

Chapter 7 – Equipment and Utensil Cleaning and Sanitization

The importance of proper cleaning can be appreciated when one realizes that contaminated equipment (equipment and utensils which are not clean) is another major cause of foodborne disease outbreaks.

Cleaning comprises many operations in the food establishment, and the process is usually specific to the type of cleaning necessary. No cleaning task in the food establishment is as important as the cleaning and sanitization of **food contact surfaces** of equipment and utensils.

CLEANING FOOD CONTACT SURFACES

Food contact surfaces of equipment and utensils are those surfaces with which food normally comes into contact. These surfaces also include surfaces from which food may drain, drip or splash back onto surfaces normally in contact with food. For example, the interior of a microwave oven is considered a food contact surface because food on the sides or ceiling of the oven could drip into other foods being warmed in the oven.

Effective cleaning and sanitization of food contact surfaces of equipment and utensils serve two primary purposes:

- Reduces chances for contaminating safe food during processing, preparation, storage and service by physically removing soil, bacteria and other microorganisms; and
- Minimizes the chances of transmitting disease organisms to the consumer by achieving bacteriologically safe eating utensils.

Although we all know about the practice of "washing," many do not understand and/or appreciate the principles and **exactness** of the process. For the most part, chemistry plays a very important part in the cleaning and sanitization process. Washing equipment and utensils until visibly clean is just not enough.

WAREWASHING CYCLE

The following numerated list and comments pertaining to the wash cycle of food contact surfaces will help supervisors and managers appreciate why there is a particular order in the process.

1. **Equipment and Utensils Clean Prior to Use.** Properly cleaned and sanitized equipment and utensils should be bacteriologically safe prior to use. Should contamination be suspected, the equipment and/or utensils should not be used, but recleaned and sanitized.

2. **Soiled Equipment and Utensils.** During use, equipment and utensils become soiled and contaminated with bacteria.

3. **Scraping, Preflushing and Presoaking.** Scraping, preflushing and presoaking, as necessary, are methods for removing gross amounts and stubborn soil from equipment and utensils.

4. **Cleaning.** There are four steps in the cleaning process – washing, rinsing, sanitizing and air drying:

Washing, when using proper detergents, cleaners, chemicals and abrasives, removes the remaining soil from equipment and utensils. This is a physical and a chemical process. The soil and bacteria, as well as cleaning compounds, are suspended in the wash water; and

Rinsing removes most of the suspended soil, bacteria and cleaning compounds from the equipment and utensils.

Although the equipment and utensils look visibly clean at this point, they are still contaminated with many bacteria.

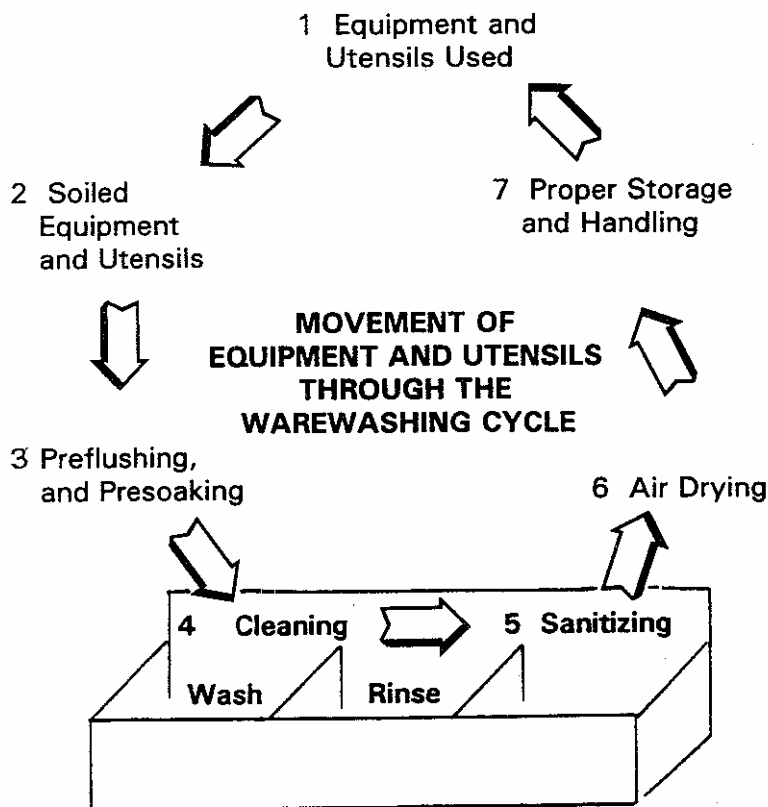
5. **Sanitizing.** Sanitizing kills the remaining pathogenic organisms on the equipment and utensils. Sanitization will occur when certain specific chemical concentrations, temperature requirements, time requirements and water conditions are satisfied. These conditions are crucial for effective sanitization. Therefore, precise measurements of the sanitization process are made periodically. **NO**

RINSING OR ANY OTHER CLEANING PROCESS SHOULD TAKE PLACE AFTER THE SANITIZING PROCESS.

