

**ALABAMA DEPARTMENT OF PUBLIC HEALTH  
ADMINISTRATIVE CODE****CHAPTER 420-3-16-A  
APPENDICES****420-3-16-AF      Appendix F - Cleaning and Sanitization.****I. METHODS OF SANITIZATION****CHEMICAL**

Certain chemical compounds are effective for the sanitization of milk containers, utensils, and equipment. These are contained in either in 40 CFR 180.940 and shall be used in accordance with label directions, or Electro-Chemical Activation (ECA) device manufacturer's instructions if produced onsite in accordance with Section II below.

**STEAM**

When steam is used, each group of assembled piping shall be treated separately by inserting the steam hose into the inlet and maintaining steam flow from the outlet for at least five (5) minutes after the temperature of the drainage at the outlet has reached 94°C (200°F). The period of exposure required here is longer than that required for individual cans because of the heat lost through the large surface exposed to the air. Covers shall be in place during treatment.

**HOT WATER**

Hot water may be used by pumping it through the inlet if the temperature at the outlet end of the assembly is maintained to at least 77°C (170°F) for at least five (5) minutes.

**II. CRITERIA FOR THE ONSITE PRODUCTION AND USE OF ELECTRO-CHEMICAL ACTIVATION (ECA) GENERATED HYPOCHLOROUS ACID FOR THE SANITIZATION OF MULTI-USE CONTAINERS, UTENSILS, AND EQUIPMENT**

The following is a list of criteria that are required for on-site generation of ECA generated hypochlorous acid that was produced onsite and used as a sanitizer for the sanitization of multi-use containers, utensils, and equipment.

1. The ECA device manufacturer shall be registered with the EPA as a pesticidal device establishment pursuant to 40 CFR 152.500 and shall comply with the labeling requirements outlined in 40 CFR 156.10.

2. The minimum dilution percentage of the sanitizer shall be fifty (50) parts per million (ppm) free available chlorine (FAC) with a minimum contact time of thirty (30) seconds pursuant to the efficacy requirements for EPA DIS/TSS four (4) Sanitizer rinses, for previously cleaned milk-contact surfaces, and less than two-hundred (200) ppm FAC. The sanitizer produced shall meet the data requirements of 40 CFR Part 158 Data Requirements for Registration, Pesticide Assessment Guidelines - Subdivision G, 91-2(f), and its test documents shall be pursuant to Good Laboratory Practices (GLPs).
3. The salt used to generate the sanitizer shall be of food-grade quality rated at a minimum of 99.6 percent purity, and potable water shall be used to ensure quality and consistency of the sanitizer generated.
4. The ECA device and its solution concentrate storage containers shall be constructed of materials that do not impart toxic materials into the sanitizing solution either as a result of the presence of toxic constituents in the materials of construction or as a result of physical or chemical changes that may occur during the ECA process.
5. The ECA solution concentrate storage containers shall be labeled with the following:
  - (a) Contents.
  - (b) Environmental Protection Agency (EPA) establishment number for the ECA device manufacturer.
  - (c) Dilution percentage instructions for use and storage conditions, including the shelf-life.
  - (d) A list of its active and inert ingredients.
  - (e) Other required standard safety data disclosures, formerly referred to as Material Safety Data Sheet (MSDS).
6. The ECA device used to produce the hypochlorous sanitizer shall control and record the parameters to ensure that the ECA device is operating within its design limits and provides an effective real time notification or alarm and shall shut down when it falls out of the required range as recommended by the ECA device manufacturer.
7. Standard measurement methods such as FAC titration or chlorine test strips shall be used to verify that the concentration of the ready to use sanitizer being applied is in a range between 50 ppm and 200 ppm. Measurement equipment shall be checked, calibrated, and measurements recorded. All

records shall be accessible to the Health Officer for inspection. Electronically generated records for FAC concentrations, if used, shall meet the criteria specified in Appendix H, Section V.

