Sanitation Activities and Best Practices - Food Safety

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Many food plants are large and complex while others small and simple. All food operations require sanitation activities to meet company, customer and regulatory expectations for lowering the risk of releasing adulterated contaminated products into commerce. Contamination may occur as chemical (cleaning compounds), physical (insects) and microbiological (bacteria). In an environment where cleaning may require production downtime, time is a significant cost to the manufacturer. Sanitation managers usually have a limited budget and must be efficient and effective in their efforts. Efficient sanitation is based upon science and is complex. Efficient is commonly defined as working quickly and effectively in an organized manner bringing about a desired result with little waste. A food facility, structures, environment, equipment, tools and utensils must be cleaned and sanitized at the right time in the right way. For example, under cleaning increases the risk of contamination, over cleaning creates an unnecessary cost and wrong cleaning can create contamination which may lead to a product recall. Sanitation has a direct impact on managing pests, especially insects, controlling microorganisms, especially pathogenic bacteria, and preventing slips, trips and falls. Effective cleaning is an ongoing balancing act to prevent contamination while combating the varying consequences of soil and time. Sanitation is a key part of Good Manufacturing Practices (GMPs), an essential prerequisite for a Hazard Analysis Critical Control Point (HACCP) and Hazard Analysis Risk-based Preventative Control (HARPC) programs in addition to being a Food Safety Modernization Act (FSMA) required preventive control. Sanitation is a challenge and will always face scrutiny by company, customers, third parties and regulatory personnel.

Although sanitation issues can lead to regulatory action, an effective sanitation program will impact allergen, microbiological, pest and safety activities within a food plant. Food industry personnel must understand the why, how often and how assuring manufacturing of safe food products while protecting employees and property in carrying out sanitation tasks. The why and how often should be a well thought out process in preventing allergen, microbiological, pest and safety related issues.

Understanding sanitation begins with understanding basic practices, common words and concepts. Sanitation generally refers to the maintenance of hygienic conditions with a series of activities and programs to accomplish such conditions. Sanitation utilizes two basic activities; cleaning to remove food debris, organic material and soil, and sanitizing to reduce microbiological organisms to a safe level, rarely can both be accomplished simultaneously. Sanitation consists of assigned personnel engaged in such activities to ensure a plant operation will meet sanitation requirements for food facility, structures, environment, equipment, tools and utensils. An effective sanitation program will remove food debris, organic material and soil from areas that may support the survival or growth of microbiological organisms and insects without contaminating areas with such activity. Master Cleaning Schedule (MCS) and Sanitary Standard Operating Procedures (SSOP) are two key programs to guide assigned employee activities to meet desired sanitation requirements. Successful sanitation can be measured

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by a number of means such as visual inspection, microbiological testing for indicator bacteria using sponge sampling or swabbing.

Cleaning is a process of removing food debris, organic material and soil from a surface. The right cleaning agent and method must be selected because not all can be used on food contact surfaces. A food-contact surface is a surface of equipment or utensil with which food normally comes into contact. The type and frequency of cleaning depends on the complexity of the process, equipment design and soil type. There are three basic cleaning types:

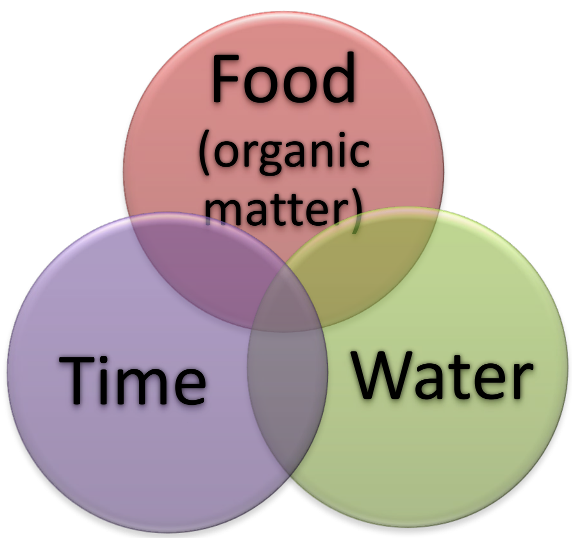
- **Regular cleaning** provides normal frequent unscheduled cleaning. Ongoing cleaning during production is fundamental to any sanitation program. However, cleaning during production must not contaminate product with debris. The better one cleans during production the better the sanitation program. Sometimes regular cleaning can rise to a good looking area but create an illusion of food safety level clean.
- **Maintenance cleaning** provides scheduled and unscheduled upkeep for normal and food safety level clean. Scheduled upkeep will occur in the form of a preventive maintenance program and in some cases requiring disassembly, service, clean and reassembly of equipment. Unscheduled maintenance cleaning can occur in the form of equipment malfunction resulting in fixing a problem and cleaning a spill.
- **Deep cleaning** typically provides a scheduled and less frequent food safety level clean. Food safety clean is intensified reaching the niche areas of structures, environment, equipment, tools and utensils getting deep into cracks, crevices and pores generally not reached during the normal or maintenance types. Improper cleaning of niche areas can create food safety issues and must be cleaned using appropriate methods and chemicals. Deep cleaning is often performed during an entire food plant shut down in conjunction with preventive equipment maintenance followed by pest management.

