of a 'food borne Intoxication' appear quickly. Food Borne toxins are mediated infections, that result when a person consumes food containing toxins produced by the pathogens in it; which grow in the human intestine and produce toxins that cause discomfort or disease.

c. Food Borne Toxi-infection - These are the organisms which can infect the intestine when ingested along with the food and produce toxins in situ to bring about symptoms of poisoning.

1.2.3.2 Conditions favouring growth of Microorganisms - Milk is the most suitable medium that favours the growth of microorganisms.

FAT TOM

Conditions	Embellishment
Food	Food borne Microorganisms draw nutrients from foods
Acidity	Food borne Microorganisms grow well between the pH range of most foods
Temperature	Microorganisms grow well between the temperature range of 5°C – 60°C, most commonly known as the 'Danger Zone'
Time	Microorganisms need sufficient time to grow; when exposed to the 'Danger Zone'
Oxygen	Microorganisms require oxygen in free or combined state; to favor their growth
Moisture	Microorganisms require moisture to grow and is measured in the form of 'Water Activity (Aw)'

1.4 Allergens

An **allergen** is normally, any harmless substance that causes an immediate allergic reaction in a susceptible person. Food allergens are usually proteins although other food constituents, such as certain additives, are known to have allergenic (allergy-causing) properties.

1.4.1 The following foods and ingredients are known to cause hypersensitivity and shall always be declared:

- Cereals containing gluten; i.e., wheat, rye, barley, oats, spelt or their hybridized strains and products of these;
- Crustacea and products of these;
- Eggs and egg products;
- Fish and fish products;
- Peanuts, soybeans and products of these;

- Milk and milk products (lactose included)
- Tree nuts and nut products; and
- Sulphite in concentrations of 10 mg/kg or more



1.4.2 A milk allergy is an immune reaction to one of the milk Constituent.

Most common milk allergenis: Lactose

1.5 Food Quality

Food quality is a complex concept that can be assessed only in relation to food safety. The relation between quality and safety is intricate and although safety cannot be viewed as a very independent aspect from quality, recognising the complexity of both concepts brought the need of managing them separately. In fact the reason behind separating food safety from quality was the need to place the concept of safety first and above all the other quality aspects.

Quality is a measure of the degree of excellence by degree of acceptability of the consumer. Further, Quality may be achieved through:

- Quality Control
- Quality Assurance

1.5.1 Quality control is an essential component of any milk processing industry whether small, medium or large scale. It is the evaluation of final product prior to its marketing.

Milk quality control is the use of various tests to ensure that milk and milk products are safeand meet the standards for chemical and microbial requirements.

1.5.1.1 Functions of Milk quality control programme are

- Physical, chemical and sensory evaluation of raw materials and processed products.
- Control of
 - Raw material, ingredients, packaging, and supplies
 - Processing parameters
 - Finished products
- Microbiological analysis
- Control of handling and storage condition
- Hygiene and Sanitation
- Waste products handling and disposal

Assurance that the products is within the legal established standards.

1.5.2 Quality Assurance is implementation of quality checks and procedures to immediately correct any failure and mistake, which may reduce the quality of the interim products at any production step.

It seeks to generate confidence both within the organization and externally, among its customer, that their requirements will be fulfilled.

1.5.2.1 Functions of quality assurance are

- To define quality policy and its objective
- Development of quality manual
- Ensuring competency of personnel
- Conducting periodic internal audits
- Elimination of the root cause of the problems found
- Periodic review of the system by top management

Thus, desired high quality of the final product is planned & obtained by adopting

- Standard Operating Procedures (SOP's)
- Good Manufacturing Practices
- Good Hygienic Practices
- Good Laboratory Practices
- Total Quality Management
- In process Quality checks

NOTES



PART-2

LOCATION AND LAYOUT

Location, Layout and Facilities

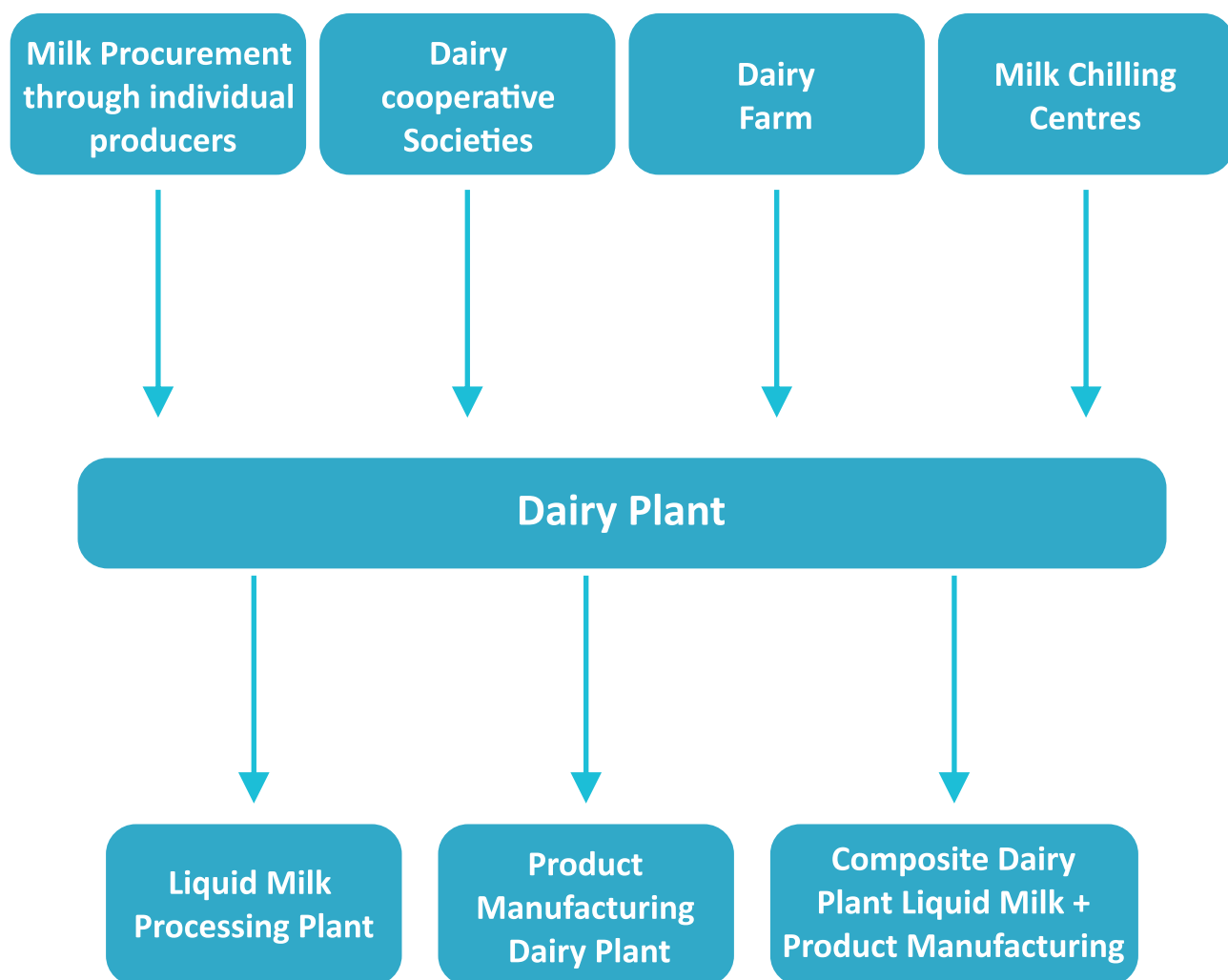
Dairy industry in India is growing at a fast pace and as such, there is need for scientific Layout and Planning to have seamless operation and smooth flow of production by Dairy designers and engineers.

Milk and Milk Products, however, impose certain hygienic requirements, which do not occur in other food industries. These special requirements affect the internal finishing and the layout of the building, the provision and distribution of services and the choice of site.

There is need for highest standard of hygiene. Therefore, every possible measure should be taken to reduce the possibility of contamination, especially after processing. A good layout design and use of proper materials and technique contribute greatly towards hygiene.

To sum up, Dairy plant layout needs careful thought and planning keeping in view manufacture of the products and their Quality & Safety aspects.

2.1 Classification of Dairy Plants



2.2 Location of Dairy Plant

A few points mentioned below will help in determining the location of Dairy Plant:

- Availability of Transport Facility (Road & Rail Connectivity)
 - Provide easy transport of Raw material to the plant and dispatch of finished products
- Dairy should be situated close to consumption area
- Availability of necessary facilities such as electricity, water, waste disposal at reasonable cost
- Free from atmospheric pollution/Hazard prone site
- Availability of adequate labour

2.2.1 Planning consideration of location of Dairy Plant

2.2.1.1 Site Location

The criterion, which has foremost operational important is minimum cost for procurement, production and distribution.

Essential factors for location includes

- Topography
- Shape and size of site
- Availability of water, power and fuel
- Climatic conditions

However, due to increased pollution and industrialization, all sites are not permitted for industrial work. Some states or central government gives incentive for development of certain industry on specified locations. Therefore, all such points to be analysed judiciously for finding out the best location.

2.3 Planning consideration of layout of Dairy Plant

The Dairy Plant Layout and design means designing a layout plan for Dairy factory, i.e.

- layout of various sections in Dairy building
- equipment layout
- laying of Dairy Machines in each section for economical and efficient movement of men and material in the plant

Successful design of Dairy plant largely depends on selection of facilities and equipment for appropriate handling of the various resources involved in the product manufacturing. Therefore, one of the foremost steps would be to estimate the capacity of a Dairy and earmark production of various products with capacity. Other requirements like equipment, utilities, structure and workforce required for proper functioning of proposed Dairy.



Fig. 2.1 – Layout of Dairy Plant

2.3.1 Checklist for planning consideration of Dairy layout

Sr. No.	Estimation of Capacity	Sr. No.	Selection of Plant Equipment
1	Milk shed area and its potentiality	1	Finalize Production technology of Milk and Milk Products
2	Future possibility of expansion	2	Number of equipment with their capacities
3	Nearby Dairy plant, its distance and expansion possibilities	3	Milk processing Production line Milk Product Production line
4	Productivity of animals and future aspects of affecting milk production	4	Cleaning and sanitary provision to low maintenance, cleaning, disinfection, monitoring and inspection
5	Connectivity of villages, possibilities for milk procurement and expected development	5	<ul style="list-style-type: none"> ➤ Plant equipment material should be non-reactive, non-toxic and food grade quality specially that coming in the direct contact of milk. ➤ Withstand heat treatment processes like heating and cooling. ➤ Materials of heat transferring equipment should be good heat conductors.
6	Social tendencies for milk business	6	Provision for controlling and monitoring of temperatures, humidity, airflow and other parameters – as these parameters are detrimental to food safety
7	Allied occupation of farmers and extent of their sustainability	7	Space requirement for equipment should be analysed
8	Government policies for augmenting milk production	8	Utility requirements associated with the product and equipment
9	Change in life style, purchasing power of consumers and nutritional awareness among people	9	Spacing between adjacent equipment and service pipelines to facilitate maintenance
		10	Develop flow diagram to identify sequence of operations and flow of materials
		11	<ul style="list-style-type: none"> ➤ Housing requirement for each product and equipment. ➤ Few product needs to be manufactured in controlled atmosphere and need proper building ➤ Few manufactured within the equipment kept in open.

Sr. No.	Estimation of Capacity	Sr. No.	Selection of Plant Equipment
			<ul style="list-style-type: none"> ➤some of the equipment requires proper housing ➤Few needs open air for their efficient operation.

2.3.2 Principles of Dairy Layout

Principle	Effect
Shortest possible Milk Route	Minimize the cost of pipe length and save the cleaning time
Method of Milk collection and optimum rate of intake	Contamination is minimized to safe level
Dispatch of Pasteurised Milk	Choice between cold storage at Dairy or immediate distribution to local depots
Method of Distribution to consumers	Prevention of Post Production Contamination
Electricity, Water Supply and Waste Water Disposal	Where appropriate, suitable facilities to be available for temperature, humidity and other controls
Choice of Fuel for steam production	To minimize production cost and air pollution
Provision for subsequent future expansion	For easy plant handling and maintenance
Approach to main road	Convenient Transportation
Single point entry/exit	Permits appropriate maintenance, cleaning and disinfections and minimize air borne contamination



Fig. 2.2 – Single point entry/exit in Dairy Plant premises including well-guarded entrance

2.4 Design Of Establishment

Attention to good hygienic design and construction, appropriate location, and the provision of adequate facilities, are necessary to enable hazards to be effectively controlled. In this context, each aspect of Dairy is discussed below:

2.4.1 Location - Suitable location for the establishment and equipment should include following considerations:

a) Establishments

- To prevent potential sources of contamination to food
- No food establishment should be located in the hazard prone site
- Location should be away from environmentally polluted area that can contaminate food, such as, flooded waste and infestations of pest prone area

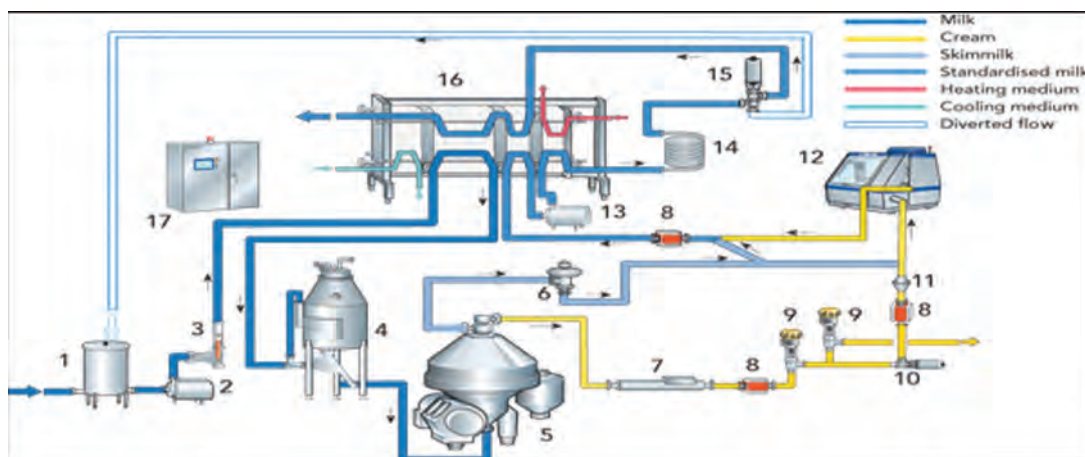
b) Equipment

- Equipment should be properly located to permit adequate maintenance and cleaning
- The location facilitates good hygienic practices and effective monitoring

2.4.2 Premises and Rooms

Suitable consideration should be given depending upon requirement and nature of equipment:

a. Design and Layout: Where appropriate/applicable, the internal design and layout of Dairy establishment should permit hygienic practices including protection against cross-contamination during manufacturing and storage.



b. Internal Structure and Fittings: Structure within Dairy establishment should be soundly built of durable materials and easy to maintain, clean and/or disinfect. To achieve this, the surfaces of wall, ceiling and floor should be impervious and of non- toxic materials. The surfaces should be smooth and allow proper removing of water, dirt and germs. The material of facilities or fittings coming in the direct contact of milk should be non-reactive type.

c. Temporary/Mobile premises and vending machines: Premises and structures like stalls, mobile

sales and street vending points as temporary housing should be sited, designed and constructed to avoid, as far as reasonably practicable, contaminating food and harbouring pests.

2.4.3 Equipment and Containers

- The contact surfaces should be made of food grade materials (preferably SS 304/316) and gaskets shall be of also food grade material like Neoprene.
- Design of equipment should facilitate easy movement and capability of disassembling to allow maintenance, cleaning, disinfecting, monitoring and inspecting pest.
- Withstand processing condition without affecting food safety aspect.
- Provision and capability for monitoring and control of process parameters.
- Specific identification, safe design and placement at appropriate location for waste, by-products and non-edible or dangerous substances containers
- Required safeguard should be made to prevent cross contamination from these containers or their contents.

2.4.3.1 Process & Storage Equipment



Fig. 2.4 Process & Storage Equipment

The equipment must not be defective, unsuitable or unsanitary.

Equipment used in the receiving, processing, manufacturing, packaging, storing, dispensing, transporting or marketing of a Dairy products shall be of an approved type or where applicable be based on Food Grade Standards.



Fig. 2.5 Process & Storage Equipment

During receiving / handling / processing / storage of milk or intermediate product or finished milk products, certain equipment e.g. tanks, silos, hoppers, pipes, heat exchangers, packaging machines, filters, etc. come into contact with food. All these food contact surfaces shall be:

- Made up of non-corrosive / rust free material
- Smooth, free from any grooves
- Easy to clean and maintain
- Non-toxic and non-reactive
- Food grade quality



Fig. 2.6 Milk Processing Section



Fig. 2.7 Liquid Milk Packing Section

- All processing equipment used during receiving, processing and packaging shall be designed, located and fabricated to facilitate easy cleaning and shall be kept away from contaminated air and dust.
- Every processing and storing equipment shall at all times be either provided with a properly fitted cover/lid or other material of texture sufficiently fine to protect the milk and milk products completely free from dust, dirt and flies and other insects.
- All equipment shall be kept clean, repaired and maintained in sound condition all the time.

2.5 Design of Facilities

Dairy plant has to be provided with required facilities for water supply, drainage/waste disposal, cleaning system, personal hygiene, toilets, humidity, air and temperature control, lighting and storage of various materials. These are discussed below:

a. Water Supply: Treatment of water occupies the predominant place in the modern Dairy industry.

- An adequate and potable water supply with appropriate storage, distribution and temperature control, should be available whenever necessary to ensure the safety and suitability of food.
- Supply and storage line for non-potable water should be separate with proper identification.
- Complete details of the water supply pertaining to the source and proposed treatment (when necessary) must be known.
- Professionally engineered water systems may be required depending on source and type of Dairy products being processed.
- An adequate supply of hot and cold water under pressure shall be provided in all plants.

- Water supply system should be bacteriologically and chemically safe.

Water Quality for Dairy processes

Treatment of water implicitly means changing its physical & mainly its chemical properties by removing undesirable suspended & dissolved impurities of organic, inorganic as well as biological in nature. The level of chemical dosing involved & method adopted for treatment are according to the end use requirement as well as the nature of composition of raw water sources; which are mainly from surface wells, lakes, rivers or from underground sources such as deep-wells & in some places from sea.

The specific method adopted for conventional treatment such as flocculation / coagulation, filtration and disinfection, lime soda softening process, electro-dialysis, demineralization and reverse osmosis depending upon product quality requirement.

Note:

Treated water used in Dairy industry should comply latest IS 4251: Quality Tolerances for water for Food industry standards.



Fig. 2.9 Hydro flow system for water supply.

Apart from process requirement, water is also required for **steam generation and cooling water for condenser in refrigeration plant**. For these requirements, Water hardness - below 5 ppm.

Many modern dairy industries where raw water hardness is in excess of 500 ppm and TDS is more than 2000 ppm, utilize RO water for steam generation and cooling water in condensers.

- Use of RO water improves efficiency by reducing blow-down in boilers and bleeding in condensers. Equipment life expectancy is also improved.
- Water used in cleaning of equipment should be potable.
- The water used for processing of Milk & Milk products should be free from contaminants and preferably pasteurized.
- Water used for steam generation to process milk and manufacture milk product shall be generated from soft/DM/RO water.
- Wherever steam is mixed with the product as in DSI (Direct Steam Injection) heater, it should be of culinary grade.



Fig. 2.8. RO Plant for water purification

If non-potable water is used anywhere in the plant for cleaning purpose then the concerned pipeline shall be identified as such or differentiated from potable/processed water.



b. Drainage and disposal system:

Adequate sanitary condition in and around plant can be maintained by proper arrangement for types of drains with cleaning and disinfection arrangement. Slope of floor and drains is of equal importance to let-out the spillage and washings.



Fig. 2.9. Hygienic designed Drainage

Properly trapped and covered floor drains with removable covers are essential in all areas of the plant. The drains must be of an adequate size and cleaned regularly.



Fig. 2.10. Floors to be sloped to ensure easy drainage

c. Cleaning:

Cleaning of plant premises and equipment should have provision in the planning stage itself. Proper clearance and facilities need to be considered. When manual cleaning is either not possible or less effective, then alternative methods like cleaning-in place (CIP) should be employed.

d. Personnel facilities & toilets:

In order to prevent cross contamination from machine and materials to man and vice versa, required arrangement should be thought for necessary equipment, space and water supply.

- Employee's facilities shall include a suitably designed dressing room and lunchroom. Conveniently, located sanitary toilets for male and female employees shall be provided exclusively for the use of Dairy plant personnel and shall not open directly into an area used for the processing or packaging of Dairy products.

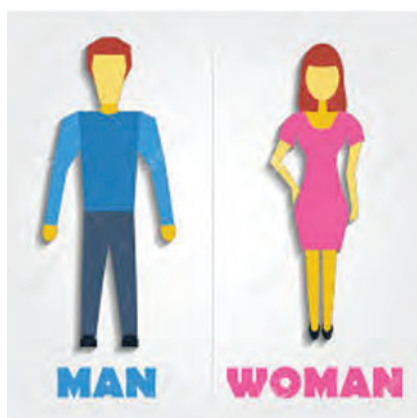


Fig. 2.11. Separate Toilet facilities for male and female



Fig. 2.12. Change room facilities for male and female

- Adequate and conveniently located facilities for hand washing and drying must be provided wherever the process demands. Where appropriate, facilities for hand disinfection should



Fig. 2.13. Hand washing facility



Fig. 2.14. Hand drying facility

f. Temperature Control:

Most of the Dairy operations are temperature dependent. Heating, cooling or holding at certain temperature are required to obtain product with good microbiological quality, flavour and texture. For this steam supply unit, refrigeration unit and temperature recording, monitoring and controlling mechanism are provided.

g. Air Supply System:

Adequate air supply system should include compressor, inter-cooler, oil separator, air filters and drier/ humidity controller. Air pipeline is provided to meet operation requirements of agitation, oxidation, control and/or conveying function. If air comes in direct contact of product, then its proper hygienic quality should be ensured.

➤ Air Quality

Usage of air in dairy industry

- Dairy industry utilizes compressed air for pneumatic valves& cylinders/machines and instruments.
- Production of powder
- Conveying of powder produced into storage silos.
- Culinary grade of Air for mixing with product like Ice-cream and powder.

Note: Care has to be taken wherever compressed air comes into contact with food because compressed air is not clean by nature. On the contrary, solids and particles in various concentrations are present almost everywhere in the form of dust.

Water, in the form of natural humidity, is released in large quantities when the compressed air cools down. Thus, compressed air quality in accordance with the requirements of the application provides the best possible safety for food consumers and food producers.

Standards-compliant Compressed air preparation

Extremely strict demands are made of the compressed air quality in food industry.

