Practical Exercise 15

Cleaning and sanitation of equipment

Objective

To learn about cleaning and sanitation of equipment

Principle

Milk and milk products have a tendency to form deposit on the equipment contact surfaces which is known as soil. Cleaning is the complete removal of such deposits or soil using suitable detergent chemicals under recommended conditions.

Cleaning methods

It is important that personnel involved have proper understanding of the nature of the different types of soil, conditions and chemistry of its removal. Cleaning methods can be classified as:

- Clean-in-place (CIP): Also known as mechanical cleaning requires no disassembly or partial disassembly of the equipments.
- Clean-out-of-Place (COP): Equipments are partially fully disassembled and cleaned in specialized COP pressure tanks.
- Manual Cleaning: Equipments are completely disassembled for cleaning and inspection.

Cleaning compounds

The properties desirable for cleaning compound used in a dairy processing plant are:

- Economical to use
- Water softening characteristics
- Quick and complete solubility
- Good wetting or penetrating action
- Noncorrosive
- Germicidal action.
- Low toxicity
- Easily rinsed

The cleaning compounds may be categorized into:

Alkalis - Soften water, emulsify, saponify fats

Acids - Soften water, mineral deposit control

Chelating - Are organic compounds, soften water by sequestering, prevent mineral deposits, peptize proteins

Surfactant - Also known as wetting agents as it improves wetting properties, emulsify and disperse fats

Complex Phosphates - soften water by sequestering, disperse and suspend soils, emulsify fats and oils, peptize proteins

CIP CLEANING CYCLES

The following cleaning stages used in succession are possible and are used in practise depending on the nature of the soiling matter:

- W — C — W
- W — C — W — A — W
- W — A — W — C — W
- W — A — W — C — W — A — W

W = Water rinse, water pre-rinse if W is at the beginning
C = Caustic rinse
A = Acid rinse

Table 15.1. CIP cycle for tank cleaning

Cycle	Temperature °C	Duration (min)
Water rinse	40-60	5
Caustic soda (2.5%) rinse	65-75	10
Intermediate water rinse	65-75	5
Nitric acid (1%) rinse	65-75	10
Final water rinse	65-75	5-10
Steam sterilization	130-150	20

Note: The protocol for CIP varies for different models and milk plants

Table 15.2. CIP cycle for HTST pasteurizer

Cycle	Temperature °C	Duration (min)
Cold water rinse	-	-
Warm water rinse	< 38	-
Nitric acid (0.5%) rinse	60-65	30
Hot water rinse	60-65	10-15
Alkali (0.25-0.5%) rinse*	60-75	30
Cold water rinse	-	-
Hot water sterilization	80-90	15

*Soda, ash, tri sodium phosphate or sodium silicate

Note: The protocol for CIP varies for different models and milk plants

Sanitization

Sanitization refers to the reduction of microorganisms to safe levels considering public health. Sanitation procedures have set process, duration and chemical conditions. The official definition (Association of Official Analytical Chemists) of sanitizing for food product contact surfaces is a process which reduces the contamination level by 99.999% (5 logs) in 30 sec. The official definition for non-product contact surfaces requires a contamination

reduction of 99.9% (3 logs or more) in 5 min. The standard test organisms used are *Staphylococcus aureus* and *Escherichia coli*. General types of sanitization include the following:

- Thermal Sanitization: Hot water or steam for a specified temperature and contact time.
- Chemical Sanitization: Use of an approved chemical sanitizer at a specified concentration, and contact time

REVIEW QUESTIONS

1. What are methods used for equipment cleaning?
2. What are differences between CIP and COP?
3. List the properties desirable for cleaning compound used in a dairy processing plant.
4. What do you understand by sanitation.

Practical Exercise 16

Design and layout of a dairy plant

Objective

To understand design and layout of a dairy plant

General design consideration for milk processing plant

1. The milk route should be as short as possible. This will minimise the cost of pipe length, pumping requirement and save time in cleaning.

2. Reception and dispatch Platforms must be arranged in relation to plant in such a way that congestion of transport vehicles is avoided.

3. A small dairy handling milk upto 20,000 liters/day may have reception and despatch at one dock as there will not be much rush of vehicles. In large dairies, this separation is essential. Generally milk reception and despatch of washed cans is on one side (because whased cans are reloaded on the same vehicle and returned to milk producers) and dirty bottle reception is on the other side.

4. Where space is available, single storey building is most suited. The plan may have a rectangular shape with road on all sides.

5. The floor level of milk reception and dispatch docks and of all rooms concerned with milk cans and bottles should be at the same height above the ground level suited to vehicles. However, the weigh tank and raw milk pump should be at a lower level in order to have a convenient tipping height. A well or pit must be constructed for the weigh tank and raw milk pump.