Inadequate cleaning, not removing all of the organic material, can leave behind deposits creating a biofilm rendering a sanitizer ineffective. When a sanitizer comes in contact with organic material the microbiological killing capacity is neutralized and the result is water. If residual microorganisms are not inactivated they will use the residual organic matter and water to rapidly increase in number in a very short time. Eliminating food soils require knowledge of soil types to determine the optimal cleaning agent. There are four basic soil types:

- Alkali Soluble Food Soil
  - Fats, Proteins
- Water Soluble Food Soil
  - Carbohydrates, Sugars, Starches
- Acid Soluble Food Soil
  - Minerals; calcium and magnesium
- Combination of Alkali, Water Soluble and Acid
  - Typically Heavier Accumulations

Fat and protein soils are common in food facilities. Fat can be removed with water temperature higher than the fat emulsion (any colloidal suspension of a liquid in another liquid such as fat in milk). An alkali detergent will penetrate the fat improving the soil removal. Protein based soils are more difficult. Warm water and alkaline detergents are needed to clean surfaces soiled with fat and protein. Another common soil type in food is carbohydrates, sugars and starches. Warm water and/or a solvent such as alcohol are effective removing carbohydrates. Minerals such as calcium and magnesium are not as common in a food facility but can be difficult usually requiring an acid to remove mineral buildup. A combination of alkali, water soluble and acid is the most difficult and will likely require some abrasion for optimal removal. Removing fat, protein and carbohydrates without water within a dry zone of a food plant is challenging.

It is difficult to remove all of the organic material from food manufacturing equipment. Much of this equipment is designed for efficiency, not for cleaning and sanitizing. Consequently, many extrusion food plants maintain a dry-clean approach to sanitation. The philosophy behind this concept is that if one can eliminate one of the key factors in microbiological growth, water, then microbiological contamination will be controlled. The three basic necessities for microbiological growth include food (organic material), water and time. Eliminating one or more of these and/or controlling all will aid in the proper preventative microbiological control. Unfortunately, controlling moisture does not eliminate microorganisms; it only keeps microbes from growing and even has a lesser impact to control insects. A dry environment and dry equipment may still accumulate organic material in untidy factories and poorly designed equipment.



Time + Water + Food = Bacteria Growth

When microorganisms grow on equipment they are growing in the organic material left behind. This growth can create a biofilm layer on the equipment which is invisible to the naked eye. The biofilm is made up of microorganisms, microbial byproducts (excreted polymeric substances) and residual organic material (food). The biofilm often fills scratches in stainless steel, plastics, rubber and other surfaces in addition to small cracks. Only strong oxidizing agents can reduce or eliminate the organic material in the biofilms. Cold sanitizer cannot penetrate these biofilms. Biofilms are the mechanism that allow for the tenacious attachment of microorganisms to surfaces and act as an important survival strategy. The matrix of extracellular polymeric substances (ESPs) act as a 'crazy glue' that allow the bacteria to adhere to each other as well as inert surfaces. Extremely difficult to locate and as difficult to remove, biofilms protect the microbial growth from UV exposure, desiccation and many antimicrobial agents. The formation of this microbial 'plaque' becomes 'stacked' on itself allowing for logarithmic growth to occur in a contained environment. Failure to completely remove the lowest layer of the biofilm will only allow for the microbes to proliferate once again over time. Non-corrosive peroxide-based detergents and acids e.g. Peracetic Acid are effective in controlling and eliminating biofilms. Recently approved for food contact by the FDA, silver ion containing antimicrobials are proving to be an effective approach to biofilm removal. If you suspect a bio-film may be forming on equipment that comes into contact with food, contact your chemical or equipment supplier for instructions on how to best clean the affected area with the right chemical and procedures.

There are four basic cleaning agent categories:

- Detergents … Penetrators
    - Dawn … dishwashing
- Solvents … Degreasers
    - Fantastik … burned on grease
- Acid … Mineral Removers
    - CLR … scale, calcium buildup
- Abrasive … heavy accumulations
    - Comet with steel wool or course nylon

Cleaning agents can be complicated for a food plant. Resources such as a cleaning chemical company or knowledgeable sanitation expert must be consulted to utilize the best cleaning method and/or chemical for a particular soil type. The soil type will usually vary by area and zones within a facility made even more complicated by wet cleaning or dry cleaning. A dry designed zone should not be wet clean as a presence of water will likely promote microbiological and insect problems.