6. **Air Drying.** The only acceptable method of drying equipment and utensils is air drying. The use of towels for drying, polishing or any other purpose re-contaminates equipment and utensils with bacteria.

7. **Proper Storage and Handling.** Proper storage and handling of cleaned and sanitized equipment and utensils is very important to prevent recontamination prior to use. Cleaned and sanitized equipment and utensils must be:

- stored on clean surfaces; and
- handled to minimize contamination of food contact surfaces.



SANITIZATION PROCEDURE

Chemical sanitization requires greater controls than hot water sanitization. The following factors must be considered in order to obtain effective sanitization by chemical sanitization methods:

- Amount of water used;
- pH of the water;
- Hardness of the water;
- Temperature of the water; and
- Contact time.

The pH and hardness needs to be determined. Should the water supply be from a municipal supply, the water company may already have this information. If not, the water will need to be tested periodically.

MANUAL SANITIZATION

The following table provides information pertaining to minimum and maximum chemical sanitization requirements for manual operations (in parts per million - ppm). To use the chart, identify which chemical compound your food establishment uses for sanitization purposes. The "Temp" column refers to the temperature of the water used. The pH column indicates the strength of the sanitizer to use, according to the pH of the water. For example, if the water pH is 9.0, and the water temperature is 100°F (warm) the concentration of chlorine sanitizer needs to be 50 parts per million. The "Maximum" column refers to the maximum strength of sanitizer. The "Contact" column refers to the minimum time that the utensils or surfaces should be in contact with the sanitizer solution. If the pH of the water is less than 5.0, Iodine should be used as the sanitizer.

Chemical Solutions	Temp (°F)	pH		Maximum Allowed
		10 or less	8 or less	
Chlorine	120°	25 ppm	25 ppm	200
	100°	50 ppm	50 ppm	200
	75°	50 ppm	100 ppm	200
	55°	100 ppm	100 ppm	200
≤				

Iodine	75° +	12.5	25
Quats**	75° +	As specified by manufacturer, see label; hardness 500 ppm or less*	200

- *unless container label specifies a higher pH and/or water hardness limit
- ** Quaternary ammonium compounds

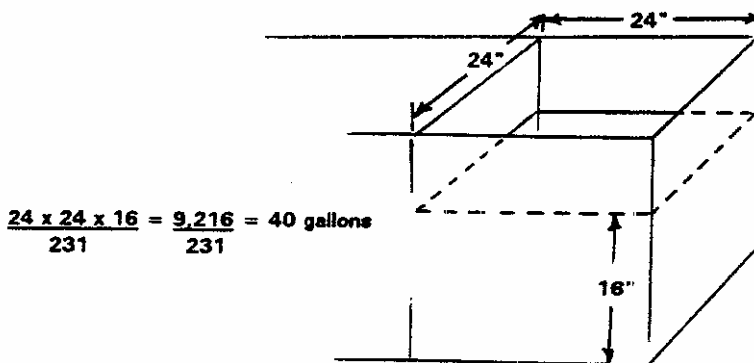
OBTAINING PROPER SANITIZATION

All chemical sanitizer instructions call for a given amount of sanitizer per gallon of water. The following are two methods of determining the amount of water used for sanitization:

- Use a gallon container and pour a gallon of water at a time into the sink until the water is at a suitable depth; or
- Use the following formula:

width x length x water depth = total gallons

231 (cu. in. in one gallon)



The following will serve as an example:

Length of sink = 24" Width of sink = 24" Depth of sink = 16"

$$\frac{24 \times 24 \times 16}{231} = \frac{9,216}{231} = 40 \text{ gallons}$$

- Use the test kit each time and adjust water amount or sanitizer amount until proper concentration is obtained.

In the first two methods, the same amount of water **must** be used each time, unless the amount is recalculated.

Another problem in measuring the right amount of sanitizing chemical is the method of measure stated on the label. The following table provides equivalents of various measurements:

	Drops	ml.	tsp.	tbsp.	f.o.
1 ml.	20	--	--	--	--
1 tsp.	60	5	--	--	--
1 tbsp.	--	15	3	--	--
1 f.o.	--	--	6	2	--
1 cup	--	--	--	16	8

ml. = milliliter tbsp. = tablespoon

tsp. = teaspoon f.o. = fluid ounce

Household bleach is often used as a sanitizer. When used, only pure bleach (without additives) is acceptable.

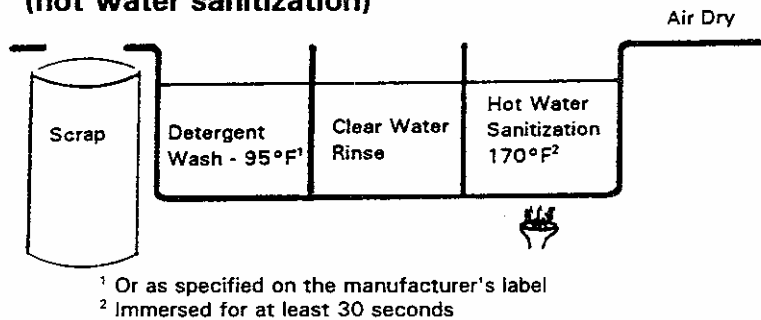
"Ultra" or "Extra Strength" bleach is not acceptable.

