

Hazards & Safety Measures in Dairy Industry – A Review

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Abstract: Dairy Industries now a days plays a significant role in the Indian economy. Milk is an essential Commodity which is to be consumed by all aged people. The production processes cover Fresh Liquid Milk, Fermented Milk, Butter, Chanch, Paneer, Skim Milk Powder, Ghee, Icecream. Milk was collected from farmers of different locations & transported through tankers for its processing at factory through different process like filtration, pasteurization, homogenization, heat treatment, refrigeration etc. During the operational activity at different sections, various hazards exists which may harm to employees & surrounding if adequate measures not ensured. In this paper hazards in Dairy Industry with control measures required to avoid any untoward incident, discussed.

Key Words: Dairy, Hazard, Safety, Fire, Electrical, Mechanical, Chemical, Explosion, Training, SOP.

1. INTRODUCTION

Indian Dairy Industries plays a major role in production in the economy Dairy industry Product manufacturing process looks simple but due to different activities it involves different hazards. Inadequate Safety measures may lead to a serious incident may cause harm to human being as well as to environment. It is also the moral responsibility of an employer to ensure identification of different hazards and take adequate steps to minimize the risk due to identified hazards to ensure Zero Incident in work place. Hence a review of Hazards and Safety Measures required in dairy industry is essential to control hazards.

2. DIFFERENT DEPARTMENTS

In a Dairy Industry generally different departments & sections exists for Plant operations.

- Raw Material Handling
- Logistics
- R& D and QC (testing of Milk quality & finished products etc.)
- Production (Fresh *Liquid Milk*, *Fermented Milk*, *Butter*, *Chanch*, *Paneer*, *Skim Milk Powder*, *Ghee*, *Ice-cream*, *CIP*.)
- Engineering (Boiler, Electrical Maintenance, Mechanical Maintenance, ETP, STP, RO, Refrigeration)
- Packaging & handling of Finished Products.
- HR & Admn (HR, Security, IT, Legal, Canteen, Training, Colony)

- Purchase & Stores
- Projects (Brown & Green field Project)
- EHS (Environment, Health, Safety, Fire)
- Accounts
- Discussion with shop floor team
- Hazard identification with the help of Technical Team Group.

3. HAZARDS & SAFETY MESURES

There are different Hazards exists in the Dairy operations due to different activities.

- Physical Hazard
- Chemical Hazard
- Electrical Hazard
- Mechanical Hazard
- Fire & Explosion Hazard
- Biological Hazard

Details activity wise identified hazards and recommended Safety measures explained.

4. METHODS

Following points consider identifying the hazards in different department & activities.

4.1. Raw Material Handling

Associated Hazards & its Effect

- Collision of Vehicles during movement & placement for loading, unloading of Material may cause serious Injury to Human being & Damage to Property.
- Fall of person during inspection of Raw material on truck or tanker may cause serious injury.
- Contact with Overhead Power cables or transmission lines may cause shock, electrocution, Fire incident.
- Overheating of vehicle engine, explosion in battery may cause fire in vehicle.
- Contact with rotating parts of conveyors during transfer for raw materials in solid form.

Safety Measures

- Parking of vehicles in its designated place under supervision. Wheel chokes, Hand break, removal of vehicle key must be ensured.
- Display of warning signs & SOP's. Provision of Traffic Barriers.
- Proper traffic routing for vehicle movement.
- Adequate platform with protective railing and approach must be provided to take sample of milk before unloading. Ensuring use of Safety Helmet.
- Milk transfer hose pipe must be tied properly to avoid sudden failure of hose.
- All rotating parts of Conveyors must be well guarded, and emergency stop switch must be provided at both end of conveyors.
- All electrical installation must have adequate earthing & proper insulation.
- Adequate illumination must be ensured near the unloading point during night hours.

4.2. *Logistics*

Associated Hazards & its Effect

- Collision of Vehicles during movement may cause serious Injury to Human being & Damage to Property.
- Slip & Fall of person during inspection of vehicle.
- Contact with Overhead Power cables or transmission lines may cause shock, electrocution, Fire incident.
- Overheating of vehicle engine, explosion in battery may cause fire in vehicle.

Safety Measures

- Ensure vehicle in good condition. Driver with valid licence and good behavioral condition.
- Following all Traffic rules and regulations.
- Provision of suitable vehicle as per need basis of Raw materials.
- Avoid rush driving by Driver.
- Inspection of vehicle time to time to avoid failure.
- Be careful about on the way Over Head transmission lines and other cables, structures to avoid incident.

