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EC92-2308 Principles and Practices for Food Sanitation Programs

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Principles and Practices

for Food Sanitation Programs

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Introduction

Food plant sanitation programs will vary depending on the type of product produced. All sanitation programs begin with a commitment to construct, upgrade, and maintain the food processing system. Follow federal, state and local regulations. Your food plant sanitation program should concentrate on the following areas:

1. Plant and Grounds
2. Plant Construction
3. Equipment
4. Receiving and Storage
5. Processing and Packaging
6. Warehousing and Shipping
7. Cleaning and Sanitizing
8. Personal Hygiene and Food Handling

■ Plant and Grounds

The first impression of your facility is the appearance of the building and grounds. Keep the grounds clean and uncluttered. The parking lot should be paved and maintained properly. Is there proper drainage so there is no standing water for insects and microbes to breed? Do not store refuse and garbage near the plant.

■ Plant Construction

The plant itself should be pest-proof. Check the building for cracks or other entrances for pests and repair them. Doors and windows should fit tightly and be screened when opened.

A well-designed processing plant is not a safeguard against microbial infiltration unless the design incorporates hygienic features, such as easy-to-clean interior structures. Walls should be smooth and easy to clean, preferably glazed tile or epoxy-coated block walls. The floors should be concrete or tile and slope to covered drains. The covers should be easily removed for cleaning.

Protect all light fixtures with plastic shields to reduce extraneous material from falling into food. Good illumination in a food plant is generally related to good plant keeping practices. Thoroughly clean and maintain all light fixtures regularly.

Proper ventilation in a food plant is basic to food plant sanitation. Condensation control will help stop mold growth. Well-engineered exhaust hoods and ducts will help control moisture and off-odors in the food plant. Positive filtered air flow in a food plant will help eliminate dust, dirt, and most airborne contaminants. Properly maintain all ventilation system filters and keep them in a sanitary condition.

Design plumbing for water, waste disposal, and the steam lines to

prevent any possible cross contamination. Use potable water for all cleaning operations, food manufacturing operations, and the personal needs of all plant personnel. If you have a private well have the water tested periodically.

Facilities should be large enough to provide an organized flow of materials through the facility without a crossover of raw and finished product to facilitate an effective sanitation program.

■ Equipment

Stainless steel is the best finish for all food plant equipment, piping, and all food contact surfaces. Surfaces should be smooth and free of pits, crevices and ledges. All equipment should be designed to eliminate dead ends and dead spaces that could harbor soil, bacteria, and other contaminants. Equipment should be designed so all contact surfaces can be readily and thoroughly cleaned and sanitized. Do not locate stationary equipment within a foot of walls and ceilings. Allow 6 inches above the floor so access for cleaning is available. Install equipment to allow easy cleaning and to eliminate hiding and breeding places for pests. When possible, install equipment on casters with sanitary quick connect utilities.

■ Receiving and Storage

Source of Raw Materials

Good sanitation, like the process itself, begins with raw materials; the ingredients from which the food product is manufactured.

Buy ingredients only from a certified and approved source.

1. Only purchase from inspected wholesalers to assure that the ingredient is handled in a sanitary method.
2. Purchase meat that has the U.S.D.A. stamp.
3. All poultry purchased must be inspected by federal or state government agencies.
4. Eggs should be U.S.D.A. graded. All frozen and dried eggs must be pasteurized.
5. Purchase fish that has been graded and inspected.

Shipment Inspection

Food supplies must be in excellent condition when they arrive. Check the condition of the transport vehicle. Train receiving inspectors to judge quality, check temperatures and look for external evidence of pests, insects and rodents. They also should check for toxic materials that may have been shipped with the food ingredients.

1. Inspect food immediately.
 - a. This makes returns or credits from suppliers easier.
 - b. Make sure perishable foods are not out of their proper storage conditions for more than a brief time.
2. Arrange for delivery during slow periods.