Mixing bleach with detergent will result in the bleach not being able to effectively sanitize any surfaces. The amounts of bleach (which contains 5.25% sodium hypochlorite) needed to obtain certain concentrations are as follows:

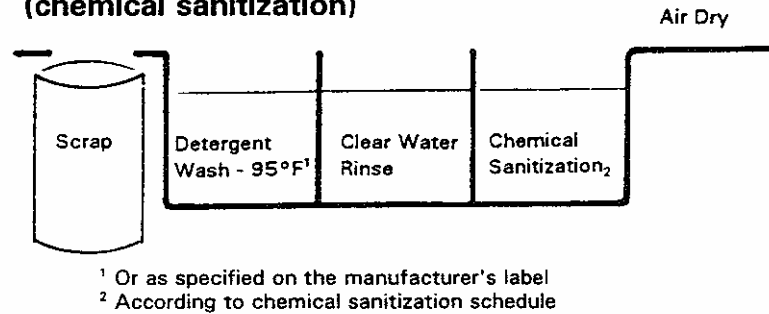
Concentration	Amount of bleach/gallon(s) water
25 ppm	3/4 teaspoon/2 gallons 1 1/2 teaspoons/4 gallons 1 tablespoon/8 gallons
50 ppm	3/4 teaspoon/1 gallon 1 1/2 teaspoons/2 gallons 1 tablespoon/4 gallons 1/4 cup/16 gallons
100 ppm	1 1/2 teaspoons/1 gallon 1 tablespoon/2 gallons 1/2 cup/16 gallons
200 ppm	1 tablespoon/1 gallon 1 cup/16 gallons

MANUAL WAREWASHING METHODS

Three-Compartment Sink Method (hot water sanitization)



Three-Compartment Sink Method (chemical sanitization)



When a two-compartment sink cleaning method is used, a special sanitization formulation must be used in both sink compartments.

ALTERNATE MANUAL WAREWASHING METHODS

When equipment is too large or fixed for cleaning as specified above, cleaning and sanitization can be done by swabbing or pressure spraying.

Swabbing Method

1. Disassemble;
2. Rough clean to remove gross food particles;
3. Detergent wash with water $\geq 95^{\circ}\text{F}$;
4. Clear water rinse;

5. Chemical sanitize at **TWICE** the strength required; and
6. Air dry.

Pressure Spraying procedure has the same essential steps as swabbing except high pressure spray equipment is used. Follow equipment manufacturer's operating instructions.

MECHANICAL WAREWASHING METHODS

Mechanical warewashing methods must be according to manufacturer's operating instructions.

THERMOMETERS AND TEST KITS

Thermometers and/or test kits are required in all food establishments with warewashing operations. The purposes are as follows:

- To confirm sanitizing solution strength and proper water temperature for manual warewashing operations;
- To check sanitizing solution strength and water temperature during the warewashing period. Temperature and sanitizer concentrations need to be checked throughout the cleaning process. This is because the effective strength of the sanitizing solution may be reduced because of the carryover of organic matter and because of a drop in temperature.
- To check water temperature for hot water sanitization; and
- To check proper operation of mechanical warewashing equipment.

SPECIAL CLEANING AND SANITIZATION

Food processing equipment and some vending equipment that requires in-place cleaning shall be designed and fabricated so that:

1. Washing and sanitizing solutions can be circulated throughout a fixed system using an effective cleaning and sanitizing procedure; and
2. Cleaning and sanitizing solutions will contact all food contact surfaces;
3. The system is self-draining or capable of being completely evacuated; and
4. The procedures utilized result in thorough cleaning of the equipment.

Equipment used in production-line food processing shall be cleaned and sanitized according to the following schedule:

1. Each time there is a change in processing between types of animal products;
2. Each time there is a change from raw to ready-to-eat foods;
3. After substantial interruptions;
4. After each shift change and/or every 4 hours;
5. Throughout the day as necessary; and
6. After final use each working day.

Bulk water hauling equipment needs to be cleaned and sanitized, and the procedure shall be similar to food processing equipment. For specific recommended procedures, see EPA technical bulletin entitled **Guidelines for the Preparation of Tank Trucks for Potable Water Use**.

SUMMARY

- Contaminated equipment is another major cause of foodborne disease outbreaks.
- ***Food contact surface*** is the surface of equipment and utensils with which food normally comes into contact and those surfaces from which food may

drain, drip or splash back onto surfaces normally in contact with food.

- Washing equipment and utensils until visibly clean does not complete the process. A sanitization step must also be completed.
- Proper sanitization is one of the most important steps in the warewashing cycle.
- No rinsing or any other cleaning process should take place after the sanitizing process.
- Equipment and utensils must be ***air dried only***.
- The sanitization procedure is an exact process.
- Swabbing can be utilized when the sanitizing solution is ***twice*** the strength required.
- Thermometers and test kits are required.

References: *Idaho Food Code*, Chapter 4, Sections 4-6 and 4-7.