Chlorine-free cleaning of milking equipment

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Chlorine-free cleaning- What is required

- **Removal of chlorine as a cleaning agent is compensated by changes to existing wash protocols**

- **A number of individual changes or combinations of changes are required:**

  - **Higher caustic concentrations in product/wash solution**
  - **Increased hot water usage**
  - **Increased use of acid based products**
  - **Addition of cleaning agents to caustic products e.g. surfactants**
  - **Peracetic acid**

Chlorine-free cleaning

Higher product caustic concentrations

- Caustic concentrations in liquid products ideally 21-29%
- To calculate the correct amount of detergent to use, need to know level of water used for main wash cycle
- Usage levels also depend if using hot (0.7%) or cold (1%) water _ products with higher concentrations, could use less
- Liquid based caustic solution not to be recycled
- Powder based caustic solution can be recycled due to higher caustic content (up to 76%)

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Hot water usage

- **Adequate hot water is vital-9 litres/unit**
- **7 hot washes per week**
  - **Minimum with liquid based products**
  - **Less hot washes required when using powder**
  - **One cleaning protocol involves 14 hot washes**
- **Water temperature- check in the wash trough**
  - **Start cycle -75/80^{o}C**
  - **Mid cycle - 55/65^{o}C**
  - **End cycle -45/55^{o}C**
- **Achieving correct detergent wash cycle temperature**
  - **Warm post milking rinse-20/30^{o}C**
  - **Option to send to dump first 10/20 l of hot water**
  - **Circulation times for detergent cycle too long-8 to 10 min sufficient**
  - **Some new systems can maintain temperature during the complete cycle**

Chlorine-free cleaning

Use of acid based products

- 3 to 12 acid washes per week required depending on the protocol chosen
- Descale acid products generally contain phosphoric acid and can contain some nitric acid
- New 'ONE for ALL' acid based products – descale/clean/disinfect
- **Peracetic acid:**
  - Only direct alternative to chlorine as a sterilizing agent
  - Very important if water quality is an issue
  - Used in an additional rinse
  - Very effective against Thermoduric bacteria
  - Less descale washes required if used twice daily
  - Low usage rates
  - Not required with all cleaning protocols

5 chlorine-free milking machine cleaning protocols recommended

- *Option chosen may depend if manual or automatic cleaning*
- *Protocols with higher acid washes –more suited to automatic systems*

OPTION 1: Chlorine free cleaning based on powder detergent (sodium hydroxide) and peracetic acid in an additional rinse

After each AM milking

1. Wash outside of clusters and jetters. Attach jetters to clusters
2. Remove or replace the milk filter sock
3. Rinse plant with 14 litres (3 gals) of warm or cold water per unit
4. Add an approved *powder detergent **(sodium hydroxide)** at the recommended use rate **in cold water or hot water at 70-80°C (minimum 3 hot washes per week)**, allowing about 9 litres (2 gals) of solution per unit
   - Circulate the wash solution for 8-10 min, having allowed the first 5 litres to run to waste. Can retain for the PM wash occasion.
5. Rinse the plant with a minimum of 14 litres (3 gals) of water per unit immediately after the wash cycle or prior to the next milking
6. Add peracetic acid at recommended rates in an additional cold water rinse

After each PM milking

1. Wash outside of clusters and jetters. Attach jetters to clusters
2. Remove or replace the milk filter sock
3. Rinse plant with 14 litres (3 gals) of warm or cold water per unit
4. Re-use the detergent wash solution retained from AM milking.
   - Circulate the solution for 8-10 min
5. Rinse the plant with a minimum of 14 litres (3 gals) of water per unit
6. Add peracetic acid at recommended rates to an additional cold water rinse

Replace the *powder detergent with an **acid** product on at least one occasion per week and more regularly if peracetic acid is not used twice daily

OPTION 2: Chlorine-free cleaning based on liquid detergent (AM) and an Acid (PM) (Sodium hydroxide/phosphoric acid)

After each AM milking

1. Wash jetters and outside of clusters and remove or replace the milk filter
2. Rinse the plant with 14litres (3 gals) of warm or cold water per unit
3. Add an approved **liquid detergent** (sodium hydroxide) at the recommended rate in hot water (70-80°C), allowing about 9 litres (2 gals) of solution per unit
   - *Circulate the wash solution for 8-10min,having allowed the first 5 litres to run to waste*
4. Rinse the plant with a minimum of 14 litres (3 gals) of water per unit immediately after the wash cycle

After each PM milking

1. Wash jetters and outside of clusters and remove or replace the milk filter
2. Rinse the plant with 14litres (3 gals) of warm or cold water per unit
3. Add an approved **Acid cleaning product (phosphoric acid/ all in one products)** at the recommended rate in cold or hot water (70-80°C), allowing about 9 litres (2 gals) of solution per unit
   - *Circulate the wash solution for 8-10 min,having allowed the first 5 litres to run to waste*
4. Rinse the plant with a minimum of 14 litres (3 gals) of water per unit immediately after the wash cycle

OPTION 3: Chlorine free cleaning based on liquid detergent (sodium hydroxide) and an acid (phosphoric/nitric)

After each AM milking

1. Wash outside of clusters and jetters. Attach jetters to clusters
2. Remove or replace the milk filter sock
3. Rinse plant with 14 litres (3 gals) of warm or cold water per unit
4. Add an approved liquid detergent (sodium hydroxide) **on 4 occasions per week** and an acid product on **3 separate occasions per week** (Monday, Wednesday, Friday) at the recommended use rate **in hot water** at 70-80°C, allowing about 9 litres (2 gals) of solution per unit
   - Circulate the solution for 8-10 min, having allowed the first 5 litres to run to waste
5. Rinse the plant with a minimum of 14 litres (3 gals) of water per unit immediately after the wash cycle

