

# Preparation of Safety Manual for Dairy Industry – A Review

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## Abstract

Dairy industry is of crucial importance to India. India is one of the largest milk producing country in the world. In dairy industries milk is from the outsource by farmers and they are processing of milk using various machineries such as pasteurizer, homogenizer, refrigerators and packaging machines. When the dairy employees are working with these machines they can cause health hazards etc.. It affects the surrounding areas and also exposed by the public. Dairy industries creates air pollution and also many environment hazards. In this paper discuss about the possible hazards involved in the milk dairy industries and have control measure for that.

**Keywords:** Environment, Dairy, Noise, Hazard, Pollution

## I. INTRODUCTION

Industrialization is the backbone for development of our country. In India dairy industry has ranks first among the maximum major milk production nations [1]. Milk has been one of the most important and most valuable man's food. Many problem are faced by dairy industry in Today's itself for Processing, sanitation, and storage methods, human involvement, as well as the types of equipment that are incorporated into the production process vary from producer to producer depending on the production capacity, and the types of products produced. So that the hazard involved in the dairy industry will varies according to the equipment used [2].

According to World Health Organization (WHO), food-borne diseases are widespread and becoming increasingly serious threats for both developed and undeveloped countries all over the world. However, satisfying high safety standards is a common requirement for all processes since milk and milk products are perishable food products [3]. The safety and suitability of dairy foods for human consumption must be ensured through the implementation of proper hygienic control of milk and milk products throughout the process, from farm to table. Modern dairies have become increasingly good practice and follow safety rules [4]. This has result for increasing opportunities and incidences for problems

and harm from these chemicals. Risks to employees on a dairy industry have ammonia gas hazards and also using chemicals for cleaning, ergonomics hazards for equipment handling purpose [5]. The dairy industry is now facing increasing pressure to ensure that their company's activities are environmental issue, health and safety. [6]. The dairy industries are also polluting the environment by producing the high amount of waste waters and producing some odor smell around the industry [7]. The general hazards which are present in the dairy industries are biological hazard, toxic hazards, dust explosion hazards, environment hazards [8]. To control these hazards various methods are available according to the nature and severity of the hazard.

## II. MATERIAL AND METHODS

To identify the possible hazards in dairy we take the following actions were undertaken

- Observing operations
- Receipt of raw materials, storage, heat treatment, cooling and packaging
- Fermentation, concentration, homogenization, additives, temperature, packaging and storage
- Personal hygiene, education, health, cleanliness, habits, premises, equipment, floors, walls and ventilation (working conditions).
- Measuring operations

## III. SAFETY MANUAL INCLUDES THE DETAILS ABOUT THE FOLLOWING THINGS

1. Site selection to establish a dairy industry
2. General sections involved in dairy industry
3. How the Safety policy should be.
4. Safety systems which are needed for dairy industries
5. PPEs needed
6. Trainings
7. Types of pollutions from dairy industries
8. Emergency situation handling

### A. Site Selection to Establish a Dairy Industry

Dairy Establishment shall be located away from environmentally polluted areas and industrial activities which produce disagreeable or obnoxious odor, chemical or biological emissions and pollutants,

and which pose a serious threat of contaminating food; areas subject to flooding; areas prone to infestations of pests; and areas where wastes, either solid or liquid, cannot be removed effectively [9].

Area occupied by machinery shall not be more than 50% of the manufacturing area. Floor surfaces shall remain dry and maintained in a sound condition so that they are easy to clean and where necessary, disinfect. The openings of the drains to be thoroughly covered with wire mesh to prevent insects and rodents from entering the processing area [12].

The selection of a site for the construction, replacement or expansion of a dairy plant and nature of wastes produced and the proposed nature of waste recycling, reuse or disposal. Depending on the proposed waste disposal system, adequate land should be available for effluent treatment water to irrigate the land. To check the site for soil types, whether they can provide reasonable drainage and have a good capacity to land. Therefore, wastewater treatment and disposal areas should not be sited above major ground water recharge areas such as gravel or sand beds or fractured rock aquifers.

#### **B. General Sections Involved in Dairy Industry**

Dairy industry generally involves the following sections

- RMRD
- Milk process section
- Butter/ghee manufacturing section
- Powder plant sections
- Ice cream production section
- Refrigeration
- Electrical
- Boiler
- Ware house
- Labs
- Maintenance
- Civil
- Tanker washing
- CIP

#### **1) General Hazards Present in the Dairy Industries are**

- Physical hazard
- Chemical hazard
- Biological hazards

#### **C. Health And Safety Policy**

Health and safety policy is the mandatory of all common industry. It is the policy of the dairy industries to provide a safe work environment for all employees working in dairy premises. It is also the policy to provide the same safe and healthful

environment for the company visitors. Safety policy shall be a cooperative effort between labor 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 the responsible of different levels
- Arrangement for involving the workers
- 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 and retraining its own employees at different levels and the public

#### **D. Safety Systems Which Are Needed For Dairy Industries**

Dairy industry involves several hazards. To handling these hazardous environment following safety systems are very essential.

