Sanitizer Basics

How to select the best solution for your chemical sanitizer needs.

Most professionals involved in food plant sanitation recognize the value of using a final application of a sanitizer solution to ensure food contact surfaces and surrounding areas are safe for the production of edible products. These same professionals understand that they cannot sanitize a dirty surface because chemical sanitizers will not effectively penetrate soil layers consisting of organic matter, mineral deposits and inert materials. Surfaces must be thoroughly cleaned and rinsed prior to the application of the sanitizer solution. Only then can a properly concentrated sanitizer solution effectively eliminate most of the remaining microorganisms. However, there is some confusion about selecting the best sanitizer chemicals from the increasing number of materials available. This article will help you select the best solution for your chemical sanitizer needs.

Chemical Classification. Chemical sanitizers commonly available as commercial preparations can be divided into three groups:

1. Oxidative sanitizer compounds
   a. Chlorine compounds *
   b. Iodophors or Iodine compounds *
   c. Chlorine dioxide *
   d. Acidic hydrogen peroxide *

2. Surfactant-based sanitizers
   a. Acid-anionic-sulfonic acid *
   b. Sulfonated fatty acids
   c. Quaternary ammonia compounds *

3. Other types of sanitizers
   a. Phenolic compounds and surfactants

Materials indicated by an asterisk (*) are readily available as commercial products and most are commonly used by the food industry. Remember, for legal use on food contact surfaces, sanitizing compounds must meet the requirements of FDA’s 21 CFR, Section 178.1010 — Sanitizing Solutions. The manufacturer or formulator who supplies the products you purchase should provide clear documentation that states these requirements are being met at the dilution ratios or use concentrations specified on the product label. Following label directions precisely is important to ensure the efficacy of the sanitizer solution and compliance with legal requirements. Although the processes that groups 1 and 2 use to destroy microorganisms are somewhat different (oxidative sanitizers have a corrosive effect on the cell membranes or cell walls of the microorganisms, while surfactant-based sanitizers weaken cell structures to promote ruptures), the result from the proper use of either is cell death and a more sanitary surface.
# Plant Sanitation

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<tr>
<th>Type of Sanitizer</th>
<th>Advantages</th>
<th>Disadvantages</th>
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| Chlorine Compounds      | • Powerful sanitizer; effective for spores and viruses  
                          • Deodorizes  
                          • Non-poisonous when proper concentrations used  
                          • Colorless and non-staining  
                          • Economical  
                          • Concentration easily measured with simple-to-use test kits  
                          • No water rinse required at proper use dilution | • Short shelf life  
                          • Dissipates rapidly from solutions  
                          • Adverse effect on skin, irritating to mucous membranes  
                          • Corrosive to some metals (i.e., aluminum and other “soft” metals)  
                          • Decreased activity in hard water (>500 ppm)  
                          • Produces corrosive gas above 115°F  
                          • Can produce off tastes/odors in foods  
                          • Loses efficacy in alkaline solutions (pH >7.5)  
                          • Chlorine residual gases off at pH <6.0  
                          • Rapidly consumed by organic matter and microorganisms |
| Iodophors               | • Fast action against bacteria, yeasts, molds  
                          • In proper use dilution — non-staining, non-corrosive, non-irritating to skin; leaves no residual film  
                          • Color of solution (amber) serves as an indication of concentration  
                          • Good shelf life (approx. 2 years)  
                          • Effective in cold water  
                          • Effective in hard or soft water  
                          • No water rinse required at concentrations of 25 ppm available iodine  
                          • Effective at or below pH 4.0  
                          • Helps inhibit mineral scales on surfaces  
                          • Activity not lost as rapidly as chlorine in presence of organic matter | • Should not be used at temperatures above 120°F  
                          • Potential staining of porous and some plastic surfaces  
                          • Efficacy adversely affected by high alkalinity  
                          • Slow acting at or above pH 7.0  
                          • Low activity against spores and bacteriophages |
| Chlorine Dioxide        | • Broad spectrum activity (greater than chlorine)  
                          • Effective at low concentrations (<5 ppm)  
                          • Very effective on spores and fungi  
                          • Very little impact on taste or odor of foods  
                          • Effective over a pH range of 2 through 10  
                          • Activity good in solutions with high amounts of organics  
                          • No residual at sanitizing concentrations  
                          • Can be used as a rinse on uncut and unpeeled fruits and vegetables at concentrations up to 5 ppm  
                          • Very low corrosive potential at use concentrations  
                          • Very active against biofilms | • The most effective forms of this material must be generated onsite  
                          • More expensive than chlorine (hypochlorites)  
                          • Cannot be manufactured or shipped in bulk |
| Acid Hydrogen Peroxide  | • Fast action on a wide range of microorganisms  
                          • Non-foaming in solution  
                          • No rinsing required  
                          • Environmentally friendly (breaks down to water, oxygen and vinegar)  
                          • Good shelf life (about 1 year)  
                          • Non-corrosive to stainless steel  
                          • Effective over a broad range of temperatures and pH  
                          • No impact on taste or odor of foods  
                          • Good for use in CIP systems and aseptic equipment | • Pungent odor causes irritation to nose  
                          • Corrosive to skin  
                          • Mildly corrosive to aluminum and galvanized metals  
                          • Reduced efficacy when in contact with organic matter |
Plant Sanitation

**Acid-Anionic**

- Broad spectrum activity
- Non-staining
- Long shelf life
- Ideal in CIP systems if combined with a defoamer
- Provides sanitizing and inhibition of mineral deposits
- Non-corrosive to stainless steel
- Short duration residual sanitizing effect
- Germicidal action enhanced by high temperatures

- Best results obtained in a narrow pH range (1.9 to 2.5)
- Low activity against spore-forming organisms
- Will remain effective in hard water but requires a higher initial concentration
- Corrosive to most metals other than stainless steel

**Quaternary Ammonium Compounds (QAC)**

- Very long shelf life
- Forms a bacteriostatic film
- Non-corrosive and usually non-irritating to skin
- Safe for use on most surfaces
- Non-toxic to humans and animals at normal use dilutions
- Effective against a wide variety of microorganisms
- Good efficacy against molds
- Effective over a wide pH range
- Effective over a wide temperature range
- Relatively stable in the presence of organic matter

- Slow to dissipate (leaves a residual film)
- May generate foam in mechanical operations
- Irritating to mucus membranes if dispensed as an aerosol or mist
- Not compatible with anionic detergents
- Not effective against some gram negative organisms
- May not be acceptable for use in cheese plants (slows cheese cultures)

**CONCLUSION.** Armed with basic information about the available chemical sanitizers, and equipped with a thorough understanding of the processes used and products made in your plant, you should be able to choose the best materials for each area of your operation. Consult with the chemical company’s representative and completely read the labels of the chemicals you select to ensure you understand the safe and legal uses of each product. To verify that your sanitation programs (including the final sanitizers) are performing satisfactorily, freshly cleaned food contact and non-contact surfaces should be tested regularly for the presence of microorganisms. If the results are acceptable, you can feel comfortable with the choices you have made and be confident that your sanitation programs are helping to produce safe, wholesome food products. **AIB**

The author is XXXXXXXX.

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Each sanitation situation requires a specific solution — Salmonella bacteria, for example, would be handled differently than flour dust.