



## **Good Handling Practices (GHPs):** **Cleaning and Sanitation of Equipment and Packing Lines**

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### **Introduction**

Good Handling Practices, or GHPs, refer to the practices that occur during or after produce harvest. These practices vary by farm and commodity, and may include harvesting (manually or mechanically), packing (in a field or going through a packing line), refrigeration, and transportation. These particular practices occur directly before the produce is sold to the consumer, and are therefore very important.

This fact sheet focuses on one large aspect of GHPs: cleaning and sanitation of equipment, packing lines, and harvest containers. Produce coming from the fields may have low, but measureable, levels of pathogens. Our goal with having a cleaning and sanitation program is to minimize the transfer of pathogens between batches of produce. By improving the cleaning and sanitation practices on equipment and produce contact surfaces, we can limit the introduction of pathogens from the packing area and minimize chances of cross-contamination.

### **Why is cleaning and sanitation of equipment and packing lines important?**

Dirt and contamination on equipment, packing lines, and produce contact surfaces can introduce both human and plant pathogens (such as molds) to harvested produce. This type of contamination not only reduces the quality of the produce, but it shortens its shelf-life and storage ability as well. Bacteria on equipment can also form a build-up of biofilms – a hard plaque of bacteria that is very difficult to remove and can lead to microorganisms breaking off and re-contaminating produce.

### **What is sanitary design?**

Sanitary design simply means that equipment and packing lines can be properly cleaned and inspected between uses. Packing areas are set up so that any equipment, tables, and other surfaces:

- 1) Can **be accessed for inspection**. Allow for room between equipment and walls, so that all parts of the packing line can be monitored for buildup of dirt and debris. Shields can be removed for further inspection.
- 2) Are **constructed** from materials that can be properly cleaned and sanitized.  
Attributes of sanitary construction include:
  - a) having hard surfaces that are impervious and nonabsorbent,
  - b) easily cleanable,
  - c) smooth surfaces,



**Zone 2:** Non-product contact areas that are **adjacent to contact surfaces**.

Examples of Zone 2: Lubricants, equipment framework supports, drip shields over the produce, lights, water nozzles, equipment buttons, phones (workers will be checking their phones before touching produce), cleaning tools (brooms, mops, buckets, sponges).

**Zone 3:** Non-product contact areas **within the packing/processing area** that are removed from produce contact surfaces BUT could result in cross-contamination.

Examples of Zone 3: Floors, hoses, condensate, forklifts, trash cans, walls and ceilings, pallets, drains



**Zone 4: Farthest from the production area.** This zone includes all non-product contact surfaces outside of the packing area.

Examples of Zone 4: Cooler/freezer floors, bathrooms, breakrooms, loading docks.

*Figure: Examples of control zones in a packinghouse.*

Photo source:

<http://www.qvcustomsoftware.com.au/Images/CaseStudies/Turiwiri%20Packing%20Line.jpg>

**What are the steps involved in cleaning and sanitizing a packing area?**

1. **Remove dirt and debris.** Detergents and sanitizers will not be able to properly clean and kill microorganisms in a dirty environment. This may be done with a broom or rake to remove bulk debris, depending on how dirty the equipment is. A water rinse can then be used to soften and remove dirt.
2. **Use a surfactant solution,** like soap and water, to remove the rest of the dirt. There are many types of cleaners that can be used (surfactants, alkaline cleaners, acid cleaners, enzymatic cleaners) depending on the surface and type of soil you are dealing with (oils or animal fats, for example). Surfactants, the category that includes soaps and detergents, are suitable for most surfaces and soils and are easy to obtain. Surfactants work by lowering the surface tension of water which allows for increased penetration into the soil and for soil to be suspended in solution. Surfactants can also be successful in removing bacterial biofilms from equipment.

3. **Use a water rinse to remove surfactants and soil.** This rinse step will remove any soil and surfactants left on the equipment. Residual surfactants (soaps and/or detergents not rinsed off) would counteract the efficacy of the sanitizer about to be used.
4. **Apply a sanitizer to disinfect your equipment and packing area.** Sanitizers are relied on to kill disease-causing bacteria, viruses, and parasites on food-contact surfaces. Certain sanitizers are also effective in removing bacterial biofilms from equipment.

**What sanitizer should I use for sanitizing my packing line and equipment?**

Type of Sanitizer	Recommended Concentration	Advantages	Disadvantages	Examples
Chlorine	50 – 200 ppm	<ul style="list-style-type: none"> <li>- Relatively inexpensive</li> <li>- Easy to obtain</li> <li>- Effective on wide range of bacteria</li> </ul>	<ul style="list-style-type: none"> <li>- Dependent on pH</li> <li>- Breaks down with organic matter</li> <li>- Light degradation</li> <li>- Limited use on organic processes</li> <li>- Corrosive</li> <li>- Off-gassing at high temperatures</li> </ul>	<ul style="list-style-type: none"> <li>- Chlorine bleach (Sodium hypochlorite)</li> <li>- Calcium hypochlorite</li> </ul>
Peroxyacetic Acid (Peracetic acid, PAA)	50 – 350 ppm (Check manufacturer’s label)	<ul style="list-style-type: none"> <li>- Removes biofilms</li> <li>- Stable at range of pH levels</li> <li>- Not broken down by organic matter</li> <li>- Effective on wide range of bacteria</li> </ul>	<ul style="list-style-type: none"> <li>- More expensive</li> <li>- Corrosive</li> <li>- Can be volatile at high temperatures</li> </ul>	<ul style="list-style-type: none"> <li>- Tsunami (Ecolab)</li> <li>- Sanidate (Biosafe Systems)</li> </ul>

**What records must be kept for your cleaning and sanitation practices?**

1. Material Safety Data Sheets (MSDS) and labels for any cleaners and sanitizers.
2. Logs of application time, date, and concentrations.
3. Standard Operating Procedures (SOPs). These should include enough information for any worker to perform the cleaning and sanitizing tasks. These SOPs can be very useful when training new workers how to perform these important cleaning and sanitation practices.

