



Sanitation programs should address:

- Packing areas
- Coolers and storage rooms
- Transport equipment used in field or packing shed
- Equipment that comes into contact with food, such as harvest totes, storage bins, knives, conveyor belts, sorting tables, etc.
- Wash tanks and flumes
- Restrooms

Thoroughly clean niches that are known to harbor bacteria, such as:

- Equipment seams
- Gaskets
- Conveyor belts & rollers
- Floors and floor drains
- Cleaning tools & utensils
- Gear boxes
- Condensate drip pans
- Wheels of forklifts, tractors, and wagons
- Drain lines and grates
- Filters
- Roller brushes
- Undersides of equipment

Sanitation in Produce Packing Sheds

Why is Sanitation Important?

Microorganisms are everywhere in the environment, and most of them are harmless to people. However, there are many opportunities for illness-causing microorganisms (pathogens) to be introduced into fruit and vegetable farms – through water, manure, animals, or people. Using effective sanitation methods in the packing shed reduces the risk of contaminating produce during washing, sorting, packing, storage and shipping. Routine cleaning and sanitizing prevents the spread of these organisms onto produce as well as the growth of pathogens on equipment. Poor sanitation practices can lead to unsafe produce and contribute to post-harvest losses.

What is the difference between cleaning and sanitizing?

Cleaning consists of washing and rinsing equipment to remove dirt and organic debris from the surface. The cleaning process uses soaps or detergents, and does not kill pathogens that may remain on equipment surfaces.

Sanitizing is the application of heat or chemicals to cleaned surfaces, resulting in the reduction of 99.999% of disease-causing organisms. Sanitizing can be accomplished only after dirt and debris have been removed through proper cleaning. Equipment must be clean prior to sanitizing, as organic debris can interfere with the sanitizer's ability to kill pathogens.

General Cleaning & Sanitizing Procedures

1. Remove excess soil (dirt, debris, and vegetation) using dry brushing or scraping. If equipment cannot be adequately cleaned in place, it should be disassembled for thorough cleaning.
2. Pre-rinse equipment in the same direction as product flow.
3. Apply foaming cleaner from bottom to top, allowing it to remain on the surface without drying for the appropriate contact time as indicated by product label.
4. Scrub from top down to remove any stubborn build-up.
5. Rinse* equipment from top to bottom and in same direction as product flow.
6. Visually inspect equipment and floors to determine if all debris has been removed. If visible residue is left, or if ATP test indicates failure, repeat steps 2 through 5.
7. Apply sanitizer to equipment and floors using appropriate concentration and contact time as indicated by product label**. Note that some sanitizers require a final rinse, while some do not. If high pressure hoses are used to clean floors, avoid splashing water on clean equipment. Do not use high pressure hoses to clean floor drains.
8. Allow equipment to air dry and ensure areas of standing water on floors are removed by air drying or squeegee.

* Use only potable water for cleaning & post-harvest operations

** Periodically rotating sanitizers may increase long term effectiveness of your sanitation program.



Employee Hygiene

To prevent contamination of food & equipment, employees should wash their hands before handling food or clean equipment, and after:

- Coughing or sneezing
- Handling culls or garbage
- Cleaning activities
- Using the restroom
- Coming in from working the field

Employees should not harvest produce or work in the packing shed if they are experiencing symptoms of vomiting or diarrhea, **OR** if they are diagnosed with any of the following illnesses:

- **Norovirus**
- **Shigella**
- **Salmonella**
- **E. coli**
- **Hepatitis A**

Employees with open sores or cuts should wear a bandage or impermeable covering over the wound and a single use glove covering the hand.

Designated break areas should be provided for eating and drinking.

Employees should not eat or drink in food handling or storage areas.

Food contact surfaces – what materials are appropriate?

Effective sanitation cannot be achieved without equipment and facilities constructed of a sanitary design. This is particularly important for food-contact surfaces-- surfaces that produce will come into contact with, such as conveyor belts, sorting tables, harvest bins, chutes, wash bristles, etc.

Food-contact surfaces must be constructed of materials that are smooth, durable, non-absorbent, non-porous, and free from chips, cracks, pits, or corrosion. Additionally, seams on food-contact surfaces must be smoothly bonded and maintained. Materials with these characteristics will minimize accumulation of food particles, dirt, and organic matter and thus minimize the opportunity for growth of microorganisms.

