SAFE FOODS™
CHEMICAL INNOVATIONS

SANITIZER TYPES AND LEVELS OF USE

CHEMICAL CATEGORIES

CATEGORY	DESCRIPTION
Inks	Used to identify, mark and stamp meat products (i.e. USDA grading, plant identification, etc.)
Denaturants	Marks meat that is unsafe for human consumption
Defoamers	Used to control foam in various areas of the operations
Laundry Products	Used in operations with onsite laundries
Floor Treatments	Either powders spread on the floors or as foam around doorways as an anti-slip & bacteria reduction process
Employee Products	Includes hand soaps, hand sanitizers, etc.
Direct Meat Applications	These products are applied directly to meat components to reduce pH or help control bacteria (usually acid based)
Detergents	A detergent is a surfactant or a mixture of surfactants with cleaning properties in dilute solutions
Sanitizers	Chemicals that are capable of destroying microorganisms including food poisoning and other disease-causing bacteria. When manufacturer's instructions are followed, they can reduce surface contamination by bacteria to a safe level.

COMPONENTS OF CLEANING COMPOUNDS

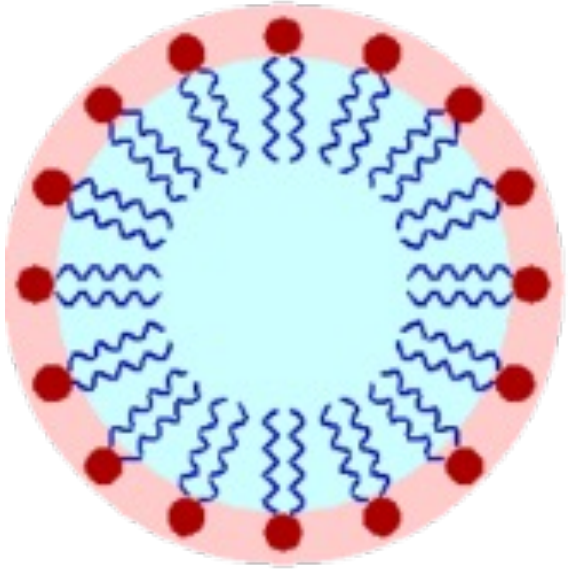
The components of commercial cleaning compounds modify the nature of water so that it may efficiently penetrate, dislodge and carry away surface contamination that we term —soil.

Although water alone will act as a good cleaning agent if enough external energy is put into the system (generally in the form of heat and applied force), cleaning compounds decrease the external energy requirements by increasing the internal potential energy of the water.

The compounds required for adequate cleaning of food plant equipment generally are rather complex mixtures of chemicals combined to achieve a specific purpose. Before the basic characteristics of cleaning compounds can be considered, the fundamental phenomena involved in the cleaning process needs to be reviewed. In this respect, it is helpful to consider cleaning in terms of a series of four steps:

1. Bringing the detergent solution into intimate contact with the soil to be removed by means of good wetting and penetrating properties.
2. Displacement of the solid and liquid soils from the surface to be cleaned by saponifying the fat, peptizing the proteins and dissolving the minerals.
3. Dispersion of the soil in the solvent by dispersion, deflocculating or emulsification.
4. Preventing re-deposition of the dispersed soil back onto the clean surface by providing good rinsing properties.

SURFACTANTS



PHYSICALLY ACTIVE INGREDIENTS

- The primary physically-active ingredients are the surface-active compounds termed surfactants.
- These organic molecules have general structural characteristic where a portion of the structure is hydrophilic (water-loving) and a portion is hydrophobic (not reactive with water). Such molecules function in detergents by promoting the physical cleaning actions through emulsification, penetration, spreading, foaming, and wetting.
- The classes of surfactants are as follows:

  Ionic surfactants that are negatively charged in water solution are termed anionic surfactants. Conversely, positively charged ionic surfactants are termed cationic surfactants. If the charge of the water-soluble portion depends upon the pH of the solution, it is termed an amphoteric surfactant. These surfactants behave as cationic surfactants under acid conditions, and as anionic surfactants under alkaline conditions. Ionic surfactants are generally characterized by their high foaming ability.

  Nonionic surfactants, which do not dissociate when dissolved in water, have the broadest range of properties depending upon the ratio of hydrophilic/hydrophobic balance. This balance are also affected by temperature. For example, the foaming properties of nonionic detergents is affected by temperature of solution. As temperature increases, the hydrophobic character and solubility decrease. At the cloud point (minimum solubility), these surfactants generally act as defoamers, while below the cloud point, they are varied in their foaming properties.

- It is a common practice to blend surfactant ingredients to optimize their properties. However, because of precipitation problems, cationic and anionic surfactants cannot be blended.