International standards are helpful in this respect. ISO 8573-1, for example, represents the key quality requirements for compressed air and specifies the maximum amount of contaminants and particle sizes that can be present in each class.

Compressed Air Quality classes to ISO 85731:2010

ISO 8573-1:2010	Solid particles				Water		oil
	Maximum number of particles per m ³			Mass concentration	Pressure dew point	Liquid	Total oil content (liquid, aerosol and vapour)
	0.1-0.5 µm	0.5-1 µm	1-5 µm	mg/m ³	°C	g/m ³	mg/m ³
0	In accordance with specification by the device user, stricter requirements than Class 1						
1	≤20,000	≤400	≤10	-	≤-70	-	0.01
2	≤400,000	≤6000	≤100	-	≤-40	-	0.1
3	-	≤90,000	≤1,000	-	≤-20	-	1
4	-	-	≤10,000	-	≤+3	-	5
5	-	-	≤100,000	-	≤+7	-	-

ISO 8573-1:2010	Solid particles				Water		oil
	Maximum number of particles per m3			Mass concen- tration	Pressure dew point	Liquid	Total oil content (liquid, aerosol and vapour)
	0.1-0.5 μm	0.5-1 μm	1-5 μm	mg/m³	°C	g/m³	mg/m³
6	-	-	-	≤5	≤+10	-	-
7	-	-	-	5-10	-	≤0.5	-
8	-	-	-	-	-	0.5-5	-
9	-	-	-	-	-	5-10	-
10	-	-	-	>10	-	>10	>10

Adherence to the above standard is important in order to ensure the best possible food safety, and thus reduce the risks for consumers as well.

h. Lighting

While designing the lighting in a Dairy plant, following factors been taken into consideration:

- Availability of natural light
- Provision of artificial light needs to be made according to the requirement of operation.
- All plants shall be provided with adequate lighting and shielded with shatterproof coverings to ensure clean and efficient plant operation.
- In humid operating conditions e.g. CIP room and processing plants, light fixtures should be moisture proof.
- The colour rendering property of lighting should be such that Milk & Milk products exhibit their true and natural colours.

A minimum illumination requirement (Lux) at different section of Dairy units is as follows:



Fig. 2.15. Adequate lighting in dairy plant

- Reception, processing and cleaning section - approximately 500 to 600 (250-300) Lux.
- Monitoring places like weighing, equipment with gauges, filling & inspection, laboratory and accounting is approximately 1000 (500-750) Lux.

- Corridor and utility section is 200 to 300 (100-120) Lux.
- Recommended illumination level for Milk premises (common areas like internal roads, corridors etc.) is 100 Lux. (As per IS 3646 Part-I 1992)



Fig. 2.16. Adequate lighting in dairy plant

I. Storage

Adequate facilities should be provided for the storage of food, ingredients and non-food chemicals (e.g. cleaning materials, lubricant fuels).

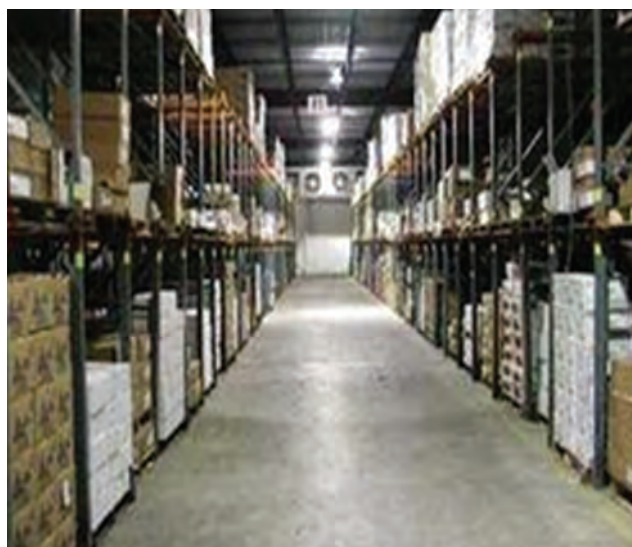


Fig. 2.17 Stacking of Milk product

- Appropriate food storage facilities should be designed and constructed to permit adequate cleaning and maintenance
- Avoid pest access and harbourage, enable food to be effectively protected from contamination. Provide proper environment that minimizes the deterioration.
- Storage of edible, non-edible and hazardous materials should be separate.
- A separate dry storage area shall be provided in Dairy plants for sugar, powder, salt, packaging materials etc.
- The storage area will depend upon the volumes of the milk and milk products handled by the Dairy.
- Now-a-days, in modern Dairy plants, ASRS (Automatic Storage & Retrieval System) is also used for automatic storage and distribution of finished goods.



Fig. 2.17 Stacking of Milk product

2.6 Design Of Dairy Establishment Premises

A building plan showing cross sections of the plant, floor plan of each level, the purpose for which each room is intended, location of walls, partitions, windows, doors, posts, conveyors and all equipment. The floor plan must indicate location of floor drains, process water and sewer lines, and plumbing fixtures including hand sinks and slope of floors to drains.



Fig. 2.18 Premises with tar road and RCC hard park to minimize entry of dirt/dust in Production area



Fig. 2.19 -Well-defined pathways



Fig. 2.20 Hygienic Plant entrance



Fig. 2.21 Unwanted Vegetarian growth surrounding Dairy plant



Fig. 2.22 Stagnant water near Dairy premises

2.7 Plant Construction Standards

Dairy processing sections require stringent hygienic construction standards with special attention paid to non-stagnation of water, clean drains, good ventilation and well-illuminated areas.

For ready reference, key requirements are listed below:



Fig. 2.23 Epoxy Flooring

a. Floors:

- Sealed concrete or other impervious material with a smooth surface and adequate slope to drains
- The floor/wall joints are to be covered for ease of cleaning and maintenance

- Floor surface in production areas should be acid and alkali proof - to resist the chemical action of the cleaning chemicals (e.g. Red Mandana, Epoxy flooring etc)



Fig. 2.24 Tiled floor to resist chemical action

B. Wall and Ceilings:



Fig. 2.25 Cracked Ceiling



Fig. 2.26 Fungus infected Ceiling

- Walls and ceiling of rooms in which Dairy products are processed, manufactured, packaged or stored shall be
 - Smooth

- light coloured
- impervious to moisture smooth
- Should be fungus free.

c. Doors and Windows



Fig. 2.27 Air Curtain at entry



Fig. 2.28 PVC Strip Curtain at entry

The doors and windows in the Dairy plant shall be made of smooth and non-absorbent surfaces and they shall be easy to clean and disinfectant. Doors can be fitted with automatic closing spring, PVC strip or air curtain to stop entry of dust, insects etc.

d. Ventilation

Adequate ventilation is required in all plants to prevent

- excessive heat,
- dust accumulation,
- odours
- condensation
- to provide proper environment for processing and conducive working conditions for employees.



Fig. 2.28 Eco Ventilator

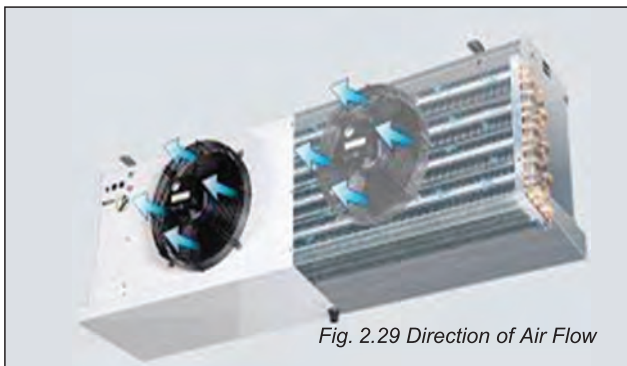


Fig. 2.29 Direction of Air Flow

The direction of airflow should be from the processing area to outside the building.

e. Overhead Utility Lines:

- All overhead utility lines should be installed in such a manner to avoid contamination of products below by condensation droplets, dust falling off during cleaning/maintenance.
- They must be easy to clean.



Fig. 2.30 Standard colour code for utility lines



Fig. 2.31 Screw Compressor Refrigeration Plant

- Chilled water and product lines should be insulated where necessary
- Designed to prevent the accumulation of dirt, minimize mould development and flaking
- Painted with specific colours as per IS 2379 for easy identification of type of Utility pipes

2.8 Effluent Treatment Plant

- An Effluent treatment plant is mandatory by Central Pollution Control Board/State Pollution Control Board for Dairy plant operations and consequent effluent and waste disposal.
- Waste water disposal facilities (either municipal or private systems) must be provided at all dairy plants and must be hygienic and approved. These systems are subject to provincial and PCB requirements and
- Effluent is generated in any Dairy industry during the processing, cleaning, spillages,

leakages and spoilage of milk & milk products.

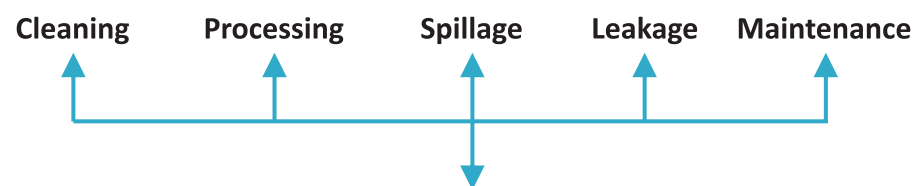
- The effluent cannot be drained into water bodies and land areas without proper treatment as it can cause environmental pollution and irreparable damage to ecology.



Fig. 2.31 Effluent Treatment Plant



Effluent generates due to



Right from Reception to Final Product Packaging

a. Usage of clarified water generated from ETP

- Gardening purpose
- Cleaning floors of Dairy dock and toilets
- Surplus treated water from ETP can be channelized into other natural water bodies.

b. ETP plant also generates solid waste in form of sludge

- Sludge can be dried and used as manure for gardening
- Bio-gases can be used as cooking gas or as a fuel for generation of electricity/steam.
- Fat separated initially is sold to soap industry.



Fig. 2.32 Effluent Treatment Plant

c. Typical wastewater effluent & treated water characteristics from ETP at 27°C are as under:

Parameters	pH	BOD	COD	TSS	TDS	Oil & Grease
Unit	-	(mg/liter)	(mg/liter)	(mg/liter)	(mg/liter)	(mg/liter)
Effluent	5.9 to 7.5	1200-1600	3500-4500	300-600	800-1200	150-400
Treated water	6.5-8.5	<30	<100	<100	<800	<10
Efficiency (%)	-	97.85	97.57	7.8	-	93.3

d. Eco-friendly Effluent Treatment Plant in Dairy



Fig. 2.33Purification through Vacuum Pressure Swing Adsorption System



Fig. 2.34 flaring Biogas into the atmosphere



Fig. 2.35 Purified gas filled into the cylinders



Fig. 2.36 Double Membrane Balloon for Purified Biogas



Fig. 2.36 Double Membrane Balloon for Purified Biogas



Fig. 2.38 Raw Biogas Purification System



Fig. 2.39 Biogas Filling Station



Fig. 2.39 Biogas Filling Station

NOTES



PART-3

MILK PROCESSING & PACKAGING

MILK PROCESSING & PACKAGING

Milk is normal mammary secretion of a healthy animal. Hence, animal health is an important aspect in the production of clean milk. Good hygiene and sanitation practices would keep it free from bacterial contamination. Thus, both these aspects discussed mainly from the point of Clean Milk Production. If raw milk is brought to Dairy plant by a producer, then it shall be ensure that he brings it within shortest possible time of milking and it shall be cooled as soon as practicable to a temperature of 4°C or lower and maintained at the temperature until processed.

3.1 Necessary Steps to be taken care for Clean Milk Production

a. Cattle

- Give sufficient quantity of feed and drinking water to milch animal prior to milking.
- Remove accumulated cow dung.
- Milch animal shall be bathed and if bath is not possible dry cleaning by broom / duster should be done.
- Maintain the milch animal clean and healthy.
- In case animal is under treatment, discard the milk during the withdrawal period of the treatment.
- Clean the udder and teats of the milch animal by clean (potable) water and wipe using a dry & clean cloth.
- Teats should be cleaned after sucking, if cattle is letting down the milk by calf sucking.
- It is good to keep the animals standing for at least half an hour after milking. Feed may be provided to encourage this

b. Cattle Shed.

- Clean the cattle shed floor either by washing with water or dry cleaning 10 – 15 minutes before milking.
- The floor should not be slippery. It should be firm and dry so as to provide a proper foothold to the animal while rising or standing.

c. Utensils

- Clean thoroughly the milk collection vessel preferably with detergent and hot water etc. and keep it inverted to dry before milking.
- Avoid use of measures, tumbler etc. in the milking vessel for removing or to transfer milk from milking pail.
- The utensils and the storage vessels should be of SS 304 construction and free from sharp edges.
- A suitable size lid should always be used to cover the utensils and the vessel.
- They should be cleaned and sanitized before and after their use and kept dry.
- They should be exclusively used for milking.
- The milk should be filtered before pouring into the vessel.
- The utensils should be the same in which the milking is done to avoid contaminations due to multiplicity of vessel etc.

d. Milk Handler

- Milker should wash his/her hands with soap to make them clean and germ free.
- Milker should wear clean clothes.
- Milker should avoid contact between milk and his body parts, clothes and other belongings.
- Chewing and spitting with tobacco and smoking should be avoided during milking.
- Sneezing/ coughing towards udder/vessel during milking should be avoided.
- Milker should not be suffering from any respiratory ailment or contagious disease.
- Milker should not have any open sores or cuts.

e. Miscellaneous

- Use separate vessel for washing of udder and teats & for milking.
- Discard the initial milk from all the four teats to minimize the bacterial load.
- Flies, hay, husk, dry cow dung cake or other extraneous matter should not get

into the milking vessel.

- After milking rinsing of teats in a disinfective solution (with water, iodophor etc.) shall be done to avoid post milking infection.

3.2 Delivery of milk to DCS (Dairy Cooperative Society) / MCC (Milk Collection Centre)



Milk producers come together and form a village dairy cooperative society (DCS) with the support of Milk Union and start supplying the surplus milk to the DCS, after retaining milk for their household consumption.

Raw milk is collected daily from a producer, and it shall be cooled immediately to the temperature of 4-6°C or lower and maintained at that temperature until processed.

The major operations of a DCS are hygienic **milk collection** and providing **input services**

- Milk collection involves reception, testing, local and sample milk sale, dispatch of milk to the Milk Union, payment and accounts keeping.
- Input services include animal health coverage, artificial insemination, supply of cattle feed, mineral mixture and other feed supplements, fodder seeds, providing extension services to producer members including propagation of Clean milk production practices.
- Milk should be carried in SS utensils/ SS Cans.
- Milk should be brought to DCS/MCC as quickly as possible after milking to avoid multiplication of harmful bacteria.

3.2.1 Bulk Milk Cooler Cleaning & Sanitation

Bulk tanks must be properly cleaned and sanitized. An improperly cleaned tank would be a major source of bacterial contamination in milk, thereby causing its deterioration and mitigating the advantages of chilling milk at farm level. Prevailing low temperatures of milk in an improperly cleaned tank favour rapid multiplication of psychrophilic bacteria (microorganisms capable of rapid growth at temperatures of 2 to 10°C) and cause serious flavour defects in milk.

3.2.1.1 Cleaning procedure: Tanks may be cleaned manually or with CIP. A typical example of cleaning cycle for bulk milk tanks is provided below:

a. Manual Cleaning of Bulk Milk Tanks

➤ Pre-rinse

Rinse the tank manually and flush pipeline with lukewarm (38-43°C) water immediately after use to remove remaining milk residues.

- Disassemble all parts that must be hand-washed. Before carrying out routine cleaning of the tank, the thermometer probe and dipstick should also be removed and put aside carefully.

➤ Detergent Wash

Alkaline cleaning solution (0.5-0.75%) (Usually containing basic alkali, phosphates, wetting agent, and chelating agent) or as specified in manufacturer's recommendations and based on water quality tests.

- All detachable parts like tank covers, gaskets, calibration rod etc. should be cleaned manually after disassembling.
- For hand washing of disassembled parts:
 - Soak all parts at 49-57°C for at least 5 minutes.
 - Brush all parts thoroughly.
 - Drain.

b. CIP of Bulk Milk Tanks:

➤ Pre-rinse

Rinse the tank manually and flush pipeline with lukewarm (38-43°C) water immediately after use to remove remaining milk residues.

➤ Detergent Wash

- Start with detergent solution (0.8-1.0%) and circulate it at 77°C for 6-10 min.
- Brush all parts, including outside of tank and outlet valve, not designed for cleaning by circulation of cleaning solution.
- Drain.
- Clean the outlet connection and outlet valve manually.

➤ Rinse

- Rinse off the detergent solution with tap water before the acid rinse, if required.
- Rinse tank thoroughly (inside and outside).
- Rinse tank outlet valve.

➤ Acid-rinse (Occasional)

- Occasionally, rinsing with an appropriate acid (nitric acid) solution (55°C-60°C) is

required to remove inorganic soils that build over a period of time.

- Circulate for 2-3 minutes and drain.
- Visually inspect line, receiver jar, etc., for proper cleaning.

c. Check Points to follow in CIP

- Check that all solutions drain completely between cycles.
- Check that the pump has sufficient pressure to reach all areas.
- Consider an acid wash if no softener is being used in hard water.
- Check outlet valve, gasket and manhole area for cleanliness.
- Check inlet area to cooler and inlet pipe.
- The outside of the bulk milk cooler needs to be kept clean at all times.



Fig 3.2 – Closed Type Bilk Milk Cooler Society



Fig 3.3 – Open Type Bilk Milk Cooler Society

3.3 Milk Transportation from DCS to Dairy Plant

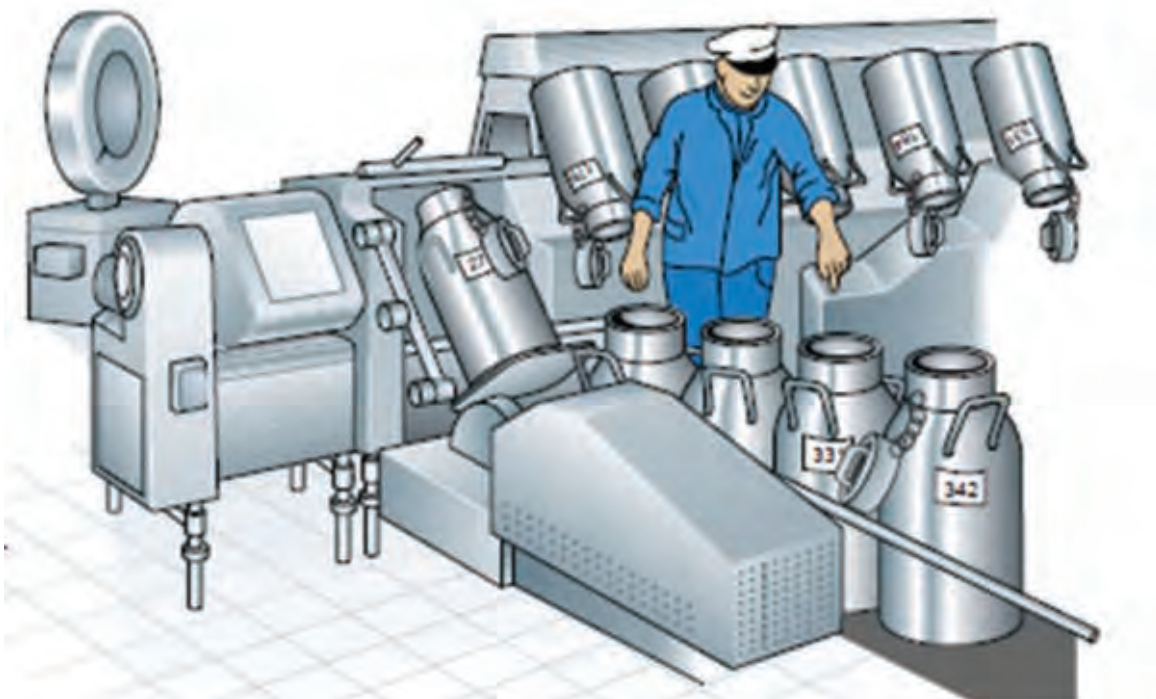
Milk from Dairy cooperative society/Milk collection Centre is transferred to Dairy plant through Cans/Road Milk Tankers.

3.4 Milk Reception at Dairy

Dairies have reception bays most commonly known as Raw Milk Reception Dock to receive the milk brought from the Dairy Cooperative Societies / Farms in cans as well as milk tankers. The first thing done at reception is to determine the quality of milk. The quantity is recorded and entered into the weighing system that the Dairy uses to weigh the gross and net weight.

3.4.1 Steps of Can reception

- a. The cans arrive from the lorry on a conveyor. Each can is subjected to rapid sensory evaluation and some preliminary tests to decide the acceptance or rejection of the milk.
- b. In automatic can reception, the lids are automatically removed and emptied into a weighing bowl, which indicates the quantity.
- c. Cans are also unloaded manually and placed on the conveyors for emptying it.
- d. Drip Saver is provided to collect milk which is left while dumping into the weighing bowl.
- e. The weighing-in system is programmed so that the operator enters the society identification on a keyboard before weighing all the cans from that route.
- f. The weighing balance must be well maintained and checked every day to ensure accuracy. Periodic calibration needs to be carried out by external agency.
- g. From weighing-in, the raw milk is pumped to storage tanks through in-line filter and milk chiller.



3.4.1.1 Can Washer

The empty cans are conveyed to a Can washer, where they are washed with water and detergent to remove all traces of milk.

Two types of Can washers are used in Dairy industry:

- Rotary Can washer
- Straight through Can washer

➤ Rotary Can Washer

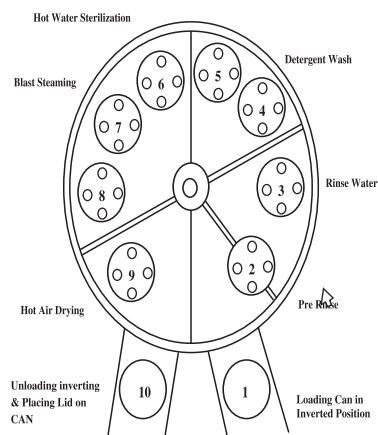


Fig 3.5 –Schematic Diagram of Rotary Can Washer

These are semi-automatic or automatic can washing machines, in which cans are rinsed, cleaned and sterilized very effectively.