Sanitizing is the process of reducing the number of micro-organisms that are on a properly cleaned surface to a safe level and is accomplished by using heat, radiation, or chemicals. A surface must be cleaned as it is impossible to obtain close contact between the sanitizer and the surface. Some chemical sanitizers, such as chlorine, react with organic matter and are less effective if a surface is not clean. Successful cleaning is a prerequisite for a sanitizer's effectiveness. There are four basic sanitizing agents:

- Chlorine - 50 ppm in water
    - Effective on a wide variety of bacteria
    - Corrosive, irritating, dissipates rapidly
- Quaternary Ammonia - 200 ppm in water
    - Effective over a wide pH range, non-toxic
    - Slow micro-organism destruction
- Iodine - 25 ppm in water
    - Active against a wide variety of bacteria
    - Discolors equipment and surfaces.
- Alcohol – 70% solution
    - Very powerful sanitizer, quick

- Flammable

There are pros and cons with the various sanitizing agents. A selection of the sanitizer depends upon the surface and microbes encountered. An alcohol (long recognized as an optimal sanitizing agent) with a four-chain quaternary ammonium (continues sanitizing after the alcohol has evaporated) compound is an overall effective approach in most food plant operations and very active against a wide variety of bacteria. Rotating sanitizers periodically is suggested to prevent bacteria resistance. In some applications one can sterilize problematic "hot spots" with heat (320 degrees F.) for a few hours. However, this approach is hard on processing equipment but can be used with portable equipment that might be microbiologically contaminated. A good example is a floor scrubber used in many food plants throughout the world. These walk behind or ride on devices CANNOT be effectively cleaned and sanitized. Scrubbers can pick up and redistribute microbiological contamination throughout the food operation. Organic material combined with the aqueous cleaner/sanitizer does indeed make the floor appear cleaner. However in doing so an invisible deposit of microbial contamination is applied wherever the floor scrubber has traveled. Microbiological swabbing of these units has confirmed this fact. Placing these units in a hot confined area for a few hours can eliminate the microbial contamination.

Sanitizing is the application of a chemical to a clean surface reducing microorganisms, without adversely affecting the food product. Sanitizing provides health benefits by reducing microorganisms to a safe level on surfaces. Cleaning to prepare a surface for sanitizing and not sanitizing is like applying shaving cream and then not shaving. Pathogens such as *Salmonella* are a beast and must be controlled using all tools in the food safety toolbox. Some people are convinced they do not need a sanitizer following washing. Simply put if one washes, one must sanitize. A low moisture product's processing equipment and environment should be dry cleaned and sanitized. Semi-moist or high moisture product's processing equipment and environment should be wet cleaned and sanitized.

Cleaning prepares a surface for sanitizers to reduce microorganisms to a safe level. If the surface is not clean, that surface cannot be effectively sanitized. In food plant operations, the type of food being processed will determine a cleaning regimen. Wet cleaning is necessary to remove fats, proteins, carbohydrates, sugars and/or a combination. Seven basic steps in washing and sanitizing hold true for most soil removal in higher moisture food processing areas, systems, equipment and environment.

1. Inspect and identify an area for the task ahead to remove large soil accumulations typically using dry clean methods, plan and prepare. Get the big stuff out of the way. Determine if equipment should be broken down or if any extenuating conditions exist that may require cleaning or sanitizing modifications.
2. Scrape, brush or flush soil from a surface with water at a warm 110° F. (43°C.) temperature.
3. Use the appropriate method and cleaning agent to clean the surface(s). It might be necessary to scrub areas to remove stubborn soils before applying a detergent. Foaming is effective with many stubborn soil buildup scenarios. Alcohol or other solvent is effective in a dry facility that evaporates with time.
4. Rinse and flush the detergent or foaming agent from the surface with water and dry. This rinsing step is important as many detergents are alkaline and sanitizers acidic.
5. Apply the selected sanitizer on adequately cleaned surfaces, best with a light misting. There are two forms of sanitizers - rinse off or leave on. A leave on sanitizer will protect a surface maintaining its effectiveness for hours.

6. Dry all surfaces and dehumidify the area. Even in a designed wet zone keeping the area dry will prevent microbiological growth while providing a safer work area.
7. Perform an organoleptic inspection and conduct microbiological evaluation.