4.3. *R&D and Quality Control*

Associated Hazards & its Effect

- Slip & Fall of person from tanker, truck top during sampling of raw material.
- Skin infection, Burn injury, inhalation of toxic gas in laboratory during testing of different raw material quality.
- Fire and Explosion in case of reaction between chemicals.
- Busting of Autoclave due to over pressurization.
- Fire in laboratory due to failure of electrical system.
- Shock & electrocution due to contact with electricity.
- Cut injury due to contact with broken glass items.

Safety Measures

- Display of warning signs & SOP's.
- All chemicals should be identified with their name and MSDS should be made available.
- Chemicals should be used by trained Chemist.
- All glass items should be handled carefully. Broken glass items must be removed immediately.
- Use of PPE's must be ensured.
- Ensure to wash hand before taking food. Do not take food inside the Lab.
- Be careful about contact with hot surface and hot water.
- Compressed gas cylinders should not be kept inside laboratory. Same should be kept with chain lock under shed. All PRV should be ensured in good operational condition to avoid failure. Autoclave must be examined through competent person in every six months interval.
- Do not switch on or off any electrical equipment's with bare hand.
- Do not use any damaged electrical associates.
- Switch off electrical supply when not in use.
- Ensure adequate earthing and insulation.
- Do not operate any equipment if you are not trained.
- Ensure calibration of all measuring systems to avoid failure.

4.3 *Production*

Associated Hazards & its Effect

- Slip, fall of person in shop floor and during CIP may cause serious incident like injury to person (fracture, dislocation, sprain, Fatal).
- Burn injury due to contact with hot water, steam, chemicals.
- Shock, electrocution, Fatal due to contact with electricity.
- Cut, Amputation injury due to contact with rotating parts of machines.
- Slip & fall and collision with structures due to poor illumination.
- Noise and vibration due to poor maintenance of machines.
- Exposure to Toxic, Corrosive chemicals.
- Fire and explosion due to reaction of chemicals, failure of equipment's.
- Busting of Clarifier, Homogenizer, pasteurizer, dryer, compressor, Boiler and other pressure parts may cause major injury to human being and loss of property.
- Smoke and Fire due to burning of Skimmed Milk Powder or dairy whitener.
- Failure of hoses used for transfer of oil, milk, chemicals may cause burn injury or blunt injury.

Safety Measures

- All chemicals should be identified with their name and MSDS should be made available.
- Use of PPE's must be ensured.
- Be careful about contact with hot surface and hot water.

- Compressed gas cylinders should not be kept inside laboratory. Same should be kept with chain lock under shed.
- All PRV should be ensured in good operational condition to avoid failure. Autoclave must be examined through competent person in every six months interval.
- Do not switch on or off any electrical equipment's with bare hand.
- Do not use any damaged electrical associates.
- Switch off electrical supply when not in use.
- Ensure adequate earthing and insulation.
- Do not operate any equipment if you are not trained.
- Ensure calibration of all measuring systems to avoid failure. Use right tools and equipment's for different activity.
- Ensure Valid work permit with isolation before doing any critical routine and non-routine activity.
- Adequate platform with protective railing and approach must be provided for carrying out CIP of tankers. Ensuring use of Safety Helmet.
- Identification of Pipelines and Silos. Adequate illumination in the process house.
- Adequate Food Safety measures.
- Control room PLC systems in good operational condition
- Housekeeping & hygiene must be ensured.
- Implementation of 6S practices. Ensure concentration on job.
- Be careful while handling glass bottles.
- Ensuring insulations on heat generating systems and heat transfer pipelines.
- Provision of interlocks, earthing, bonding, alarms, explosion proof vents on dryer. HAZOP study of Ammonia handling systems, Boiler and dryers.
- Calibration of measuring systems.
- Be careful about fingers while pressing & cutting paneer in machine. Do not change setting of machine.
- Provision of adequate stair ways, platforms with protective railings to avoid fall hazard.
- Regular training to employees, Preparedness for Emergency situation.
- Fire protection measures.
- Monitoring of the shop floor activity through CCTV.

4.4. Engineering

Associated Hazards & its Effect

- Slip fall of person in shop floor may cause serious incident like injury to person (fracture, dislocation, sprain, Fatal). Slip & fall and collision with structures due to poor illumination.
- Burn injury due to contact with hot water, steam, chemicals.
- Shock, electrocution, Fatal due to contact with electricity.
- Cut, Amputation injury due to contact with rotating parts of machines.
- Exposure to Toxic, Corrosive chemicals.