- a. This allows time to examine foods properly.
3. Plan for arrival of shipments.
 - a. Sufficient refrigerator, freezer and dry storage space should be available.
 4. Complete and file a record of every lot of merchandise received.

Inspect loading docks for spillage and pest evidence. Don't neglect these areas when cleaning since they are ideal entrance areas for contaminants.

Food Storage Principles

1. "First In, First Out" (FIFO)
Create a system such as dating of goods upon receipt and placement in the rear of storage areas.
2. Keep perishable and potentially hazardous foods out of the temperature danger zone. Examples of potentially hazardous foods are raw eggs, and raw meat and poultry. To avoid the risk of microbial growth, handle these products properly.
3. Store food only in areas designed for that purpose.
4. Keep all goods in clean wrappers and containers.
 - a. Dirty wrappers attract pests or contaminate food.
 - b. Do not reuse packaging.
 - c. Wrap products in moisture proof and air-tight material in most cases.
5. Keep storage areas clean and follow cleaning schedules. This is a good time to check for damaged, spoiled or out of date products and dispose of them.

6. Keep vehicles for transporting food within the establishment clean. Do not use the same cart to carry garbage to transport food.

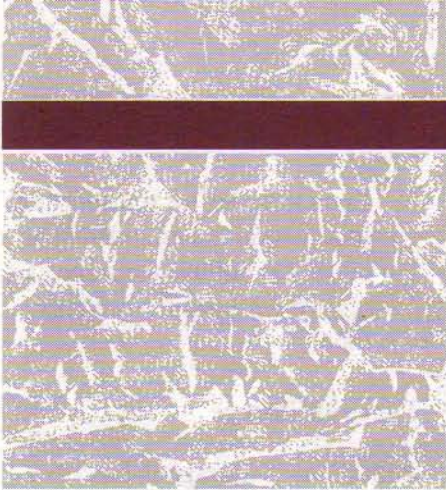
Types of Storage

Refrigeration Storage is for short-term holding of perishable and potentially hazardous foods at 40°F.

Ideally, separate refrigerators should be available for different food types. This also would help prevent cross-contamination. When one refrigerator is used, put meat and fish in the coldest parts of the refrigerator. Maintain a maximum temperature of 40°F or lower. Check temperatures regularly.

1. Use large capacity commercial equipment.
2. Overloading discourages cleaning, slows cooling and allows moisture buildup.
3. All surfaces should be of materials that clean easily and resist corrosion, chipping and cracking.
4. Elevate shelves 6 inches off the floor so as not to harbor vermin or allow dirt to accumulate; removable shelves allow easy regular cleaning.
5. Interiors should be free of sharp edges and tight corners where harmful microorganisms may lurk.

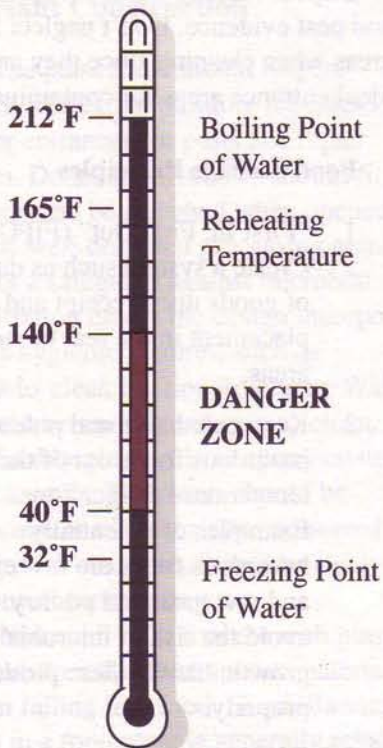




6. Locate refrigeration coils to avoid condensation that might collect and drip into food or contact food surfaces causing contamination. Clean coils regularly.

Freezer Storage is for the long-term keeping of perishable foods.