CLEANERS

GOOD CLEANERS SHOULD BE...

- Adequate for effectively softening the water.
- Quickly and completely dissolved.
- Non-corrosive.
- Non-toxic.
- Economical to use.
- Stable upon storage.
- Non-caking and non-dusting.

No single chemical can satisfy these rigorous requirements, and the selection of the compounds to be blended into a good cleaner requires highly specialized knowledge. In addition to the functions of the chemical compounds, a number of other factors must be considered. The most important of these are the nature of the soil to be cleaned, the characteristics of the water to be used as the vehicle for the cleaning compounds, and the methods of application of the cleaning compound.

DETERGENTS

What products do we use to remove ORGANIC SOILS

- Caustic (Alkaline) Products
- pH greater than 7
- Neutralize, break-up, and suspend soil in the cleaning solution
- Used for removal of fats, carbohydrates, protein, and oils, greases & carbonized soils

What products do we use to remove INORGANIC SOILS

- Acid products
- pH less than 7
- Removes mineral deposits and salts (whiting) which have accumulated on contact surfaces
- Shines stainless-steel and aids in protein removal
- Neutralizes residual alkalinity

SANITIZERS

- Sanitizers are used to destroy pathogenic and spoilage microorganisms on surfaces.
- Sanitization and disinfection could be achieved with the same product. Disinfection achieves higher microbial kill rate and requires higher concentration and/or longer contact time.
  - Wide range of products based on different chemistries. Some sanitizers are not compatible, mixing should be avoided.

REGISTRATION

- Registered with Environmental Protection Agency (EPA)
- Antimicrobial efficacy data
- Product chemistry
- Toxicology data
- Label & technical literature

RESTRICTIONS

- Fresh solution - Not reused
- Accurate concentration - Not below - questionable efficacy, Not above - violates regulation

IDEALS

- Broad spectrum of activity
- Rapid kill
- Easily prepared and soluble in water
- Stable
- Tolerant of soil, hard water, etc.
- Environmentally compatible and non-toxic
- Noncorrosive

SANITIZER COMPARISONS

✓ Advantages
❖ Disadvantages

Chlorine

- ✓ Broad spectrum of activity
- ✓ Hard water tolerant
- ✓ Low temperature efficacy
- ✓ Relatively inexpensive
- ✓ No residual activity / non-film forming

- ❖ Potential for toxic chlorine gas formation
- ❖ Corrosive
- ❖ Unstable, short shelf life
- ❖ Formation of potentially toxic by-products, THM'S
- ❖ Not effective above 120° F.

Chlorine Dioxide

- ✓ Strong oxidizing chemical
- ✓ More tolerant of organic matter than chlorine
- ✓ Less corrosive to stainless steel
- ✓ Less pH sensitive

- ❖ Safety
- ❖ Toxicity
- ❖ Sensitive to light and temperature
- ❖ Cost
- ❖ Hard to handle

Iodophors

- ✓ Broad spectrum of activity
- ✓ Less irritating than chlorine
- ✓ Low toxicity
- ✓ Effective pH range
- ✓ Broader than chlorine - 2-8
- ✓ Less corrosive than chlorine
- ✓ Stable, long shelf life
- ✓ Color of use solution provides visual control

- ❖ Staining porous and plastic materials
- ❖ Poor activity against bacteriophage
- ❖ Poor low temperature efficacy
- ❖ Corrosive at high temperatures. DO NOT USE ABOVE 120°F
- ❖ More expensive than chlorine
- ❖ Odor may be offensive

Quat Ammonium Compound

- ✓ Nontoxic, odorless, colorless, Non-corrosive
- ✓ Temperature stable
- ✓ Relative stability in presence of organic soil
- ✓ Broad spectrum of activity
- ✓ Residual antimicrobial film
- ✓ Some detergency and soil penetrating ability
- ✓ Stable, long shelf-life
- ✓ Mold and odor control

- ❖ Incompatible with anionic wetting agents
- ❖ Low hard water tolerance
- ❖ Limited low temperature activity
- ❖ Excessive foaming in mechanical applications
- ❖ Antimicrobial activity may vary depending on formulation

Carboxylic Acid

- ✓ Nontoxic, odorless, colorless, temperature stable
- ✓ Aggressive against bio-film formations
- ✓ Broad spectrum of activity
- ✓ Residual antimicrobial film
- ✓ Good detergency and soil penetrating ability
- ✓ Stable, long shelf-life
- ✓ Mold and odor control
- ✓ Antimicrobial activity may vary depending on formulation

- ❖ Incompatible with anionic wetting agents
- ❖ Low hard water tolerance
- ❖ Limited low temperature activity
- ❖ Excessive foaming in mechanical applications
- ❖ Some soft metal corrosive potential