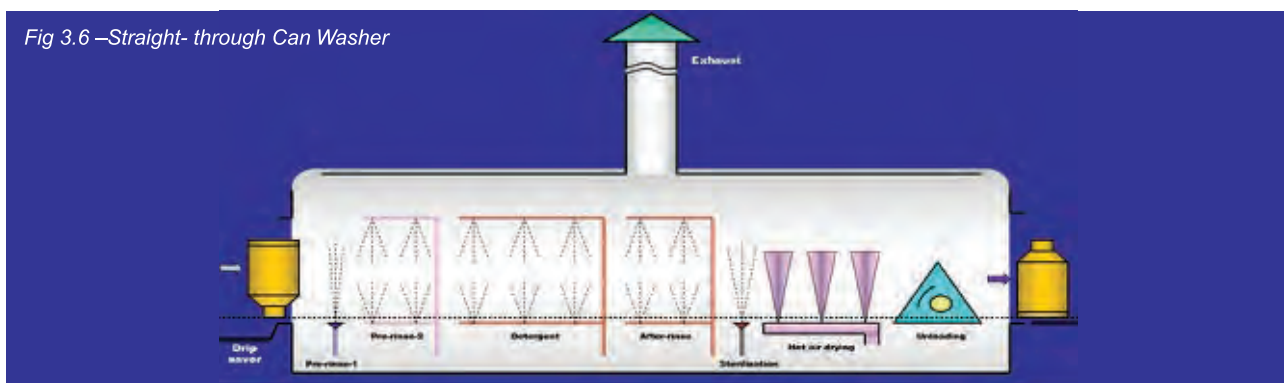
Design and Operation:

The cans are carried on a large rotating table or carrier. This type of washer is very simple in construction. De-shaped cans are also cleaned without any problem of falling. These are built in various sizes for handling low to medium number of cans and are very compact machines.

Precaution	Maintenance
Check the effectiveness of cleaning. In case of dented cans or heavy soiled can, scrub the can in the can scrubber before loading in the rotary can washer.	Pumps and nozzles are to be checked timely
	Lubricate the moving parts daily or as per the manufacturer's instructions.
	Check and attend the gland/oil seal/water seal
	Keep all the doors closed except entry and exit

➤ Straight-through Can Washer

Fig 3.6 –Straight- through Can Washer



The washer has rinsing, detergent spraying, hot water rinsing, steaming and air-drying sections.

Design and Operation:

- The cans are moving from entry door over the mild steel or plastic chains of special design to hold the can and carry towards the exit door.
- In other type of moving arrangements cans are carried forward through a ratchet from one position to the next.
- Can moves forward from entry door in inverted position to rinsing section, where warm water is injected from bottom and other sides removing loosen soils and some part of dirt.
- Then these cans move to detergent section, in which hot detergent solution of 0.5 to 1% concentration is sprayed inside and outside surface of cans to remove the soil completely.
- These cans move to hot water (75-80oC) rinsing section where the traces of detergent and soils are removed.
- Now, the cans are effectively clean and move to steaming section for sterilization.

Finally, the hot cans are dried into the air-drying section. Before reaching to exit door, by suitable attachment, inverted cans are brought to the normal position with mouth upside.

Precaution	Maintenance
Steam jets should be cleaned regularly for proper injection of steam.	Check the steam nozzle before and after the washing operation. Clean the blocked nozzle.
Damaged cans should not be used, as they often fall inside the washer and interrupt the washing operation.	Can conveying chain should be checked, loose link should be repaired/ replaced.
Use steam and air at enough pressure & temperature.	Clean all the tanks (water/detergent/hot water).
Ensure that proper quantity of water is available to can washer	Inspect the oil seal/water gland of pumps
Keep door closed while washing is in progress	Check the door gaskets and replaced if found damaged
	Check ratchets movement and do needful adjustment, if required.

➤ Can Scrubber

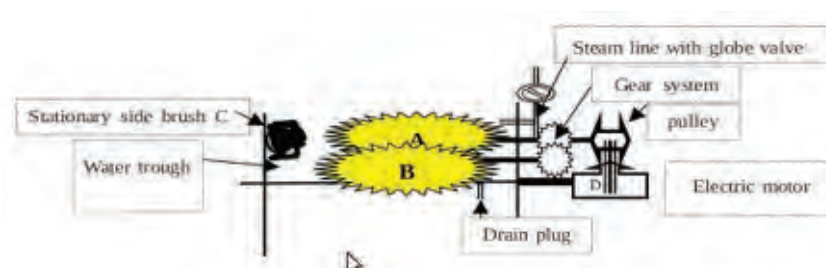


Fig 3.7 –Schematic Diagram of Can Scrubber

Design and Operation:

These are very simple type of Can washing machines. As shown in the Fig. one nylon fibre hard brush “A” of cylindrical shape revolves about its axis which is driven by small rating (usually 0.5 to 0.75 HP) electrical motor. Another brush “B” is driven with the connected gear. One stationary brush “C” to suit the shape of can is fitted at one sidewall of the scrubbing machine. The arrangement of these brushes are shown in the schematic diagram

Following procedure is usually employed for washing cans in the scrubber:

- Fill the washer and put the required quantity of detergent.
- Heat the solution up to 45 to 50oC.
- Now start the motor of can scrubber to rotate the brushes.
- Collect can from drip saver and insert it into the scrubber brush “A” from the free end side.
- Hold the can for enough time to loose the deposited materials.
- The brush “A” will scrub the inside surface of can, and rotating brush “B” and, stationary side brush “C” of special shape will scrub the external surface of can.
- Take out the cans and rinse with cold water.

Precaution	Maintenance
Proper temperature, concentration of solution and enough holding/scrubbing time	Draining of dirty detergent solution and washing properly to keep thorough cleaning
Operators should be provided with protective hand gloves	Checking all the brushes for proper alignment, tightening and condition of fibres. If found not proper set right properly. Change worn out brushes.
Regular monitoring of the condition of Brush	Checking motor and motion/power transmission system including chain/belt and sprocket/pulley for wear - tear and alignment.
Clean and Soft Water to be filled up to required level	Providing grease/oiling over the chain/gears
Concentration of the detergent solution is checked at desired interval of operation	Checking the drain plug to prevent leakage through it.
The solution is drained after every 150 can washing and then recharged freshly	
Interval could be changed after observing the practical requirements	



Fig 3.8 –Can Scrubber

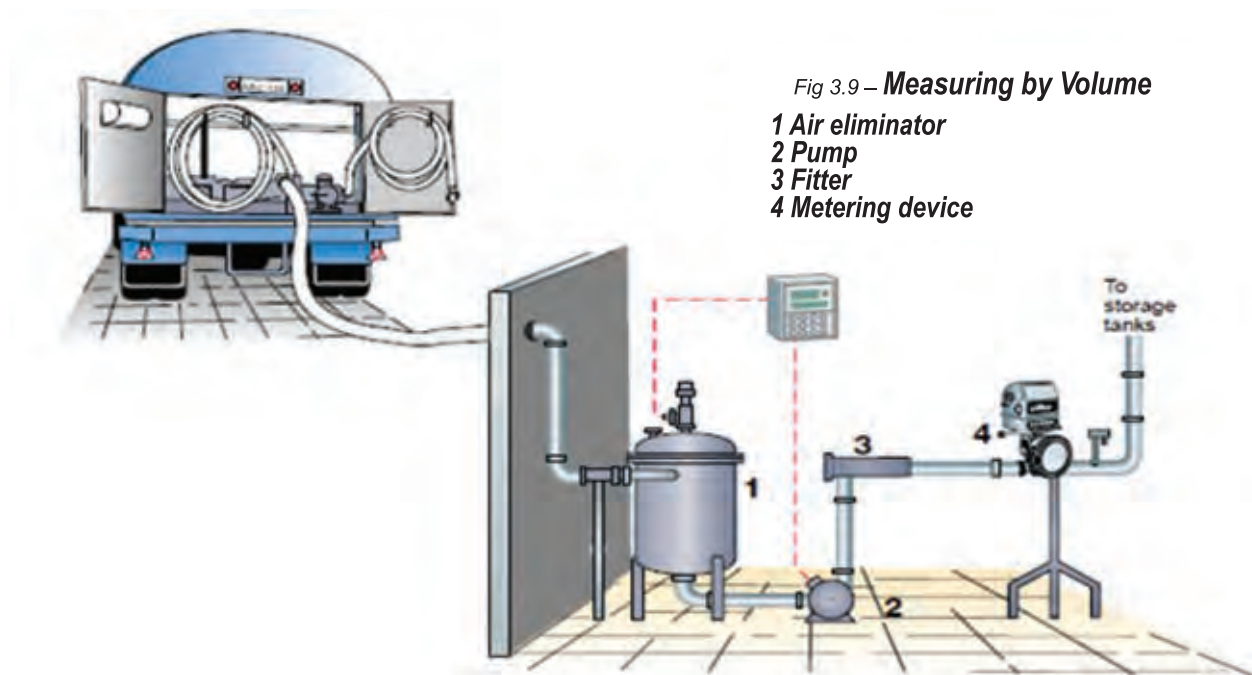
3.4.2 Tanker Reception

Tankers arriving at the Dairy drive straight into a reception bay, often large enough to accommodate several vehicles.

The milk is measured either by volume or by weight.

➤ Measuring by volume

This method uses a mass flow meter. To avoid error in the readings of mass flow meter, a deaerator which eliminates the air in the milk being unloaded from the tanker is installed.



➤ Measuring by weight

Bulk-collected milk can be weighed in as following procedure:

- By weighing the tanker before and after unloading and then subtracting the empty tanker weight from the gross weight value.

The tanker is driven onto a weighbridge at the Dairy. Operation may be manual or automatic.

- If manual, the operator records the weight against the driver's code number.
- If automatic, the necessary data are recorded when the driver places a card in a card scanner.

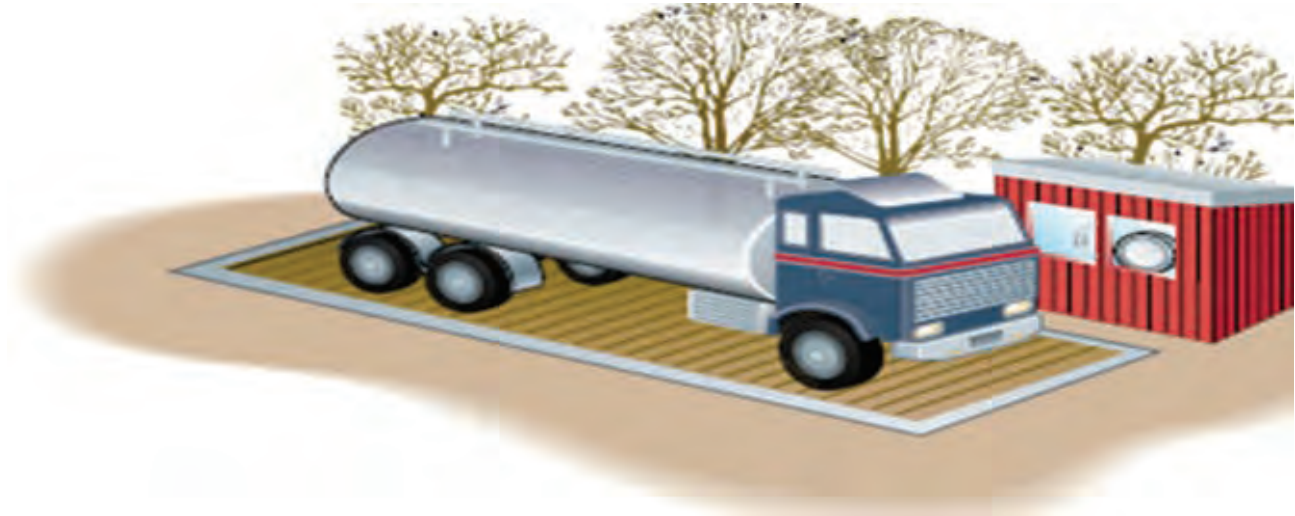
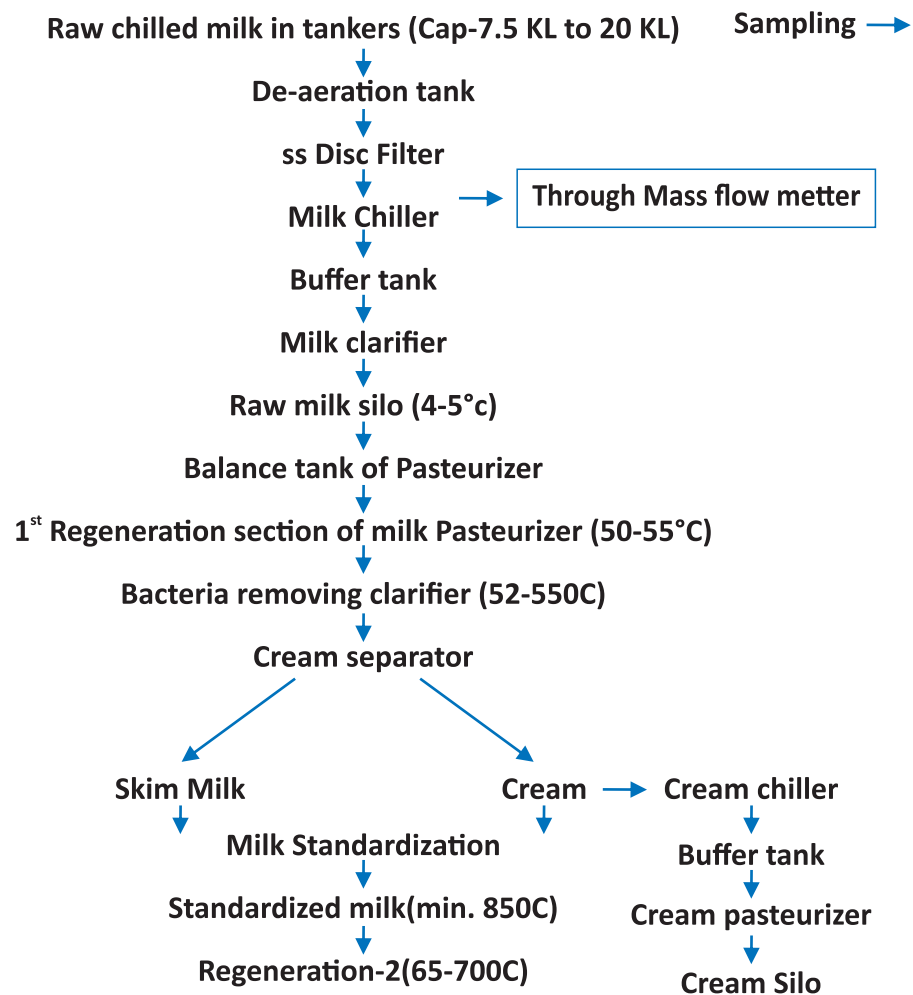
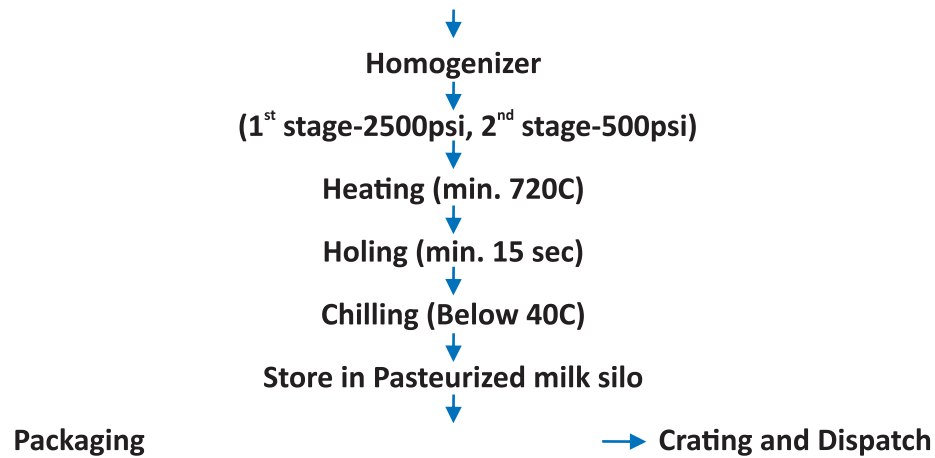


Fig 3.10 –Weigh Bridge for Weighing Tanker

3.5 Process flow-diagram of milk reception & processing:





3.5.1 Chilling of incoming milk

Normally a temperature increase to slightly above 40C is unavoidable during transportation. The milk is therefore usually cooled to below 40C in a plate heat exchanger before being stored in a silo tank to await processing.

3.5.2 Raw milk storage



Fig 3.11 –typical bird- proofing on silos to avoid contamination

- The untreated chilled raw milk as received at RMRD is stored in large vertical tanks or silos which have capacities ranging from 50 KL to 150 KL.
- Smaller tanks can be located indoors while the larger capacity tanks are placed outdoors to reduce building costs.
- Material of Construction (MOC) of silos is SS-304 and they are insulated with EPS or polyurethane foam sheets of sufficient thickness to prevent temperature rise.
- The outer cladding is also of SS- 304 sheet in modern silos.
- The inner tank is of stainless steel with minimum 150 grit finish.
- There is an agitator mounted on top or inclined near the bottom of the silos for agitating the milk to keep it homogenous and also to cool it uniformly.
- The agitator with mechanical seal that prevents oil from dripping and also to avoid leaking into the milk inside the silo.

3.5.3 Clarifier



Fig 3.11 –Clarifier

Function of the clarifier

- Remove undesirable milk solids like dirt, dust, hay, manure, bacteria, somatic cells and pulverized hair by the application of centrifugal force.



Fig 3.12 –Bacteria removing Clarifier

Function of the Bacteria removing clarifier

- Remove bacterial spores present in milk by the application of centrifugal force.
- 2-stage Bactofugation can remove 99.9% bacterial spores and 90% bacteria from milk.

3.5.4 Cream Separator



Fig 3.13 –Cream Separator

Centrifugal equipment that separates milk into cream and skimmed milk.

3.5.6 Milk Standardization

The separated cream and skim milk are remixed in certain proportions to make standardized milk as per further process/market requirement. Different types of milk like Toned, Double toned, Standardized, Full cream etc. have different standards of Fat & SNF as prescribed by the FSSAI. For certain specific product, even protein content may be adjusted.



Fig 3.13 –Auto Standardization Unit

Standardization of Milk for Fat: This can be made by simple Pearson's square method. Only Fat or SNF can be standardized by this method.

Standardization of Milk for Fat & SNF: This can be made by Algebraic method.

On line milk standardization: This is achieved by using combination of online Density-meter and Flowmeter instruments.

3.5.7 Homogenizer

Homogenization is the process of reducing the fat globule size below 2 microns so that they float suspended evenly throughout the entire milk solution.

Homogenization is done in two stages. In first stage, the milk is passed through small openings with applied pressure of 2500 PSI followed by 500 PSI in 2nd stage to prevent fat globule clumps.



Fig 3.14 –Homogenizer

3.5.8 Pasteurizer

Pasteurization (LTLT/HTST) is a process that kills pathogens in milk. Pasteurizer (Plate Heat Exchanger) is the equipment used for HTST Pasteurization.

This is achieved by heating the milk in the pasteurizer to a temperature of minimum 72°C, holding it at that temperature for 15 seconds and then rapidly cooling it below 4°C.



Fig 3.15 –Plate Heat Exchanger

3.5.8.1 Requirements for successful operation of Pasteurization Plant

Sr. No.	Process Parameter	Required Solution
1	Application of correct thermal Process	<ul style="list-style-type: none"> a. Use of thermostatic control to ensure heating medium at correct temperature b. Use of Positive control to ensure flow rate through holding tube correct c. Use of long, thin holding tube to minimize short holding time due to turbulent flow d. Fitting of automatic flow diversion device to return under heated milk to raw milk buffer tank
2	Prevention of crosscontamination within pasteurizer	<ul style="list-style-type: none"> a. Vent interspace between seals to atmosphere to provide an immediate visual indication of gasket failure. b. Maintain a positive pressure balance between pasteurized milk and raw milk in the regeneration section. c. Ensure correct positioning of flow diverter and associated pipework to avoid contamination of pasteurized milk when through-flow resumes after diversion.
3	Cleanability	<ul style="list-style-type: none"> a. Fabricate milk contact surfaces from high-grade stainless steel finished, preferably by electropolishing to avoid crevices and consequent entrapment of soil. b. Welds, joins, etc., should be finished to the highest possible standard. c. All materials used in construction should withstand contact with cleaning fluids.
4	Limitation of heat damage	<ul style="list-style-type: none"> a. Minimize temperature difference (1°C is desirable) between heating medium and milk. b. Minimize milk residence time in 'hot' section of pasteurizer. c. Ensure efficacy of cooling section

Sr. No.	Process Parameter	Required Solution
5	Economic operation	a. Ensure efficacy of regeneration section b. Employ maximum possible ratio of heating surface to volume.

3.5.9 Milk Packaging

Processed milk is pumped to the packaging plant where milk is packed in various sizes for final distribution to the end user.

Modern trend is to use mechanical pouch packing machines instead of pneumatic type packaging machines.

3.5.10 Crating and dispatch

Poly packs are arranged in plastic crates systematically and loaded on to trucks for dispatch to different milk sales outlets.

3.5.10.1 Crate washer

Effective cleaning of crates before transport of milk pouches at Dairy plant level decreases contamination. This could also lead to improvements in product quality, transportation and storage. Clean crate meets the hygiene requirement of your customers. To achieve that, you need high quality at flexible crate washers.

A typical crate washer consists of a washing section(s) and a rinsing section. In these sections, the nozzles that are mounted on the spraying racks will produce the Mechanical Action of the Temperature Controlled and Chemical Dosed water. Each washing section has its own reservoir for re-use of the washing water and for the rinsing section, fresh water will be used. A transport chain or transport belt will be used to transport the crates through the machine with a certain (controllable) speed to meet the Washing Time for a certain crate/pollution.

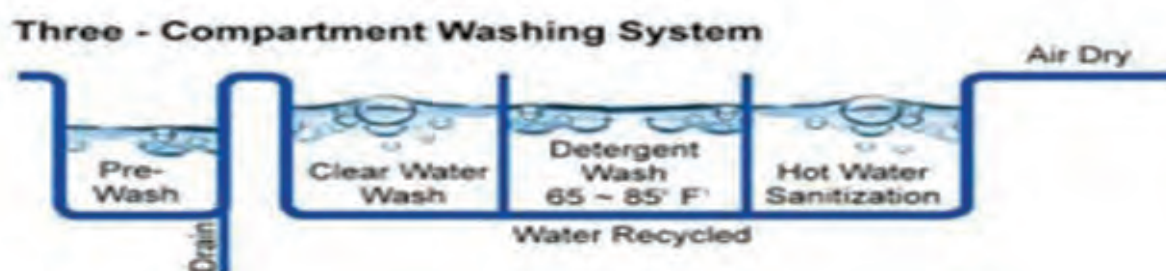


Fig 3.16 –Three Compartment Washing System



3.5.10.2 Advantages of High Pressure Jet cleaning

- Reduction in plant down time
- Saves labour cost and space
- Environment friendly as it saves water, reduces noise pollution & air pollution as there is no generation of gas, smoke and heat
- Safe to use: Effective cleaning without/less use of hazardous chemicals with no damage to the underlying surface

3.6 Precautions against re-contamination of pasteurized milk

Sr. No.	Source	Pathway	Precautions
1	Raw Milk	a. Direct b. Indirect via contamination of plant environment, passive transfer on hands of personnel, etc	a. Correct design- Correct operation and maintenance of pasteurizer b. Correct plant layout- Control of personnel movement and avoidance of 'hands-on' operations involving milk or milk-contact surface
2	Plant Environment	a. Usually indirect via contamination of equipment b. Also via personnel and packaging	a. Prevent contamination of plant environment from outer environment including animals and birds, soil and water b. Eliminate contamination of pasteurized milk side of plant by correct environmental sanitation.