1. Maintain freezers at an air temperature of 0°F. A slight variation above 0°F can be destructive, especially for meat. Defrost damage is cumulative.
2. Keep a visible thermometer to monitor and record temperatures.
3. Place products in storage promptly on delivery.
4. Wrap foods stored in a freezer in moisture-proof material to prevent flavor loss, discoloration, dehydration, and odor absorption.
5. Defrost freezers as frequently as necessary to maintain efficiency (refer to operator manual).
6. All surfaces should be made of materials that are easily cleaned and without sharp edges or corners.



Dry Storage is the long term storage of less perishable items.

1. Dry storage areas should be ventilated and well-lighted.
2. Temperatures of 60° F to 70° F are adequate for most goods placed in dry storage.
3. A 50-60% relative humidity is satisfactory for most goods.
4. Prominently display a thermometer and possibly a hygrometer in all storage locations monitored and recorded.

5. Slatted shelving and covered bins should be of corrosion resistant metals.
6. Avoid overcrowding to improve circulation.
7. Keep foods 18 inches from walls and at least 6 inches above the floor. This eliminates hiding places for pests, makes cleaning easier, protects food from dampness and helps keep food containers clean.
8. Windows should be frosted to avoid direct sunlight in the room to help maintain food quality.
9. Steam pipes, ventilation ducts, water lines and sewer lines should not be found in a well designed storeroom. Condensation and dripping can promote bacterial growth in dry stable items.
10. Clean storerooms routinely.
11. Maintain an effective pest control program.
12. Never store chemicals and cleaners in the same areas as food ingredients.
13. Never keep garbage in the same room as food.
14. Do not permit smoking in dry storage areas.

■ Processing and Packaging

1. Always start with thoroughly cleaned and sanitized equipment and utensils.
2. The time-temperature principle is the most critical line of defense in keeping food safe during processing. Keep the time potentially hazardous foods are exposed to temperatures in the danger zone during preparation to an absolute minimum.
3. Perform mechanical manufacturing steps: washing, peeling, trimming, cutting, sorting and inspecting, cooling, shredding, extruding drying, and whipping, to protect food against contamination.
4. Avoid cross contamination from raw to cooked and ready-to-serve foods via hands, equipment, and utensils.
5. Clean and sanitize food-contact surfaces of equipment after every use. Follow the "Clean as you go" rule.
6. Thaw frozen foods properly. Freezing does not kill most bacteria, it just keeps them from multiplying. The microorganisms present on a product before freezing are still present and can multiply as the product begins to thaw. Keep frozen foods out of the temperature danger zone while thawing.

NEVER THAW FOOD AT ROOM TEMPERATURE.

7. Post all processing time and temperature schedules in the processing areas for each product. Keep a record for each lot or batch of product.

8. Careful monitoring of time/temperature and other physical factors: humidity, water activity, and pH (acid levels) minimize the potential for the growth of microorganisms.

■ Packaging

Fill, assemble, and pack food to protect against contamination. Food containers and food packaging materials should be safe, food grade material and suitable for the product. The surface of the package that contacts the food must be as clean and sanitary as possible. This is not the case for canned foods that are processed in their packages. Check films and flexible packages for water vapor transmission, especially if your product relies on low water activity to prevent microbial growth. Obviously, the type of packaging system selected for a given product is a complex, critical decision. Protection of the product, the most important function of packaging, ultimately involves many different aspects of sanitation.

■ Warehousing and Shipping

Storage of the finished product before shipping will depend on the product. Keep each product at its proper temperature and humidity following the guidelines for each storage area as discussed in the storage section. Do not store the finished product in the same area as the raw ingredients.

Inspect all shipping vehicles for proper temperature and cleanliness before loading.

■ Cleaning and Sanitizing

Cleaning frequency depends on the type of product produced. Processing highly perishable products may

require equipment and production areas to be cleaned every hour or two. On the other hand, very dry processes may require cleaning only when the line is used to produce a different product.