- Failure of hoses used for transfer of oil, milk, chemicals may cause burn injury or blunt injury.
- Exposure of Ammonia gas in case of leakage in compressor.
- Failure of lifting tools and tackles may cause serious injury and damage to property.

Safety Measures

- Use of PPE's (Safety shoes, Safety helmet, cotton hand gloves, leather apron, safety goggles) must be ensured.
- Be careful about contact with hot surface and hot water.
- Do not switch on or off any electrical equipment's with bare hand.
- Do not use any damaged electrical associates.
- Ensure adequate earthing and insulation.
- Use right tools and equipment's for different activity.
- Ensure work permit & adequate isolation before start of any critical routine and non-routine maintenance job.
- Ensure on line monitoring of Ammonia gas.
- Ensure use of quality items with proper specification for maintenance of machinery and plant systems.
- Ensure inspection of lifting tools, tackles, machines, pressure parts, pipe lines, portable power tools, hand tools before use and ensure routine inspection.
- Ensure use of insulated tools and insulated ladders during electrical maintenance activity.
- Training to workforce. Display of warning signs and Safety instructions.
- Adequate illumination in the shop floor.
- Replacement of damaged / defective equipment's.
- Calibration of all measuring systems.
- Ensuring proper housekeeping to avoid fall hazard.
- Proper keeping of compressed gas cylinders.
- Diversion of smoke to atmospheres through stack.
- Examination of PRV, Pressure vessels, lifting tools, tackles through competent person.
- Sprinkler provision around the Ammonia receiver area.
- Onsite emergency plan and mock drill should be conducted.
- Proper colour coding of pipe lines.
- Compressed gas cylinders should be kept with chain lock and with proper identification under shed.
- Storage of Coal and husk under shed to avoid spreading.
- Adequate fire Fighting systems. Operation of Boiler through qualified boiler engineer.
- Ensure adequate guarding on rotating parts of equipment's. Siren Pull cord and emergency push bottom switch for conveyor operation.
- Acoustic enclose for DG to control noise pollution.
- Adequate safety measures related to confined space work in silos, ETP, STP tanks.
- Ensuring monitoring of oxygen level & other toxic gas if any in confined space.

4.5. Packing & Handling of Finished Products.

Associated Hazards & its Effect

- Slip fall of person in shop floor may cause serious incident like injury to person (fracture, dislocation, sprain, Fatal). Slip & fall and collision with structures due to poor illumination.
- Shock, electrocution, Fatal due to contact with electricity.
- Cut, Amputation injury due to contact with rotating parts of machines.
- Exposure of Ammonia gas in case of leakage of ammonia in Cold rooms.
- Exposure to cold atmosphere in Cold room.
- Fall of materials.
- Cut injury due to contact with broken glass.
- Hitting with trolley, Powered industrial vehicles
- Fire in packing materials, insulations, overheating of machines and failure of electrical systems.
- Injury due to fall of film rolls and cut injury due to contact with broken glass items.

Safety Measures

- Use of PPE's (Safety shoes, Safety helmet, cotton hand gloves, leather apron, safety goggles) must be ensured.
- Do not switch on or off any electrical equipment's with bare hand.
- Do not use any damaged electrical associates.
- Ensure adequate earthing and insulation.
- Ensure work permit & adequate isolation before start of any critical routine and non-routine maintenance job.
- Training to workforce. Display of Safety instructions and posters. Implementation of 6S Practices.
- Proper maintenance of Ammonia transfer systems including pressure control systems.
- Calibration of measuring systems.
- Proper maintenance of hand trolley & industrial powered trucks, Fork lifts.
- Proper housekeeping and hygiene practices.
- Ensure provision and use of cold safety apron in cold room
- Monitoring temperature of cold room.
- Fire protection systems. Provision of smoke detectors and alarms.

4.6. HR & Administration and Accounts.

Associated Hazards & its Effect

- Slip fall of person in shop floor may cause serious incident like injury to person (fracture, dislocation, sprain, Fatal). Slip & fall and collision with structures due to poor illumination.
- Shock, electrocution, Fatal due to contact with electricity.
- Cut injury due to contact with broken glass.
- Fire due to overheating of electrical systems, AC's, Printer, Xerox machine, micro oven etc in office.
- Fire in PNG / LPG facility inside canteen.

- Insect bite during Gardening activity.
- Injury due to Public unrest.