Peroxyacetic

- ✓ Low foam (foaming version available)
- ✓ Broad temperature range of activity
- ✓ Combine sanitizing and acid rinse
- ✓ No residue
- ✓ Generally non-corrosive to stainless steel and aluminum
- ✓ Relative tolerance to organic soil
- ✓ Phosphate free
- ✓ Environmentally responsible (paired with Hydrogen Peroxide breaks down into water, oxygen and acetic acid/vinegar
- ✓ Broad spectrum of bactericidal activity
- ✓ Active over broad pH range up to pH 7.5

- ❖ Metal ion sensitivity
- ❖ Corrosive to soft metals
- ❖ Odor of concentrate
- ❖ Varied activity against fungi

Table 3. Comparison of the Chemical and Physical Properties in Commonly Used Sanitizers*

	Chlorine	Iodophors	Quarternary ammonium compounds	Acid anionic	Fatty Acid	Peroxyacetic acid
Corrosive	Corrosive	Slightly corrosive	Noncorrosive	Slightly corrosive	Slightly corrosive	Slightly corrosive
Irritating to skin	Irritating	Not irritating	Not irritating	Slightly irritating	Slightly irritating	Not irritating
Effective at neutral pH	Yes	Depends on type	In most cases	No	No	Yes
Effective at acid pH	Yes, but unstable	Yes	In some cases	Yes, below 3.0–3.5	Yes, below 3.5–4.0	Yes
Effective at alkaline pH	Yes, but less than at neutral pH	No	In most cases	No	No	Less effective
Affected by organic material	Yes	Moderately	Moderately	Moderately	Partically	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 alkalies
Stability of use solution	Dissipates rapidly	Dissipates slowly	Stable	Stable	Stable	Dissipates slowly
Maximum level permitted by FDA without rinse	200ppm	25ppm	200ppm	Varied	Varied	100–200ppm
Water temperature sensitivity	None	High	Moderate	Moderate	Moderate	None
Foam level	None	Low	Moderate	Low/Moderate	Low	None
Phosphate	None	High	None	High	Moderate	None
Soil load tolerance	None	Low	High	Low	Low	Low

*Comparisons made at approved "no-rinse" use levels.

SANITIZER APPLICATION METHODS

Sanitizing can be performed through several methods; the end result should always be that food contact surfaces are thoroughly covered with a no rinse level of sanitizer and environmental surfaces are disinfected properly.

Flood Sanitizing

- Flood sanitizing is the method of choice for all external surfaces, including food contact and environmental surfaces.
- Approximately 5 gallons per minute flow should be used for flood sanitizing. Flood sanitizing can be accomplished through wall mounted venturis, or centrally piped systems that inject properly proportioned amounts of sanitizer to hose drops.

Foam Sanitizing

- Foam sanitizing is also an acceptable method. The foam should be “wet” and contact all external surfaces, including food contact and environmental surfaces.
- Foam sanitizing is generally used for environmental surfaces. Great care must be taken when sanitizing through air operated foamers. Air is needed to push the solution through the foam hose, creating atomization of sanitizer into the air and reducing the amount of sanitizer coming in contact with the surface being sanitized.
- Foam should be wet and sloppy with minimal air applied. Using bleach through a foamer is especially dangerous to the safety of employees and creates a potentially corrosive environment.

CIP Method

- Using this method to flush pipelines, cookers and kettles is more effective than flood type sanitizing.
- A pre-determined amount of sanitizer is added to a pre-determined amount of water and circulated or flushed through the interior surfaces.
- Contact time should be a minimum of one minute before dumping. Interior surfaces need not be rinsed with potable water provided the sanitizer is used at approved levels.

Dip Sanitizing

- This method involves adding a pre-determined amount of sanitizer to a pre-determined amount of water.
- Utensils and other equipment is then dipped into the solution and held for 60 seconds. The equipment is removed and allowed to air dry.
- No rinsing is necessary is sanitizer is used at no rinse concentration.

Disinfecting

- Disinfecting surfaces involves using a high ppm amount of sanitizer to provide effectiveness against heavy microbial formations.

Fog Sanitizing

- Involves atomizing a sanitizer through a fogger or central fog system.
- Can be effective for reducing spores and airborne contamination.
- Great care must be taken when fogging to provide total evacuation of personnel until fog is completely dissipated.
- Chlorine and quats are generally used. Quats can be irritating to lungs and chlorines can be corrosive to the environment.

Hot Water Sanitizing

- Hot water sanitizing involves the use of 185°F or higher water for a minimum contact time of 15 minutes.
- Often followed by purified or sanitizer treated water to cool down.

Prepared by

North Little Rock, AR

(501) 758-8500

www.pssi.com/contact-us