After each PM milking

1. Wash outside of clusters and jetters. Attach jetters to clusters
2. Remove or replace the milk filter sock
3. Rinse plant with 14 litres (3 gals) of warm or cold water per unit
4. Add an approved liquid detergent (sodium hydroxide) at the recommended use rate **in cold water**, allowing about 9 litres (2 gals) of solution per unit
   - Circulate the solution for 8-10 min having allowed the first 5 litres to run to waste
5. Rinse the plant with a minimum of 14 litres (3 gals) of water per unit immediately after the wash cycle

Include peracetic acid in an additional cold water rinse **twice daily.**

OPTION 4: Chlorine free cleaning based on liquid detergent (sodium hydroxide) used with hot water twice daily

After each AM milking

1. Wash outside of clusters and jetters. Attach jetters to clusters
2. Remove or replace the milk filter sock
3. Rinse plant with 14 litres (3 gals) of warm or cold water per unit
4. Add an approved *liquid detergent (sodium hydroxide) at the recommended use rate **in hot water** at 70-80°C, allowing about 9 litres (2 gals) of solution per unit
   - Circulate the wash solution for 8-10 min, having allowed the first 5 litres to run to waste
5. Rinse the plant with a minimum of 14 litres (3 gals) of water per unit immediately after the wash cycle

After each PM milking

1. Wash outside of clusters and jetters. Attach jetters to clusters
2. Remove or replace the milk filter sock
3. Rinse plant with 14 litres (3 gals) of warm or cold water per unit
4. Add an approved liquid detergent at the recommended use rate **in hot water** at 70-80°C, allowing about 9 litres (2 gals) of solution per unit
   - Circulate the wash solution for 8-10 min, having allowed the first 5 litres to run to waste
5. Rinse the plant with a minimum of 14 litres (3 gals) of water per unit immediately after the wash cycle

*Replace the liquid detergent with an **acid** product on at least two occasions per week

OPTION 5: Chlorine free cleaning based on new 'one for all' acid cleaning products

After each AM milking

1. Wash outside of clusters and jetters. Attach jetters to clusters
2. Remove or replace the milk filter sock
3. Rinse plant with 14 litres (3 gals) of warm or cold water per unit
4. Add an approved **acid 'one for all' product** at the recommended use rate **in hot water** at 70-80°C, allowing about 9 litres (2 gals) of solution per unit (recommended **to replace the acid product with a detergent product** (sodium hydroxide) **on two occasions per week (Monday, Friday))**
   - Circulate the wash solution for 8-10 min, having allowed the first 5 litres to run to waste
5. Rinse the plant with a minimum of 14 litres (3 gals) of water per unit immediately after the wash cycle

After each PM milking

1. Wash outside of clusters and jetters. Attach jetters to clusters
2. Remove or replace the milk filter sock
3. Rinse plant with 14 litres (3 gals) with warm or cold water/unit
4. Add an approved **acid 'one for all' product** at the recommended use rate **in hot or cold water** allowing about 9 litres (2 gals) of solution per unit.
   - Circulate the wash solution for 8-10 min, having allowed the first 5 litres to run to waste
5. Rinse the plant with a minimum of 14 litres (3 gals) of water per unit immediately after the wash cycle

Chlorine-free cleaning of bulk milk tanks:

70/80%!! OF THE RESIDUE PROBLEM

- **Bulk tanks generally easier to clean than machines as tank surfaces are stainless steel & hot water usually available**

- **Critical to re-calibrate detergent pumps to check usage**
  - **New CF products can have a higher caustic content than previous detergent sterilizer products e. g. 2%↑29%**

- **Detergent intake tubes more likely to get blocked due to higher caustic product**
- **Same detergent storage rules apply-products contain minimal level of chlorate**
  - **Important to store products out of direct sunlight and on pallets to avoid frost damage**

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Chlorine-free bulk milk tank cleaning

Option chosen may depend if wash system is manual (M), semi-automatic (SA) or fully automatic (A)

Option1:

- Sodium hydroxide (caustic) (21/29%) used on alternate collection days with an acid descale product or caustic used after two collection days with a descale product used at the third collection day (A, SA, M)

Option 2:

- Sodium hydroxide (caustic) (21/29%) used after each milk collection, followed by a peracetic acid in an additional rinse (A)

Option 3:

- An acid based 'one for all' product used after each collection or used after 3 collection days with a caustic product used at the 4^{th} collection (A, SA, M)

- Hot water ($60/75^{0}C$) used with all wash protocols

10 CF farms short listed in 2020 for NDC/Kerrygold milk quality awards

Farm No	CF cleaning Product	Hot wash p/week	Water temp.	Acid wash p/week	Bulk Tank product
1	Autosan Blue	3	80	2	same
2	Multisan CF	7	80	2	same
3	Avalksan Gold	2	70	.5	Osan
4	Arkshield CF	7	70	1	same
5	Multisan CF	7	85	1	same
6	Arkaline CF	5	75	2	Osan
7	Farm Cold Cleaner	7	85	3	Osan
8	BFS Extreme CF	14	75	1	same
9	Turbosan CF	1	80	1	same
10	Circodine CF	7	70	2	same

10 different CF products used and all resulting in excellent milk quality

Thank you

- Information on chlorates, CF wash protocols and CF cleaning products on the Teagasc milk quality webpage

- https://www.teagasc.ie/animals/dairy/milk-quality/