Low moisture foods have many dry processing areas such as receiving, ingredient handling & storage, milling, batching, packing, palletizing, warehousing and shipping. Vacuuming is the preferred dry cleaning method with filtered pressurized air the least preferred. There is a place for using pressurized air (limited access to a void) but one should not spread the potential contamination i.e. insect eggs, bacteria, to nearby areas. Catching the blown soil into something such as simple as a trash bag is a preventive step. Dry ice blasting, where dry ice, the solid form of carbon dioxide, is accelerated in a pressurized air stream directed at a surface is best done in a manner to also contain the blast and soil. Use alcohol based wipes on dry cleaned surfaces.
Dry cleaning is simpler than wet cleaning and consists of four basic steps.

1. Pre-Cleaning Steps:
    - Assemble all cleaning & sanitizing tools and chemicals
    - Ensure hand and foot wear is clean, dry and sanitized
    - Lock-out/tag-out equipment
    - Personal Protective Equipment (PPE)
    - Disassemble equipment, remove parts to secured area
    - Follow SSOP for cleaning parts and transports
    - Inspect equipment to be cleaned
    - Review applicable SSOPs
2. Dry Cleaning Steps:
    - Remove (sweep, scrape) excess debris & organic matter
    - Use systematic top-down cleaning approach
    - Minimize high pressure air use
    - Use pads, brushes, lint free towels and cleaning solution
    - Use alcohol-based fast dry wipes for surface cleaning
    - Spot clean problem areas on framework & areas nearby
    - Double check all surfaces and equipment are cleaned
    - Empty, clean and sanitize all trash containers
3. Dry Sanitizing Steps:
    - Follow the inspected cleaning process with sanitizer
    - Follow sanitizer label instructions
    - Use a low-moisture sanitizer
    - Approved for food-contact surfaces, no rinsing
    - Sanitizers may be in the form of ready-to-use
    - Alcohol wipes, sprays or mists
    - An alcohol/quaternary ammonium sanitizer can be used most anywhere as a final kill step
    - Conduct a visual inspection, validate, verify, document
4. Ongoing Steps:
    - Hand washing, hand and foot wear sanitizing is continuous.
    - Set up near/in processing areas to prevent contamination.
    - Grounds, entries, raw material receiving to finished product shipping.
    - Clean as you work.

- Transports wheels sanitizing should not be overlooked.
- Training and employee culture is a key to good hygiene.
- Contractors, visitors and truckers must not be overlooked.
- Document.

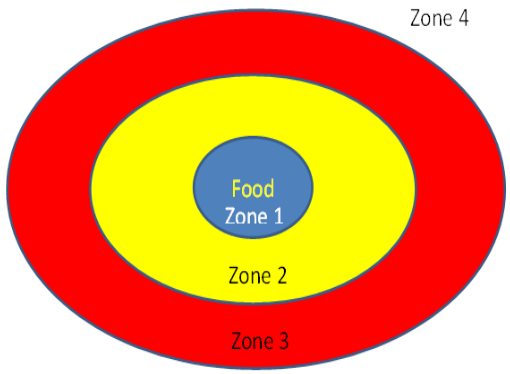
The removal of excess soil is an important step in the cleaning process. Sending large soil accumulations to the drain especially with high pressure washing is problematic. The type of cleaner must be effective against the soil in question. What works in one situation for a specific soil may not work for all. The type of sanitizer and application method must also be effective for a specific surface and soil in question left behind.

Some food plant areas should not be wet cleaned. Receiving, ingredient handling & storage, milling, batching, packing, palletizing, warehousing and shipping are such areas. Many low moisture food plants contain a wet clean area e.g. extrusion <u>within</u> a dry cleaned facility. These wet clean areas must be isolated and separated from the dry cleaned areas. These common walls are a common source of insects and should be monitored closely. The drains are a common source of bacteria and should be monitored closely. Vacuum systems are excellent equipment for dry cleaning. These systems should be maintained and kept clean so they themselves are not a source of microbiological and/or insect contamination. Food plants with well-designed central vacuum systems are much cleaner operations than those without. Vacuum systems must be inspected on a routine schedule to ensure insect eggs have not hatched inside the system.

Good sanitary design provides specific areas to be wet cleaned and other areas to be kept dry. Wet cleaning a designated dry clean zone provides conditions for microbiological growth such as hidden moist debris in, under and around supporting framework. Dry cleaning a designated wet clean zone will also provide conditions for microbiological growth such as unused drains. Some insects such as drain or moth flies (family Psychodidae) can find a problematic microbiological source and are an indicator of a hidden problem.

Sanitation programs are separated into four basic cleaning zones.