1. Firefighting systems
  - i. Fire hydrant
  - ii. Fire Extinguishers
  - iii. Fire Sand Buckets
  - iv. Fire extinguishing ball
  - v. Sprinkler systems
2. Emergency alerting system
  - i. Smoke Detectors
  - ii. Ammonia Detector
3. Emergency Declaring systems
  - i. Emergency Siren
  - ii. Manual Call Points
4. Emergency Indicating systems – Cold room bells
5. Escape routes
6. Assembly point
7. Wind sack
8. First Aid systems
  - i. Ambu bag
  - ii. First Aid box
9. Personal Protective Equipment's (PPEs)
10. Emergency Control Center

#### **E. PPE**

Personal protective equipment (PPE) is an important means of preventing work related illness. To maintain a safe work environment and eliminate all hazards in dairy premises. Therefore, health and safety representative will ensure the employees worn PPE or not. In dairy employees can use sufficient PPE for that

workplace and also maintained by adequate training [14].

**The Appropriate Personal Protective Equipment's is very Essential for a Dairy Industry**

- Safety helmets
- Goggles
- Ear muffs
- Ear plugs
- Ammonia half Face mask
- Self-Confined Breathing Apparatus
- Gloves
- Gum boots / shoes
- Aprons
- Safety belts
- Supplied Air Line Mask
- Safety shoes

**F. Need of Health and Safety Training**

In dairy employees have need sufficient training for health and safety standards

- Employee in dairy industry to work safely and without risks to health;
- Develop a health and safety standards, and also good environment provide to off-site of dairy premises.

**For a Dairy Industry the Following Trainings Should Be Conducted at Regular Intervals of Time Period**

1. SCBA handling
2. Waste management
3. Ammonia safety
4. EMS internal audit
5. Environmental awareness
6. ETP process and operation
7. Fire safety
8. First aid
9. Mock drill
10. Safety systems

**G. 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 onsite emergency plan is conducted at least one in every six months

**1) Types of Emergency Plans**

- Off-site Emergency
- On-site Emergency

**a) On-site Emergency**

If a fire takes place in a factory, its effects is confined to the factory premises, involving only the persons working in the factory and the property inside the factory it are called as On-site Emergency.

**b) Off-site Emergency**

If the fire is such that its affects inside the factory are uncontrollable and it may spread outside the factory premises, it is called as Off-site Emergency.

**2) Identification of Possible Emergency Situations in Dairy Industry**

The following emergency situations might be arise in the dairy industry

- Ammonia leakage
- Fire in Raw Material Stock Yard (Viz. Coal, LPG and Furnace oil etc.)
- LPG leak

**3) Teams**

The following teams comprising members ranging from two in each have been nominated to discharge duties assigned to them.

- Fire Fighting Team - to extinguish the fire
- Repair & Task force Team – to keep rest of the plant in safe condition
- Transport Team - to arrange transport for casualties
- Medical Team - to arrange for aid, stretches, medicines
- Safety Team - to arrange required safety equipments
- Evacuation Team - to rescue the casualties on priority basis.

**H. Pollutions From Dairy Industries**

Dairy industry majorly creates the three types of pollution

- Air pollution
- Noise pollution
- Water pollution

### 1) **Air Pollution**

The main air emissions from dairy manufacturing processes are odours and particles.

#### a) **Odours**

Odours in and around milk processing plants come from the biological decomposition of milk derived organic matter, generally found in wastewater. Often these odours are due to poor housekeeping, overloaded or improperly run wastewater treatment and disposal facilities, and prolonged storage of strong wastes such as whey.

#### b) **Particles**

Particle emissions are caused either by combustion of solid or liquid fuel or, more often, spray drying of milk. Excessive emissions are often sporadic and happen during plant upsets, shutdowns or startups. The use of solid or liquid fuel such as briquettes and oil can result in fallout – carbonaceous ash particulate is usually emitted during boiler upsets or tube soot-blowing operations. A further source of annoyance to residents and factory workers is powder settling on nearby motor vehicles. The drier emissions depend on the product being dried – for example, skim milk tends to result in the highest emissions.

