COSHH Risk Assessment overview for Dairy Cleaners

Cleaning process in dairies is usually by CIP systems - Circulatory cleaning-in-place systems adapted to the various parts of a processing plant have been developed to achieve good cleaning and sanitation results.

Cleaning is aiming to achieve: -

- Physical cleanliness – removal of all visible dirt from the surface
- Chemical cleanliness – removal not only of all visible dirt but also of microscopic residues that can be detected by taste or smell but are not visible to the naked eye
- Bacteriological cleanliness – attained by disinfection
- Sterile cleanliness – destruction of all microorganisms

The cleaning cycle in a dairy comprises the following stages:

- Recovery of product residues by scraping, drainage and expulsion with water or compressed air
- Pre-rinsing with water to remove loose dirt
- Cleaning with detergent
- Rinsing with clean water
- Disinfection by heating or with chemical agents (optional); if this step is included, the cycle ends with a final rinse, if the water quality is good.

Acid cleaners: The theory

Hard water scale sticks to glass and stainless steel surfaces, where it can harbour milk and bacteria, and prevent alkaline cleaners and disinfectants from cleaning effectively.

Traditionally alkaline cleaners were used in the circulation cleaning of milking machines. An occasional acidic wash containing milkstone remover was used to prevent a build-up of hard water deposits and other minerals. Modern research coupled with the development of milking machines into larger, more complex installations means that we now recommend the use of an acid detergent in one wash each day.

Acid cleaners consist of three basic ingredients:

- Acidity to dissolve milkstone, chalkstone, pyruvates and iron oxide;
- A disinfection component to kill bacteria;
- Surfactants to de-attach fats and proteins from surfaces.

Acidity

Acidity is generally provided by phosphoric acid, nitric acid or sulphuric acid. They dissolve hard water deposits and milkstone leaving plant surfaces clean and shiny with no crevices or corners that enable the build-up of milk solids and harbour bacteria.

Surfactants

Surfactants de-attach milk fats and proteins from the surfaces of the milking machine, helping in the cleaning process and enabling effective disinfection

Risks:- Acid based cleaners are typically solutions of very strong acids that are highly corrosive and can cause severe burns to skin, eyes and throat etc. if ingested and irritate the respiratory tract if inhaled. The use of PPE that is resistant to strong acids is required.

Typical Acid based cleaners include: -

Trade Name	Active Ingredients
• CIRO Power FM -	Phosphoric Acid and Nitric Acid
• FABDEC Mega Acid	Phosphoric & Sulphuric Acid
• Topstock Milkstone Remover	Phosphoric & Nitric Acid
• Superscalox Milkstone Remover	Phosphoric & Nitric Acid
• Deosan Acidophy	Phosphoric & Nitric Acid
• Deosan Coldbrite	Phosphoric Acid & Toluenesulphonic Acid
• Deosan Acidbrite & Circabrite	Phosphoric Acid
• FAM 30	Phosphoric Acid & Iodine
• Acidsan	Nitric acid

Alkaline cleaners: The theory

Alkaline cleaners are effective sanitisers and are used to remove milk fat and protein. Milk contains fats, proteins, sugars and minerals. These tend to stick to the surfaces of the milking and cooling equipment, and effective dairy chemicals are needed to ensure they are removed during the cleaning process.

Whilst sugars are soluble in water, fatty acids and minerals are not, and proteins are only partially so. A well-formulated alkaline dairy chemical will contain ingredients that ensure that these substances are effectively removed from the plant surfaces.

Alkaline cleaners consist of three basic ingredients:

- Alkalinity – emulsifies fat;
- Chlorine – breaks down protein;
- Sequestration agents: tie up and remove dissolved solids.

Alkalinity

Alkalinity is generally included in alkaline dairy cleaners either as potassium hydroxide or as sodium hydroxide. They act by breaking up the fats and combining with the resulting fat particles to form soap in a process called saponification. Alkalinity also helps in the removal of proteins by breaking up the long molecular chains of proteins into smaller pieces.
However, the total alkalinity of a detergent is comprised of active and inactive alkalinity, and the percentage that is active (and hence effective) varies between products. The pH is also important: an effective alkaline detergent will deliver a pH of 10.5 – 11.5 and an active alkalinity of at least 200ppm in the wash solution.

Chlorine

Chlorine breaks down proteins into peptides that are more easily removed in the cleaning process. It also destroys bacteria so is an effective sanitiser. To break down proteins the wash solution needs to contain at least 200ppm chlorine, whilst effective sanitation requires only 100ppm.

However chlorine will also react with substances that are used in components of the milking machine, particularly rubber and, to a lesser extent, silicone. Products containing excessive amounts of chlorine will therefore cause premature deterioration of service parts of the milking machine.

