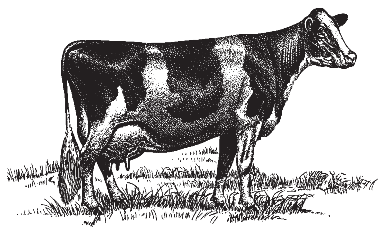

B.C. DAIRY TALK

Mastering Milk Quality Basics of Dairy Sanitation

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Introduction

In today's competitive environment, quality milk bonuses are becoming increasingly more lucrative. Subsequently, cooperatives are employing tougher standards for determining milk quality. More and more cooperatives are using bacteria tests such as the Preliminary Incubation Count (PI count) to reveal more about the quality of the milk they are purchasing from dairy farmers. Because milk cooperative standards have toughened as premium bonuses have increased, dairy farmers are forced to be more conscious of the milking equipment cleaning procedures they follow if they wish to obtain their bonuses.

Understanding the requirements of the Clean In Place (CIP) procedure and the importance of implementing all four equipment cleaning cycles increases the dairy farmer's confidence in maintaining low bacteria counts. It also provides the self-assurance needed to troubleshoot elevated counts and consistently produce quality milk. The steps involved in mastering milk quality are the same as they have always been, only now it is becoming much more difficult to take a short cut on the way to milk quality.

Requirements of C.I.P. Cleaning

The three basics steps of any cleaning process are to lift the soil from the surface, to break the soil down into smaller parts and to disperse the soil. In the manual cleaning process, the brush is used to lift the soil, "elbow grease" is used to break it down and sudsing detergent is used to disperse the soil load. However, these elements are not present in the CIP process and the mechanics of the system must be relied on to properly clean the pipeline. CIP cleaning has certain mechanical requirements that are essential for successfully and effectively removing milk soil. Those requirements are time, temperature, volume, detergent/chemical balance, velocity and drainage.

Time

The length of time that each cycle circulates in the CIP process dictates how effectively the chemicals perform. Inadequate contact time on equipment surfaces can result in milk soil build-ups.

During the **wash cycle**, the detergent solution should circulate for **ten minutes**. If the wash cycle greatly exceeds ten minutes, water temperature may drop to a level that may cause the soil to redeposit. If the wash cycle falls short of the required ten minutes, the chemical may not have enough contact time on the equipment surface to properly clean.

The recommended circulation for the **acid rinse** is **five minutes**. Again, this time frame should be maintained to provide the chemical enough contact time on the surface to effectively lower the pH of the equipment, neutralizing the potential negative effects of chlorine and alkaline residues, and prevent water spotting. It also is recommended that the **sanitize cycle** run for at least **five minutes** to provide the chemical enough contact time to kill bacteria.

Temperature

The temperature of the water used in each cycle also will dictate how effectively the chemicals work. During the wash cycle, temperature is especially important because chlorinated-alkaline detergents do not work as well in low water temperatures. If water temperature is not maintained, build-ups can occur.

The water temperature during the pre-wash rinse should fall between 95° F (35° C) and 110° F (43° C). This temperature will help remove the bulk of the soil load and warm the equipment surface for the wash cycle maximizing the efficiency of cleaning during the detergent cycle.

During the wash cycle, the water temperature ideally should begin at approximately 160° F (70° C) and end at no less than 120° F (50° C). Proteins can be baked onto equipment surfaces at temperatures exceeding 170° F (77° C) and butterfat will begin to solidify below 93° F (34° C). Excessive heat may also dissipate the chlorine in liquid CIP detergents, potentially minimizing protein removal.

The water temperature for the acid rinse should fall between 95° F (35° C) and 110° F (43° C). Temperatures should not exceed 140° F (60° C) because extremely hot temperatures can cause the acid rinse solution to evaporate quickly resulting in mineral deposits.

The sanitize cycle can use warm or cold water depending on the product used. Consult the label for proper use directions.

Volume

The amount of water used during each cycle influences how well the system cleans and dictates how much chemical is used. During all cycles, the wash vat should never be empty before return water re-enters the vat and the system should never be allowed to suck air. A table of equipment capacities should be made available by the equipment manufacturer from which the proper amount of water can be calculated. Insufficient amounts of water will only allow for minimal wash solution contact with the equipment surfaces, potentially leading to fat, mineral or protein build-ups.

