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For Efficient Dairy Plant Operation

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GOOD MANUFACTURING PRACTICES I

This bulletin includes technical and latest development on products, systems, techniques etc. reported in journals, companies' leaflets and books and based on studies and experience. The technical information on different issues is on different areas of plant operation. It is hoped that the information contained herein will be useful to readers.

The theme of information in this issue is **Good Manufacturing Practices I**. It may be understood that the information given here is by no means complete.

In this issue:

INTRODUCTION

The demand of producing safe and quality food is ever-increasing globally, as well as in India. Dairy factories have been taking suitable measures in this direction including applying principles of hazard analysis and critical control point (HACCP) system which helps in producing safe food.

There are procedures or universal steps that control the operational conditions within a dairy plant, allowing for environmental conditions that are favourable to the production of safe dairy products. These are called good manufacturing practices (GMPs) and are prerequisites to HACCP plans. These include premises, receiving and storage, equipment performance and maintenance, training, sanitation and recalls.

Codex guidelines 'Recommended International Code of Practice: General Principles of Food Hygiene' include many of these aspects in general (see Technews Issues 35 to 37). These requirements are presented in details in this and next issues of Technews to provide guidelines to dairy plant management on GMPs.

FACTORY CONSTRUCTION

General

- Building and surroundings must be designed, constructed and maintained to prevent conditions that may result in contamination of dairy products. The premises considered include all elements of the building surroundings: the outside property, roadways, drainage, building design and construction, product

flow, sanitary facilities and water quality.

- Adherence to the environment is verified through the written programme of the plant, which outlines procedures that ensure satisfactory conditions are maintained.
- Land must be free of debris and refuse and must not be in close proximity to any source of pollution (e.g., objectionable odours, smoke, dust, or other contaminants).
- Roadways must be properly graded, compacted, dust proof, and drained.
- Premises and loading and receiving areas must provide or permit good drainage.
- The building and facilities must be designed to readily permit cleaning, prevent entrance and harbouring of pests, and prevent entry of environmental contaminants.
- Buildings need to be of sound construction, maintained in good repair, and not present any microbiological, chemical, or physical hazards to the dairy food.
- The building must be designed to provide suitable environmental conditions, permit adequate cleaning and sanitation, minimise contamination by extraneous materials, prevent access by pests, and provide adequate space for satisfactory performance of all operations.
- Floors, walls, and ceiling materials, as well as various coating and joint sealants, must be approved materials that are durable, smooth, cleanable and suitable for production conditions conducted in the area.
- Walls must be light coloured and well joined.

Receiving or Loading Dock

- Should be built no less than a metre or truck bed height above the ground. Lower distances may permit rodents to jump into the dock.
- No stairways should lead directly from the dock to ground level. Ladder rungs should be provided in the walls for personnel use.

- No closed space should be left under dock.
- There should be a 30 cm overhang on the dock to prevent rodents from access to the dock itself.

Doors, Windows, Skylights, Ventilators

- All such openings must be tight fittings and free of holes.
- Outside openings must be protected against the entrance of insects by screens, fans or other suitable devices.
- Self closing doors should be used, and should have less than 6 mm clearance when the doors are closed, for keeping mice and rodents out.
- Window sills and door casings should be flush with the walls on the inside of the facility and metal flashing at least 20 cm high on the outside of all outside doors for rodent proofing.
- If window sills are not flush with the wall, they should be at a 45 degree angle so that dust will not collect and no articles can be placed on them.
- All opening windows must be adequately screened, preferably with a No.16 mesh screen. Screens must be tight fitting.
- All doorways, except loading doors, should be fitted with self-closing screen doors.
- The loading doors should be designed so that air curtain or fly-screening fans can be installed directly above them on the outside. There must be at least 100 cm of space left free above the door for the installation of the outside fly fans.

Interior Structure

- Must be designed to facilitate cleaning.
- Structural features where dust accumulates should be eliminated because insects may breed there.
- Interior walls must be designed so that cracks and crevices do not develop.
- Walls must be designed so that cracks and crevices do not develop.
- Walls must be designed so that rodents and insects

harborages are not present.