Soil will vary with the nature of the product. For example, raw vegetables will have field dirt. In a meat processing plant, there will be protein and fat which are difficult to remove with heat. There are various cleaning and sanitizing agents and it is vital to use the proper agents for effective cleaning.

Specific soil and detergent applications are found in Table 1.

A cleaning agent loosens soil from the surface being cleaned and keeps it suspended so that it is not redeposited on the item. Anything that removes soil - steam, water, soap, or sand is a cleaning agent. Ordinarily, the word refers to chemical compounds specifically formulated for special cleaning. Most synthetic detergents used in food processing plants are alkaline-based. Acid cleaners remove lime build-up and rust stains. Abrasive cleaners remove firmly-attached soil. Use abrasive cleaners with caution because they can mar smooth surfaces. Water temperature and type can affect the cleaning process. Generally, the higher the temperature the more effective the cleaner, but there are some cleaners



**Table 1-
Soil and Detergent
Application.**

Film/Deposit	Description	Cause	Removal	Prevention
Protein	Blue-rainbow hue, varnish-like, "apple sauce"	Using nonchlorinated cleaner Inadequate prerinse, Improper (sporadic periodic) cleaning	Chlorinated alkaline detergent	Adequate prerinse Proper cleaning w/ proper use dilution after each usage Chlorinated alkaline detergent
Milkstone	White to yellow	Mineral from milk Mineral from water	Acid wash	Regular and proper cleaning procedures coupled with acidified rinse
Fat/grease	Hanging water droplets Greasy (white) appearance	Low temperature Improper detergent concentration Regular use of acids in place of alkaline detergent	Proper temperature Correct concentration of alkaline detergent	Regular and proper cleaning procedures coupled with acidified rinse
Mineral salts (Calcium, Magnesium)	White (waterstone) chalky to gray	Rinse too hot drop-out of minerals from water supply No acidified rinse Alkaline detergent used, cannot handle hard water at present concentration	Acid wash	Acid wash Alkaline detergent used has good water conditioning ability Water softener or treatment
Iron	Red to brown /black	Water supply using chlorine with high iron content	Acid wash	Regular effective acid rinse Water treatment Proper selection of sanitizers

that work better in cold water. Some detergents may become ineffective in hard water. Cleaning effectiveness increases with the time of exposure to the cleaning agent and pressure applied to loosen and remove soil. This can be accomplished by friction from a brush, spray action or water under pressure. Consider cleaning needs when purchasing equipment.

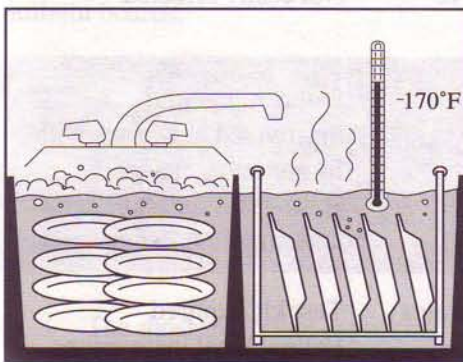
Sanitizers

After a surface has been thoroughly cleaned, it may be sanitized, or in the case of a food-contact surface, it **MUST** be sanitized.

Sanitization is done either by heating the object to a high enough temperature to kill microorganisms, or treating it with a chemical sanitizing compound. The object must be thoroughly clean and completely rinsed for the sanitizing process to work. Sanitizing is no substitute for good cleaning.

Immersing an object in 170 degree water for at least 30 seconds is a form of heat sanitizing. This is also done when equipment is cleaned in place. Water must be kept hot enough to effect sanitizing during pumping and circulation.

Sanitization can be achieved through the use of chemical compounds capable of destroying



disease-causing bacteria. Chemical sanitizing is done either by immersing an object in the correct concentration of sanitizer for one minute or by rinsing, swabbing, or spraying double the usual recommended concentration of sanitizer on the surface to be sanitized.

Test the strength of the sanitizing solution frequently, since the sanitizing agent is depleted as bacteria are killed. Change the solution when it is no longer effective. The sanitizer manufacturer usually provides test kits at no charge for this purpose.