### **III. EVAPORATING, DRYING, AND DRY PRODUCT EQUIPMENT CLEANING**

#### **CLEANING**

Cleaning of Evaporators and Condensers - Some evaporators are designed so that the milk or milk product is exposed to large surface areas for a long period of time at temperatures conducive to the growth of microorganisms.

Pipelines and/or equipment designed for automated mechanical cleaning of evaporators should meet the following requirements:

- (a) A pH recording device should be installed in the return solution line to record the pH and time which the line or equipment is exposed during the cleaning and sanitizing operation.
- (b) These pH recording charts should be identified, dated, and retained for three (3) months.
- (c) During each official inspection, the Health Officer should examine and initial the pH recording charts to verify the time of exposure to the cleaning solutions and their pH.

The following are suggested procedures for cleaning and sanitizing evaporators and condensers:

The surface area inside an evaporator is extremely large. Not only is there a large separator chamber and vapor lines but steam chests may also have as many as 500 to 1400 heating tubes from 3 to 15 meters 10 to 50 feet long. The total surface area may be 4,000 to 35,000 square feet, which may require large volumes for recirculation. This surface area shall be cleaned and sanitized carefully or it will contaminate the milk or milk product. The operating temperatures in an evaporator are very close to the growing temperatures of thermophilic and certain mesophilic types of bacteria. The first effect may operate at 60°C (140°F) to 77°C (170°F), the second effect at 52°C (125°F) to 63°C (145°F), and the third effect at 38°C (100°F) to 49°C (120°F). The product being evaporated is often re-circulated in the last effect several times until the right concentration is reached, which may give bacteria ample time to grow. A clean evaporator operates more efficiently. It is necessary to clean the evaporators after long periods of operations because burned-on material reduces heat transfer and efficiency. A point is reached where it will be more economical to stop and clean up than to continue to operate. Evaporators need cleaning for sanitary reasons as well as for efficient operation. Tube chests and heating plates shall be

cleaned to get good heat transfer. If vapor lines are not cleaned, it is possible to get a back surge of vapor when the vacuum is released. This can carry soil back into the milk or milk product thus lowering the quality. This soil may drop into the thermo-compression unit, block passage of vapors, and actually prevent good operation. Compounds for cleaning are usually divided into two (2) main groups:

(a) The alkaline cleaners usually contain caustic with water conditioners, synthetic detergents, and foam depressants added to enhance cleaning action. The purpose of the alkaline cleaner is to digest the bulk of the soil. The alkaline solutions are usually run first at concentrations ranging from 1 percent to 3 percent at temperatures of 83°C (180°) to 88°C (190°F) for 30 to 60 minutes.

(b) Acid cleaners are usually food grade with synthetic detergents and inhibitors to prevent attack on metal surfaces. The purpose of acid cleaners is to remove mineral films, alkali cleaner residues, and shine the inside surfaces. Acid solutions are usually used last at concentrations of 0.2 percent to 0.5 percent at 60°C (140°F) to 71°C (160°F).

In all cases, cleaners and cleaning instructions should be followed as recommended by the manufacturer of the cleaning compound. It is also necessary to follow the recommendations and instructions of evaporator manufacturers. The evaporators operating with compressed ammonia require special cleaning precautions.

Cleaning Methods - There are four (4) basic methods of cleaning evaporators:

1. Boil-out;
2. Circulation;
3. Spray cleaning; or
4. A combination of the three methods.

(a) The boil-out method is the oldest, but it is still very effective. It is accomplished by rolling or boiling the cleaning solution under partial vacuum. Heat is applied by the evaporator and just enough vacuum is used to roll the solution. Cleaning solutions are elevated to the dome and upper parts by opening and closing the vacuum breaker. Hand-brushing of some areas is often necessary following boil-out because it is difficult to thoroughly clean the upper surfaces with this method.

(b) Circulation cleaning is a newer method of cleaning. The cleaning solution actually follows the milk or milk

product path. The solution is circulated by returning it back to the starting point. Heat is applied by a pre-heater, tube chest, or steam jet, sometimes called a boil-out nozzle. This method is not adaptable to all types of evaporators and it is usually necessary to add spray cleaning devices to thoroughly clean separators and the bottom tube sheet in steam chests.