Detergent/chemical balance refers to using the proper dilution rate for the appropriate chemical during the appropriate cycle. During each cycle, label directions should be followed to attain the proper concentration of chemical. Hard water situations require the use of more chemical than soft water due to the negative effects hardness minerals have on the cleaning action of the detergents.

During the wash cycle, the detergent dilution rate should be strong enough to deliver a minimum pH of between 10 and 11.5 to emulsify fats. The same dilution rate also should provide between 50 and 80 ppm of chlorine for peptizing proteins.

During the acid rinse cycle, the pH of the diluted solution should be between 3 and 4 at the beginning of the cycle and no greater than 6.0 at the end.

If a liquid chlorine product is used during the sanitize cycle, the solution should be diluted to provide at least 100 ppm of active chlorine.

The term detergent balance, also refers to using a detergent that is properly formulated to provide the correct balance of alkalinity to properly saponify and emulsify milk fats, chlorine to peptize milk proteins and sequestration agents to “tie up” milk and water minerals that may interfere with the detergents cleaning ability or cause mineral build-ups that could lead to milkstone formulation.

Some chemical manufacturer representatives and dairy consultants have test kits capable of measuring key characteristics of cleaners and sanitizers to determine if products possess the ability to remove milk soils.

Velocity

Because the physical scrubbing action and elbow grease in the manual process are missing in CIP cleaning, it is essential for adequate velocity to be generated within the system. Velocity substitutes for both the brush and elbow grease in the CIP process, scrubbing the equipment surface as well as lifting and carrying the soil load out of the pipeline.

Velocity is generated by using air injectors to admit air into the system at timed intervals. The air admission forms slugs of water that scrub the surface and remove the soil. Air injectors may also minimize and/or reduce the amount of water required to wash the system. The reduction in water required will result in less chemical needed to clean.

Drainage

To prevent milk soil from redepositing, the pipeline needs to be adequately sloped and secondary drains are required. Secondary drains and adequate line slope ensure proper and rapid drainage allowing the system to be completely flushed before the soil can redeposit. Also, the use of diverter valves guarantees the rinse water is not recirculated through the system during the pre-wash rinse.

CIP CLEANING CYCLES

Maintaining the requirements of CIP cleaning is essential for effectively removing the soil load from the milking system. However, using all four CIP cleaning cycles while maintaining these requirements will assure that only quality milk is produced.

Pre-Wash Rinse

A clear, clean potable, tepid 95° F (35° C) to 110° F (43° C) water rinse should be flushed through the system to remove the bulk of the soil load. A pre-wash rinse will also serve to warm the equipment surface for better cleaning action during the wash cycle. Proper water temperature will aid in effectively cleaning and sanitizing the system. Keep in mind, proteins can be baked onto equipment surfaces at temperatures exceeding 120° F (50° C) and fats will begin to solidify at 93° F (34° C) during this cycle.

Wash Cycle

A hot, 160° F (70° C) solution of chlorinated-alkaline cleaner should be circulated for ten minutes. Chlorine will aid in soil removal by peptizing proteins while the high alkalinity (pH of 10 or higher) emulsifies fats. Water temperatures should be maintained above the optimum 120° F (50° C) to prevent redeposition of milk soils.

Acid Rinse

An acid rinse should be applied using water with a temperature of 95° F (35° C) to 110° F (43° C). Daily acid rinses will neutralize chlorine and alkaline residues prolonging the life of rubber goods; prevent mineral deposits, water spotting and filming which helps prevent milkstones; and reduce the pH of the equipment which inhibits bacterial growth. The reduced pH from the acid rinse will allow chlorine sanitizers to perform more effectively.

Sanitize Cycle

The Pasteurized Milk Ordinance (PMO) states that a sanitize cycle must be circulated through the system prior to milking to lower bacterial levels on equipment. This cycle should be completed thirty minutes before milking. Water temperature for the sanitize cycle will vary depending on the product used. If a liquid chlorine product is used to sanitize the system, a minimum of 100 ppm of active chlorine is recommended. It is also recommended that only EPA registered products be used to sanitize milking equipment.

Conclusion

As mentioned, the steps for mastering milk quality have not changed, but their importance has grown tremendously in recent years. Producing milk with low bacteria counts is the result of employing proven techniques and keeping a close eye on the mechanical requirements of the cleaning system. Following the proper cleaning cycles and making sure the requirements are met during each cycle will reward the dairy farmer with quality milk that passes the strictest standards. As a result, the cooperative will reward the quality milk producer with a big bonus check and the producer will have the feeling that he has done his best to provide the consumer with a high quality product.

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