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Technical Bulletin

ABI CIP Hydrogen Peroxide Protocol

Here's a practical, step-by-step CIP outline using hydrogen peroxide as the sanitizing step in dairy lines. You'd still adapt exact concentrations, times, and temperatures to your equipment supplier's specs.

Step 1: Prepare and isolate the system

1. Stop milk flow and drain lines
   Action: Stop production, drain all milk from lines, receivers, and tanks.
   Why: Reduces organic load so the CIP chemicals and peroxide can work effectively.

2. Isolate the circuit for CIP
   Action: Set valves to route the CIP solution through the desired milk line loop only.
   Why: Ensures full flow and turbulence where you actually need cleaning.

Step 2: Pre-rinse with water

3. Cool or lukewarm water pre-rinse
   Action: Circulate potable water at about 25–35 °C through the line until the return runs clear (typically 5–10 minutes).
   Why: Flushes out residual milk and reduces soil load before detergents.

4. Drain the rinse water completely
   Action: Stop circulation and drain the system.
   Why: Avoids diluting the next (alkaline) step.

Step 3: Alkaline wash (detergent cycle)

5. Circulate alkaline detergent
   Action: Use an approved dairy alkaline cleaner at the manufacturer's recommended concentration (commonly 0.5–2.0% w/v) at 70–80 °C for 10–20 minutes.
   Why: Removes fats and proteins that hydrogen peroxide alone won't handle efficiently.

6. Maintain flow and temperature
   Action: Ensure turbulent flow (target 1.5–2.0 m/s line velocity) and stable temperature throughout the circuit.
   Why: Mechanical action plus heat greatly improves soil removal.

7. Drain the alkaline solution
   Action: Return solution to the CIP tank if reused, or send to waste per your protocol.
   Why: Prepares the system for rinsing and acid step.

Step 4: Intermediate water rinse

8. Rinse with clean water
   Action: Circulate potable water at 25–40 °C until pH at the return is close to neutral and detergent residues are minimal.
   Why: Prevents unwanted reactions between alkaline residues and the acid or peroxide.

9. Drain the system
   Action: Fully drain rinse water.
   Why: Avoids dilution of the acid and sanitizing steps.

Step 5: Acid rinse (mineral removal)

10. Circulate acid cleaner
    Action: Use an approved dairy acid (e.g., nitric or phosphoric-based) at the recommended concentration (often 0.3–1.0% w/v) at 50–70 °C for 5–15 minutes.
    Why: Removes stone, scale, and mineral deposits that can shelter bacteria and biofilms.

11. Drain the acid solution
    Action: Return to CIP tank or send to waste as per your system design.
    Why: Clears the way for the hydrogen peroxide sanitizing step.

Step 6: Rinse before hydrogen peroxide

12. Short water rinse
    Action: Rinse with potable water until conductivity and pH indicate most acid is removed (usually 3–5 minutes).
    Why: Prevents excessive neutralization or decomposition of hydrogen peroxide.

13. Drain thoroughly
    Action: Drain lines and low points as completely as possible.
    Why: Ensures the peroxide solution reaches its intended working concentration.

Step 7: Hydrogen peroxide sanitizing step

14. Prepare hydrogen peroxide solution
    Action: Dilute 35% food-grade H_2O_2 with clean water to a working strength of about 0.1–0.5% (1–5 g/L), or as specified by your chemical supplier and equipment manufacturer.
    Example: For 100 L of a 0.5% solution, add about 1.4 L of 35% H_2O_2 and top up with water.
    Why: Provides an effective oxidizing disinfectant without excessive corrosion risk.

15. Circulate peroxide solution
    Action: Circulate the hydrogen peroxide solution through the dairy line at ambient to 40 °C for 10–20 minutes, ensuring all internal surfaces are wetted.
    Why: Oxidizes residual organics, disrupts biofilms, and reduces microbial load.

16. Optional: Static contact time
    Action: If your protocol allows, stop the pump and let the solution sit in the line for an additional **5–10 minutes**.
    Why: Extends contact time in hard-to-reach areas.

17. Drain peroxide solution
    Action: Drain completely to waste or recovery, following local regulations and supplier guidance.
    Why: Prepares for final rinsing and prevents over-exposure of seals and gaskets.

Step 8: Final rinse and line preparation

18. Final potable water rinse
    Action: Rinse with potable water until peroxide residuals are below your target (often <1–3 ppm, or as required by your QA program). Use peroxide test strips to confirm.
    Why: Ensures no significant hydrogen peroxide remains that could contact milk.
19. Optional: Final hot water or steam step
    Action: Some systems use a final hot water (e.g., 80–90 °C) or steam sterilization step, depending on plant standards.
    Why: Adds an extra thermal kill step where required.
20. Drain and close the system
    Action: Drain lines, close CIP valves, and return valves to production configuration.
    Why: Prepares the system for the next milking or processing run.

Step 9: Verification and records

21. Check critical parameters
    Action**:** Verify that time, temperature, flow, and chemical concentrations met your CIP set points (from charts or CIP logs).
    Why: Confirms the cycle was effective and repeatable.
22. Micro and residue checks (as required)
    Action**:** Periodically perform ATP swabs, microbial counts, and peroxide residue tests at key points in the line.
    Why: Validates that the CIP program with hydrogen peroxide is delivering the hygiene level you need.
23. Document the CIP cycle
    Action: Record date, time, circuit, chemicals, concentrations, and any deviations.
    Why: Supports traceability, troubleshooting, and regulatory compliance.

Safety notes specific to hydrogen peroxide

PPE: Always use gloves, goggles/face shield, and protective clothing when handling **35% H_2O_2**.
Storage: Keep in original, vented containers, cool and out of direct sunlight.
Compatibility: Confirm compatibility with stainless steel grades and elastomers in your system.

Never add to milk: Hydrogen peroxide is for equipment and water treatment only, not for direct addition to milk or finished product.