Safety Measures

- Safety instructions to workforce.
- Proper housekeeping.
- No work to be carried out without valid work permit.
- Ensuring electrical safety measures.
- Display of SOP's, road safety signs and safety poster.
- Fire protection systems.
- Adequate illumination in case working during night hours.
- Proper maintenance of Electrical installations and server room.
- Switching off AC's, PC's, Xerox machine, printers, lights when not required.
- Adequate emergency preparedness at Unit to handle any emergency.
- Adequate training to employees.
- Behavioral based training & statutory related training programs for employees.
- Provision of PPE during gardening activity.
- Proper maintenance of Fire protection systems.
- Ensuring statutory Compliances.

4.7. Stores and Purchase

Associated Hazards & its Effect

- Slip fall of person in shop floor may cause serious incident like injury to person (fracture, dislocation, sprain, Fatal). Slip & fall and collision with structures due to poor illumination.
- Fall of material.
- Cut injury due to contact with broken glass.
- Hitting with trolley, Powered industrial vehicles
- Fire in packing materials, insulations, overheating of machines and failure of electrical systems.
- Fire in compressed gas cylinders.
- Splashing of chemical during unloading of chemicals from tanker.
- Fall of person from truck, tanker during inspection of material.
- Wearing of PPE's.

4.8. Projects (Green Field & Brown Field)

Associated Hazards & its Effect

- Slip fall of person in shop floor may cause serious incident like injury to person (fracture, dislocation, sprain, Fatal). Slip & fall and collision with structures due to poor illumination.
- Hand / Finger Cut, amputation, blunt injury.
- Fire and explosion, loss of property.
- Electric shock, Electrocution.
- Fatal in case fall of person.
- Collapse of building / structures.
- Collision of vehicles. Road accidents.
- Fall of person in excavation pits.

- Exposure to steel rods.
- Failure of lifting tools, tackles, lifting machines.
- Insect bite.
- Fire in compressed gas cylinders.

Safety Measures

- Safety instructions to workforce. Site Tool box talks.
- Inspection of equipment's before use. Use of right tools for the job.
- Compressed gas cylinders should be kept with chain lock and with proper identification under shed.
- No work to be carried out without valid work permit.
- Ensuring electrical safety measures. Display of warning sign & barricading of the site.
- Inspection of all equipment's before use.
- Fire protection systems.
- Deployment of qualified person for supervision of the job. Approval of design drawing.
- Adequate illumination in case working during night hours.
- Ensure examination of lifting tools, tackles and lifting machines through competent person.
- Proper housekeeping practices.
- Proper stacking of materials.
- Ensuring use of required PPE's (Safety helmet, safety shoes, safety goggles, nose mask,
- Road safety practices.
- Strict enforcement of Safety rules and regulations.

4.9. Environment, Health, Safety & Fire

Associated Hazards & its Effect

- Slip fall of person in shop floor may cause serious incident like injury to person (fracture, dislocation, sprain, Fatal). Slip & fall and collision with structures due to poor illumination.
- Hand / Finger Cut, amputation, blunt injury.
- Fire and explosion, loss of property.
- Electric shock, Electrocutation.
- Collision of vehicles. Road accidents.
- Busting of Fire extinguishers during hydrotest.
- Exposure to smoke and fire during Firefighting.
- Expose to Ammonia and corrosive chemicals during handling emergency in case of leakage.
- Exposure to Hazardous waste.

Safety Measures

- Safety instructions to workforce.
- Inspection of equipment's before use. Use of right tools for the job.
- Proper housekeeping.
- No work to be carried out without valid work permit.
- Ensuring electrical safety measures. Display of warning sign & barricading of the site.
- Proper maintenance of Fire protection systems.
- Adequate illumination in case working during night hours.
- Ensuring use of required PPE's (Safety helmet, safety shoes, safety goggles, nose mask,
- Adequate emergency safety measures. Mock drill, Fire drill must be conducted for awareness among employees.
- Provision & maintained all emergency safety equipment's like BA set, Safety showers, portable gas detectors, safety touch, hand siren etc. in good condition.
- Compliance to all legal requirements related to EHSF.
- Regular inspection and audit of different sections.
- Implementation of 6S practices.

5. CONCLUSION

Employees are valuable assets for an organization and Safety is paramount importance. It is the moral responsibility of employer to ensure adequate safety provisions in work place. Hazard identification and control measures according to identified hazard is a vital tool for eliminating incidents in dairy industries.

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