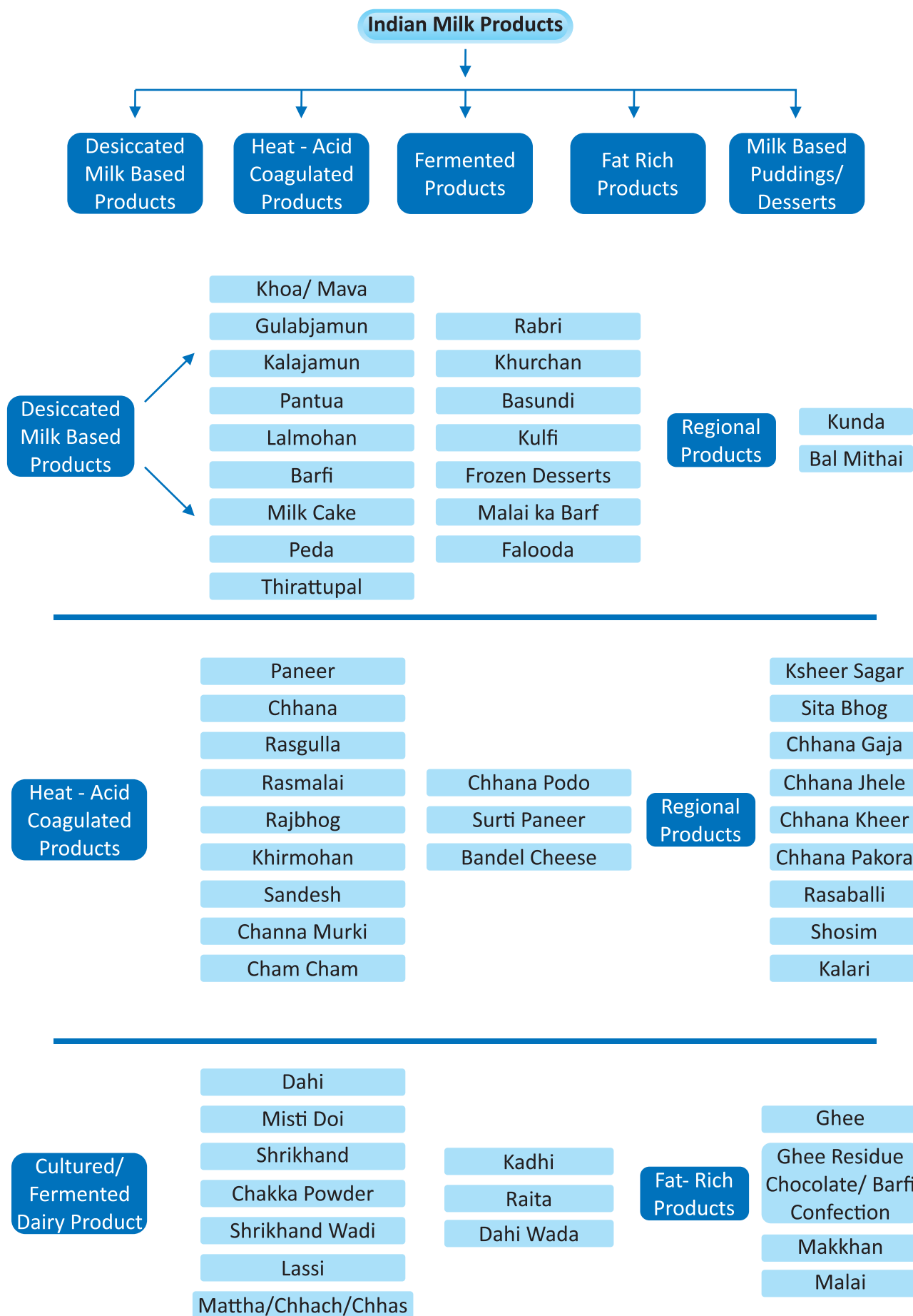
Sr. No.	Source	Pathway	Precautions
3	Personnel	a. Direct due to personnel suffering with clinical illness or being convalescent or chronic carrier of pathogens. b. Indirect due to introduction to plant of contamination from outside environment, etc. A particular hazard can exist in some rural areas where personnel are also small holders.	a. Apply appropriate medical and exclusion policies b. Ensure good personnel hygiene and correct use of protective clothing and footwear c. Prohibit raw produce such as eggs being brought into the plant by part time farmers for sale to follow workers
4	Equipment	a. Contamination of equipment by raw milk b. Development of biofilms and colonization of milk contact surfaces by microorganisms	Utilize suitable cleaning and sanitization programmes
5	Packaging	a. Failure to adequately clean and sanitize reusable Bottles b. Contamination of Packaging from plant environment	a. Institute correct cleaning, sanitization and inspection procedures b. Protect Packaging from contamination

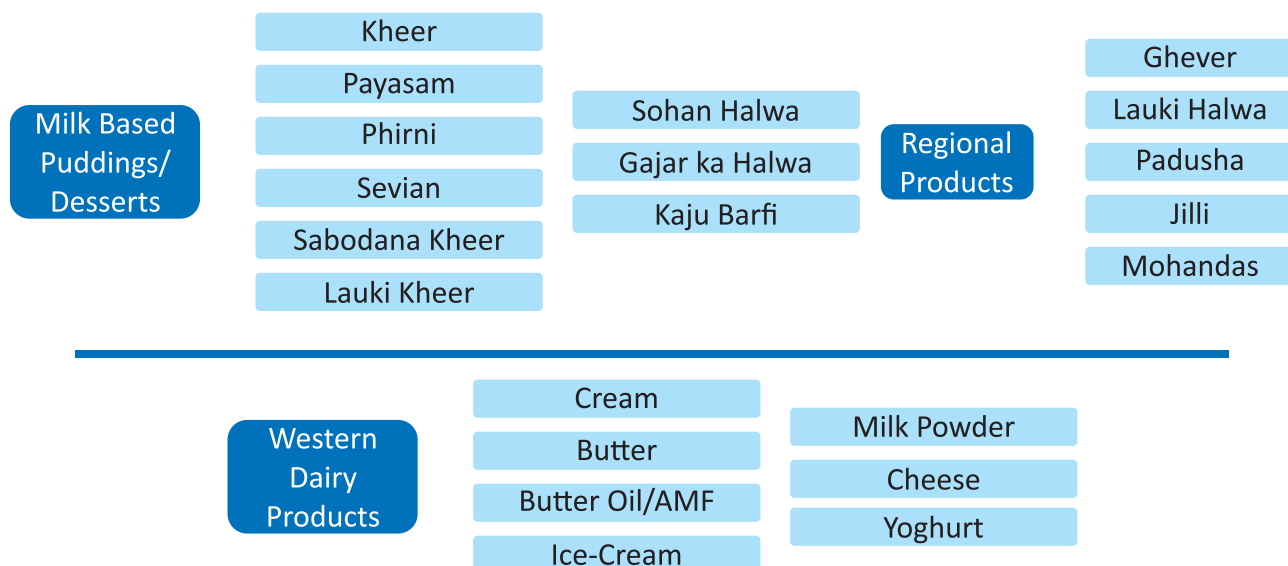
3.7 Milk and Milk Products

In recent years, there has been considerable diversification of the types of milk available. Type of Milk is as follows:

Type of Milk

Raw Milk	Double Toned Milk	Condensed Milk
Pasteurised Milk	Reduced Lactose Milk/ Lactose Free Milk	Vitaminized/ Irradiated Milk
Standardized Milk	Full Cream Milk	Condensed Milk
Homogenized Milk	Frozen Concentrated Milk	Flavoured Milk
Sterilized Milk	Recombined Milk	Soft Curd Milk
Thermized Milk	Reconstituted Milk	Dried Milk
Toned Milk	Evaporated Milk	Fermented Milk





3.8 Packaging requirements for milk and milk products

- The rooms for storing packaging material shall be free from vermin and from dust which could constitute an unacceptable risk of contamination of the product and shall be separated from rooms containing substances which might contaminate the product. Packaging material shall not be placed directly at the floor.
- Packaging shall be done without delay and shall be handled by separate group of staff having experience in product packaging.
- Bottling or filling of containers with heat-treated milk and milk product shall be carried out mechanically and the sealing of the containers shall be carried out automatically.
- Wrapping or packaging may not be re-used for Dairy products, except where the containers are of a type, which may be re-used after thorough cleaning and disinfecting.
- Sealing shall be carried out in the establishment in which the last heat-treatment of drinking milk or liquid milk-base products has been carried out, immediately after filling, by means of a sealing device which ensures that the milk is protected from any adverse effects of external origin on its characteristic. The sealing device shall be so designed that once the container has been opened, the evidence of opening remains clear and easy to check.

Product	Packaging Material
Liquid Milk/Flavoured Milk	<ul style="list-style-type: none"> ➤ Glass Bottle ➤ Tetra pack ➤ Flexible LDPE Pouch ➤ Flexible laminated Pouch ➤ PET Bottle

Product	Packaging Material
Milk Powder	<ul style="list-style-type: none"> ➤ Tin Container ➤ Metalized Aluminium Foil ➤ Lined Cartoon ➤ Bag in Box: Powder filled in laminateottle
Butter (Table/White)	<ul style="list-style-type: none"> ➤ Card Board with vegetable parchment paper ➤ Tin Container ➤ Tub/ Paper laminate
Cheese/Cheese Spread	<ul style="list-style-type: none"> ➤ Tin Containers ➤ Aluminium Foil in carton board ➤ PET Cup
Ghee	<ul style="list-style-type: none"> ➤ Tin Container ➤ Flexible HDPE Pouch ➤ PET Bottle
Icecream	<ul style="list-style-type: none"> ➤ Plastic Container (Polystyrene) ➤ Wax coated paperboard carton ➤ Fibre board container
Paneer	<ul style="list-style-type: none"> ➤ Laminated Poly Pack ➤ Tin Container

NOTES

NOTES

NOTES

Handwriting practice lines consisting of 30 horizontal dashed blue lines.



PART-4

CLEANING & SANITATION AND EQUIPMENT MAINTENANCE

Cleaning & Sanitation and Equipment Maintenance

4.1 Cleaning and sanitation

Milk is a perfect media for growth of micro-organisms at ambient conditions and gets easily contaminated once it comes in contact with uncleaned equipment and vessels. It is, therefore, essential to clean & sanitize the equipment in which milk is held during processing.

There are different methods for cleaning:

- Manual
- Semi-automatic
- Automatic

Before we deliberate further it will be prudent to understand some of the basic terms commonly used in Cleaning & Sanitation.

4.1.1 Some of the definitions regarding Cleaning & Sanitation:

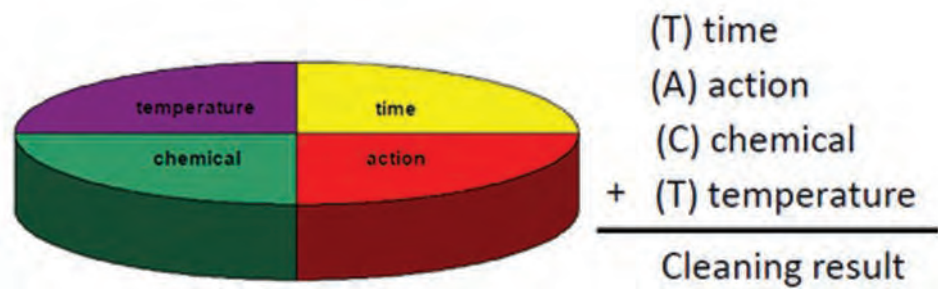
- **Soil:** Primarily milk/milk product residues, may be more or less modified by processing treatment or by interaction with water or cleaning materials previously used, or by dust, dirt or other foreign matters
- **Cleaning / Washing:** Process of removal of soil from the surface of equipment
- **Sanitization:** Destruction of all pathogenic and almost all non-pathogenic microorganisms from equipment surface
- **Detergent:** A substance or mixture of substances, which when added to water helps to remove dirt and grease
- **Sanitizer:** Any chemical/hot water/steam used for sanitization or disinfection capable of 100% destruction of pathogens

4.1.2 Food Soil and their removal

Components on Surface	Solubility	Ease of Removal	Change on Heating
Sugar	Water and Acid Soluble	Easy	Caramelization more difficult to clean
Fat	Water in-soluble, alkali soluble	Difficult	Polymerization - more difficult to clean
Protein	Water insoluble, alkali soluble, slightly acid-soluble	Very Difficult	Denaturation –much more difficult to clean
Mineral Salts	Variable Water solubility , mostly acid soluble	Easy to difficult	Generally easy to clean

4.2 Cleaning In Place (CIP)

CIP is the cleaning of Dairy plants without dismantling equipment/pipes and without altering the production process configuration.



The *cleaning result* is considered constant, since anything less than completely clean is unacceptable

There are two types of CIP:

- Manual
- Automatic

Cleaning solution contacts all of the production food-contact surfaces by:

- Spraying on vessel surfaces
- Recirculation through pipes and flooded equipment

CIP reduces cleaning costs by controlling the consumption of:



Cleaning chemicals



Time



Water & other customer resources



Energy

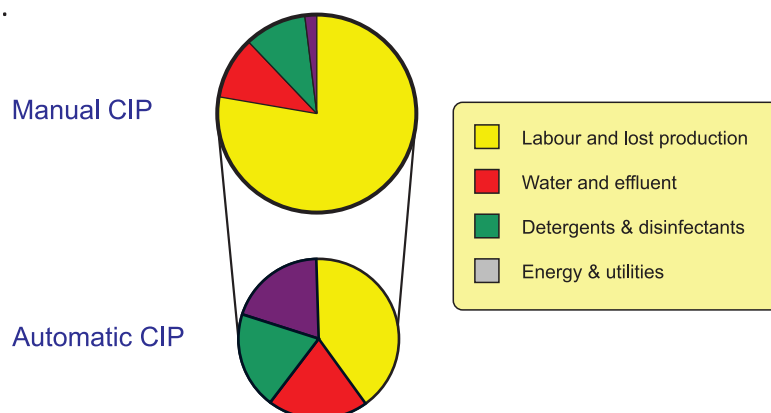
Modern CIP units are designed to effectively clean and quickly sanitize the equipment and minimize production downtime.

4.2.1 Advantages of CIP

- CIP assures the repeatable application of all cleaning and disinfecting parameters (time, temperature, detergent, and mechanical action), thus saving of cost and time.
- Increased economy in use of cleaning detergents, which helps in cutting the operational costs
- Automated systems clean better than manual systems due to their consistency
- Automated cleaning increases the level of equipment/storage space utilization
- CIP systems enhance safety at the processing plant since people do not come into direct contact with the cleaning detergents
- Enhanced efficiency will definitely improve productivity at the plant. There will be efficient use of water and detergents.

4.2.2 Manual CIP vs Automatic CIP

Manual CIP depends on the knowledge, skill, training, and dedication of the operator and hence can be inconsistent.



4.2.3 Designing of CIP Cycle

- Dairy CIP programs differ according to whether the circuit to be cleaned contains heated surfaces or not. We distinguish between:
- CIP programs for circuits with pasteurisers and other equipment with heated surfaces (UHT, Condensing plant etc.).
- CIP programs for circuits with pipe systems, tanks and other process equipment with no heated surfaces
- The main difference between the two types is that acid circulation must always be included in the first type (heated surfaces) to remove encrusted protein and salts from the surfaces of heat-treatment equipment.

4.2.3.1 A CIP program for a pasteuriser, "hot components", circuit can consist of the following stages:

Rinsing with warm water – 10 Mins

**Circulation of an alkaline detergent solution
(0.5-1.5%) – 30 Mins at 75°C**

**Rinsing out alkaline detergent with
warm water – 5 Mins**

**Circulation of (nitric) acid solution
(0.5 – 1.0 %) – 20 Mins at 65-70°C**

Rinsing with warm water

**In Some Plant, Low strength caustic solution (0.3-0.5 %)
(for neutralizing acid solution in pipe lines)**

Final Rinse with Warm Water

Note:

- The pasteuriser is usually disinfected in the morning, before production starts. This is done by circulating hot water at 90 – 95°C for 10 – 15 minutes after the returning temperature is at least 85°C.
- CIP is repeated depending on the reduction in flow-rate due to formation of soil.

4.2.3.2 A CIP program for a circuit with pipes, tanks and other "cold components" can comprise the following stages:

Rinsing with warm water for 3 minutes.

Circulation of a 0.5 – 1.5% alkaline detergent at 75°C - 10 minutes.

**Rinsing with warm water
- 3 minutes.**

**Disinfection with hot water
90 – 95°C - 5 minutes.**

4.2.4 Design of CIP systems

In practice, there is no limitation to satisfy stringent individual demands as to the size and complexity of CIP plants. The CIP station in a Dairy consists of all necessary equipment for storage, monitoring and distribution of cleaning fluids to the various CIP circuits.

The exact design of the station is determined by many factors, such as:

- How many individual CIP circuits are to be served from the station? How many are “hot” and how many are “cold”?
- Are the milk rinses to be collected? Are they to be processed?
- What method of disinfection is to be used? Chemical, steam or hot water?
- Will the detergent solutions be used only once or recovered for reuse?
- What is the estimated steam demand, momentary and total, for cleaning and sterilisation?

Looking back over the history of CIP, we find two schools of thought:

- Centralised cleaning
- Decentralised cleaning

Solubility	Ease of Removal
Until the end of the fifties, cleaning was decentralised	The centralised CIP system was developed during the sixties and seventies.
The cleaning equipment was located in the Dairy, close to the process equipment	A central CIP station was installed in the Dairy.
Detergents were mixed by hand to the required concentration – an unpleasant and hazardous procedure for the personnel involved.	Rinsing water, heated detergent solutions and hot water were supplied from this unit by a network of pipes to all the CIP circuits in the Dairy.
Detergent consumption was high, which made cleaning expensive.	The used solutions were then pumped back to the central station, and from there to the respective collecting tanks.

Solubility	Ease of Removal
	Detergents recovered in this way could be topped up to the correct concentration and reused until they were too dirty and had to be discarded.

Note:

Centralised CIP works well in many Dairies, but in large Dairies, the communication lines between the central CIP station and the peripheral CIP circuits have grown excessively long. The CIP pipe systems contain large volumes of liquids, even when they are “drained”. The water remaining in the pipes after pre-rinsing dilutes the detergent solution, which means that large amounts of concentrated detergent must be added to maintain the correct concentration. The greater the distance, the greater the cleaning cost. A move back towards decentralised CIP stations therefore began in large Dairies at the end of the seventies. Each department had its own CIP station.

4.2.4.1 Tanker Cleaning



Fig. 4.3 Milk Tanker



Fig. 4.3 Milk Tanker

If the tanker makes several rounds a day, cleaning should take place after each round. Cleaning can be carried out by connecting the tanker to a cleaning system while in the reception area or by driving it to a special cleaning station.

The CIP steps for tanker cleaning are as under:

- Rinse with normal water
- Caustic solution (0.5-0.8%) circulation for 5 mins
- Final Rinse with normal water for 5 mins

4.3 Sanitation/Disinfection

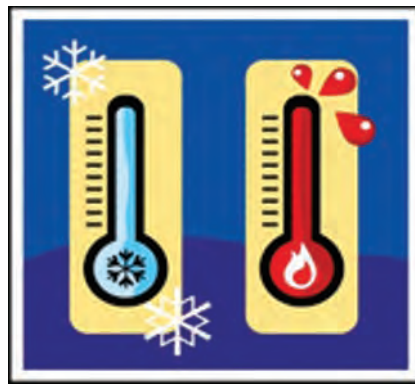
Why is Sanitation necessary?

- Cleaning may not be 100% effective.
- Microorganisms remain on surfaces after cleaning.
- Some of these organisms may be pathogens or spoilage organisms.

4.3.1 Effective sanitation depends on



Concentration



Temperature



Contact time



Degree of soiling

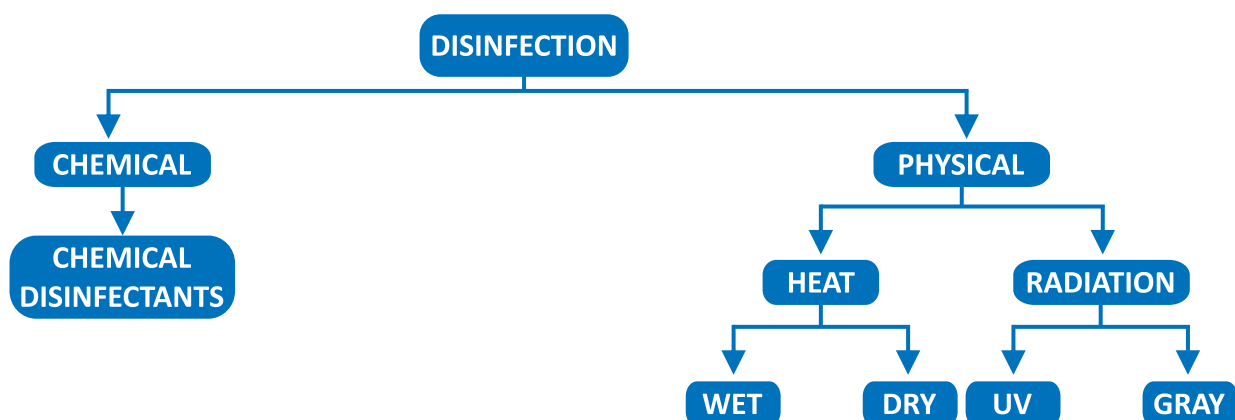


Water hardness



pH

4.3.1 Effective sanitation depends on



4.3.2.1 Chemical sanitation kills by affecting the metabolism and / or structure of the microorganism.

e.g.

- Proteins oxidised by hypochlorites and peracids.
- Disruption of active transport across the cell membrane by quaternary ammonium compounds and amphoterics.