- Zone 1 - direct food contact surfaces within a food plant including tools, utensils, containers and human hands. Zone 1 is the highest priority of food safety.
- Zone 2 - nonfood contact areas within a food plant closely adjacent to food contact surfaces. This is an area where environmental contamination is likely to affect a product.
- Zone 3 - nonfood contact surfaces adjacent zone 2. If zone 3 is contaminated, it might lead to contamination of zone 2 by employee actions or movement of machinery.
- Zone 4 - area remote from the product processing areas. If zone 4 is not maintained in a good sanitary condition, it might lead to cross contamination of zones 1, 2, and 3.



It is important to understand the zone concept and simply observe the operation. Often zones 2 and 3 (nonfood contact) equipment and environment can become zone 1 (direct food contact) when trim or rework is allowed to come into direct contact with equipment. For example food related material is collected off some pieces of equipment to be reworked, salvaged or used at reclaim packaging to make weight creating a zone overlapping problem.

Good sanitary design is critical to an effective and efficient sanitation program and consists of a few basics:

- Accessibility - structures & equipment. If you cannot access, you cannot clean it.
- Cleanability - surfaces. If not designed to be clean, you cannot clean surfaces.
- Free of Voids - framework. Voids will become contaminated usually by insects.
- Eliminate the Need to Clean - Why clean more than necessary?
  - Effective dust control reduces cleaning time in all four zones.
  - Effective spill control reduces cleaning time of repeating cleaning activity.
  - Area Separation - Do not allow one cleaning activity to create problems in another area.
  - Isolate Dirty Areas - Contain dust and spills to minimize cleaning time.

Validation, Verification and Calibration are often wrongly used interchangeably. Validation is what will be done and what will work. Validation can refer to scientific journals, research or other support data. Will what we will do achieve a desired outcome?

Verification is the things we do to see if we actually are doing what we say we are going to do. Will what we did achieve a desired outcome?

Calibration is making sure the equipment to be used is operating correctly. Are the readings accurate?

Validation is the science, verification is the checking and calibration is the accuracy.

There is a combination of methods that will verify the sanitation practices are effective. **Organoleptic observation** is instantaneous using sight, smell and touch to verify surfaces are free of soil. Although the equipment may pass an organoleptic observation, one cannot tell if bacteria have been reduced to a safe level. **Microbiological testing** includes testing for pathogen as well as indicator microorganisms. The types of bacteria, target pathogen (s), sampling locations and testing frequency should be incorporated into the overall **Microbiological Environmental Monitoring Program**.

The goal of a robust microbiological environmental monitoring program is to determine and document if the processing environment is in microbiological control. Microbiological control is not defined only by low to no microbial counts on post sanitation sponge samples. Environmental control also means having an awareness of every aspect of the production environment; equipment surfaces, water, air, and the materials moving in and out of an environment. Understanding the microbiological level and types of microorganism in these various environmental areas allows potential problems to be corrected before they can impact the finished product. Microbiological control also means knowing that microorganisms (any microorganisms) are not proliferating in an environment which might create a potential for cross contamination.

There are a variety of ways to build confidence (quality assurance) in the microbiological quality of a food manufacturing environment. Many companies rely on quick read systems such as ATP (adenosine triphosphate) swabs to verify sanitation efforts. However, these systems only provide a read immediately after cleaning and do not reflect the status of the environment during production. In addition, ATP swabbing is difficult to interpret in dry clean processing areas where organic matter may interfere with proper readings. Microbiological samples that are only collected post sanitation also do not reflect conditions during operations which can be extensive in continuous or extended run factories. Sanitation verification is an essential part of quality control but it is only one aspect of a good environmental program. Ideally, a microbiological sampling program includes product contact surfaces, with the samples being taken during production. In-process samples collected during production are a direct indication of the overall microbiological control of the finished product.

A comprehensive microbiological environmental program should include testing for pathogens as well as indicator organisms such as Enterobacteriaceae and or fungi. Results from these analyses must be compiled into a format that will allow for easy understanding and interpretation of trend data by Quality, Production and Regulatory personnel. Data from a properly executed environmental program will reveal issues in sanitation, air and water quality, changes in staffing, lack of compliance with SOPs (standard operating procedures) and SSOPs, construction and infrastructure that have the potential to influence the microbiological quality of the finished product. *Salmonella* will typically contaminate a finished product food through the environment.