Some sanitizing agents are toxic to humans as well as bacteria; therefore, use them only on nonfood-contact surfaces. Other agents may not be toxic, but they pass on undesirable flavors and odors and are unfit for food processors' plant use. Be sure that sanitizers in this category have not been selected.

Chlorine, iodine, and quaternary ammonium (quats) are the most common chemicals used in sanitizing.

Characteristics of some chemical sanitizers are listed in Table 2.

Many factors affect the action of chemical sanitizers:

1. Contact time
2. Selectivity - types of microorganisms killed by the sanitizer
3. Concentration - critical factor
Too low - failure to sanitize
Too high - taste and odor problems
4. Temperature - Generally, sanitizers work best between 75-120°F.

5. Solution pH - detergent pH levels can affect some sanitizers. Thoroughly rinse off detergents before sanitizing.
6. Quality of water
7. Directions for chlorine sanitizer
 - a. *Washing dishes:*
1/2 tablespoon chlorine/gallon of water
 - b. *Washing food contact surface:* 1 tablespoon chlorine/gallon of water

Factors affecting the action of chemical sanitizers are listed in Table 3.

Follow package directions explicitly for proper use of sanitizers. Write a procedure specifying cleaning and sanitizing chemicals and methods for each part of the plant and each piece of equipment. Properly train the persons responsible for cleaning in how to clean and dismantle the equipment.

At some point, determine the effectiveness of cleaning and sanitizing procedures used. Estimate bacteria counts on equipment surfaces before and after cleaning and sanitizing. After establishing the effectiveness of the sanitation procedure, sampling on a regular basis is all that is needed.



**Table 2 -
Chemical
Sanitizing Agents**

	Chlorine	Iodine	Quaternary Ammonia
Minimum Concentration			
-For Immersion	50 parts per million (ppm)	12.5	200 ppm
-For Power Spray or cleaning in place	100 ppm	25 ppm	
Temperature of Solution	75°F	75-120°F Iodine will leave at 120°F	75°F
Time for Sanitizing			
-For Immersion	1 minute	1 minute	1 minute; however some products require longer contact time; read label
-For Power Spray or Cleaning	Follow manufacturer's instructions	Follow manufacturer's instructions	Follow manufacturer's instructions
pH (Detergent Residue Raises pH of Solution)	Must be below pH 10	Must be below pH 5.5	Most effective around pH 7 but varies with compound
Corrosiveness	Corrosive to some	Non corrosive	Non corrosive
Responses to Organic Contaminants in Water	Quickly inactivated	Made less effective	Not easily affected
Response to Hard Water	Not affected	Not affected	Some compounds inactivated but varies with formulation; read label. Hardness over 500 ppm is undesirable for some quats
Indication of Strength of Solution	Test kit required	Amber color indicates effective solutions, but test kits must also be used	Test kit required Follow label instructions closely

References

Table 3 -

Factors of Sanitizer Effectiveness -

adapted from Giese (1991)

Sanitizers	Use Concentration ppm	Exposure Time	pH	Temperature Range (°F)	Dilution Effect	Recommended Effect
Chlorine	100-200	2-10 min	4	70-100	Significant	General
Iodophors	25	2-15 min	<3	70-100	Moderate	Hand/Utensil Dip
Quats	100-200	>24 hr	6-10	70-120	Little	Long Exposure
Acid-Anionic	200-400	>30 min	1.6-2.3	90-150	Very little	CIP or COP

■ Personal Hygiene

Humans are the most common source of food contamination. Therefore, provide proper training in personal hygiene or house rules. The best time to discover if workers are poor sanitation risks is before they are hired.

Write policies on personal hygiene or house rules in manuals and post in restrooms, over washstands, and on bulletin boards.