There are number of Sanitizers available but factors that affect choice of sanitizer are as follows:

Sanitizers	Factors affecting Sanitizer choice
Chlorine (Hypochlorite)	Microbiological performance required
Quaternary Ammonium Compounds (QAC's)	Manual or C.I.P. System
Peracetic acid	Production Plant
Amphoterics	Toxicity
Aldehydes	Effect on product
Alcohol	Health and Safety
Chlorine Dioxide	Temperature
Iodophor	Foam characteristics
Phenolics	Time available for sanitation
Biguanide	Water hardness
Preservatives	Storage
Bacteriocines	Cost
	Concentration
	Residues

4.3.2.2 Summary of Sanitizers Activity

Type of Disinfectant	Type of Micro-Organism							
	Gram +ve bacteria	Gram -ve bacteria	Myco bacteria (e.g.) Tuberculosis	Pseudomonas species	Yeasts	Moulds	Spores	Viruses
Halogens (e.g. Chlorine Iodine, Chlorine Dioxide)	++	++	++	++	++	+	+	++
Q.A.C.	++	+	-	+ / -	++	+	-	+ / -
Q.A.C. + chelator	++	+	-	+	++	+	-	+ / -
Peracetic acids	++	++	++	++	+	+		++
Amphoterics	++	++	-	+ / -	++	+	-	+ / -
Amphoterics + chelator	++	++	-	+	++	+	-	+ / -

Type of Disinfectant	Type of Micro-Organism							
	Gram +ve bacteria	Gram -ve bacteria	Myco bacteria (e.g.) Tuberculosis	Pseudomonas species	Yeasts	Moulds	Spores	Viruses
Aldehydes	++	++	++	++	++	+	+	++
Alcohols (60-70%)	++	++	-	++	+	+	-	+ / -
Phenolics	++	++	-	-	+	-	-	+ / -
Acid Biguanides	++	++	-	+	+	+	-	+ / -

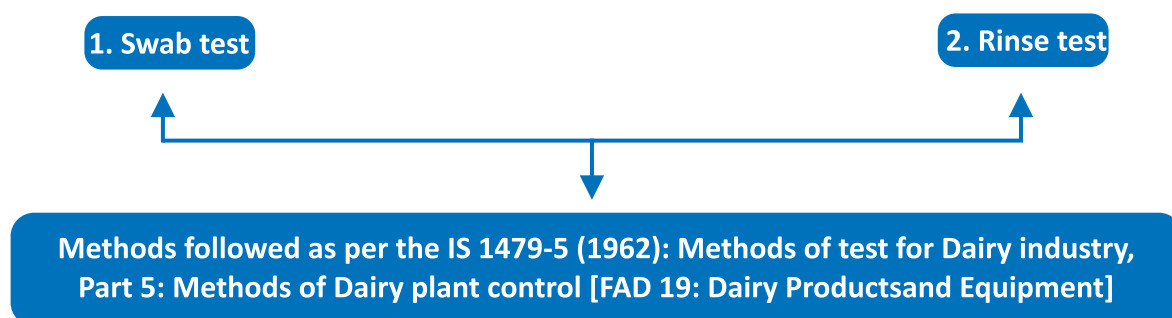
++ = Good Activity + / - = Limited & Selective Activity

+ = Moderate Activity - = No Practical Activity

4.3.2.3 Summary of Sanitizers Properties

Disinfectant Type	Possibility of Taint	Relative Toxicity	Corrosion
Hypochlorite	MEDIUM	MEDIUM	MEDIUM / HIGH
Q.A.C	LOW	LOW	LOW
Peracetic acid	LOW	LOW	LOW / MEDIUM
Amphoteric	LOW	LOW	LOW
Iodophor	MEDIUM / HIGH	MEDIUM / HIGH	MEDIUM / HIGH
Biguanide	LOW	LOW	LOW

4.4 Checks for Cleaning Efficiency





3. ATP Bioluminescence technique

Adenosine Triphosphate, or ATP, is the energy molecule found in all living cells making it a perfect indicator when trying to determine if a surface is clean or not.

Food processors use ATP systems to rapidly verify surfaces have been cleaned thoroughly so that new product runs are not contaminated by prior product runs, and to ensure biofilms are not developing on the surface that could affect quality.

4.5 Hygiene station for monitoring hygiene for workforce

Hygiene station is designed for the controlled passage of the workforce in and out of the work environment.

Hygiene station combines functions of hand and sole disinfection at the entry and sole cleaning at the exit from the work environment.

This type of Hygiene station is designed for larger production plants.

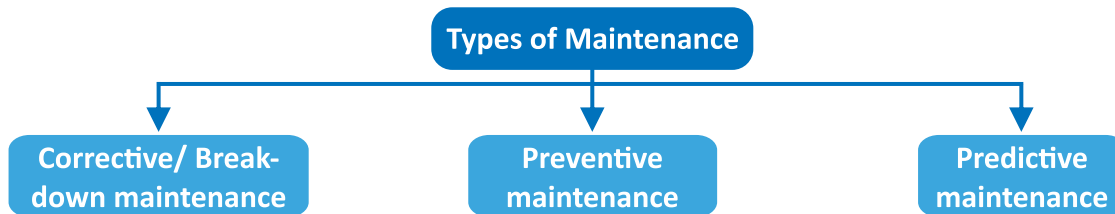
This double lane station enables the passage, in both the entry and exit direction.



4.6 Equipment Maintenance

Maintenance plays very important role for getting optimal efficiency of machine in Dairy plant.

There are 3 types of maintenance:



Corrective/ Break-down maintenance	Preventive maintenance	Predictive maintenance
Maintenance of equipment after equipment break down or malfunction is often most Expensive	Maintenance performed with the intent of avoiding failures, safety violations, unnecessary production losses, and to conserve original materials of fabrication	Advances in sensing and computing technology have given rise to 'predictive maintenance'
The worn out equipment part can damage other parts and lead to multiple damage and increase repair/ replacement costs.	The effectiveness of a preventive maintenance schedule depends on the Root Cause Analysis	It uses sensors to monitor key parameters within a machine or system and uses this data in conjunction with analysed historical trends to continuously evaluate the system health and predict a breakdown before it happens e.g. on-line monitoring of bowl speed, motor current, flow-rate etc. during operation of Clarifier / Cream separator / Bacteria removing clarifier.
Higher Machine downtime and Production loss	The history sheet maintained also helps in early detection of problems and increased equipment life.	The continuous temperature monitoring of say bearings or internal motor / transformer windings would enable the operator to take appropriate action even before the equipment is due for preventive maintenance.

4.6.1 List of processing plant equipment are as follows:

- Chiller
- Clarifier
- Milk Pasteurizer
- Bactria Removing Clarifier
- Cream Separator
- On-Line Milk Standardization Unit
- Cream Pasteurizer
- Homogenizer
- Valves & Pumps

4.6.1.1 Pasteurizer maintenance

- Periodic inspection of Pasteurizer for leakages and opening of Pasteurizer once in 6 months/1 Year.
- Checking of rubber gaskets i.e. corner gasket, channel plate gasket and end plate gasket when the Pasteurizer is opened every six months/year. In case leakages are observed before six months, it needs to be checked immediately.
- Checking of pin holes in PHE plates, block and tie-rod after every 10 years of interval.

4.6.1.2 Self-desludging Clarifier / Cream Separator / Bacteria Removing Clarifier

Two types of maintenance are required

- Intermediate maintenance- after every 2000 hour of machine run for parts above bowl and oil change in gear box
- Major maintenance- after every 8000 hour of machine run in which all parts i.e mechanical seals, bearings, O-rings and gaskets have to be changed

4.6.1.3 Homogenizer maintenance

Homogenizer	1	Homogenizing head	Valve Seat Forcer Impact Ring	Quarterly
	2	Oil Changing		After 5000 running hours

4.6.1.4 Valves maintenance

Sanitary Remote Butterfly Valve/Sanitary Remote Seat Valve/Sanitary Mix proof Valve

Sanitary Remote Butterfly Valve	Maintenance of Valves	Two Years	Service Kit
	Changing of Valve seat		Valve Seat
	Changing of Air pipe		PU Air Pipe
	Maintenance of Control Unit		Solenoid Valve

4.7 Instrumentation in Dairy sector

In the modern Dairies, considering the complex operations and scale of production, automation is unavoidable and inevitable. The basic dictum is if we can measure, we can control. The first step is, therefore, to measure the field parameters and then cross-check with standard values /parameters. The controlling and integration into the automation system comes thereafter.



Fig: Multi-parameter measurement, i.e. mass, temperature, density and viscosity



Fig: Level switch/measurement in small tanks and vessels

For measurements to be accurate, high precision instruments should be used. The instruments should also measure and provide accurate readings throughout its lifecycle. This requires calibration of the instruments at regular intervals. Why is **Validation&Calibration** necessary?

4.7.1 Validation It ensures that the instrument works correctly and provides accurate and reliable data /results.

4.7.2 Calibration Ensures on an on-going basis that the instrument is performing accurately

The word calibration is defined as “a test during which known values of measured and are applied to the transducer and corresponding output readings are recorded under specified conditions.” The definition includes the capability to adjust the instrument to zero and to set the desired span.

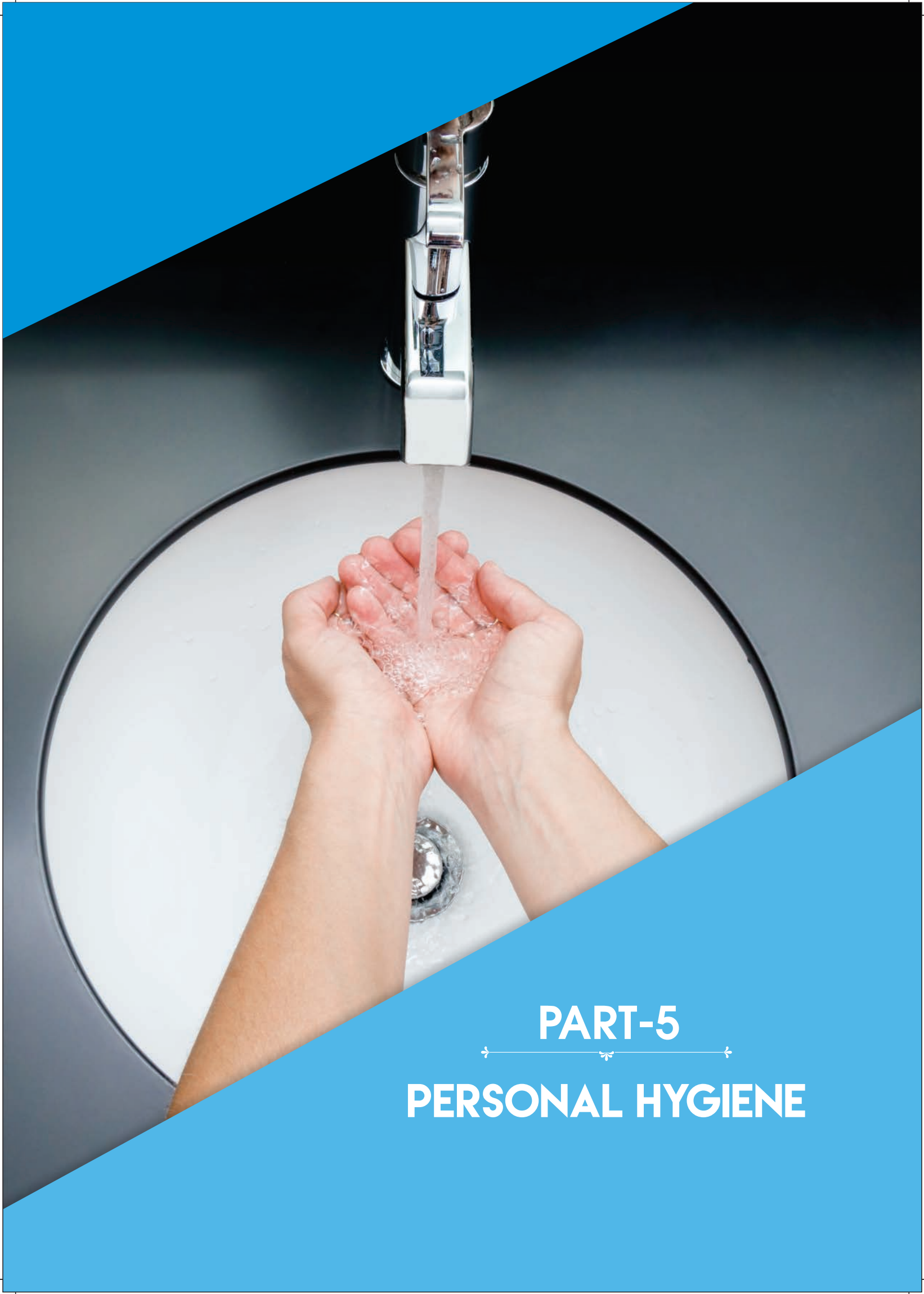
Calibration is a comparison of measuring equipment against a standard instrument of higher accuracy to detect, correlate, adjust, rectify & document accuracy of instrument being compared.

Rugged system must be in place to ensure that all instruments are calibrated

The instruments, which are generally used in the dairy plant, are listed as under with their calibration schedule:

NOTES

Handwriting practice lines consisting of 30 horizontal dashed blue lines.



PART-5



PERSONAL HYGIENE

PERSONAL HYGIENE

5.1 Health Status

- Personnel known, or believed, to be suffering from, or to be a carrier of a disease or illness likely to be transmitted through food, shall not be allowed to enter into any food handling area.
- The Food Business shall develop a system, whereby any person so affected, shall immediately report illness or symptoms of illness to the management and medical examination of a food handler shall be carried out apart from the periodic check-ups, if clinically or epidemiologically indicated.
- Arrangements shall be made to get the food handlers / employees of the establishment **medically examined once in a year** to ensure that they are free from any infectious, contagious and other communicable diseases.
- A record of these examinations signed by a registered medical practitioner shall be maintained for inspection purpose.
- The factory staff shall be compulsorily inoculated against the enteric group of diseases as per recommended schedule of the vaccine and a record shall be kept for inspection.
- In case of an epidemic, all workers are to be vaccinated irrespective of the scheduled vaccination.

The Food Business Operator shall employ those persons only in such an establishment to work directly with and handle raw materials or Dairy products if those persons have proved to the occupier's satisfaction by means of a medical certificate, on recruitment, that there is no medical impediment to their employment in that capacity.



Health check up by medical practitioners

An illustrative Performa is shown below and it can be downloaded from www.fssai.gov.in

**PERFORMA FOR MEDICAL FITNESS CERTIFICATE FOR FOOD HANDLERS
(FOR THE YERA)**

(See para No. 10.1.2, Part-II, Schedule - 4 of FSS Regulation, 2011)

It is certified that shri/Smt./miss..... employed with M/s , coming in direct contact with food items has been carefully examined* by me on date..... Based on the medical examination conducted, he/she is found free from any infectious or communicable diseases and the person is fit to work in the above mentioned food establishment.

Name and Signature with Seal
of Registered Medical Practitioner /
Civil surgeon

*** medical Examination to be conducted :**

1. Physical Examination
2. Eye Test
3. Skin Examination
4. compliance with schedule of Vaccine to be inoculated against enteric group of diseases
5. Any test required to confirm any communicable or infectious disease which the person suspected to be suffering from on clinical examination

5.2 Behavioural & personal cleanliness

5.2.1 Behavioural Hygiene Requirement

Persons working directly with and handling milk & milk products shall maintain the highest standards of personal cleanliness at all times. In particular, they shall

- Avoid certain hand habits - e.g. scratching nose, running finger through hair, rubbing eyes, ears and mouth, scratching beard, scratching parts of bodies etc. that are potentially hazardous when associated with handling Dairy products, and might lead to food contamination through the transfer of bacteria from the employee to product during its preparation. When unavoidable, hands should be effectively washed and sanitized before resuming work after such actions.
- Food handlers engaged in food handling activities shall refrain from smoking, spitting, chewing, sneezing or coughing over any food whether protected or unprotected and eating in food preparation and food service areas.
- The food handlers should trim their nails and hair periodically, do not encourage or practice unhygienic habits while handling food.

A. General Hygiene practices for food handlers



B. Good Behavioural Practices for food handler





5.2.2 PERSONAL CLEANLINESS

- Food handlers shall maintain a high degree of personal cleanliness. The food business shall provide to all food handlers adequate and suitable clean protective clothing, head covering, face mask, gloves and footwear and the food business shall ensure that the food handlers at work wear only clean protective clothes, head covering and footwear every day.
- Food handlers shall always wash their hands with soap and clean potable water, disinfect their hands and then dry with hand drier or clean cloth towel or disposable paper at the beginning of food handling activities immediately after handling raw food or any contaminated material, tools, equipment or work surface, where this could result in contamination of other food items or after using the toilet.
- Cover wounds to the skin with a suitable waterproof dressing. No person with injury on hand, even with dressing, shall be placed in any product making/handling section.

A. Hand Washing Step



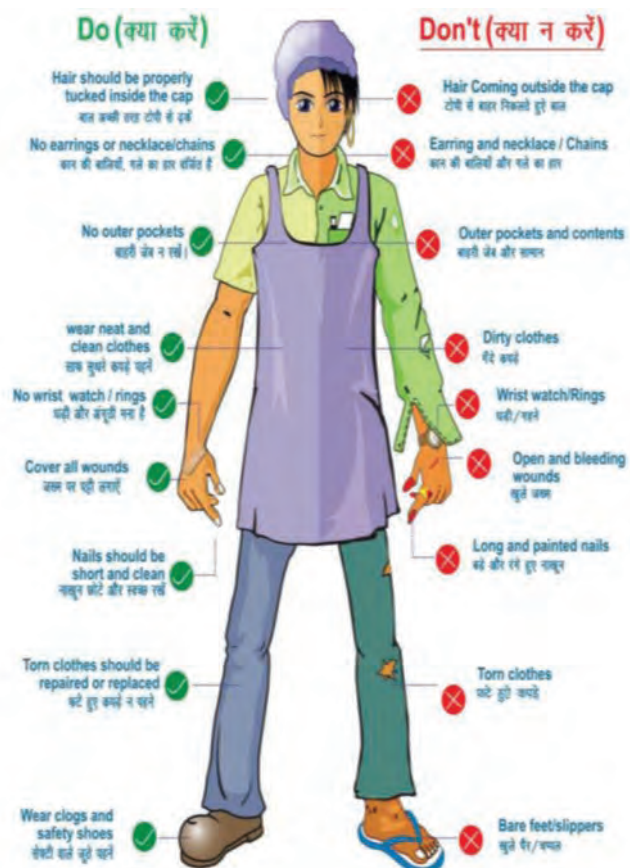
B. How to wash hand



C. When to wash your hands



D. Basic Requirements for Personal Hygiene



5.3 Visitors

- Generally, visitors should be avoided from going inside the food handling areas. Proper care has to be taken to ensure that food safety & hygiene is not being compromised due to visitors in the floor area.
- The Food Business shall ensure that visitors to its food manufacturing, storage or handling areas must wherever appropriate, wear protective clothing, footwear and adhere to the other personal hygiene provisions envisaged in this section.



Visitor policy shall be documented



Visitor shall be given visitor card with restricted entry



Visitor shall wear protective clothing & footwear and shall adhere to food safety provisions as mandate.

5.4 Health and Safety Policy

5.4.1 Health and safety policy is mandatory for all industries. Safety policy of Dairy industry is as follows:

- To provide a safe work environment for all employees working in Dairy premises.
- To provide the same safe and healthful environment for the company visitors.
- Safety policy shall be a cooperative effort between labour and management in order to prevent hazards, work related causes and minimize losses of property damage.
- The safety policy should have the first of management level. The occupier shall prepare as often as may be appropriate, revise a written statement of his general policy in respect of Health & Safety of workers.
- **Policy should contain:**
 - Assigning work responsibility related to particular safety hazard to each level in the unit Arrangement for involving the workers at different work of health and safety issues

- Relevant techniques and method (such as safety audits and risk assessment) for periodical interval at least once in every two years on the status of Dairy employees health and safety
- Arrangements for informing, educating and retraining own employees at different levels and the visitor

5.4.2 Safety systems for Dairy industry

- Dairy industry involves several hazards. To handle these hazardous environments following safety systems are very essential:

A. Fire fighting systems:

- Fire hydrant
- Fire Extinguishers for different types of Fires- A, B, C or combination
- Fire Sand Buckets
- Sprinkler systems

B. Emergency alerting system

- Smoke Detectors of optical and heat sensing type
- Ammonia Detector

C. Emergency Declaring systems

- Emergency Siren
- Manual Call Points

D. Emergency Indicating systems - Cold room bells

E. Escape routes

F. Assembly point

G. Wind sack

H. First Aid systems

- Ambu bag
- First Aid box

I. Personal Protective Equipment's (PPEs)

J. Emergency Control Room

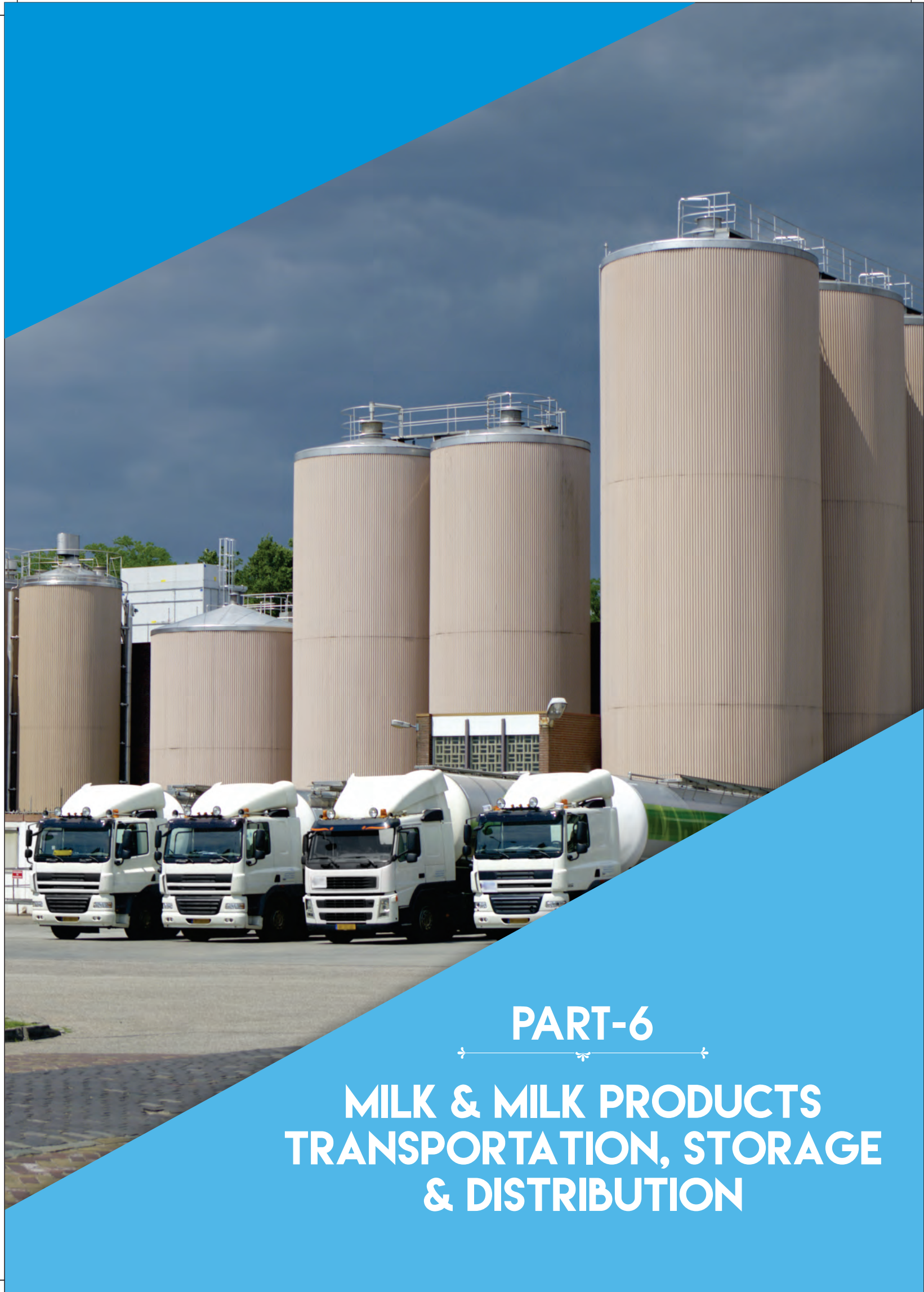
- The Appropriate personal protective equipment are very essential for a Dairy industry.
 - Safety helmets
 - Ammonia half Face mask
 - Safety belts
 - Goggles
 - Gloves
 - Supplied Air Line Mask
 - Ear muffs
 - Gum boots / shoes
 - Ear plugs
 - Aprons

5.4.3 Health and Safety Training

- Need of health and safety standards training of Dairy employees to work safely and without risks to health:
 - Develop a health and safety standards
 - Emergency plans after the incident of Bhopal gas disaster, the Factories Act 1948 has been amended and a new chapter. Preparation of On-site Emergency Plan by the occupier is mandatory. The occupier shall ensure
 - a mock drill of the on-site emergency plan is conducted at least one in every six months
- Identification of possible emergency situations in Dairy industry
 - The following emergency situations might arise in the Dairy industry
 - a. Ammonia leakage
 - b. Fire in Raw Material Stock Yard (Viz. Coal, PNG, LPG, and Furnace oil etc.)
 - c. Powder burning in Spray dryer
 - d. Explosion in boiler
- Teams
 - The following teams comprising members ranging from two in each have been nominated to discharge duties assigned to them.
 - a. Fire Fighting Team - to extinguish the fire
 - b. Repair & Task force Team – to keep rest of the plant in safe condition
 - c. Transport Team - to arrange transport for casualties
 - d. Medical Team - to arrange for aid, stretches, medicines
 - e. Safety Team - to arrange required safety equipment
 - f. Evacuation Team - to rescue the casualties on priority basis.