The four programs that make up a comprehensive Microbiological Environmental Monitoring Program include the following:

1. **Air Monitoring** - microbiological air monitoring is critical since what falls out of air falls onto product and product contact surfaces. It is suggested to collect weekly air monitoring samples with inexpensive air impingement Total Microbial Counts (fungi & bacteria) with an acceptable limit of <250 colony forming units per 15 min exposure.
2. **Pre-Operational** - This type of microbiological monitoring is a verification of appropriate cleaning and sanitization of food equipment. Since most food production areas are dry cleaned, this program may be implemented only in a meat room or following a burn out or other clean break. Total Microbial Counts are normally the analysis used with an acceptable limit of <100 colony forming units per sponge.
3. **In-Process** - This is the most common program for food plant verification of microbial control. Enterobacteriaceae is recommended as the indicator of appropriate microbiological control. A typical specification (acceptable limit) of <100 colony forming units per sponge is often used but can be as high as <1000 cfu per sponge. Both food contact and non-food contact surfaces are included as sampling sites.

4. **Pathogen** - This program is essential. The most common target species for many food plants is *Salmonella*. However, recently some food plants with high meat constituents included *Listeria* in their pathogen program as well. Both *Salmonella* and *Listeria* are monitored in other FDA and USDA regulated facilities.

Samples are collected, coded and analyzed by a competent laboratory. Analytical results should be incorporated into a trend analysis type of reporting system and interpreted by an experienced food microbiologist.

Color coding cleaning tools is applied in conjunction with a cleaning program to enhance food safety and prevent contamination between areas such as raw to cooked, food contact surfaces with non-contact surfaces, toilet facilities from a production area while helping with program training. In addition color coding helps with inventory control and separating cleaning from sanitizing chemicals to prevent contamination by misusing a chemical in a specific zone. Although there is not a universal color standard currently, some common colors for utensils, tools and containers are evolving: white - used on food contact surfaces, green - used where food is handled, blue - used in lower risk areas, red or yellow - used in high risk cross contamination likely areas and black - used outside of facility. Whatever color coding system is used, consider matching the color of utensils, tools and containers with approved chemical, rags, cloths and spray bottles.

In conjunction with color coding cleaning tools is providing a place for the cleaning tools and assuring the tools are kept in their designated place. To prevent the time to lean syndrome with time to clean will require designated cleaning stations frequent in number for a get ready to clean activity. Some cleaning stations e.g. contact surfaces will require protection e.g. cabinet and others wall mounted holding brooms, brushes, shovels and vacuum hoses. An approved list of cleaning tools and chemicals is a suggested practice.

A Master Cleaning Schedule (MCS) is the foundation of a sanitation program requiring management commitment and ongoing support. Positively re-enforced effective and efficient cleaning is a way of life in a clean environment. A MCS is a map to accomplish a desired level of clean at desired times. This program is driven by a knowledgeable Food Safety Leader formerly a full time position called plant sanitarian but now usually a combined position known as HACCP Coordinator, Plant Hygienist, Quality Assurance Coordinator, etc. To be practical and sustainable, a MCS should be developed realistically for cleaning activities occurring other than daily. A MCS is a well thought out program and upon completion is an actual work record providing a cleaning and sanitizing checklist on a predetermined schedule helping to achieve the right amount of cleaning preventing over and under cleaning. The amount of hours to clean a particular task can be utilized as a return on investment (ROI) for something better with the procedure e.g. central vacuum or equipment e.g. dust collection. More cleaning requires more time which require more cleaning hours, more cleaning compounds and more tools. All this, along with production downtime, make for a significant cost. Effective cleaning is an ongoing balancing act to prevent contamination from occurring with the right amount of cleaning delivered at the right time to combat consequences of soil and time.

A MCS includes grounds, structures, walls, overheads, floors, drains, equipment, tools, utensils, containers, transports, etc. organizing the entire cleaning process as follows:

1. By Department
2. Item/task/area - Tasks other than daily and area broken down into a manageable size

3. Risk = Bacteria e.g. *Salmonella*), pest e.g. flies)
4. Cleaning Frequency
    - Weekly, Bi-weekly, Monthly, Quarterly, Semi-annual, Annual
5. Cleaning types = dry, dry using alcohol, wet
    - Cleaning dry options = Vacuum, Sweep, Wipe, Dry
    - Cleaning dry alcohol options = Wipe, Sanitize, Dry
    - Cleaning wet options = Rinse, Foam, Detergent, More Rinse, Sanitize, Dry

5b. Assign applicable Sanitary Standard Operating Procedure (SSOP)

6. Assigned to whom for cleaning and to whom for verification
7. Task completed by (person doing the task)
8. Completed on (date/time) and verified by (typically a supervisor)

Using a systematic, methodical format customized for each plant and department such as an Excel spreadsheet is an excellent practice. Initially the program will be more of an estimate using the experience and knowledge of on the floor personnel who know the building, equipment, products and problems. One does not develop a MCS right the first time. It is a work in progress and must be updated periodically. People in the plant that do the cleaning should be asked for their ideas how to improve the cleaning process. As the operation changes, the cleaning needs will change. As with illegible entries, unaddressed changes will invalidate a MCS. A MCS should be an establishment of policy, rules and procedures to follow all written with a purpose. Do not write one thing and do another. Some tasks and frequencies will vary depending upon the season e.g. outdoor silos, equipment legs, etc. Although "as needed" is not an acceptable frequency, an "inspect and clean if required" is an acceptable frequency. There should be an agreement of an acceptable level of clean by area, by surface, by data and by need. A building contractor's perspective of clean is different than a food microbiologist and much different than a hospital. The acceptable level of clean is that prevents contamination from occurring at any time and prevents a predetermined hazard from developing.