(c) Spray cleaning is the newest method of cleaning evaporators. Cleaning solutions are pumped through spray devices and distributed over the surfaces which are contacted by the milk or milk product. Heat is applied by a pre-heater, a surge tank, or on the run with live steam. When properly designed and operated spray cleaning systems are used, cleaning problems are at a minimum. Spray cleaning offers many advantages over boil-out or circulation methods of cleaning. Less water and less cleaning solution are required. This not only results in a saving of water, heat, and cleaners, but more concentrated cleaning solutions can be used giving faster, more effective cleaning. Heat for the rinse water and cleaning solutions is applied externally, preventing additional burn-on in tube chests. As the evaporator is not under vacuum, less heat is required to keep the solution hot, resulting in a saving of fuel. Higher temperatures can be used to improve cleaning efficiency. There are some disadvantages to spray cleaning. Spray devices cost extra money because they are specifically designed for almost every operation. Spray devices shall be properly placed and designed to cover the top of the dome in the separator, the tangential inlets, the vapor lines, sight glasses, and steam chest tubes. Spray cleaning may require additional stainless steel lines to convey the solution at the necessary volumes. Larger pumps are also required to pump the necessary volume of cleaning solution. Even with these disadvantages, the advantages of savings in heat, water, cleaning compound, and time outweigh the disadvantages.

(d) Sometimes there are advantages in using combined systems of cleaning. It may be possible to boil-out the steam chests and spray the separators. Sometimes it is possible to circulate the steam chests and spray clean the separators or other portions of the unit. Quite often the combined systems, especially the circulation in the spray system, will work best on certain types of evaporators.

(e) One of the biggest factors affecting the method of cleaning used is the type of evaporator. In a falling film type evaporator, circulation cleaning can be used to clean the tube chests and spray cleaning can be utilized to clean the evaporator chambers. When using a plate-type

evaporator, circulation cleaning is best. In an internal type tube chest, a boil-out system for the tubes and spray cleaning of the separator works very well. With an external chest type evaporator, the entire unit can be spray cleaned. If it is a compressed ammonia operated evaporator, spray cleaning works well, and sanitizing should be done to eliminate any microorganisms which may have survived the cleaning regimen. Sanitizing can best be accomplished by using chemical sanitizers. Heat may be used if all surfaces are heated to 83°C (180°F) or higher. Since there is a tremendous investment in stainless steel evaporators, it is necessary to use cleaning and sanitizing products which do not corrode stainless steel. Chemical sanitizers can be applied through the spray equipment or they can be applied with fogging guns.

**1. High-Pressure Pump and High-Pressure Lines** - The high-pressure pump and high-pressure line to the dryer nozzles may be cleaned as a separate circuit by connecting the line to the nozzle back to the drop tank and this tank connecting to the inlet of the high-pressure pump. The regular milk or milk product atomizing nozzles should be removed before cleaning is to be done.

Another method of cleaning the high-pressure pump and lines is to include this pump and high-pressure lines in the circuit when wet cleaning some types of spray dryers. In either case, a solution of 1-3 percent caustic heated to 72°C (160°F) should be circulated for at least thirty (30) minutes. A solution of inhibited acid should be pumped through the atomizing system as a daily procedure to remove the milkstone from the high-pressure pump and high-pressure line. A solution of inhibited acid should be recirculated a minimum of 10 to 15 minutes and followed by a rinse with potable water.

It is also recommended that the high-pressure pump head be disassembled as a daily procedure immediately following the final rinse and the parts be placed on a table or rack for air drying. When the pump is disassembled the parts are to be checked to see if they are clean, and to see if any maintenance is required to remove pits. Seats are also checked at this time. Since a high-pressure pump is subjected daily to extreme heavy duty, the valves and seats are recommended to be ground periodically to maintain uniform pressure on the atomizing nozzles. Prior to use, the entire system should be sanitized.