NOTES

NOTES



PART-6

MILK & MILK PRODUCTS TRANSPORTATION, STORAGE & DISTRIBUTION

MILK & MILK PRODUCTS TRANSPORTATION, STORAGE & DISTRIBUTION

6.1 Storage & Transportation

- The vehicles used to transport milk and milk products must be maintained in good condition and kept clean. Ensure that as much as possible the required temperature shall be maintained throughout the supply chain from the place of procurement or sourcing till it reaches the end consumer including chilling, transportation, storage etc.
- The cans/containers made up of mild steel metal and plastic material used for storage and transportation of milk and milk products shall not be allowed.
- Immediately after packaging the Dairy products shall be placed in designated rooms provided for storage under required temperature.
- Dairy products other than raw milk are stored under cooled conditions, their storage temperatures shall be registered and the cooling rate shall be such that the products reach the required temperature as quickly as possible.
- The maximum temperature at which pasteurized milk may be stored until it leaves the Dairy plant shall not exceed 5°C and must be transported in insulated vans..



Fig: 6.1 Road Tanker



Fig: 6.2 Rail Tanker

- Milk and milk products while in transport in packaged form or in containers shall maintain the required temperature.
- Whenever frozen food / raw materials are being used / handled / transported, proper care should be taken so that defrosted / thawed material are not stored back after opening for future use.



Fig: 6.3 Refrigerated vehicles for transportation of Dairy products like Ice-cream, Butter, Cheese and Paneer

- All critical links in the supply chain need to be identified and provided to minimize food spoilage during transportation.
- Processed / packaged and / or ready-to-eat food shall be protected as per the required storage conditions during transportation and / or service.
- Temperatures and humidity which are necessary for sustaining food safety and quality shall be maintained.
- The conveyance and /or containers shall be designed, constructed and maintained in such manner that they can effectively maintain the requisite temperature, humidity, atmosphere and other conditions necessary to protect food conveyances and / or containers used for transporting / serving foodstuffs shall be nontoxic, kept clean and maintained in good condition in order to protect Dairy Products from any contamination.
- Receptacles in vehicles and / or containers shall not be used for transporting anything other than Dairy products where this may result in contamination.
- Same conveyance or container is used for transportation of different Milk and Milk Products or high risk foods, effective cleaning and disinfections shall be carried out between loads to avoid the risk of cross- contamination.
- For bulk transport of food, containers and conveyances shall be designated and marked for food use only and be used only for that purpose.

6.2 GPS (Global Positioning System) for Monitoring of Tanker moment/ Refrigerated Vans

90% of the milk produced in India is collected from individual farmers by milk collection centre. Collected milk is then transported to a nearby chilling centre/Dairy Plant owned by a specific Milk

Union, if milk is received through Bulk Milk Cooler.

From processing and product manufacturing plant, packaged milk and milk products are then transported to Sales office/ Regions in Insulated/Refrigerated Trucks. Again, at Sales Office/Region Milk is then distributed to the different route in the region in smaller trucks or autos to milk sales agents. On top of intensive transportation operations, timing and efficiency very important for a Dairy for effective sales and customer service.

Any discrepancy in the transportation operation will cost Dairies a lot and also their reputation in the market will be at stake. Most of the Dairies will operate by outsourcing entire or part of the transportation vehicles so that they can concentrate on their core business than to worry about fleet management. So to avoid any discrepancy during transportation of milk and milk products, GPS System helps in effective and controlled transportation.

6.2.1 GPS will give Alert when Tanker/Van:

- Reached to destination
- Divert from route
- Tanker Stoppage more than specified time on unidentified location
- Over speed
- Device tempered/ power cable disconnected
- Engine On/off alert
- Tanker out of service alert
- Tanker not update from last one hour



6.2.2 Benefits of GPS System

- Track the location of theft and tempering activity
- Continuous monitoring of milk tanker while it is in transit so that one can monitor the route which milk tanker is following
- Accurate planning of product manufacturing
- Prevention of adulteration in milk and hence maintains the quality of milk
- Automation in data collection and accurate data of milk procurement
- Saving the cost of milk theft and adulteration

NOTES

NOTES

Handwriting practice area with 30 horizontal dashed lines.



PART-7

MANAGEMENT AND SUPERVISION

Management And Supervision

7.1 Standard Operating Procedure

A detailed Standard Operating Procedure (SOP) for the processing of food as well as its packaging, despatch and storage will be developed. A standard operating procedure, or SOP, is a living document showing technical instructions of how to perform a routine or repetitive task.

SOP aim to achieve efficiency, quality output and uniformity of performance, while reducing miscommunication and failure to comply with establishment requirements. The SOP should be based on 5W's & 1H (i.e. why, when, what, where, who & how)

A good standard operating procedure

- The Should provide all information necessary to perform a task
- Should usually specific to the equipment used for the procedure
- Should be meticulous
- Should be standalone
- Should provide quality information
- Should provide references

The technical managers and supervisors shall have appropriate qualifications, knowledge and skills on food hygiene principles and practices.

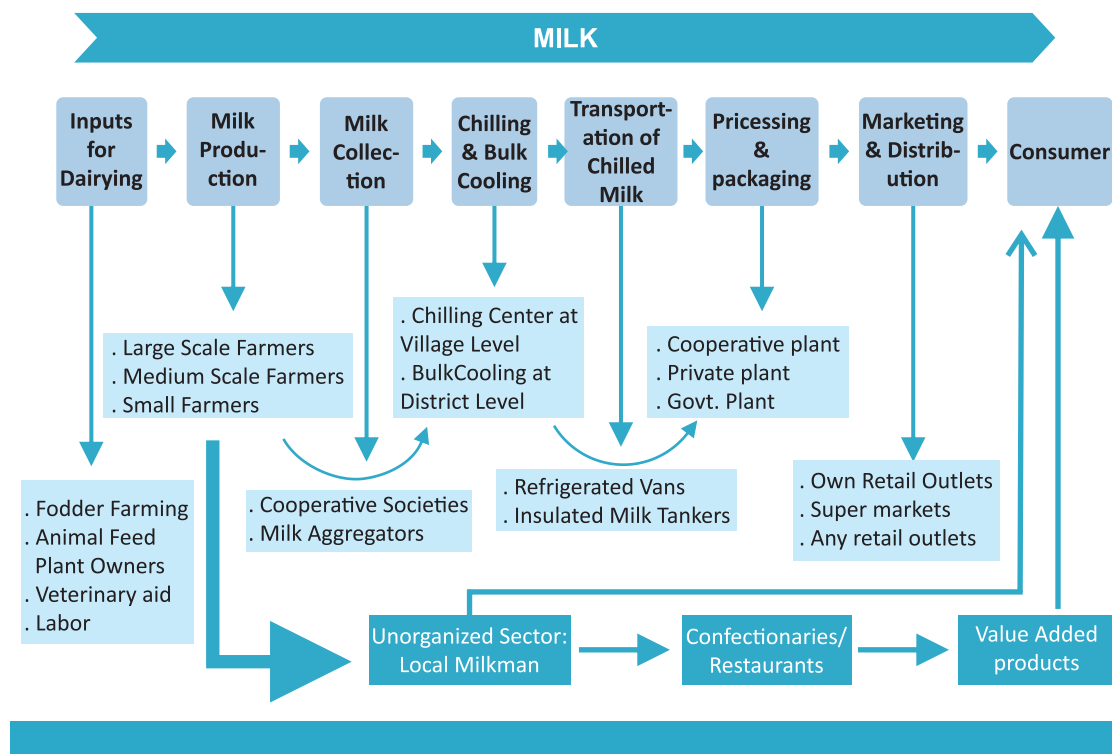
Condition of FSSAI license – The Food Business Operator shall employ at least one Technical person to supervise the production process.

Technical Qualification of the supervisor - at least a degree in science with Chemistry/ Bio-chemistry/ Food and nutrition/ Microbiology or a degree or diploma in Food Technology/ Dairy Technology/ Dairy Microbiology/ Dairy chemistry/ Dairy engineering or any degree or diploma in any other discipline related to the specific requirement of the business from a recognized university or institute or equivalent.

7.2 Supply chain of Indian Dairy Industry

- Supply of inputs for Dairying in form of fodder, cattle feed plant, veterinary aids for the cattle.
- Milk is taken out from the healthy milch animal on the daily basis by the Dairy farmers (large, medium and small scale farmers).
- Collection of milk by collection centres (various milk collection centre and milk cooperatives societies).
- Milk collected by the cooperative societies/Milk Collection Centre are sent to the Dairy plants where chilling of milk, processing and packaging of milk and milk products.
- The transportation of chilled/frozen milk and milk products from one place to another is done through the means of refrigerated vans, or insulated milk tankers/vans.

- Milk and milk products are transported to various retail outlets, supermarkets, and to retail markets from where the processed milk and milk products finally reach to their end consumers.



7.3 Cold Chain Management

Cold chain is a logistic system that provides a series of facilities for maintaining ideal storage conditions for perishables from the point of origin to the point of consumption.

The cold chain market can be divided into two types mainly:

- Refrigerated storage
- Refrigerated transport

The products and industries that rely on effective and efficient cold chain management include fresh fruits and vegetables, bakery and confectionary, chemicals and pharmaceuticals, dairy and frozen desserts, and fresh meats, fish, and seafood.

The ultimate goal for cold chain management is to deliver perishable Milk and Milk Products in a timely fashion while maintaining the quality of the products and increasing their shelf life.

7.3.1 Important aspects of Cold chain management in Dairy

- It extends and ensures the shelf life of Milk and Milk Products
- Retains the longevity of Milk products characteristics, active ingredients, freshness, nutritive value

Major infrastructure components of cold chain supply management:



Refrigerated storage facilitiesRefrigerated transport options



Packaging



Information System

NOTES

NOTES

Handwriting practice area with 30 horizontal dashed lines.

NOTES



PART-8

MILK & MILK PRODUCTS TESTING

Milk & Milk Products Testing

All products manufactured by Dairy must comply with the legal standard and should be acceptable by the consumers. The product must be safe for the consumers and comply FSSAI, BIS and AGMARK standards.

In laboratory all the raw material, ingredients, products in progress, finished products are tested for their physical as well as chemical & microbiological requirements. Packaging material is also tested for required strength & leakage and graded accordingly.

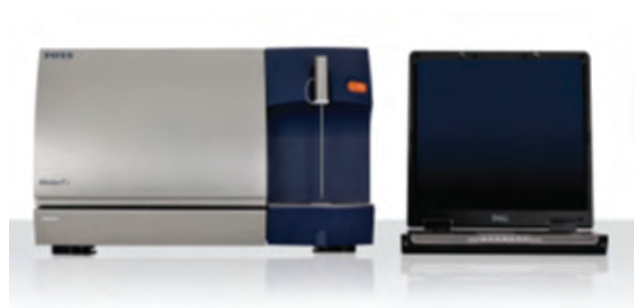
Manual for sampling & analysis of Milk and Milk products published by FSSAI is available on website as under:

http://old.fssai.gov.in/Portals/0/Pdf/Manual_Sampling_Guidelines_25_05_2016.pdf

http://old.fssai.gov.in/Portals/0/Pdf/Manual_Milk_25_05_2016.pdf

8.1 Equipment for Rapid analysis of Milk and Milk Products

A. Milk Analyser:



For analysis of Fat, Protein, Lactose, TS, SNF, Total Acidity, Density, FFA, Casein, and adulterants

B. Rapid Bacteria Counting Machine for Raw milk:



Analyse the individual bacterial count in raw milk for checking microbiological quality of Milk handled at Farmer and Dairy Cooperative Society/Milk Collection Centre.

Modern Dairies are also providing extra incentive for pouring low bacterial count milk to Dairy to encourage clean milk production.

C. Rapid Somatic Cell Counter for Raw Milk



Countsomatic cells in to milk, which gives the indication of mastitis disease in animal.

D. Butter/Cheese/Paneer Analyser



Accurately measures different parameters i.e. Fat, Moisture, Salt, TS, SNF.

E. Milk Powder Analyser



Accurately measures variety of parameters i.e. Moisture, Fat, Protein, Lactose, Acidity, Ash, Sucrose

Note:

The above shown equipment is for rapid analysis, still these equipment needs to be calibrated and results must be compared with results of conventional method of testing.

8.2 Safety Parameters for Contaminants

It is provided under the conditions of license as per FSSR licensing and registration regulations that

every FBO shall ensure that his food product is tested for relevant chemical and microbiological contaminants through FSSAI notified / NABL accredited at least once in six months.

Sr. No.	Parameter	Type of Product	Limit (ppm/weight)
1	Urea	Milk	700
Metal Contaminant			
2	Lead	Ice-cream, iced lollies and similar frozen confections	1.0
3	Arsenic	Milk	0.1
Crop Contaminant			
4	Aflatoxin M1	Milk	0.5 µg/kg
Insecticide			
5	Aldrin, Dieldrin	Milk and Milk products	0.15 (on a fat basis)
6	Chlordane	Milk and Milk products	0.05 (on a fat basis)
7	D.D.T.	Milk and Milk products	1.25 (on a fat basis)
8	Fenitrothion	Milk and Milk products	0.05 (on a fat basis)
9	Heptachlor	Milk and Milk products	0.15 (on a fat basis)
10	Hexachlorocyclohexane and its Isomers Alfa (α) Isomer:	Milk (whole)	0.02
	(b) Beta (β) Isomer :	Milk (whole)	0.02
	Gamma (γ) Isomer (Known as Lindane)	Milk	0.01 (on whole basis)
		Milk products (having less than 2 per cent fat)	0.20 (on whole basis)
	Delta (δ) Isomer :	Milk (whole)	0.02
11	Chlorpyrifos	Milk and Milk products	0.2 (fat basis)
12	Chlorpyrifos	Milk and Milk products	0.01(fat basis)
13	2,4D	Milk and Milk products	0.05
14	Ethion	Milk and Milk products	0.5 (fat basis)
15	Monocrotophos	Milk and Milk products	0.02
16	Paraquat Dichloride	Milk (whole)	0.01
17	Trichlorfon	Milk (whole)	0.05

NOTES

Handwritten notes in blue ink on lined paper. The notes are organized into several paragraphs, with some lines starting with a blue dot. The handwriting is cursive and somewhat slanted. The first paragraph discusses the importance of understanding the underlying principles of a system, rather than just its surface-level components. It mentions that a deep understanding allows for more effective problem-solving and innovation. The second paragraph talks about the challenges of implementing new ideas, particularly when it comes to gaining buy-in from stakeholders. It suggests that clear communication and demonstrating the benefits of the change are crucial. The third paragraph focuses on the role of leadership in driving organizational success, emphasizing the need for vision, integrity, and the ability to inspire others. The final paragraph touches upon the importance of continuous learning and adaptation in a rapidly changing world, noting that organizations must be flexible and open to new ideas to thrive.



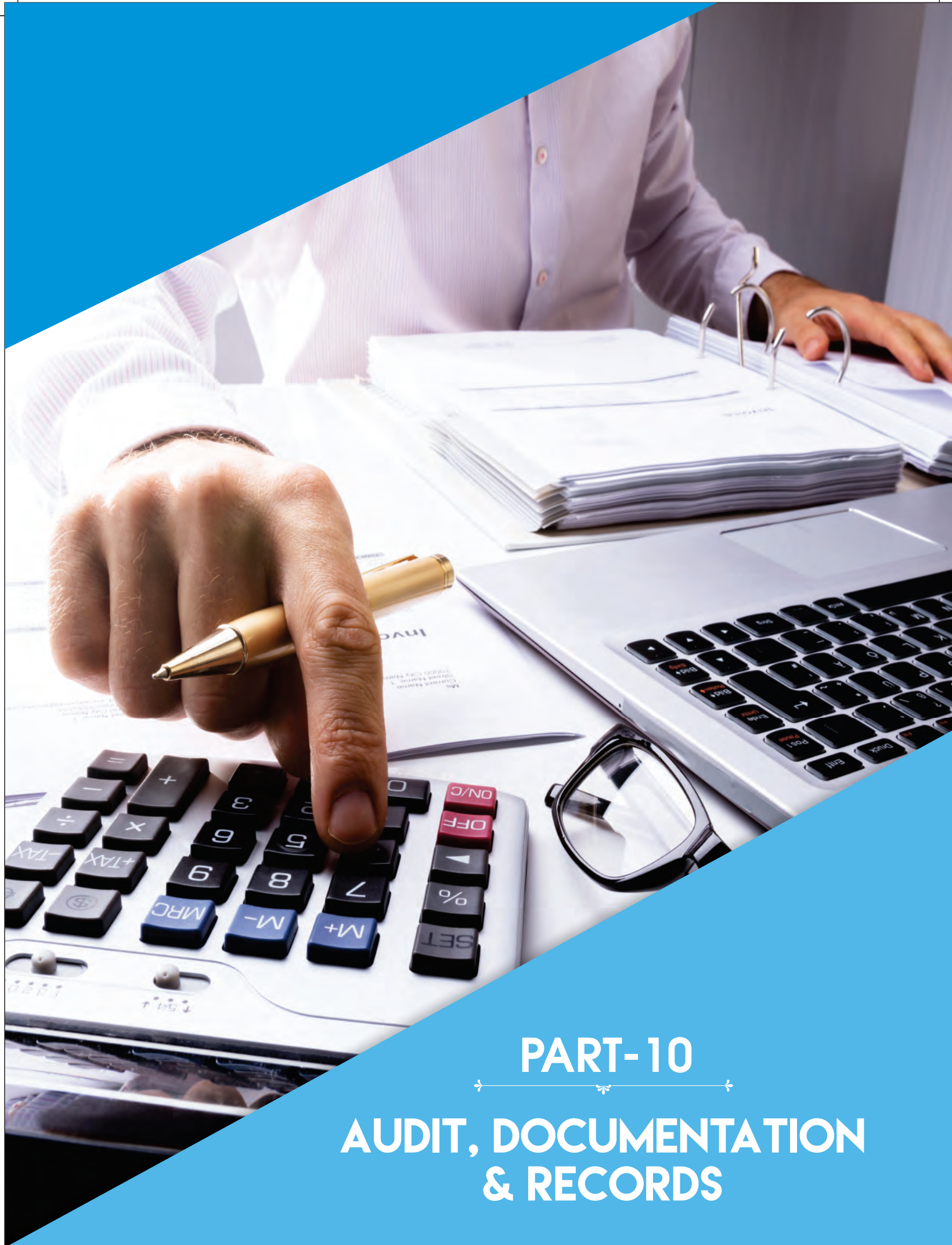
PART-9

TRAINING

TRAINING

- All food handlers shall be aware of their role and responsibility in protecting food from contamination.
- Food handlers shall have the necessary knowledge and skills which are relevant to food processing/ manufacturing, packaging, storing and serving.
- All food handlers shall be trained in food hygiene and food safety aspects along with personal hygiene requirements.
- Periodic assessments of the effectiveness of training, awareness of safety requirements and competency level shall be made.
- Training programmes shall be routinely reviewed and updated wherever necessary.

NOTES



PART-10

AUDIT, DOCUMENTATION & RECORDS

AUDIT, DOCUMENTATION & RECORDS

- A periodic audit of the whole system according to the SOP shall be done.
- Appropriate records of Milk tanker receipt, raw materials, production, storage, distribution, service, laboratory test results, cleaning and sanitation, pest control and product recall shall be kept.
- The records shall be retained for a period of one year or the shelf-life of the product, whichever is more.