A Sanitary Standard Operating Procedure (SSOP) is an acronym referring to Sanitation Standard Operating Procedure. There is some confusion about the P; procedure or policy or plan or practices? Although the P stands for procedure, perhaps the P can refer to all four. A procedure should provide a series of steps in a definitive order (the how), policy would state the goals (the why), plan for the method to achieve (the intent) and practices for employees (the work). A SSOP should connect with the MCS frequency providing a procedure for a desired action to achieve a desired level of clean. A detailed SSOP might describe when to clean, why to clean, where to clean, what to clean, how to clean, clean with what, sanitize with what (prevent microbial resistance), contact time required for sanitizers, mixing instructions, tools to use, verification action, etc. A SSOP is a series of planned steps ensuring proper consistent cleaning of a surface and a result of intelligent effort ranging from simple to complex depending on the task all with a purpose to prevent contamination. A well designed SSOP is effective in controlling hazards. There are eight steps of a SSOP driven cleaning activity.

1. Pre-cleaning Evaluation
2. Cleaning Preparation
3. Cleaning
4. Sanitizing
5. Post-cleaning Inspection
6. Documentation
7. Validation

8. Verification

SSOP's are procedures in food production plants required by the Food Safety and Inspection Service of the USDA and regulated by 9 CFR part 416 in conjunction with 21 CFR part 178.1010 and a prerequisite program of HACCP.

Outsourcing cleaning by contract to commercial companies has advantages. Putting the work in the hands of cleaning specialists with customized SSOPs will allow cleaning to be performed by experienced highly trained people to perform the task (s). Contract cleaning has its place in many dry food plants notably the human safety challenging areas of cleaning inside confined spaces and upper elevations. Some high moisture food plants or specific areas are cleaned routinely by a contracted company.

Cleaning-In-Place (CIP) is a time saving method that can be used to reliably clean equipment with little or no equipment break down. CIP relies on the turbulence of the water and the chemicals used to remove soil buildup and biofilms. CIP cannot clean the areas between gaskets and quick connect joints. These areas must be cleaned manually. Care needs to be exercised when cleaning food grade gaskets in order to prevent any gouging or scaring of the gasket materials. Many companies simply replace the gaskets every time the joints are opened rather than take the chance that the gaskets have been compromised. It is imperative that the final CIP rinse water be tested and documented for pH if caustics and acids were used in the process. It is typical that once a CIP has been completed and final rinsed, the system allows finished product to 'chase' any remaining rinse water through to the drains. If the final rinse does not completely neutralize the acid or caustic cleaning agents, the product will be harmful and lead to recalls. CIP can also be an effective tool for dry cleaning. Typically these systems have a pulley system or cable that can pull or push a tight fitting plug, known in the industry as a pig. Cablevey® systems can use a disk placed within the system to act as a squeegee in order to remove fines and debris. Brush boxes can be used on this system to dry clean the cable and disks. Being a totally enclosed system, Cablevey® can eliminate the contamination and sanitation issues commonly associated with open bucket elevators.

Most chemicals used for sanitation are either designed to provide a film that over time kills bacteria, as with Quaternary Ammonia compounds, or to oxidize the bacteria on contact (as with chlorine and chlorine dioxide) provided that the organic material residue is low. Ozone has been effectively introduced as an antimicrobial and virucide agent. Ozone is generated by an electrical discharge through air or oxygen. Like chlorine, Ozone is a strong oxidizing agent however as a gas it is unstable. Unlike chlorine, Ozone is not corrosive to stainless steel and has no harmful residuals as ozone decomposes rapidly. Ozone treated microorganisms are not protected by particulates in the water stream and do not resuscitate and regrow. Ozone is generated on site and can be available throughout the facilities entire water system. Ozone elevates the dissolved oxygen concentration of any effluent which benefits discharge treatment by municipal treatment sites. When Ozone decomposes in water it forms free radicals of hydrogen peroxy (HO_2) and hydroxyl (OH). Both of these have tremendous oxidizing capacity which leads to the complete disintegration of the bacterial cell wall. Similar to all other sanitizing chemicals, Ozone effectiveness is dependent on the susceptibility of the target microorganism, the concentration of the ozone in the water system and the contact time. Ozone as a gas is rather ineffective, however ozone injected into water can be used in final rinse applications on equipment. Ozone is more effective at lower water temperatures and has a short shelf life in open containers. A constant supply of ozone provided by an onsite ozone generator will ensure that the ozone is constantly available to oxidize bacterial cells. Ozone's effectiveness is increased when the size of the gas bubbles injected into the water is as small as possible. Therefore the ozone injector is a critical component of being successful in optimizing the ozone's application. When considering purchasing or leasing an ozone system, it is important that only reputable ozone generating companies be considered and better to have a company that has previously installed ozone systems in food manufacturing sites. Ozonated water is not a replacement to the chemical treatments that have been effective in a facility, but should be considered as a tool that provides an additional hurdle to microbial growth in niches throughout the facility.