Because microbes survive and grow on wet surfaces, absorbent materials such as sponges, bare wood, or carpet which retain moisture should not be used. These materials are also nearly impossible to clean and sanitize because of porous nature of the material. Floors, walls and ceilings in areas exposed to moisture, splash from wet cleaning, or food debris should be constructed of smooth, durable, non-absorbent surfaces to facilitate cleaning.

- Equipment should be adequately spaced from walls and other equipment so that it can be easily accessed on all sides for cleaning. The inability to adequately clean areas under and around equipment can lead to the accumulation of pathogenic organisms as well as debris that may attract pests.
- Provide adequate drainage to reduce standing water where microbial growth could occur.
- Designate specific equipment for cleaning floors, drains, or restrooms to prevent it from being used to clean food contact surfaces.
- Remove as much soil and debris from produce and harvest containers while out in the field. Leaving soil in the field will reduce the amount of debris introduced into the packing shed.
- Remove culls, leaf litter, and other debris from packing shed daily, and dispose of in a manner that minimizes attraction of pests.
- Harvest totes, storage bins, and unformed boxes should be stored off the floor to prevent animal or insect nesting as well as contamination due to accidental spills or cleaning activities.
- Domestic animals (pets) and wildlife should be excluded from the packing shed. Animals can carry disease-causing organisms and may contaminate food, or food storage areas. Eliminating food sources and harborage/nesting areas within the packing shed will minimize animal activity. Ex: Using bird netting to prevent roosting in rafters, eliminating clutter that may encourage nesting, keeping floors clean and dry.
- Include wagons, truck beds, or other equipment used to transport produce from field to packing shed, in your sanitation plan.
- Check and clean shipping trucks prior to loading.
- When cleaning floors in storage or cooling areas, avoid spray or splash-back onto produce, boxes, harvest totes, or other food contact surfaces.
- All areas of the packing shed should have enough lighting to be able to visually inspect equipment and physical facilities and conduct cleaning when necessary. Light bulbs should have covers to contain glass if the bulb should break.
- Resurface or replace food contact surfaces that are rusty, corroded, chipped, or otherwise un-cleanable.
- Distinguish between containers used for harvest, washed product and culls/waste.

Cleaning Frequency

There is no “one size fits all” standard for cleaning frequency. It should be determined on an individual basis for each operation, based on risk. Surfaces that directly contact food will generally require more frequent cleaning than other areas of the packing shed. Consulting best practices identified in commodity specific guidelines set forth by industry may be useful in determining cleaning frequency.



Types of Cleaners

All soaps or detergents used on food equipment must be labeled as approved for use on food-contact surfaces. The nature of the debris to be removed determines the type of cleaner or detergent that should be used. The basic categories of detergents are listed below.

Type of cleaner	Useful in removing	Common active ingredients
High alkaline	Protein, fat	Sodium hydroxide, potassium hydroxide
Moderately alkaline	Protein, fat, carbohydrates	Surfactants, phosphates (ex. Tri-sodium phosphate), silicates, carbonates
Acid	Mineral deposits, rust	Phosphoric, nitric, hydrochloric, peroxyacetic, citric
Enzyme	Protein, fat, starch	Hydrolytic enzymes

Types of Sanitizers

Each category of sanitizer has advantages and disadvantages that must be carefully weighed when deciding which sanitizer best meets the needs of your operation. Sanitizers can be directly affected by the temperature, pH, water hardness, contact time, and amount of organic debris in the water. Therefore, it is critical to use sanitizers consistently with EPA registered labels to achieve proper sanitation. A test kit is necessary to accurately determine the concentration of the sanitizing solution. Test kits or strips for chlorine-based sanitizers should measure free chlorine for an accurate measurement of sanitizer concentration.

The basic categories of sanitizers and their characteristics are listed below for comparison.