- The walls should be smooth and easy to clean, preferably glazed tile or, if block walls, epoxy coated.
- The floors should be constructed of concrete, tile or of approved compositional material and they must extend to, and be mortise into, the structural walls on al sides. The floor of processing room should be water-resistant, slip proof, easy to clean and impervious to lactic acid, and cleaning solutions.
- Concrete floors should be hardened by adding to the finishing coat a material such as Ferum or Carborundum, which also give the floor a highly desirable nonslip quality.
- The floors and wall juncture must be curved with large enough radii to permit good sanitation.
- The floor must slope more than 1% upto 2% to drains and drains must be no more than 6 m apart.
- Open drains should be made of one-half round 30 cm or larger tile and they should be covered with easily removable fitted grates for regular cleaning.
- All floor drains must be equipped with traps having a minimum water seal of 75 mm.
- Gutters, if planned to remove large quantities of water released onto the floor at one time, should be located along the walls or through the centre of the room. The gutter should extend the full length of the room and the floor should be evenly pitched. The gutter should have pitch of about 0.8%.
- If pipelines pass through the floors, ceilings, or walls, approved rodent proof collars should cover all these openings.

Trash and Garbage Dump Facilities

- Must be designed to provide for ready removal.
- While the trash or garbage is on the premises, it must be kept in rodent proof containers.

Lighting

- Illumination should be adequate for the job entitled. Should be sufficient to avoid eye strain which results from marked contrasts in light intensity.
- All light fixtures should be regularly and thoroughly cleaned and maintained.
- All light fixtures must be protected with plastic shields to reduce any extraneous material from broken glass in the food items.
- The illumination provided should be based on the size of the object to be seen, the time allowed for observing the objects, the degree of contrast between objects, and the brightness and glare of the objects.
- Generally, minimum lighting is no less than 215 lumens/sq. m measured at 75 cm off the floor. Inspection, office areas, and laboratories require illumination that may be as much as 1615 lumens/sq. m. The following table gives the illumination required in different areas of dairy plant.

Table : Minimum level of illumination required in different sections of a dairy plant

Sl. No.	Area / Section	Minimum illumination	
		Lumen/sq. m	W / sq. m*
1.	Receiving room	530	20
2.	Exterior areas, loading and unloading platforms	220	9
3.	Weigh scales	750	29
4.	Can washing	330	13
5.	Cooling equipment	330	13
6.	Processing	1080	41
7.	Pasteurizers and separators	540	21
8.	Gauges, on faces; thermometers	540	21
9.	Instrument panels with switch boards	540	21
10.	Casing and active storage room	220	9
11.	Dead storage	60	23

Sl. No.	Area / Section	Minimum illumination	
		Lumen/sq. m	W / sq. m*
12.	Boiler room	330	13
13.	Refrigeration (compressor) room	330	13
14.	Cold storage room	330	13
15.	Bottle washing	1080	41
16.	Bottle sorting	540	21
17.	Bottle filling	1080	41
18.	Inspection	1080	41
19.	Bottle storage	330	13
20.	Engines, generators, air compressors and blowers	220	9
21.	Laboratory	1080	41
22.	Office - filing and mail sorting	800	30
23.	Office - accounting, auditing, tabulating and machine operations	1620	72
24.	Corridor and stairway	220	9
25.	Toilet and wash room	330	13

* For 40 W standard fluorescent tube, considering coefficient of utilization as 0.6 and maintenance factor as 0.7.

Ventilation

- Should be proper and adequate
- Condensation should be controlled to eliminate any mould growth.
- Well engineered exhaust hoods and ducts should be used to control moisture and off-odours in the dairy plant.
- Positive filtered air flow in the plant will help in eliminating dust, dirt, and most airborne contaminants.
- All filters used in the ventilation system must be properly maintained and kept in a sanitary condition at all times.

Waste Handling

- Drainage and sewage systems must be equipped with appropriate traps and vents.
- Plants must be designed

and constructed so that there is no cross connection between the effluent of human wastes and any other wastes in the plant.

- Facilities must be provided for storage of waste and inedible material before removal from the plant.
- These facilities must be designed to prevent contamination.
- Containers used for waste must be clearly identified and leak proof.

Product Flow

- The traffic pattern of employees and equipment must avoid cross contamination of the product.
- Product flow must prevent contamination of the dairy food through physical or operational separation.
- Plants must provide physical and operational separation of incompatible operations.
- The facilities must be adequate for the maximum production volume encountered.
- Living quarters and areas where animals are kept must be completely separated from and not open directly into areas where dairy foods or packaging materials are handled or stored.

Sanitary Facilities

- Washrooms with self-closing must be provided.
- Washrooms, lunch rooms, and change rooms must be separate from and not lead directly into food processing areas and must also be correctly ventilated and maintained.
- Wash rooms must have hand-washing facilities with a sufficient number of well maintained sinks with properly trapped waste pipes connected to drains.
- Hand washing facilities must have hot and cold potable running water, soap, sanitary hand drying supplies or devices, and, where required, a cleanable waste receptacle.
- Processing areas must contain a sufficient number of conveniently located hand-washing stations with

properly trapped waste pipes connected to drains.