**2. Wet Cleaning of Dryers** - There are several methods of wet cleaning dryers:

(a) The first method is hand-brushing. The cleaning personnel go into the dryer with buckets of cleaning

solution and brush all surfaces of the dryer. The unit is then rinsed with a hose.

(b) Cleaning can also be done with hand-operated spray guns. These spray guns are pressure pumps which operate at high pressures in low volumes. In many cases, box-type dryers can be completely cleaned with the addition of a seven (7) foot extension on these pressure guns. By using high-pressure spray guns and cleaning compounds with a high synthetic detergent content, it is possible to remove very difficult soil.

(c) The third method of wet cleaning is by spray cleaning with various types of stationary or rotating spray devices. They usually operate at a high volume of low pressure in the range of 69 kPa (10 psi) to 138 kPa (20 psi). Constant spray coverage can be obtained when spray devices are properly designed. Usually several spray devices are required because of the many chambers, collectors, and down pipes within these units. Less time is required to do a complete job with spray cleaning. The systems are installed so that cleaning lines are easily connected to the spray devices and an effective return system. Spray cleaning time is much shorter than hand cleaning time, especially in large units. Spray cleaning eliminates the entry of cleaning personnel into the drying units. Silo or vertical type dryers are often 6.2 meters (20 ft.) to 30.4 meters (100 ft.) high and it is difficult and dangerous to clean by hand or by hand operated units. Spray cleaning eliminates the flavor contamination when switching to other milk or milk products. If an ungraded milk or milk product is run through the dryer, it is necessary to thoroughly clean before running a Grade "A" milk or milk product. There are disadvantages to spray cleaning. The spray devices shall be properly placed and designed to do the complete cleaning job. They shall be removable so as not to affect the air currents during operation. However, the advantages of safety plus cleaning time and consistently complete cleaning outweigh the disadvantages. A typical spray cleaning cycle might operate as follows:

(1) The various spray heads are placed in the dryer and securely fastened into place. The rinse water is pumped through the spray device and allowed to run down the side-walls of the drying units. Cleaning compounds which are mild alkaline or chlorinated cleaners are prepared at 0.3 percent concentration, heated to 71°C (160°F) to 83°C (180°F), and circulated for forty-five (45) minutes to one (1) hour. The unit is given a final rinse and is thoroughly dried. Occasionally acid type cleaners are used to control mineral films. Sanitizing with

chemical sanitizers is a controversial subject. Sanitizing can be done with heat but it may be difficult to heat all surfaces to 83°C (180°F). Heating to 83°F (180°F) for ten (10) minutes does not kill spore formers. However, they are killed with many chemical sanitizers. Even if heat is used, it is recommended that chemical sanitizers be occasionally used. By pumping the sanitizer solution to the high-pressure pump or by fogging with high pressure, it is possible to completely cover the milk or milk product-contact surface. Actually, the unit shall be thoroughly dried before operation. Chlorine sanitizers may cause corrosion. Obviously, these compounds should be used with care. If chlorine is left on the dryer and heat is applied, the chlorine droplets will become hot and concentrate and cause pitting. When chlorinated cleaners are used, a dryer surface can be effectively cleaned and at least partially sanitized and the solution can be completely rinsed. Acid-synthetic detergent type sanitizers have been developed which are effective on spore formers. These compounds are germicidal, effective in hard water, and stable in hot or cold solutions. They have an advantage in that they are noncorrosive to dairy metal.

(2) It is not necessary to wet clean dryers on a daily basis. However, a schedule should be set up so cleaning is done periodically. As long as a dryer is operating continuously, it is not necessary to clean it from an efficiency standpoint. Some types of dryers require very little cleaning, maybe once each month; others require dry cleaning on a more frequent basis. It is necessary to clean and sanitize dryers if they are going to remain idle any appreciable length of time. Bacteria may grow in dryers which remain idle. Dryers shall be spray cleaned if they are improperly operated, causing burn-on in the drying chamber. Whenever fires develop inside the drying unit or when burn-on occurs, it is necessary to thoroughly clean at least the drying chambers. Quality is the key to the dry milk industry. There should be a program of cleaning and sanitizing of both evaporators and dryers. Better quality milk and milk products are produced in evaporators and dryers when thoroughly cleaned and sanitized on a regular basis.