List of records as mandated under Part 2 of Schedule 4 of Food Safety & Standards (Licensing & Registration of Food Businesses) Regulation, 2011

Sr.No.	Section	Section Name	Clause	Requirement
1	Part 2 Section 4	Facilities	4.1.3	Water storage tanks shall be cleaned periodically and records of the same shall be maintained in a register.
2	Part 2 Section 5	Food Operations and controls	5.1.3	Records of raw materials, food additives and ingredients as well as their source of procurement shall be maintained in a register for inspection.
3	Part 2 Section 7	Pest Control	7.02	The pest control measures adopted by the owner of shop should be kept as a record in the premises to be shown to any officer of the concerned Panchayats / Municipalities responsible for local administration/Corporation at the time of inspection.
4	Part 2	Medical fitness certificate	8.02	A certificate / records of medical fitness of all workers handling milk & milk products should be kept as a record in the premises to be shown to any officer of the concerned Panchayats / Municipalities responsible for local administration / Corporation at the time of inspection.
5	Part 2 Section 8	Audit, documentation and records	8.1	A periodic audit of the whole system according to the SOP shall be done to find out any fault / gap in the GMP/ GHP system.

Sr.No.	Section	Section Name	Clause	Requirement
6	Part 2 Section 8	Audit, documentation and records	8.2	Appropriate records of food processing / preparation, production / cooking, storage, distribution, service, food quality, laboratory test results, cleaning and sanitation, pest control and product recall shall be kept and retained for a period of one year or the shelf life of the product, whichever is more.
7	Part 2 Section 9	Sanitation and maintenance of establishment premises	9.1.1	A cleaning and sanitation programme shall be drawn up and observed and the record thereof shall be properly maintained, which shall indicate specific areas to be cleaned, cleaning frequency and cleaning procedure to be followed, including equipment and materials to be used for cleaning. Equipment used in manufacturing will be cleaned and sterilized at set frequencies.
8	Part 2 Section 9	Sanitation and maintenance of establishment premises	9.2.3	Pest infestations shall be dealt with immediately and without adversely affecting the food safety or suitability. Treatment with permissible chemical, physical or biological agents, within the appropriate limits, shall be carried out without posing a threat to the safety or suitability of food. Records of pesticides / insecticides used along with dates and frequency shall be maintained.
9	Part 2 Section 10	Personal Hygiene	10.1.2	Arrangements shall be made to get the food handlers / employees of the establishment medically examined once in a year to ensure that they are free from any infectious, contagious and other communicable diseases. A record of these examination assigned by a registered medical practitioner shall be maintained for inspection purpose.

NOTES

NOTES

Handwriting practice lines consisting of 30 horizontal dashed blue lines.



PART-11

PRODUCT INFORMATION & CONSUMER AWARENESS

PRODUCT INFORMATION & CONSUMER AWARENESS

All packaged food products shall carry a label and requisite information as per provisions of FSS Act, 2006 and Regulations made there under.

(Please refer <http://www.fssai.gov.in/home/fsslegislation/fssregulations.html>)

11.1 General Requirements of Labelling of Milk and Milk product

- Every pre-packaged food shall carry a label containing information as required here under unless otherwise provided, namely,—
- The particulars of declaration required under these Regulations to be specified on the label shall be in English or Hindi in Devnagri script: Provided that nothing herein contained shall prevent the use of any other language in addition to the language required under this regulation.
- Pre-packaged food shall not be described or presented on any label or in any labelling manner that is false, misleading or deceptive or is likely to create an erroneous impression regarding its character in any respect;
- Label in pre-packaged foods shall be applied in such a manner that they will not become separated from the container;
- Contents on the label shall be clear, prominent, indelible and readily legible by the consumer under normal conditions of purchase and use;
- Where the container is covered by a wrapper, the wrapper shall carry the necessary information or the label on the container shall be readily legible through the outer wrapper and not obscured by it;
- License number shall be displayed on the principal display panel in the following format



11.2 Specific Requirements/ Restrictions on manner of labelling of Milk and Milk product

11.2.1 Labelling of infant milk substitute and infant food

- An article of infant milk substitutes /infant foods, whose standards are not prescribed under Food Safety and Standards (Food Products standards and Food Additives) Regulations, 2011 shall be manufactured for sale, exhibited for sale or stored for sale only after obtaining the approval of such articles of food and its label from the Authority.
- Without prejudice to any other provisions relating to labelling requirements contained in these regulations, every container of infant milk substitute or infant food or any label affixed thereto

shall indicate in a clear, conspicuous and in an easily readable manner, the words “IMPORTANT NOTICE” in capital letters and indicating there under the following particulars, namely:—

- a statement “MOTHER'S MILK IS BEST FOR YOUR BABY” in capital letters. The types of letters used shall not be less than five millimeters and the text of such statement shall be in the Central Panel of every container of infant milk substitute or infant food or any label affixed thereto. The colour of the text printed or used shall be different from that of the background of the label, container as the case may be. In case of infant food, a statement indicating “infant food shall be introduced only (after the age of six months and upto the age of two years)” shall also be given;
 - a statement that infant milk substitute or infant food should be used only on the advice of a health worker as to the need for its use and the proper method of its use;
 - a warning that infant milk substitute or infant food is not the sole source of nourishment of an infant;
 - a statement indicating the process of manufacture (e.g spray dried) except in case of infant foods, instruction for appropriate and hygienic preparation including cleaning of utensils, bottles and teats and warning against health hazards of inappropriate preparations, as under;

“Warning/ caution-Careful and hygienic preparation of infant foods/infant milk substitute is most essential for health. Do not use fewer scoops than directed since diluted feeding will not provide adequate nutrients needed by your infant. Do not use more scoops than directed since concentrated feed will not provide the water needed by your infant”.
 - the approximate composition of nutrients per 100 gm of the product including its energy value in Kilo Calories/Joules;
 - the storage condition specifically stating “store in a cool and dry place in an air tight container” or the like (after opening use the contents within the period mentioned or the expiry date whichever is earlier);
 - the feeding chart and directions for use and instruction for discarding leftover feed;
 - Instruction for use of measuring scoop (level or heaped) and the quantity per scoop (scoop to be given with pack);
 - indicating the Batch No. Month and Year of its manufacture and expiry date
 - the protein efficiency ratio (PER) which shall be minimum 2.5 if the product other than infant milk substitute is claimed to have higher quality protein;
 - the specific name of the food additives, if permitted, shall be declared in addition to appropriate class names.
-
- No containers or label referred relating to infant milk substitute or infant food shall have a picture of infant or women or both. It shall not have picture or other graphic materials or phrases designed to increase the saleability of the infant milk substitute or infant food. The

terms “Humanised” or “Maternalised” or any other similar words shall not be used. The Package and/or any other label of infant milk substitute or infant food shall not exhibit the words, “Full Protein Food”, “energy Food”, “Complete food” or “Health Food” or any other similar expression.

➤ The containers of infant milk substitute meant for (premature baby (born before 37 weeks)/low birth weight infant (less than 2500gm) or labels affixed thereto shall indicate the following additional information, namely:—

- the words [PREMATURE BABY (BORN BEFORE 37 WEEKS) LOW BIRTH WEIGHT (LESS THAN 2.5 KG] in capital letters along with the product name in central panel;
- a statement “the low birth weight infant milk substitute shall be withdrawn under medical advice as soon as the mother's milk is sufficiently available”; and
- a statement “TO BE TAKEN UNDER MEDICAL ADVICE” in capital letters.

➤ The product which contains neither milk nor any milk derivatives shall be labelled “contains no milk or milk product” in conspicuous manner.

➤ The container of infant milk substitute for lactose or lactose and sucrose intolerant infants or label affixed thereto shall indicate conspicuously “LACTOSE-FREE or SUCROSE-FREE or LACTOSE and SUCROSE-FREE” in capital letters and statement “TO BE TAKEN UNDER MEDICAL ADVICE” and shall also bear the following statements, namely:—

“Lactose free Infant Milk Substitute should only be used in case of diarrhea due to lactose intolerance. The lactose free/sucrose free Infant Milk Substitute should be withdrawn if there is no improvement in symptoms of intolerance”.

➤ The container of infant milk substitute meant for infants with allergy to cow's /buffalo's milk protein or soy protein or label affixed thereto shall indicate conspicuously “HYPOALLERGENIC FORMULA” in capital letters and statement “TO BE TAKEN UNDER MEDICAL ADVICE”.

➤ Declaration to be surrounded by line:

There shall be a surrounding line enclosing the declaration where the words “unsuitable for babies” are required to be used.

➤ Distance of surrounding line:

The distance between any part of the words “unsuitable for babies” surrounding the line enclosing these words shall not be less than 1.5 mm.

11.2.2 CONDENSED MILK OR DESICCATED (DRIED) MILK:

Every package containing condensed milk or desiccated (dried) milk shall bear a label upon which is printed such one of the following declarations as may be applicable or such other declaration substantially to the like effect as may be allowed by the State Government, namely,—

- In the case of condensed milk (unsweetened):

CONDENSED MILK UNSWEETENED
(Evaporated Milk) (This tin contains the equivalent) of (x)..... litres of toned milk

- In the case of condensed milk (unsweetened):

CONDENSED MILK SWEETENED
This tin contains the equivalent of (x)..... litres of toned milk with sugar added

- In the case of condensed skimmed milk (unsweetened):

CONDENSED SKIMMED MILK UNSWEETENED
(Evaporated Skimmed Milk) This tin contains the equivalent of (x).....
litres of skimmed milk

- In the case of condensed skimmed milk (sweetened):

CONDENSED SKIMMED MILK SWEETENED
This tin contains the equivalent of (x).....litres of skimmed milk with sugar added”

- In the case of condensed milk (sweetened and flavoured):

This has been flavoured with.....
NOT TO BE USED FOR
INFANTS BELOW SIX MONTHS

- In the case of condensed milk/condensed Skimmed milk (unsweetened) Sterilised by Ultra High Temperature (UHT) treatment:

This has been sterilised by UHT Process

- In the case of milk powder:

MILK POWDER
This tin contains the equivalent of
(x)..... litres of toned milk

- In the case of milk powder which contains lecithin:

MILK POWDER IN THIS PACKAGE CONTAINS LECITHIN

- In the case of partly skimmed milk powder:

PARTLY SKIMMED MILK POWDER
This tin contains the equivalent of (x)..... litres of partly skimmed milk
having..... per cent milk fat

- In the case of skimmed milk powder:

SKIMMED MILK POWDER
This tin contains the equivalent of (x)..... litres of skimmed milk

- The declaration shall in each case be completed by inserting at (x) the appropriate number in words and in figures, for example, “one and a half (1½)”, any fraction being expressed as eight

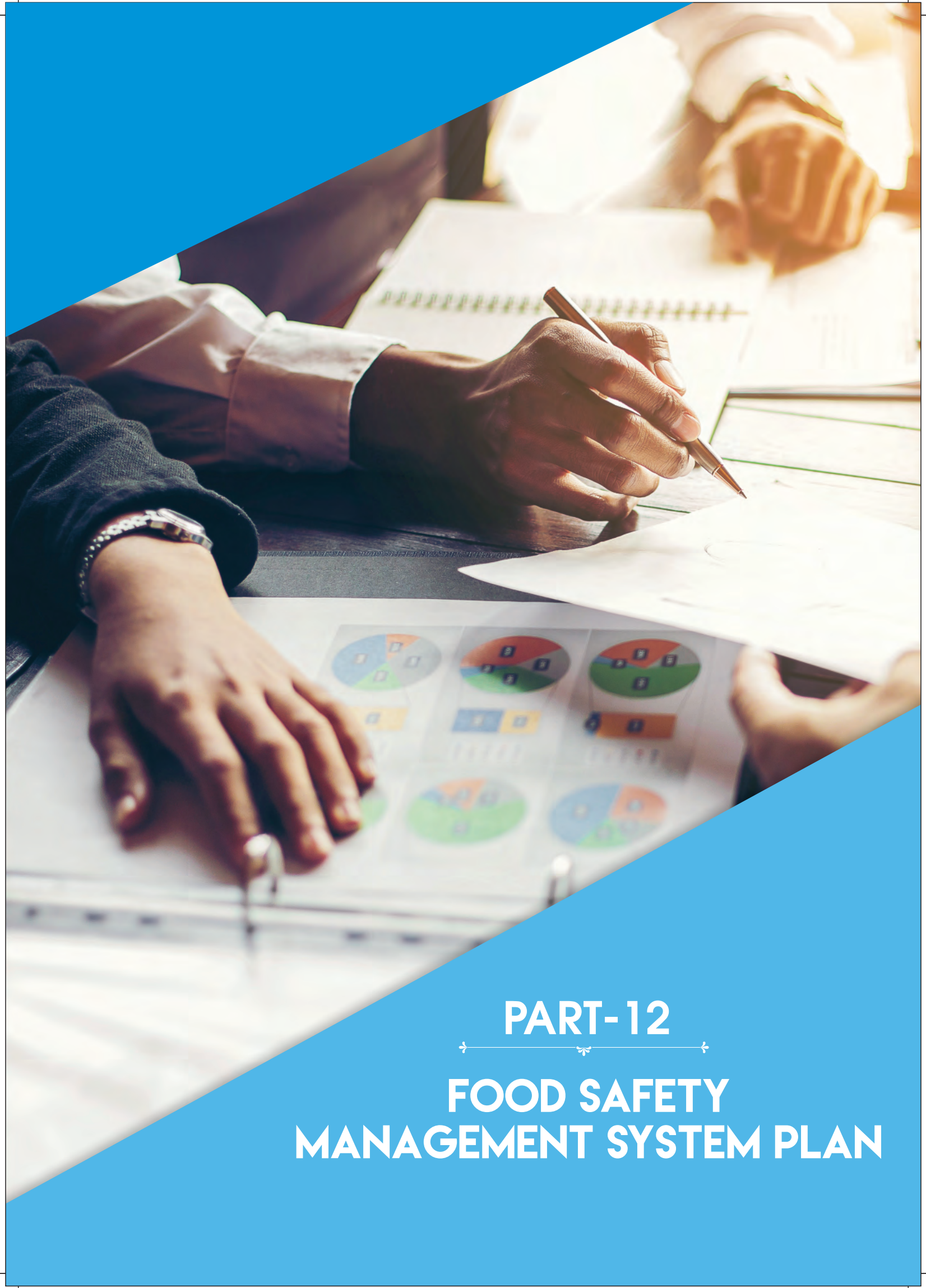
quarters or a half, as the case may be.

- There shall not be placed on any package containing condensed milk or desiccated (dried) milk any comment on, explanation of, or reference to either the statement of equivalence, contained in the prescribed declaration or on the words “machine skimmed” “skimmed” or “unsuitable for babies” except instructions as to dilution as follows:
- “To make a fluid not below the composition of toned milk or skimmed milk (as the case may be) with the contents of this package, add (here insert the number of parts) of water by volume to one part by volume of this condensed milk or desiccated (dried) milk”.
- Sweetened condensed milk and other similar products which are not suitable for infant feeding shall not contain any instruction of modifying them for infant feeding.
- Wherever the word “milk” appears on the label of a package of condensed skimmed milk or of desiccated (dried) skimmed milk as the description or part of the description of the contents, it shall be immediately preceded or followed by the word “machine skimmed” or “partly skimmed”, as the case may be.
- Fluid milk: — The caps of the milk bottles/pouch/tetrapack shall clearly indicate the nature of the milk contained in them. The indication may be either in full or by abbreviation shown below:
 - Buffalo milk may be denoted by the letter 'B'.
 - Cow milk may be denoted by the letter 'C'
 - Goat milk may be denoted by the letter 'G'
 - Standardized milk may be denoted by the letter 'S'
 - Toned milk may be denoted by the letter 'T'
 - Double toned milk may be denoted by the letter 'DT'
 - Skimmed milk may be denoted by the letter 'K'
 - Pasteurised milk may be denoted by the letter 'P'; followed by the class of milk. For example
 - Pasteurised Buffalo milk shall bear the letters 'PB'.
 - Alternatively suitable indicative colours of the packs/caps/bags shall be indicative of the nature of milk contained in them, the classification of colours being displayed at places where milk is sold\stored or exhibited for sale, provided that the same had been simultaneously intimated to the concerned Designated Officer, and information disseminated through the local media

11.2.3 Ice-cream and Frozen Dessert/Low fat Paneer/Channa/Cheese

- Every dealer in ice-cream or mixed ice-cream who in the street or other place of public resort, sells or offers or exposes for sale, ice-cream or ice-candy, from a stall or from a cart, barrow or other vehicle or from a basket, phial, tray or other container used without a staff or a vehicle shall have his name and address along with the name and address of the manufacturer, if any, legibly and conspicuously 'displayed' on the stall, vehicle or container as the case may be.

NOTES



PART-12

FOOD SAFETY MANAGEMENT SYSTEM PLAN

FOOD SAFETY MANAGEMENT SYSTEM PLAN

Introduction

Structure of the FSMS Program

Flow chart

FSMS Plan

Conclusion

12.1 Introduction of FSMS:

Internationally and even in India, there are many Food Safety Certifications which meets these requirements. These are Hazard Analysis and Critical Control Point (HACCP), ISO 22000, Food Safety System Certification (FSSC) 22000 and many more. These are voluntary certifications to strengthen the food safety system.

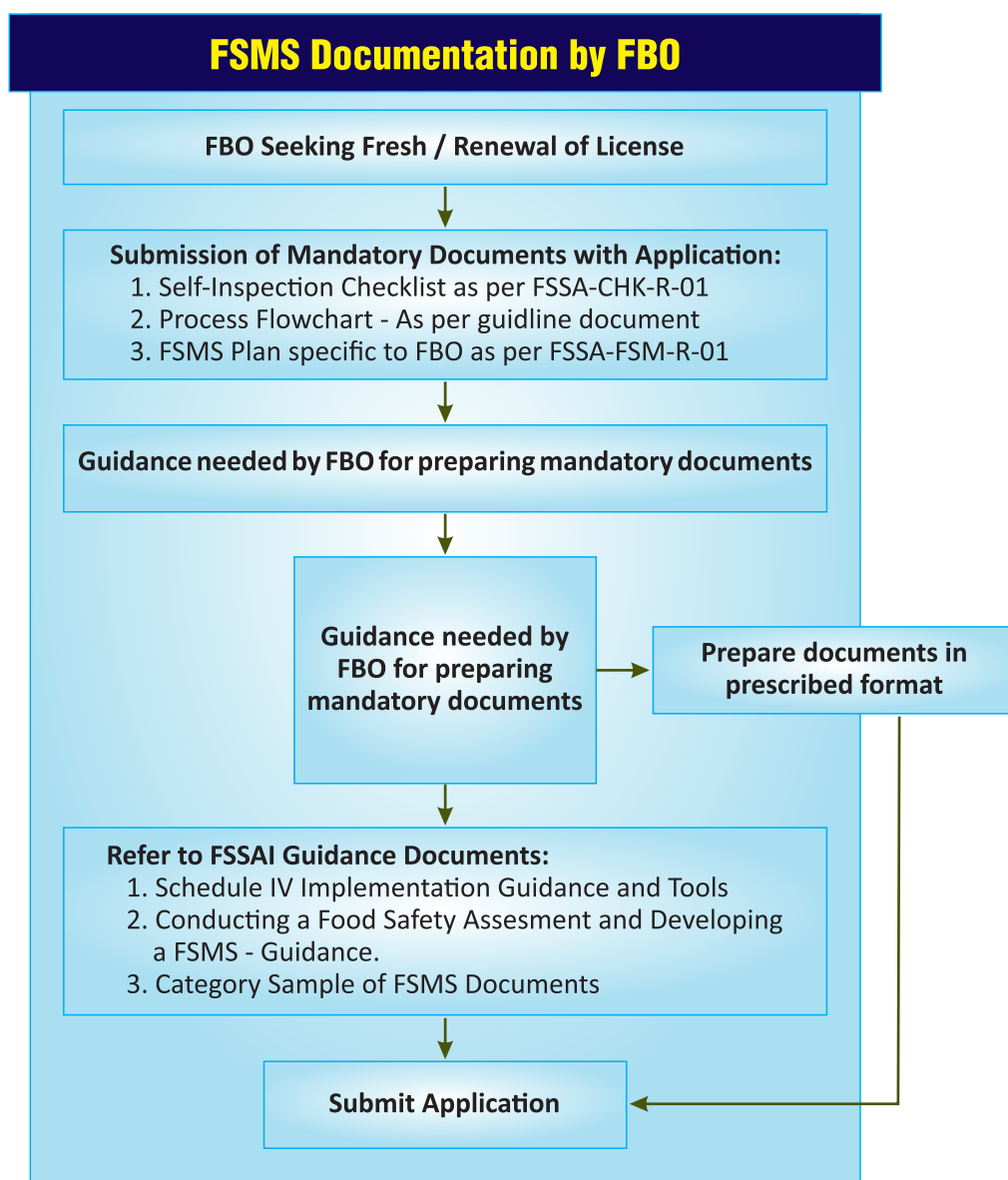
A Food Safety Management System (FSMS) is a network of interrelated elements that combine to ensure that food does not cause adverse human health effects. These elements include programs, plans, policies, procedures, practices, processes, goals, objectives, methods, controls, roles, responsibilities, relationships, documents, records, and resources. The purpose of FSMS is to ensure the manufacture, storage, distribution and sale of safe food.

However, under current Indian regulation defined by the FSS Act 2006, Food Safety Management System (FSMS) means the adoption Good Manufacturing Practices, Good Hygienic Practices, Hazard Analysis and Critical Control Point and such other practices as may be specified by regulation, for the food business.

The Key elements of FSMS:

- Good Practices/ Pre Requisites Programmes
- Hazard Analysis /HACCP
- Management Element / System
- Statutory and regulatory requirements
- Communication

12.1.1 FSMS Documentation by FBO



12.1.2 Structure of the FSMS Program

FSMS Program will cover following documents

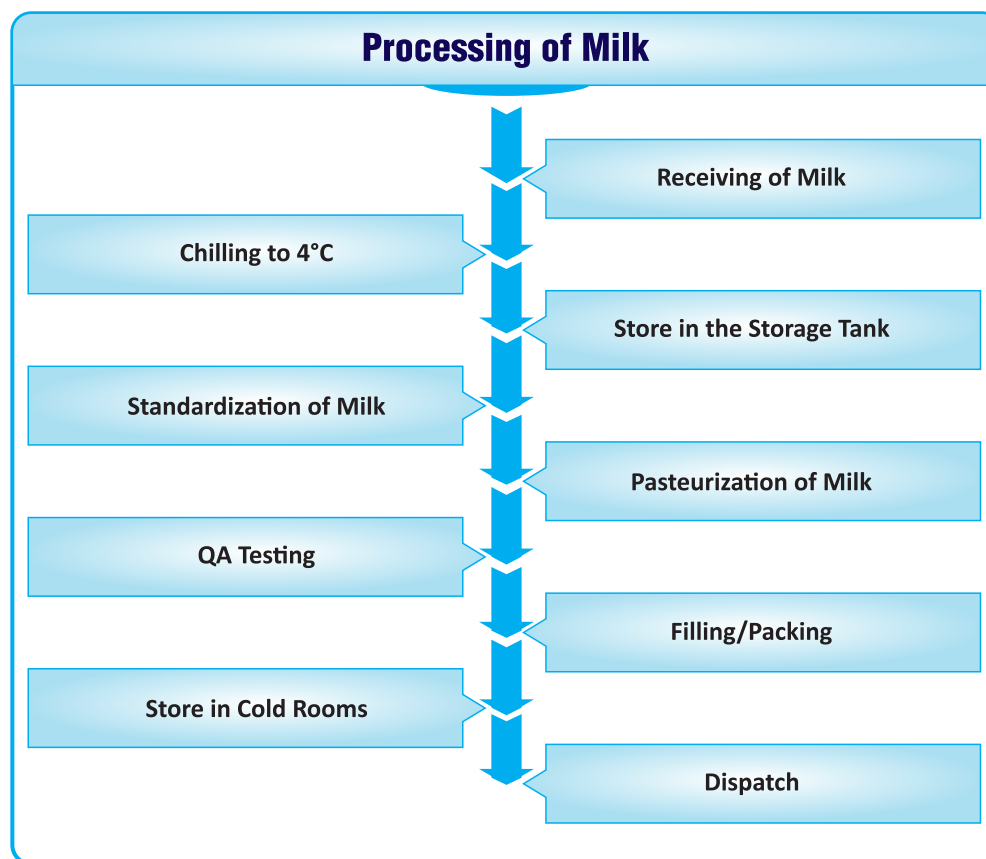
1. The FSMS Plan (samples are provided as guidance) and
2. Flow chart of for the Process
3. A self-inspection checklist, which is to be submitted as an annexure to the plan.