	Chlorine	Iodine compounds	Quaternary ammonium compounds	Acid anionic	Fatty Acid/Organic Acid	Peroxyacetic acid
Corrosive	Corrosive	Slightly corrosive	Noncorrosive	Slightly corrosive	Slightly corrosive	Slightly corrosive
Effective at neutral pH	Yes	Depends on type	In most cases	No	No	Yes
Effective at low pH	No, effective range is 6.5-7.5	Yes	In some cases	Yes, below 3.0-3.5	Yes, below 3.5-4.0	Yes
Effective at high pH	No, effective range is 6.5-7.5	No	In most cases	No	No	Less effective
Affected by organic material	Yes	Moderately	Moderately	Moderately	Partially	Partially
Affected by water hardness	No	Slightly	Yes	Slightly	Slightly	Slightly
Residual antimicrobial activity	None	Moderate	Yes	Yes	Yes	None
Cost	Low	High	Moderate	Moderate	Moderate	Moderate
Incompatibilities	Acid solutions, phenols, amines	Highly alkaline detergents	Anionic wetting agents, soaps, and acids	Cationic surfactants and alkaline detergents	Cationic surfactants and alkaline detergents	Reducing agents, metal ions, strong alkalis
Stability of use solution	Dissipates rapidly	Dissipates slowly	Stable	Stable	Stable	Dissipates slowly
Water temperature sensitivity	None	High	Moderate	Moderate	Moderate	None

University of Florida Institute of Food and Agricultural Sciences, Basic Elements of Equipment Cleaning and Sanitizing in Food Processing and Handling Operations



Biofilms

Biofilms form when bacteria adhere to moist surfaces and excrete a slimy, glue-like protective film. Organic debris provides bacteria the nutrients needed to grow and produce biofilms. While they can attach to any surface, they are more likely to form on rough, pitted, scratched or hard-to-clean surfaces. Once formed, biofilms are not easily penetrated by cleaners or sanitizers, and may result in ongoing contamination of food product. Regular thorough cleaning and sanitizing will prevent the build-up of organic matter and reduce the likelihood of biofilm development.

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Monitoring

Environmental monitoring programs can help verify the effectiveness of your sanitation program, and assist in determining adequate frequencies for cleaning and sanitizing.

ATP testing can be a useful tool to monitor how well surfaces are cleaned. ATP (adenosine triphosphate) is a molecule present in all living cells. Testing equipment detects the amount of ATP left on surfaces after cleaning and indicates how well bacteria, yeasts, molds, and organic debris have been removed. Testing is simple and conducted in-house with a hand held meter. The surface to be sampled should be swabbed according to manufacturer instructions, after cleaning and prior to sanitizing. The ATP reader will indicate whether or not surfaces have been adequately cleaned. However, it does not indicate the presence or absence of pathogens. This can only be done using microbiological testing. Microbiological analysis will identify pathogens and determine the level of contamination in specific production areas or on finished product. If microbiological monitoring is utilized in your facility, be sure to target sampling in areas that ATP testing has identified as “hot spots” within the packing shed. Consider history and trends of environmental monitoring results in determining what sanitation measures are appropriate in your facility. When utilized correctly, environmental monitoring programs can act as early warning systems that allow growers to be proactive.

Documentation

Develop written Standard Operating Procedures (SOPs) to document specific sanitation procedures so that they may be carried out properly and consistently in your facility. SOPs should:

- Establish roles and responsibilities of all individuals involved in sanitation
- Outline sanitation procedures for all areas and processes within the packing shed
- Specify what equipment will be used, how it should be used, and where it will be stored
- Identify training requirements for SOPs, and the frequency of required training
- Identify how sanitation activities will be documented and how records will be kept
- Establish what actions will be taken if there is any deviation from standard procedures or if environmental monitoring indicates a breakdown in sanitation
- Establish how frequently sanitation SOPs will be reviewed to assess whether or not sanitation goals are still being achieved. Periodic updates or changes are often necessary to for continual improvement.

SOPs must be available and readily accessible by employees. Supervisors should review sanitation logs to verify that cleaning has taken place and address any deviations from the cleaning schedule. Documentation of cleaning activities is useful in the event that there is a product recall due to contamination or environmental testing shows the presence of pathogens in the packing shed.



Food Safety Farm Consultants are available at no cost to assist in developing food safety/sanitation plans, conduct farm visits, and answer questions about Good Agricultural Practices. They are also available to conduct ATP testing to evaluate equipment cleaning procedures. Please contact the Food Safety Farm Consultant in your area for further information.