**3. Dry Cleaning** - It is very difficult to discuss proper cleaning procedures without also discussing proper operating procedures, especially the start-up and shutdown of the dryer. Assuming the dryer has been properly started and operated throughout the run or drying cycle, the first step in a

successful cleaning operation is shutting the dryer down properly. The type of energy supplying heat to the dryer chamber, i.e., steam or gas, alters the proper shutdown technique. The correct procedure in shutting down a steam heated dryer is as follows:

- (a) Shut off the main steam valve at the proper time.
- (b) Maintain the proper dryer outlet temperature for drying by gradually reducing the output of the high-pressure pump until the residual heat of the steam coil is dissipated to a point where it does not maintain proper temperature or until the milk or milk product being pumped by the high-pressure pump does not maintain a satisfactory spray pattern.
- (c) Keep the dry milk product removal system and conveying system in operation.
- (d) Keep the air intake and exhaust fans on the dryer in operation until the main chamber is sufficiently cooled to provide a comfortable atmosphere for the cleaning personnel.

On a gas-fired spray dryer, the burner assembly has very little or no residual heat capacity. Therefore, the shutdown is more rapid. The correct procedure for shutting down a gas-fired dryer is as follows:

- (a) Shut off the gas supply to the burner.
- (b) Immediately shut off the high-pressure pump.
- (c) Same procedure as steam heated dryer.
- (d) After the above procedures have been accomplished, shut down the intake fan. Let the exhaust fan and vibrators or shakers continue to operate, along with the milk and milk product removal system. The exhaust fan should be severely dampered so that it induces only a small air-flow. A small auxiliary fan is sometimes used in lieu of the dampered exhaust fan. The use of either fan serves a twofold purpose: First, it is helpful to put the drying system under a slight negative pressure to reduce the tendency for milk or milk product to drift out of the system into the milk plant through open doors, etc. Secondly, it is vital to prevent thermal currents from creating a reverse air-flow through the drying system, which tends to deposit milk or milk product on the heating surfaces and plenum duct. Milk or milk product deposits on steam coils reduce their heating ability, create sediment, and conceivably bacterial problem areas. If the dryer is gas fired, there is a further hazard of fire. It is important; therefore, that the closure or covers supplied by

the manufacturer be placed on the inlet air duct system simultaneous with the shutdown of the fan. After any prime milk or milk product has been removed from the drying system, the system is ready for cleaning. The cleaning personnel should be supplied each day with a freshly laundered set of coveralls, white cap, white face mask, and clean rubbers or boot covers (canvas or single-service plastic). Prior to donning the above uniform, the procedure is to remove the spray nozzles and pipes as these are normally cleaned with the liquid dryer feed equipment. With clean uniforms, proper brushes, and preferably vacuum cleaning equipment, the cleaning personnel enter the main desiccator chamber and start the cleaning process as far upstream as possible from the milk or milk product removal or pneumatic conveyor system:

- (1) The first portion cleaned is the collector system. This is done by inserting a brush into the cloth tubes and brushing the length of the tube. Again, this can be done more satisfactorily by utilizing the special vacuum tools designed and available for this service.
  - (2) Remove the dust covers and brush or vacuum out the nozzle ports.
  - (3) Manually brush or vacuum the ceiling and walls of the drying chamber.
  - (4) Sweep or vacuum clean the floor of the dryer, placing milk or milk product in a container.
- Note:** Do not remove this milk or milk product by way of the milk and milk product removal system.
- (5) Inspect the dryer for any inadvertent wet spraying or nozzle drippings that may have occurred during the drying cycle. Should either of these have occurred, the application of a minimum amount of water and effort will be required to remove the clinging material. Any moisture introduced shall be removed before operation begins because of its effect upon smooth milk or milk product flow and because it would establish a more favorable environment for bacterial growth if it were allowed to remain.
  - (6) Check the collector for loose or torn bags and any other mechanical checks necessary before leaving the dryer.
  - (7) Close the dryer securely and check the switches to make sure they are in the proper starting positions. At frequent intervals, not over a two (2) week period, the operator should clean and inspect the heated air intakes of the dryer, assuming that the dryer is properly