FDA has recently approved the use of sanitizers containing silver ion for food contact surfaces. Silver ion has been shown to be an extremely effective broad spectrum antimicrobial that requires a very short exposure time to eliminate many spoilage bacteria and pathogens. Silver ion containing compounds have been incorporated into epoxy floor coatings, anti-bacterial gloves and antibacterial floor mats. Silver ion containing chemicals have successfully been used in foaming equipment for equipment and floors where high vehicular traffic mitigation steps are necessary.

Peroxide-based chemicals are being marketed that have also been demonstrated to be effective against microorganisms with very little exposure time. Available as liquids, wet-able powders and powders, these agents are non-corrosive to stainless steel equipment and galvanized condensate collection pans.

Ozone, silver ion containing compounds and peroxide based cleaning agents are equally effective in eliminating microbial biofilms.

Emerging sanitation technologies has also focused on the use of enzymes to eliminate in-line waste to reduce microbial counts and eliminate biofilms. Recent research has shown that enzymes derived from extreme thermophilic bacteria, such as those found in hot springs and geothermal hot springs, can withstand boiling water temperatures and remain effective. Laboratory studies indicate that these enzymes are extremely effective in hot-to-very hot CIP systems. Additionally, these enzymes will eliminate biofilms in a very short time without the need to use other non-heat stable chemicals. New sanitation products are being offered which contain derivatives of these enzymes where they are being used in many diverse CIP and COP applications.

Sanitation Best Practices

- A robust comprehensive microbiological environmental monitoring program
- Correctly size a cleaning tool for cleaning to maximize cleaning efficiency
- Label all cleaning tools, color code and keep them in assigned areas
- Use alcohol as a sanitizing agent and rotate sanitizers
- Power sanitizing and disinfecting (Biomist)
- Train employees and update cleaning practices regularly
- Keep a plant dry, even the wet zones
- Arrange cleaning schedules in a logical sequence grouped by area
- Post cleaning schedules by area
- Transport wheels e.g. carts, forklifts along with shoes are regularly sanitized
- Provide informative charts from color codes to measurement results
- Documentation is legible with signatures and dates
- Weekly to monthly ongoing sanitation training with outside experts i.e. chemical supplier, third party laboratory microbiologist, consultant
- Engage management in food quality and safety commitment

Best practices throughout the industry include the elimination of high pressure access for general sanitation. High pressure will only serve to drive the debris and microorganisms deeper into the equipment, deeper into compromised floor-wall junctions and drive floor debris (zone 3) back up onto the cleaned zone 1 equipment and contact surfaces.

Floor scrubbing units can also be problematic in spreading bacteria and pathogens from zone to zone. Scrubbers must be included on the master sanitation schedule and must follow the recommended manufacturer's sanitation protocol. Floor scrubbers and mops are excellent environmental sample sites knowing that they have basically touch and area far larger than a typical swab program. Rinse water collected off mops and obtained from the collection tank on scrubbers have been targets of FDA environmental sampling programs during on-site regulatory investigations. Ensuring that mops are sanitized after each use and the collection tank on a scrubber is drained and sanitized in conjunction with an effective sanitation program for these items will reduce the risk of spreading contamination throughout the manufacturing site. Placing pieces of a 'quat ring' into the floor scrubber collection tank will enhance the antimicrobial activity and ensure the collected dirty floor water will not become a stagnant microbial breeding area.

A clean building is a longer lasting building and a clean plant reflects a food industry leader. First impressions are lasting impressions and clean is better than dirty. Although cosmetic cleaning might fool a visitor, deep cleaning is critical to meeting customer, regulatory and company expectations of no insects or bacteria. Good sanitation is a practical systematic solution to producing a safe wholesome food in any size plant.

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