Key concepts to include in the SOPs include:

- Concentration of cleaners and sanitizers used.
- How is the required concentration of sanitizer measured?
- How is the concentration of sanitizer adjusted?
- How often are the levels of sanitizer monitored?

- Does water pH or temperature need to be monitored? If so, how often?
- What are corrective actions if the levels are insufficient?
- What is the required contact time for each cleaner and sanitizer?

**Processing / Packing Line Log**

Name of operation:

Please see the food safety plan for overall processing/packing line water control procedures.

Date	Cleaning List (check each)					Date Cleaned	Treatment	Cleaned By (name)
	Contact Surface	Dump Tanks	Flumes	Wash Tanks	Hydro Cooler			

*Figure: Sample log for documenting cleaning and sanitation practices.*

Log source: [www.gaps.cornell.edu](http://www.gaps.cornell.edu)

**How can cleaning and sanitation practices be verified?**

Cleaning and sanitation practices can be verified through several means.

1. **Review documentation** to ensure that cleaning schedule is being adhered to, and that your packing area and equipment are being cleaned and sanitized regularly.
2. **Visually inspect** all surfaces regularly – especially those difficult to clean areas. These areas can be under safety shields, near packinghouse walls, or just difficult to reach. These are the areas that are most often neglected.
3. **Swab** Zone 1 areas (produce contact surfaces) for dirt and debris using wet sponges. If sponges become dirty while swabbing, then cleaning practices are insufficient. Additionally, sponge and swab samples can be taken and tested for pathogens. If pathogens are present, then cleaning and sanitizing measures must be improved.

**Do food-grade lubricants need to be used?**

Food-grade lubricants need to be used for any contact surfaces (Zone 1) – even if contact is unlikely. These surfaces include chain lubricants, gearbox fluids, hydraulic and compressor fluids, and general purpose lubricants. Non-food grade lubricants are acceptable for surfaces that do not contact food.

**Cleaning and Sanitation of Harvest Containers**

The above practices listed in “Cleaning and Sanitizing a Packing Area” can be used for cleaning and sanitizing harvest containers. Since these picking containers are often reused and left out in the field, it is recommended that cleaning and sanitization occurs on a scheduled basis.

We recommend the following steps when washing plastic harvest containers (see above “Cleaning and Sanitizing a Packing Area” for more detail):

1. **Remove dirt and debris.** As mentioned above, detergents and sanitizers will not be able to properly clean and kill microorganisms in a dirty environment. Any caked-on dirt can be scraped or brushed off.
2. **Use a surfactant solution,** like soap and water, to remove the rest of the dirt. If dirt is caked-on, let the container sit in solution for a few minutes. Dirt will loosen and be able to be scrubbed off. This step can be done in a large sink, wheelbarrow, or plastic container. If soapy solution is sprayed on containers (and not allowed much contact time), more scrubbing may be needed.
3. **Use a water rinse to remove surfactants and soil.** This rinse step will remove any soil and surfactants left on the containers. Residual surfactants (soaps and/or detergents not rinsed off) would counteract the efficacy of the sanitizer about to be used.
4. **Apply a sanitizer to disinfect your harvest containers.** Sanitizers are relied on to kill disease-causing bacteria, viruses, and parasites on food-contact surfaces. The easiest manner of disinfecting containers is to dip into a wheelbarrow, sink, or tub full of sanitizing solution. The same sanitizers can be used as mentioned above in the “What sanitizers can I use for sanitizing my packing line and equipment?” section.
5. **Allow containers to dry before being used.** Wet containers have a greater chance of enabling the cross-contamination of microorganisms, both human pathogens and plant pathogens.
6. **Fill out and sign off on harvest container cleaning log.**

#### **Additional Resources:**

1. “Calculating, measuring, and adding chlorine to water.” University of Maryland.  
<https://www.youtube.com/watch?v=CAfKOREDQNI>
2. “Cleaning and sanitizing basics.” Pennsylvania State University.  
<http://extension.psu.edu/food/dairy/cleaning-sanitizing-resources/cleaning-and-sanitizing-basics>
3. “Choosing and Using a Chlorine-based disinfectant during postharvest handling of fruits and vegetables.” North Carolina State University Extension Program.  
<https://www.uvm.edu/~susagctr/whatwedo/producesafety/GAPsResources/gapresChlorineProductChoosing.pdf>

#### **Sources:**

1. “Facilities and Equipment Cleaning and Sanitation”. Improving the Safety and Quality of Fresh Fruits and Vegetables: A Training Manual for Trainers. Joint Institute for Food Safety and Applied Nutrition.
2. “Types of Cleaners”. Penn State Food Science Food Safety and Sanitation.