



**SANITARY DESIGN, INDUSTRIES, LLC.**

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# **Cleaning Procedures in the Dairy Plant**

Cleaning procedures are established with four basic functions in mind. Those functions are time, temperature, chemical concentration, and mechanical action. Each function is essential and interacts with the others to achieve effective cleaning. If one function is lacking, the others can be boosted to compensate. For example, if temperature is lower than desired, then time, chemical concentration, and mechanical action can be increased to compensate for the lower temperature. Too much compensation of any one or even a few of these can result in detrimental results.

Let's start with time. The amount of time allocated to a procedure depends on the soil type, the size of the system to be cleaned, and the status of the other three functions (temperature, chemical concentration, and mechanical action). 1) Less difficult soils require less time than more difficult soils. 2) When considering the size of the system the concern is about getting thorough recirculation throughout the entire system. The smaller the system the less time required and vice versa. 3) Increasing time can be considered if there are low temperatures, low chemical concentrations, and poor mechanical action. Adding too much time can be detrimental to the results.

Temperatures are determined by taking into account the soil type, the condition of that soil (is the soil soft and loose or is it burnt or caked on), and the status of the other three functions. 1) Less difficult soils require lower temperatures and more difficult soils require higher temperatures. 2) Warm and hot water have the ability to increase the solubility of soils (dissolving soils in water). With the assistance of cleaning products, warm and hot water can hold soil in solution and allow it to go to drain at the end of the wash step. For equipment that stores or transfers cold products a cleaning temperature of 120F to 145F is sufficient. Equipment that processes products at +145F requires a cleaning temperature of 155F to 185F. Please note, the final temperature before draining solution after a wash step should not be below 120F. The melting temperature of fat is 104F. But, it has been determined cleaning solution temperatures below 115F will allow the fat to solidify and reattach to equipment surfaces. 3) It is not recommended to use the other three functions to compensate for low temps. Ideally, when there is loss of temperature the heat source must be working properly to prevent heat loss. If not it should be repaired.

Chemical concentrations are also determined by taking into account the soil type, condition, and again, the status of the other three functions. 1) Less difficult soils require less concentration and more difficult soils require more concentration. 2) Understanding product chemistry significantly helps in determining proper concentration levels. My next paper will be dedicated solely to this subject. 3) Loss of time, temperature, and mechanical action can all be effectively compensated for by increasing chemical concentration. In fact, increasing chemical concentrations is the easiest way to compensate for a system that is not performing at optimum levels. The concern here is that increasing chemical concentration does not allow for efficient use of product.

Finally, mechanical action is determined by the equipment being cleaned and the method used to clean it. There are four methods of cleaning: clean by hand, foam cleaning, COP (clean out of place), and CIP (clean in place). 1) Hand cleaning is good old fashion bucket and brush or scrubbing pad using "elbow grease" as the mechanical action. 2) Foam cleaning is use of foaming products that soften, dissolve, and lift soils from the surface. The chemistry of the product is the mechanical action and it is minimal. 3) COP is cleaning of disassembled equipment in a tank that recirculates a cleaning solution through a pump or pumps and spray nozzles or jets in the tank. These tanks usually have a heat source where temperature



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can be controlled. The mechanical action is the recirculated cleaning solution going through the nozzles and jets. 4) CIP is cleaning of equipment in place by connecting jumper or loops to lines, tanks, etc. to make a circulation loop with a system that supplies wash solution with the proper time, temperature, chemical concentration, and mechanical action. Again, the mechanical action is the recirculated cleaning solution going through the nozzles and jets. Good mechanical action can compensate for the insufficiencies of the other functions but, in most cases the CIP equipment is a permanent installation sized for maximum efficiency, not excessive efficiency.

So, to conclude, let's look at the typical expectation of a procedure for cleaning dairy equipment.

1. Pre-rinse: spray, flush, or recirculate 100F to 110F fresh water or reclaimed water from a CIP or COP system until surface is rinsed clean or water going to drain is clear.
2. Alkaline Wash:
  - a. Hand wash: wash equipment in wash sink with water, cleaning product at proper chemical concentration, and 120F minimum temperature.
  - b. Foam wash: surfaces, tables, equipment, etc. allow foam to stay on as long as possible. DO NOT ALLOW TO DRY resulting in a much more difficult soil to remove. "Wet foam" sheets off and dries faster than a dry "shaving cream" foam.
  - c. COP: wash equipment in tank with water, cleaning product at proper chemical concentration, and a temperature of 150F for 10-20 minutes. This is ideal as these temps exceed pasteurization requirements adding another layer of safety to the process.
  - d. CIP:
    - d.i. Cold product surfaces: wash tank, line, etc. with water, cleaning product at proper chemical concentration, and 120F - 145F temperature for 10-15 minutes.
    - d.ii. Hot product surfaces: wash tank, line, etc. with water, cleaning product at proper chemical concentration, and 145F - 185F temperature for 15 to 20 minutes. Time many need to be extended depending on the complexity of the system being washed.
3. Post alkaline wash rinse: spray, flush, or recirculate 100F to 110F fresh water until surface is rinsed clean or water going to drain is neutral pH (7.0).
4. Acid Wash: wash tank, line, etc. with water, cleaning product at proper chemical concentration, and 120F - 145F temperature for 10-15 minutes.
5. Post acid wash rinse: spray, flush, or recirculate cold fresh water until surface is rinsed clean or water going to drain is neutral pH (7.0).
6. Sanitize: spray, flush, or recirculate cold fresh water with sanitizer until surface is covered with solution.



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