Sequestration agents

Sequestration agents tie up dissolved solids and carry them away in the wash solution. Higher levels of sequestration agents improve the effect of active alkalinity, thereby aiding the break-up of fats and proteins.
The amount of sequestration agents needed to be effective will vary according to the quality of the water used for plant cleaning and hence the level of dissolved solids (hardness, iron, etc.).

Risks: - Alkaline cleaners typically are solutions of sodium hydroxide or potassium or sodium hypochlorite. They are very corrosive and cause severe burns to skin, eyes, respiratory tract, mouth and oesophagus etc. Eye damage can be permanent. PPE in the form of protective face visor/goggles, butyl rubber gauntlets, rubber boots and chemical resistant clothing overalls are required as well as good general ventilation.

Typical Alkaline based cleaners include: -

Trade Name	Active Ingredients
• Vanodine Dairy Hypochlorite	Sodium Hypochlorite & Sodium Chlorate
• Divosan TC86 VS8	Sodium hydroxide, sodium hypochlorite, sodium chlorate
• Red Label Hypochlorite	Sodium Hypochlorite
• Kilcosan	Sodium Hypochlorite, potassium and sodium hydroxide
• Autosan Blue	Sodium Hydroxide & potassium hydroxide
• Deosan 60	Sodium Hydroxide & Sodium Carbonate

Application methods can include automatic dosing or by hand diluted in a watering can.

Periacetic Acid

Periacetic acid is a powerful disinfectant and is often used at the end of the cycle to kill bacteria, fungi, viruses and spores.

PAA is an equilibrium mixture of acetic acid and hydrogen peroxide. It is a powerful oxidising agent with an oxidation capacity higher than sodium hypochlorite and chlorine dioxide, and is comparable to the oxidative capacity of ozone. It is usually produced in concentrations of 5 to 15 % and when dissolved in water forms acetic acid and hydrogen peroxide.
PAA at 75 mg/L is reported to successfully kill 100% of a 10(7) cell/ml yeast or bacterial population in 30- seconds. It also kills viruses and spores

Risks: - Periacetic acid disinfectants are usually a mixture of Periacetic acid and Hydrogen peroxide. They are highly corrosive and again can cause severe burns to skin, eye, respiratory tract and mouth, throat and oesophagus if ingested. It can cause permanent damage to eyes and perforation of the oesophagus. PPE in the form of protective face visor/goggles, butyl rubber gauntlets, rubber boots and chemical resistant clothing overalls are required as well as good general ventilation.

Typical Periacetic acid type cleaners include: -

Trade Name	Active Ingredients
• Circoflush PE5	Periacetic Acid & Hydrogen Peroxide
• Iosan Farm disinfectant	Periacetic Acid & Hydrogen Peroxide
• HPPA - Kilco	Hydrogen Peroxide, Acetic Acid and Periacetic Acid
• Oxi – Acid - Agroserve	Hydrogen Peroxide, Acetic Acid and Periacetic Acid

Pre milking & Post- milking teat dip care products.

Used prior to and after milking to disinfect and kill any mastitis related organisms. Often contain iodine as the effective disinfectant or lactic acid, which has a neutral PH.
Risks: - These chemicals are usually lower hazard, as they are not corrosive. Normal precautions to avoid splashing in eyes should be taken and any spillages on skin should be washed off with water.

Typical Teat dip disinfectants include: -

Trade Name	Active Ingredients
• Iosan Teat dip	Iodine & Glycerol
• Corstan Defender	Lactic Acid
• Valient Barrier -Ecolab	Lactic Acid & Sulphonic Acid
• Ioderm Plus	Iodine
• Salvoderm B	Lactic Acid

Footbaths

Footbaths are used to prevent interdigital dermatitis in cattle, foot rot and other foot conditions and lameness prevention. Usually use a solution of approximately 35% formaldehyde solution.

Risks: -Formaldehyde is a known carcinogen and should be used with caution and sparingly. Follow the Safety data sheet. It needs correct storage, ventilation and careful handling. It's less effective at low temperatures
An alternative is a copper sulfate solution but can be harmful to the environment.

An example is: -
Formalin 40 e.g. contains 5% active ingredient of formaldehyde and methanol. This solution is categorised as corrosive and a known skin sensitizer and is a suspected carcinogen. It can also form flammable vapour mixtures. PPE in the form of protective face visor/goggles, butyl rubber gauntlets, rubber boots and chemical resistant clothing overalls are required as well as good general ventilation. Respiratory protective equipment may also be required.

NB - More PPE required here!

References

Agroserve website
Lenntech website

More background information see :-

http://www.hse.gov.uk/food/disinfectants.htm