operated during this time. However, should a malfunction occur where the dryer operator does not follow the procedures outlined for proper shutdown, it may require an inspection and cleaning at closer intervals. Frequent inspection will eliminate a source of sediment contamination.

(8) On start up after dry cleaning of the cloth collector dryer, the first two (2) bags of milk or milk product shall be discarded. This will allow for the removal of any milk or milk product remaining in the tubes and system after shutdown.

#### AUXILIARY DRY PRODUCT EQUIPMENT

1. **Sifters** - In general, there are two (2) types of dry product sifters in use by the dry milk industry. These are the shaker type and the rotary or gyrating type. Both are designed to operate at various capacities either manually bagging or packaging from their outlet or designed for automatic packaging equipment.

For the general guidance of sifter manufacturers and the dry milk industry, the following screen size openings may be considered as recommended openings to result in satisfactory screening of the listed dry milk product:

**TABLE 13**

Product	Sieve Designation From The American Society For Testing and Materials (ATSM) International E-11	Maximum Sieve Opening (approximately)	
		MM	Inch
Nonfat Dry Milk	#25	0.707	0.027
Dry Whole/Dry Buttermilk	#16	1.19	0.047

It is recognized that larger screen size openings may be necessary for sifting certain special dry milk products, such as "instant" products, and for classification of dry milk products into different particle sizes.

Openings referred to above are based on general experience as to what constitutes satisfactory screening to remove dry milk product lumps or potential dry milk product contamination, and also on the ability of most currently used sifters to successfully sift dry milk products through such size openings, without excessive loss of fine dry milk product into the "reject material" outlet. Other factors also affect loss, such as:

- (a) Percent of "open area" in the screen used.
- (b) Uneven flow rates to the sifter.
- (c) Ratio of screening surface to dryer capacity.
- (d) Amount and kind of mechanical energy applied to the screening surface.
- (e) Sifter design and construction.
- (f) Nature of dry product being sifted.

Screen opening dimensions may be obtained by any desired combination of wire thickness and number of wires per inch. For instance, if the screening surface is made of stainless steel woven wire, the 0.707 mm (0.027 of an inch) opening might be obtained by using 24 X 24 mesh market grade screen cloth made of wire 0.399 mm (0.014 of an inch) thick about 45 percent open area or by using 30 X 30 bolting cloth screen made of wire 0.185 mm (0.0065 of an inch) about 65 percent open area or by many other mesh-wire thickness combinations. These combinations allow a wide choice to obtain a desired balance between screen strength and percent open area. If materials other than stainless steel are used to construct the screening surface, similar combinations may be employed to achieve the desired opening size.

Recommendations for cleaning dry milk product sifters:

a. **Dry Cleaning Program** - The procedures set forth below should be followed:

(1) Completely dismantle and thoroughly vacuum or dry brush-clean all dry milk or milk product-contact surfaces of the dry milk sifter. Reassemble as soon as finished and make every effort to keep all parts dry.

(2) Check the sifter screen(s) for broken or displaced wires (threads) and for other openings around the frame of the screen, which might permit the passage of un-sifted dry milk product. Other parts of the sifter, including ball trays and balls, if used, should also be inspected for condition. Any necessary repair or replacement should be made as soon as possible.

(3) Flexible rubber or cloth connectors at the inlet and outlets of the sifter should be thoroughly cleaned daily following the procedures as recommended for the sifter. At this time, connectors should be closely examined for holes, cracks, or other damage.