#### c) **Suggested Measures to Control Air Pollution From the Dairy Industry**

Maintain aerobic conditions for wastewater processing, Use filters or scrubbers to eliminate or reduce particles. (Particles less than 20 mg/Nm<sup>3</sup> represent best practice.), Use automatic process control, Carry out continuous routine monitoring of emission points using audible, visible alarms.

### 2) **Noise**

#### a) **Source of Noise**

Environment Protection Act requires that any noise due to activities at premises in a sensitive area must not exceed the noise limits for the area, as determined by the methods set out in the policy.

#### b) **The Principal Causes of Continuous Noise Include**

- Air discharges from drier stacks
- Heater fans
- Air supply fans
- Ventilation
- Boilers
- Pumps

#### c) **Suggested Measures to Control Noise Pollution**

Concrete construction for buildings which house mechanical plant, Sound silencers on air intake

fans and air discharges, Acoustic enclosure of outdoor mechanical plant such as pumps, restricted operating hours, Mufflers on transport vehicles and Conduct noise assessment.

### 3) **Water Pollution**

Activities at dairy plants have the potential to contaminate both surface waters and groundwater.

#### a) **Sources of Dairy Wastewater**

The main sources of dairy processing plant Waste water are:

- Raw material (predominantly milk) and product losses from leaking equipment and pipelines, and spills caused by equipment overflows and malfunctions and by poor handling procedures
- By-products such as whey from the manufacture of cheese and casein.
- The washing and cleaning out of product remaining in the tank, trucks, cans, piping, tanks and other equipment is performed routinely after every processing cycle.
- Splashing and container breakage in automatic packaging equipment

#### b) **Wastewater Treatment and Disposal**

Because of the highly seasonal nature of milk production, during peak periods the volume of wastewater generated at dairy plants may be several times greater than during off peak periods.

## IV. CONCLUSION

Safety manual comprises the details about the dairy industry process, and the hazards present in that process and its remedial measures. It has the details about the environmental pollution from the dairy industry and its remedial measures. So that this safety manual will be very much useful to whom one wants to know about the dairy industries safety standards completely.

## REFERENCE

- [1] Harush D. P, Hampannavar U. S., Treatment of dairy wastewater using aerobic biodegradation and coagulation, Vol. 1, No. 1, 2011, pp. 23-26.
- [2] L. Buys, K. Mengersen, S. Johnson, N. van Buuren, A. Chauvin, Creating a sustainability scorecard as a predictive tool for measuring the complex social, economic and environmental impacts of industries, a case study, Journal of Environmental Management 133 (2014) 184 - 192.
- [3] Levent Kurt, Sibel Ozilgen, Failure mode and effect analysis for dairy product manufacturing, Safety Science 55 (2013) 195–20.
- [4] S. E. Place and F. M. Mitloehner, A review on dairy industry's role in climate change and air quality and the potential of mitigation through improved production efficiency, J. Dairy Sci. 93:3407–3416 2010.

- [5] Natapol Thongplew, C.S.A. (Kris) van Koppen, Companies contributing to the greening of consumption : findings from the dairy and appliance industries in Thailand, *Journal of Cleaner Production* xxx (2014) 1 – 10.
- [6] Gargi Bhattecharjee, S. Bhattacharya, Emission of Ammonia from Ice Factory and its Remedial Action' Vol. 2, No. 3, September 2012.
- [7] Alka Bani Agrawal, R.K. Dave, 'Replacing harmful refrigerant R22 in a bulk milk cooler' Vol.2
- [8] B. L. Nkambule and A. M. Dlamini, 'Determination of milk-borne health hazards in raw milk from retail outlets', *UNISWA J. of Agric.* 2012
- [9] S. Thirumala, M. Pradeep and H.B. Aravind, 'Air borne microbial Hazards in Dairy and Poultry farm workers of Davangere, Karnataka' (2014).
- [10] Hema Prabha.R and Karthikeyan.N, 'Emergency preparedness in a Dairy Industry' *International Journal of Advanced Research* (2013), Volume 1, Issue 3, 166-174.
- [11] P. M. Tomasula, N. Datta, C. F. Yee, 'Computer simulation of energy use, greenhouse emissions, and costs for alternative methods of processing fluid milk', *J. Dairy Sci.* 97,2014.
- [12] A. Banaszewska ,F. Cruijssen , G. D. H. Claassen , , 'Effect and key factors of by products valorisation', *J. Dairy Sci.* 97:1893–1908, 2014.
- [13] Hamid Sharifia,b,c, Alireza Bahonard, 'Effect of health disorders of culling on the first or second lactation in Iranian dairy herds', *Preventive Veterinary Medicine* (2013) 144–147.
- [14] F. Boccas a. A. Ramanauskas b 'HACCP "train-in-action" program in the Lithuanian dairy industry' 2001.