1. Wash hair often; oily, dirty hair is attractive to bacteria, and dandruff can fall into food.
2. Bathe daily or often; skin is a prime breeding ground for bacteria.
3. The most important aspect of personal hygiene is frequent and thorough hand washing. Dirty hands transmit contami-

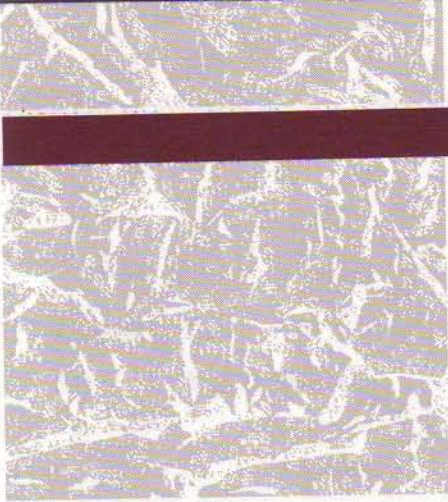
nants to the food product. Hand washing should follow any act that offers even a remote possibility that hands have picked up contaminants.

4. Fingernails kept trimmed are easier to keep clean.
5. Wounds and open sores should be antiseptically bandaged and the bandage covered with a waterproof protector. In some cases, the worker may need to be moved to another job station, where food isn't handled, until the injury heals.
6. Employees should not smoke or use tobacco while preparing food. Employees should smoke only in designated areas where tobacco use will not contaminate food. It is essential that any foodhandler

who has been smoking or doing anything that can contaminate the hands should wash his or her hands thoroughly before returning to work.

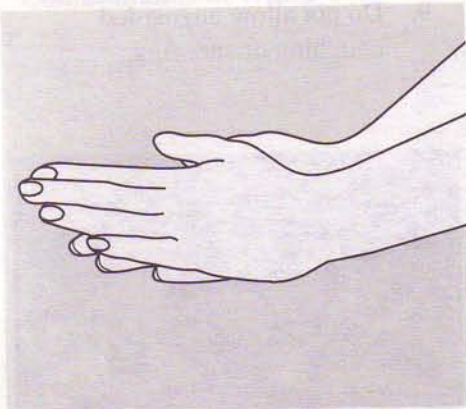
7. Do not allow chewing gum, another possible contamination source, in the plant.
8. Do not allow spitting in unauthorized places.
9. Do not allow unguarded coughing or sneezing.





Proper hand-washing techniques.

1. Use water as hot as the hands can comfortably stand.
2. Moisten hands, soap thoroughly, and lather to elbow.
3. Scrub thoroughly, using brush for nails.
4. Rub hands together, using friction for 20 seconds.
5. Rinse thoroughly under running water.
6. Dry hands, using single service towels or hot air dryer.
7. Do not touch anything that contaminates the hands before returning to work.



Hand washing should always follow these activities:

Touching areas of the body

Use of handkerchief or tissue

Hand contact with unclean equipment and work surfaces, soiled clothing, wash rags, etc

Handling raw food - particularly meat and poultry

Handling money

Smoking a cigarette

Eating

Use of restroom

Proper Working Attire

1. Work clothes - preferably uniforms - should be clean and put on at the plant. Do not wear street clothes in food preparation areas. Ideally, provide a locker room for the employees to change clothes and keep personal items.
2. Plastic or rubber gloves are used in many plants but they need to be changed as often as you would wash your hands.

3. Hair restraints are essential in food processing plants.
4. Wear no jewelry. Jewelry can collect soil and can become caught in machinery or fall into the food.

Summary

A clean food plant must be the first goal in producing and processing safe and wholesome foods. Management must desire this goal and they must invest the time and money to accomplish it. Second, a company must have properly trained and responsible personnel to maintain the plant and equipment in a clean condition at all times. Sanitation personnel must have the proper tools and materials to keep the plant clean. Finally, cleaning personnel must know how to clean each piece of equipment in the food plant.

A clean, sanitary establishment comes from a planned program, properly supervised and followed on schedule.

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