Note: These documents will need to be submitted by the FBO as part of application for new license or renewal of license. Also the FSSAI approved audit agency may inspect the FBOs on basis of this scope.



12.2 Flow chart

Sample Flowchart for Pasteurised Milk



12.3 FSMS Plan

Every manufacturing / processing unit should submit a Food Safety Management System Plan. It has to be developed based on Schedule – 4 of Food Safety and Standards Regulation, 2011 in which general hygienic and sanitary practices to be followed by food business operators have been elaborated. Along with sanitation and maintenance of establishment premises, personal hygiene of workers as well as personal cleanliness is also to be ensured by the FBO's.

Mineral Salts	What problems could happen?
Control measures	What you do to stop problems
Critical Limits	What are the critical limits set for each control measure
Monitoring method	How do you make sure that what you are doing stops the problem
Corrective Action	What you do if something goes wrong
Records	What records you keep

NOTES

Handwriting practice lines consisting of 30 horizontal dashed blue lines.

NOTES



PART-13

HACCP (HAZARD ANALYSIS AND CRITICAL CONTROL POINT)

HACCP (Hazard Analysis and Critical Control Point)

Introduction

HACCP Principles

Purpose & Importance of Hazard Analysis

Hazard Analysis Process, Hazard Identification& Evaluation, Control Measures

Flow Diagram of Liquid Milk & UHT Milk processing

Milk is highly perishable commodity and a nutritious food so there is high risk of hazard or food poisoning. Hazard analysis is the process used by the HACCP team to determine which potential hazards present a significant health risk to consumers. Only those hazards that pose significant risk to the health of consumers should be included in the HACCP plan.

13.1 HACCP Principles

PRINCIPLE 1	Conduct a hazard analysis
PRINCIPLE 2	Determine Critical Control Points (CCP)
PRINCIPLE 3	Establish critical limit (s).
PRINCIPLE 4	Establish a system to monitor control of the CCP.
PRINCIPLE 5	Establish corrective action to be taken when monitoring
PRINCIPLE 6	Establish procedures for verification to Confirm that HACCP system is working effectively.
PRINCIPLE 7	Establish documentation concerning all procedures & records appropriate to these principles and their application

13.1.1 Purpose of the Hazard Analysis

- The purpose of the hazard analysis is to develop a list of hazards, which are of such significance that they are reasonably likely to cause injury or illness if not effectively controlled.
- Successful application of HACCP principles 2-7 depends on a high-quality hazard analysis

13.1.1.1 Importance of Conducting a Thorough Hazard Analysis

- An improper hazard analysis may result in a HACCP plan that is not effective in protecting consumers regardless of how well it is followed.
- Plant operations may be modified based on a thorough hazard analysis.

13.1.2 Hazard Analysis Process

- Hazard Identification and Determination of Acceptable Levels
- List of potential hazards that may be associated with a milk and milk product.

- Determination of the acceptable level for each identified food safety hazard.

13.1.3 Hazard Identification

- HACCP team develops a list of potential biological, chemical, and physical hazards that may be introduced, increased, or controlled at each step described on the product flow diagram.
- The preliminary information collected while developing the product description
- Experience
- External information including, when possible, epidemiological and other historical data
- Information from the food chain on food safety hazards that may be of relevance for the safety of the end products, intermediate products and the food at consumption

13.1.4 Determination of Acceptable Levels

- For each food safety hazard identified, its acceptable level in the end- product shall be determined whenever possible.
- This determination shall consider:
 - Regulatory requirements
 - Customer requirements
 - Intended use by the customer
 - Other relevant data
- Record the result of the determination and its justification.

13.1.5 Hazard Evaluation

- Evaluation based on the likelihood of occurrence and the severity of effects of a particular hazard.
- Identify which of the potential hazards pose a significant risk to the consumer.
- The HACCP team decides which of the potential hazards listed during hazard identification stage present a significant risk to consumers.
- Each potential hazard should be evaluated based on two factors:
 - ✓ Severity (of the potential illness or injury)
 - ✓ Likelihood of occurrence

A. Evaluating Severity

- Will require consideration of various factors, including:
 - Susceptibility of intended customers to foodborne illness (e.g. children versus adults)
 - Possible impact of secondary problems
 - Magnitude and duration of the illness or injury

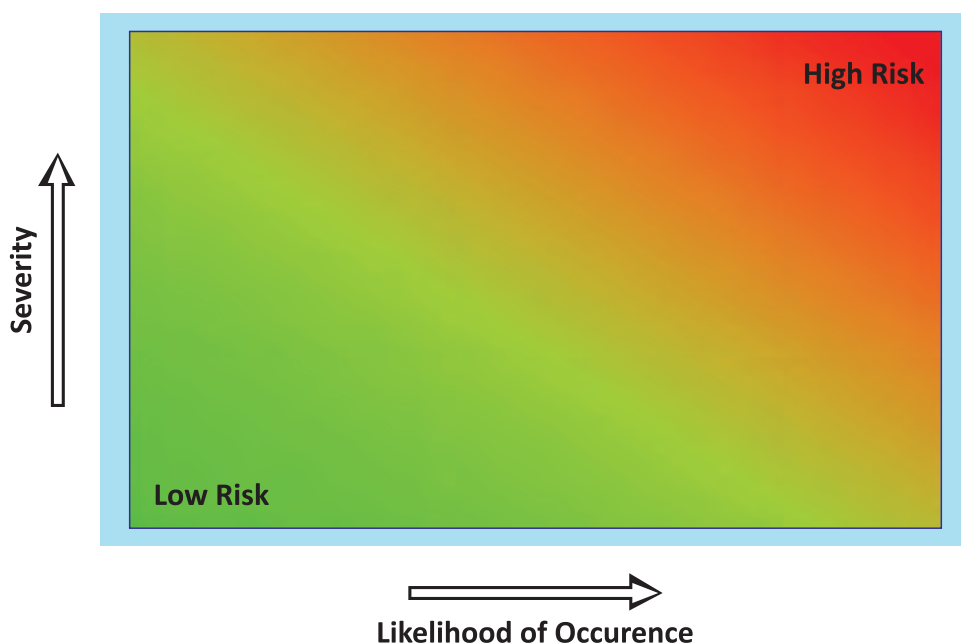
B. Estimating Likelihood of Occurrence

- Experience
- Data from past foodborne illness outbreaks
- Information in the scientific literature
- Historical information gathered by the establishment

C. Factors Influencing Likelihood of Occurrence

- Effectiveness of prerequisite programs
- Frequency of association of the potential hazard with the food or ingredient
- Method of preparation
- Conditions during transportation
- Expected storage conditions
- Likely preparation steps before consumption

13.1.6 Evaluating Hazards



13.1.7 Hazards that Pose a Significant Risk

- Should be addressed in the HACCP plan
- Control measures must be described for each hazard that will prevent, eliminate, or reduce the hazard to an acceptable level.
- Significant hazards may be different for the same product produced at different facilities.

13.1.8 Control Measures

- Any action or activity that can be used to prevent or eliminate a food safety hazard, or reduce it

to an acceptable level.

- Often termed “Preventive Measures” in earlier HACCP documents.
- More than one control measure may be required for a specific hazard.
- More than one hazard may be addressed by a specific control measure.

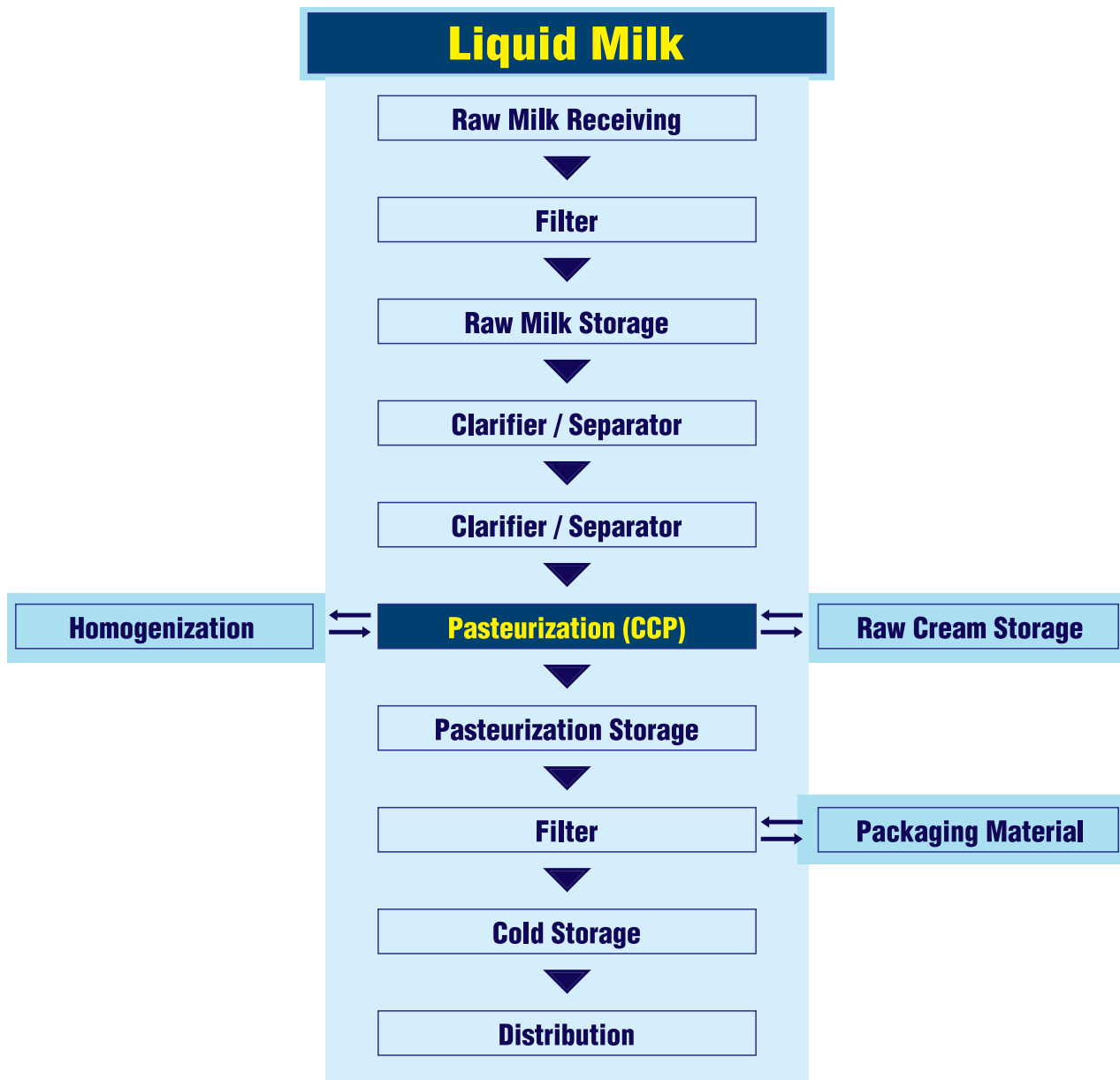
Examples of Control Measures

- Filtration
- Pasteurization
- Thermal processing
- Acidification
- Fermentation
- Disinfection
- Refrigeration
- Freezing
- Metal detectors
- X-ray devices
- Irradiation

13.1.9 Selection and categorization of control measures shall include assessments with regard to:

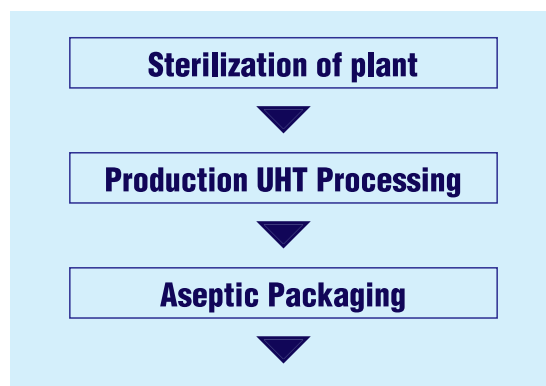
- Its effect on identified food safety hazards
- Its feasibility for monitoring
- Its place in the system relative to other control measures
- The likelihood of failure of a control measure or significant processing variability
- The severity of consequences in case of a failure
- Whether the control measure is specifically established and applied to eliminate or significantly reduce the level of hazards
- Synergistic effects between control measures
- Summarize the Hazard Analysis
- Identify potential hazards for each step in the process flow diagram.
- Determine significance of identified hazards, and justify this decision.
- Identify control measures that can be applied at each step to control the identified hazards.
- Keep records of this analysis.

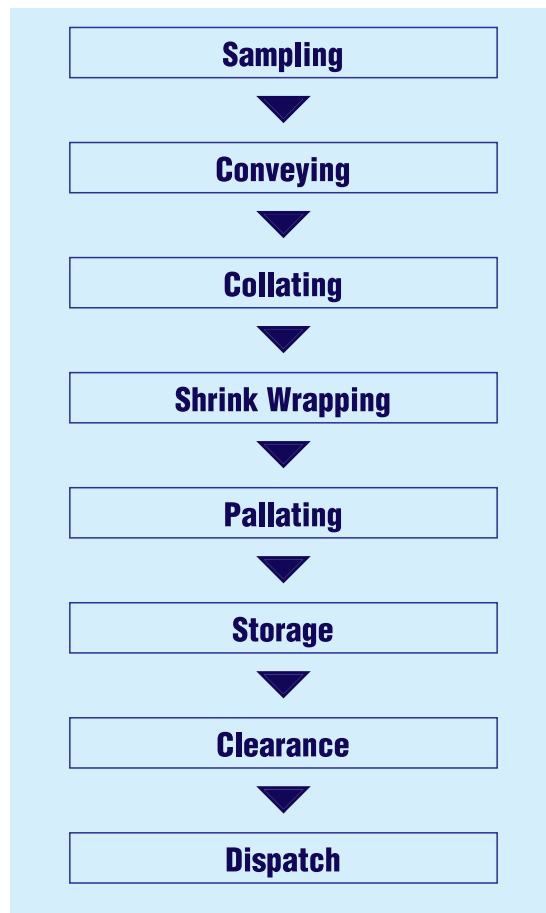
13.2 Flow Diagram of Liquid Milk processing



CCP: **Pasteurization** of Milk temperature minimum 72° C for 15 Sec and chilling below 4° C

13.3 Flow Diagram of UHT Milk processing





CCP: Milk **Sterilization** temperature minimum 137° C for 4 Sec.

Section	Sr no	CCP No	Process Step	General Critical Limit (Varies according to Plant design and Quality of Milk)
Liquid Milk Processing	1	1	Pasteurization of milk	Pasteurization of Milk at (76+2 OC) for 15 sec and Chilling temp <4 OC For Cheese milk Pasteurization at (73+1 OC) for 15 sec and Chilling temp <4 OC
	2	2	Pasteurization of Cream	Pasteurization of Cream 85-90 OC , no hold and chilling temp 8 to 12 OC
Butter	3	1	Metal Detector	Minimum detection limit: Ferrous: 3.5 mm Non-ferrous: 4.0 mm SS 316: 4.5 mm
Ice cream	4	1	Pasteurization of mix	Pasteurization Heating Min. 82±2°C/40 Sec. Chilling 7±3 °C, FDV working.
	5	2	Metal Detector	Minimum detection limit: Ferrous: 3.5 mm (FOR Box Ferrous: 2.5 mm) Non-ferrous: 4.0 mm SS 316: 5.0 mm
	6	3	Pasteurization of Juicy water for candy	Pasteurization at Min. 82±2 0 C for 40 seconds and chilling below 7+ 3 OC.
UHT Milk	7	1	Sterilization of milk	Sterilization temp. 137+4 OC for 4 sec

NOTES

Handwriting practice lines consisting of 30 horizontal dashed blue lines.

NOTES



PART-14

PEST CONTROL

Pest Control

14.1 Pest Control in Dairy industry

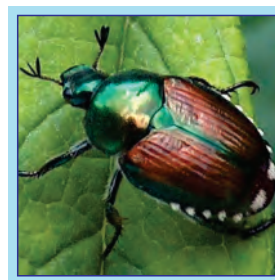
A pest is an organism which cause injury / harm to humans, animals, desirable plants or products. This obviously results in losses.

In Dairy industry we deal with milk and milk products which are primary source of nutrition for millions. Milk is a perishable commodity and gets contaminated with slightest of hygiene lapse. We give hereunder a broad spectrum of prevention techniques for Pest control in Dairy industry.

The pests can:

- Cause Contamination of dairy products by their droppings which contain bacteria and other microorganisms.
- They can spoil products by eating part of it
- The disease causing germs are carried by them on various parts of their bodies and can lead to serious diseases to people who eat the products contaminated by them.

14.2 Various types of pests



14.3 Pest control program should effectively eradicate pest from the dairy premises. The steps involves are:

- Exclusion of pests → preventing their entry in the premises.

- Removing food sources by good practices → keeping the premises clean.
- Controlling pests with appropriate methods → different pests need different treatment for effective removal
- Specific procedures / records → records to be maintained for future references as well as evolving more effective method to avoid recurrence.

14.3.1 Pest Exclusion:

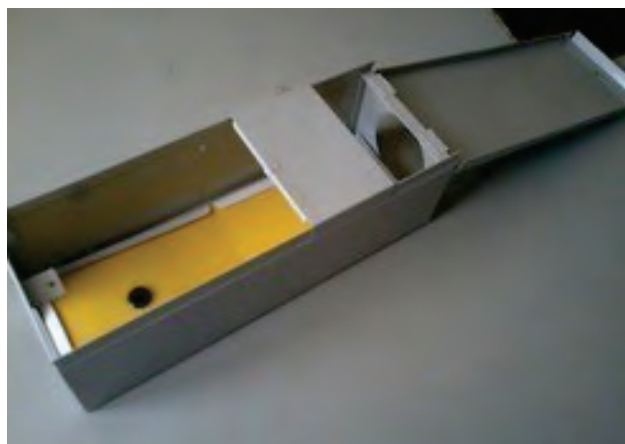
- All doors should be kept tightly closed and fitting. The windows shall be 3 track type with mosquito /fly proof wire-mesh for preventing entry of insects but allowing cross ventilation.
- Minimize gaps in doors and windows or any open able space in production areas. Use of Air curtains on main doors/ entry points is quite effective.
- Door seals in the bottom of doors and self-closers is of utmost importance.
- The exhaust openings should be provided with gravity louvers lest insects enter when the exhaust fan is not operating.
- Production areas and cold stores shall be screened by using strip curtains
- Netting and eliminate perches for birds is a sensible solution to avoid bird droppings contaminating the dairy products.
- All cracks and holes in walls should be properly plugged so that small insects do not have opportunity to thrive.

14.4 Checks should be performed from time to time for Pest infestation verification.

- Look for bird droppings or animal tracks. It will provide useful tips on the type of pests present and it can lead to their entry points and nests.
- The type of pest will enable plant personnel to choose appropriate method for controlling them.
- Notice the product or carton /container damage which will again indicate type of pest present and hence suitable method to control them.
- Observe the presence of any dead pests and decide on the method to be adopted for its control and prevention. Baits can be effective only if those are target specific. Ideally pests have to be captured or destroyed.

14.5 Rodent control:

Apart from cockroaches, rats and mice are a common menace to milk and milk products in dairies. They can be effectively controlled by use of bait stations and mouse traps. In their case the traps have to be placed inside production areas. For small rodents, Sticky pads shall be provided. These baits shall be checked & emptied regularly



lest the decomposition causes foul smell in the production areas. And milk being a sensitive product, it will catch on the foul odour.

14.5 Rodent control:

In production area acquires major significance and can be controlled by



➤ Fly Catcher

The UV light in fly catcher attracts the pests like flies and mosquitoes and the charged electric grid kills them instantly. It shall be located prominently and at an appropriate height. Nowadays, fly catcher come with a sticky pad to hold the insect. These pads are then periodically discarded and new pads are installed in place of the old ones. The charged electric grid spatters the insect body parts and they may fall in the product causing contamination and consequent rejection of the product. This results in commercial loss to milk union apart from bad name to brand value. The sticky pads are then a good alternative as they hold insects after impact.

➤ Pest Control Chemicals

There are various chemicals available in the market for effective control of the pests. But the pesticides are to be handled with care. The chemicals should be of approved make and suitable to be used in Dairy industry. Their usage should not cause any harmful side effects to the operational staff and contaminate food by their odour etc. But the effect on the targeted pests should be maximum.

Notes:

- In spite of the best pest control methods, no programme will be successful without an active participation and whole-hearted support from the employees.
- Employees to be sensitized for any garbage around the production areas as they will be potential source for pest to thrive. The damaged traps must be removed at once. The employees should be encouraged to have their lunches in designated areas only.
- Employees should report any sighting / evidence of pests so that timely action could be taken for removing the pests and stop its multiplication.


NOTES

NOTES

Handwriting practice lines consisting of 30 horizontal dashed blue lines.



Connect with FSSAI

 SMS
98 6868 6868

 @fssaiindia

 FSSAI

 Toll-Free No.
18 0011 2100

 WhatsApp
98 6868 6868

 FSSAI

 fostac@fssai.gov.in

 www.fssai.gov.in



सत्यमेव जयते

**FOOD SAFETY AND STANDARDS
AUTHORITY OF INDIA**

Inspiring Trust, Assuring Safe & Nutritious Food

Ministry of Health and Family Welfare, Government of India

FDA Bhawan, Kotla Road, New Delhi-110002