# MILK and FOOD SANITATION

## Cleaning HTST Pasteurizers

W. H. HASKELL

*Klenzade Products, Inc., Beloit, Wis.*



THE necessity for adequate cleaning of all pasteurization equipment has its beginning on the milk producing farm. The cleaning necessity for plant equipment is emphasized in HTST pasteurization because of the changes in the character of the "soil" due to the higher temperature employed, and the fact that certain microorganisms either survive or definitely increase in number at the higher temperature employed. Inasmuch as many of the heat-loving and heat-resisting bacteria gain access to the milk supply because of inadequate preparation of dairy farm utensils—milking machines being a major consideration—it is not unreasonable to assume that dairy farm sanitation is important.

### FACTORS INVOLVED

In any cleaning procedure the following factors should be considered:

1. The character and composition of the material to be effaced; 2. The composition of the water used for cleaning; and, 3. The composition of the cleaning compounds employed.

It is advisable to discuss these factors briefly in the order named.

#### *Composition of Material to Be Effaced*

Milk is a complex substance containing, essentially, fat, proteins, and varying amounts of mineral substances. The constituents of milk react specifically to variations in temperature. This specific reaction to temperature must be considered because high temperatures applied to milk invariably provide a "burn-on" of milk solids, principally calcium caseinate, with entrapped milk fat. This type of "soil" is different in character from the soil encountered on producing farms or in milk plants employing low temperature pasteurization.

#### *Composition of Water Used for Cleaning*

Water, as we find it, varies widely in its chemical composition. The "sealing" properties of water are increased as the water hardness increases. Lake water, under correct use conditions, varies greatly in chemical composition from water derived from underground sources. Applying heat to water tends to produce precipitates; in fact, water hardness may be removed by boiling through the formation of calcium carbonate, an insoluble substance.

From this brief discussion, it is obvious that water itself may vary the methods of cleaning treatment applied to specific milk equipment.

#### *The Composition of Cleaning Compounds Employed*

The Chemical composition of cleaning compounds used in removing "soil" from HTST equipment is deserving of major consideration. It is not unusual to encounter cleaning compounds so constituted that they create additional cleaning problems. Obviously, the use of such compounds should be approached with reluctance.

### CLEANING COMPOUNDS

It is well established that no one type of cleaning compound, either alkaline or acid, will permit a satisfactory cleaning job over a period of time. Proteins and mineral deposits

are the most difficult to remove. Milk solids at high temperature are not soluble in water. These two facts alone clearly indicate the necessity for the application of the principles of chemistry for efficient cleaning.

Alkaline cleaners will remove fats, proteins, and heavy character "soil".

Acid cleaners will remove mineral deposits that precipitate and bind protein to the equipment.

In average dairy farm cleaning procedures an alternate cleaning method is recommended, involving the use of a balanced alkaline cleaning compound for three days, followed by a balanced acid cleaning compound for one day. This alternate cleaning procedure is altered in the cleaning of HTST pasteurizers, due to the characteristics of the soil encountered. The alternate cleaning method recommended for HTST pasteurizers includes the recirculation of a balanced acid cleaner, thorough flushing, followed by the recirculation of a balanced alkaline cleaner, and again thorough flushing.

To be more specific, the acid and alkaline compounds are used in the same cleaning operation, one immediately following the flushing of the other. The acid compound acts more as a solvent for mineral matter than as an actual cleaner, although definite cleaning properties are possessed by the acid product. It should also be emphasized that thorough flushing with hot water should follow both acid and alkaline recirculation.

Inasmuch as it is not chemically possible to mix acids and alkalies in the same solution and maintain a definite desired balance, either acid or alkaline, the need for employing alkaline and acid balanced cleaning solutions in separate operations is obvious.

## pH VALUE

The pH value is of extreme importance in the balancing and control of various cleaning compounds designed for specific type of work. The neutral point of 7 provides an excellent point at or near which it is possible to balance cleaning compounds for the lighter type cleaning work. In the case of HTST pasteurizers with the problem of "cooked-on" deposits to consider, it is essential that cleaning materials used for balanced cleaning compounds provide a pH approaching 12.4 on the alkaline side and a pH of 4.5 on the acid side. These pH values obviously are those recommended for use dilutions.

The consideration of the pH value as a determining factor in the construction of balanced cleaning compounds clearly indicates the possibility of blending cleaning solutions designed for specific cleaning jobs of any character, under reasonably accurate laboratory control.

It should not be forgotten that consideration of other factors in cleaning is of prime importance. Correct water softening, emulsification, wetting ability, lack of corrosiveness, free rinsing, etc., are all part of the problem.

## RECIRCULATION CLEANING

The cleaning of HTST pasteurizers is frequently a time consuming task. In an effort to shorten the time and labor factors involved in this daily chore, there has been a definite trend toward the use of a chemical recirculation method of cleaning in place of the hand scrub method. Chemical recirculation cleaning does offer some advantages over hand cleaning. In the chemical recirculation method, the plate gaskets are in place and not subject to "bumping" and displacement. The chemical recirculation method also offers the application of increased pressures during recirculation. Increased pressures are desirable because of better penetration of the cleaning solution. Penetration of properly balanced cleaning solutions into the rubber gaskets is desirable because it decreases the possibility of milk fat remaining in the rubber cells. Fat left

in rubber definitely shortens the period of usability of the gaskets and tends to create leaks due to hardened rubber. If cleaning is properly done, there should be no tendency of gaskets to become unseated.

Increased pressures used during the recirculation of cleaning compounds has definite value in providing increased flushing action for cleaning.

It should also be remembered that present-day chemically balanced cleaning compounds provide much greater cleaning efficiency than was formerly the case.

It is not considered good practice for those engaged in providing chemical cleaning compounds to become too intimately involved in the engineering features inherent in HTST pasteurizers. Following the same line of reasoning, there appears to be no valid reason for those engaged in engineering to become too involved in the chemical demands of cleaning. Obviously, there are many reasons why both participants should consider the problems of the other and cooperate for the benefit of the equipment user.

A few major factors should be considered in the recirculation method of cleaning. They may be stated as follows:

1. The cleaning compound used should be designed specifically for the cleaning problem.
2. The cleaning solution should be recirculated at a greater pressure than the usual operating pressure.
3. There should be a plentiful, uninterrupted supply of *hot* water.
4. Recirculation, both for cleaning and flushing, should be of sufficient duration to secure desired results.
5. Recirculation of cleaning compounds should be at a temperature at least 10° F. above pasteurization temperature.
6. Flow diversion valve should be removed from unit before recirculation is begun and valve dismantled and hand cleaned.
7. Pasteurizer should never be permitted to run dry during recirculation, either cleaning or flushing.
8. After completion of recirculation cleaning, pasteurizer should be flushed with cold water, dismantled, and *inspected*.
9. The plates of the HTST unit should be cool to the hand before dismantling begins.

It is imperative to remember that thorough cleaning, is essential, no matter what method is employed.

## Professional Status of Sanitarians

President Tiedeman has appointed a committee to study ways and means for improving the professional status of milk and food sanitarians. The committee is as follows:

Harold B. Robinson, *Chairman*, U. S. Public Health Service, New York, N. Y.
Charles E. Carl, State Board of Health, Jefferson City, Mo.
John J. Donovan, Health Department, Brookline, Mass.
J. A. King, City and County Health Dept., Denver, Colo.
H. Clifford Mitchell, State Health Dept., Richmond, Va.
John Taylor, State Board of Health, Indianapolis, Ind.