- In the processing areas, remote controlled (e.g., foot, knee, timed) hand-washing stations are preferable.
- Sanitizing facilities (e.g., hand dips) must be in areas where plant employees are in direct contact with microbiologically sensitive dairy foods.
- Notices must be posted for employees to wash hands.
- Plant must provide adequate facilities and means for cleaning and sanitizing equipment.
- Separate means must be provided for cleaning and sanitizing equipment used for inedible materials.

Water Quality

- The water control room should evaluate the microbiological, chemical, and physical quality of source and in-plant water (from various points of usage).
- This water should include the steam supply, cooling medium, process waters, and ice supply.
- The programme should establish frequency of testing, procedures for testing, person responsible, and records to be kept.
- The plan should have procedures in place to deal with water that does not meet specific standards.
- Records of water potability (laboratory test results) and water treatments applied must be maintained.
- Potable hot and cold water is used in dairy food processing, handling, packaging, and storage areas and must be provided at adequate temperatures and pressures and in quantities sufficient for all operational and cleanup needs.
- Where required, facilities that protect against contamination must be provided for storage and distribution of water.
- Bacteriological testing of water should be done on a semi-annual basis for municipal water and on a monthly basis for water from other sources.
- Records of water potability

testing must be maintained.

- When chlorination of water occurs on premises, a metering device for adding the correct concentration of chlorine, which is designed to readily indicate a malfunction, must be used.
- Also, twice daily checks to determine total chlorine must be done or an automatic analyzer equipped with a recorder and an alarm must be used.
- No cross-connections must exist between potable and non-potable water supply systems.
- Non-potable water should never be used in dairy food processing, handling, packaging, or storage areas.
- All hoses, taps, cross-connections, or similar sources of possible contamination must be equipped with antibackflow devices.
- Water treatment chemicals used must be appropriate for their intended purpose.
- The treatment process and recirculated water and process waters must be treated and maintained in a condition so that no health hazard results from their use.
- Recirculated water must have a separate distribution system, which is readily identified.
- Records of treatment must be maintained.
- Microbiological testing needs to be conducted to monitor effectiveness.
- Steam coming into direct contact with dairy food or food contact surfaces must be generated from potable water with no harmful substances added.
- The steam supply must be adequate to meet operational requirements.
- Boiler treatment chemicals used must be appropriate for their intended use.
- Records of treatments must be maintained.

Basement

- Basement, if planned, should be at least 2.5 m high and properly lighted and ventilated.
- The floor should be of durable dust proof material and should provide good

drainage.

- In addition to the entrance from the plant itself, there should be an escape door opening directly to the outside of the building.
- The construction of the basement should be rodent and vermin proof, the walls and floors should be waterproof.

RECEIVING AND STORAGE

Plant must receive, inspect and store ingredients, packaging materials and incoming materials so as to prevent conditions that may result in contamination of dairy products. An adequate programme should be in place to monitor and control all elements in this section and appropriate records should be maintained. Following points must specifically be attended to:

- Raw-materials, ingredients and packaging materials must be inspected on receipt and stored and handled in a sanitary manner to prevent microbiological, chemical or physical contamination.
- Effective measures should be taken to prevent contamination of raw-materials, ingredients and packaging materials by direct or indirect contact with contaminating material.
- Certification of all incoming materials by letters of guarantee, certificates of analysis or other satisfactory means as may be required.
- Incoming materials should be received into an area separated from the processing area.
- All food additives must be food grade.
- All ingredients must be safe and not affect negatively on the safety of the dairy product.
- Packaging materials that are appropriate for their intended use only must be used.
- Incoming raw-materials, ingredients and packaging materials must be

monitored on receipt for acceptability for use in dairy products, and records of these monitoring need to be maintained.

- Where required, there should be adequate means of establishing and monitoring of temperature and humidity of rooms where raw-materials, ingredients, packaging materials and dairy products are stored. Records of monitoring must be maintained.
- Raw-materials, ingredients and packaging materials must be handled and stored in ways to prevent damage and contamination and must be held to avoid growth of microorganisms.
- Conditions of storage and transport must be such that the safety of the dairy products is not affected.
- Returned or damaged goods must be clearly identified and stored in designated area for appropriate dispositions.
- Conditions of storage must not affect the safety of the final product.
- Detergents, sanitizers or other chemical agents must be appropriately labelled, stored and used in ways that prevent contamination of dairy products, packaging materials and food contact surfaces.
- Chemicals must be stored and handled in an area that is kept dry and well ventilated and is separate from all food handling areas.
- Chemicals must be stored in clean, labelled containers and disposed by authorized and appropriately trained personnel.

The next issue will detail some more aspects of GMPs

Next issue : Good Manufacturing Practices II

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