Note: To facilitate removal for cleaning, the use of easily removable fastening devices are recommended.

(4) Thoroughly vacuum or dry brush-clean all external parts of the sifter, including the sifter frame and drive mechanism.

b. **Wet Cleaning Program** - The procedures set forth below should be followed:

(1) Completely dismantle as cited in a.(1) above; remove all loose dry milk product; then rinse all parts with clear water; and follow by a thorough hand-brushing of all parts, using a general purpose dairy cleaner. Rinse thoroughly to remove all evidence of cleaning solution or soil. It is recommended that hot water at 7°C (170°F) or above be used for rinsing in order to sanitize the equipment and to aid the subsequent drying.

(2) Allow all parts to air dry completely prior to reassembly.

(3) The wet wash should be done as frequently as necessary and should be done after each use if the sifter is not being used on a daily basis.

(4) After cleaning, drying, and reassembly, the dry milk product outlet should be protected from contamination.

c. General Recommendations

(1) Vacuum cleaning is preferred to brush-cleaning or cleaning with air under pressure as it decreases the dust drift problem to other areas of the milk plant.

(2) Brushes or vacuum cleaner fittings used for cleaning dry milk product-contact surfaces should not be used for cleaning non-dry milk product-contact surfaces or for other uses which might result in contamination. Such brushes and special fitting should be stored in an enclosed cabinet when not in use. For protection and housekeeping considerations, such cabinets preferably should be of non-wood construction and should have open mesh metal shelving.

**Note:** For additional details refer to 3-A Sanitary Standards for Sifters for Dry Milk and Dry Milk Products, Serial 26-##.

**2. Storage/Shipping Bins:** The use of portable bins, totes, super sacks, or other portable storage/shipping containers shall comply with the construction requirements of Item 11p and the cleaning and sanitizing requirements of Item 12p of these rules.

If interior bracing and ladders are used in milk plant storage bins, they shall be constructed of smooth rounded metal and be installed sufficiently far from the walls to prevent harborages.

Dry milk product entrance and discharge openings connected to the attending conveying equipment shall be dust-tight and shall be easily accessible for cleaning. Vents to the exterior shall be equipped with readily removable air filters of adequate capacity or readily removable covers. If air is to be introduced into the dry milk product zone, only filtered air shall be used, and it shall comply with the applicable standards of Appendix H. Auxiliary agitators or any other interior devices, if used, shall be designed to be smooth, crevice-free, and readily cleanable. The exterior surface of the bin should be smooth, hard finished, and readily cleanable. Hinges on covers, if used, shall be the take-apart type. Covers or doors shall be provided to enclose the dry milk product zone when dry milk product is not being dumped. These shall be so constructed that dirt or dust on the top will not slide or fall into the bin when the cover is open. Access openings shall be provided on all in-milk plant bins. Such openings should not be less than 45.7 centimeters (18 inches) in its smallest dimension. Covers shall be constructed without raised internal reinforcements and should be hinged and equipped with a quick opening device. The gaskets for such openings shall be made of solid material that is non-toxic, nonabsorbent, smooth, and unaffected by the dry milk product. Storage/shipping bins in continuous use either in the milk plant or in transporting dry milk products from one (1) milk plant to another should be cleaned according to manufacturer's recommendations when necessary. They may be cleaned by either approved dry cleaning methods or wet cleaned.

**3. Packaging and Packages** - Packaging equipment for dry milk products will vary greatly as to their design depending upon whether the packages being filled are drums, bins or bags. Whatever equipment is used, it should be designed so as to protect the dry milk product from contamination from outside sources and from air during the packaging operation. All connections of conveying equipment to packaging devices should have dust-tight connections. All conveyors, ducts, belts, and screws used in connection with packaging equipment should be provided with a dust collector system, capable of eliminating any visible dust. All dry milk product hoppers, when used, should be provided with covers to properly protect the dry milk product from contamination. Hand-filling should not be permitted except for periods of adjustment of automatic weighing devices.

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