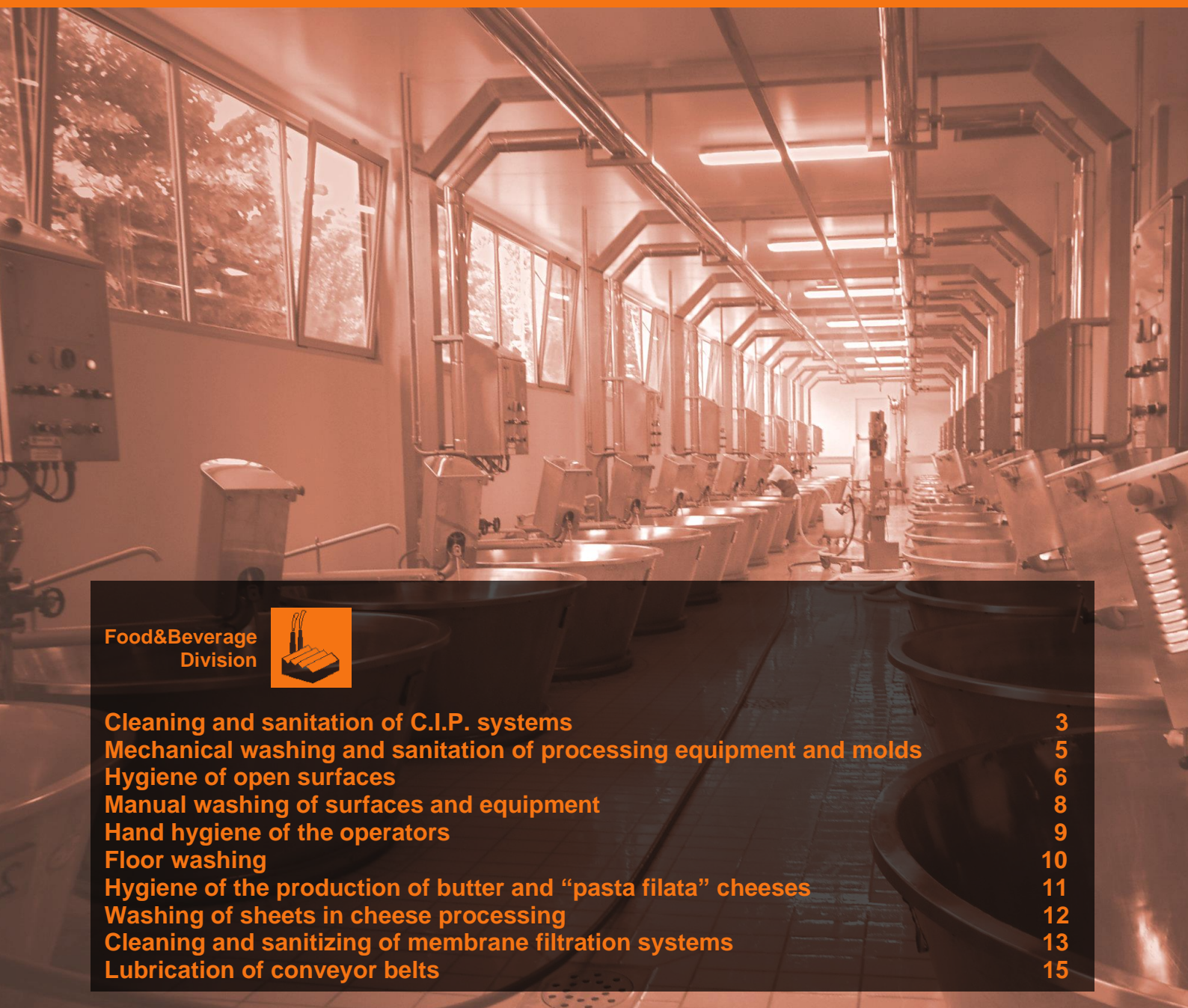




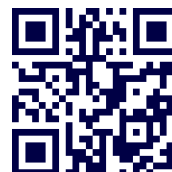
Washing and Sanitation Applications in the Dairy Sector



Food&Beverage
 Division



Cleaning and sanitation of C.I.P. systems	3
Mechanical washing and sanitation of processing equipment and molds	5
Hygiene of open surfaces	6
Manual washing of surfaces and equipment	8
Hand hygiene of the operators	9
Floor washing	10
Hygiene of the production of butter and “pasta filata” cheeses	11
Washing of sheets in cheese processing	12
Cleaning and sanitizing of membrane filtration systems	13
Lubrication of conveyor belts	15



Among the various sectors of the food industry, dairy is certainly among those that most need accurate and effective cleaning procedures to guarantee the healthiness of the products made; this is because most of the dairy specialties are made up of fresh foods that are very susceptible to microbiological alterations, and because the manufacturing processes, particularly in artisan dairies, are characterized by a high degree of product handling that can greatly affect the standards of cleaning and sanitation of the process and, consequently, on the hygienic safety of products intended for final consumers.

In the dairy sector the shelf-life of the product therefore certainly depends on the quality of the raw materials and the process technologies, but the control of potential contamination and adequate sanitation processes are certainly the fundamental technological aspects to guarantee the hygienic safety of food; in fact, an incorrect or ineffective washing procedure can seriously compromise the healthiness of the productions made.

It is for these reasons that the mandatory legislation on food safety, which has as its main purpose the protection of consumer health, has been the subject of significant revisions which have as basic principles the risk analysis to manage the control of chemical, physical and biological hazards of food and the attribution of responsibilities of the various operators in the sector, from primary production to trade, in the application of hygiene rules and traceability of product.

European legislation requires all food companies to operate in compliance with the following Regulations:

- **EC Reg. No. 178/2002**, which establishes the general requirements of food law and establishes the procedures in the field of food safety;
- **EC Reg. No. 852/2004** on the hygiene of all food products;
- **EC Reg. No. 853/2004** which establishes specific hygiene rules for food of animal origin;
- **EC Reg. No. 2073/2005 and EC Reg. No. 1441/2007** which define the microbiological criteria applicable to food products.

In particular, for the Italian dairy sector, the complete application of the current revision of the guidelines of the State-Regions Agreement of 13 January 2005 is required, which defines the "criteria for preparing self-control plans and the identification and management of dangers in companies producing food of animal origin" and is an integral part of **EC Reg. No. 853/2004**. Particular emphasis, in this context, is given to the cleaning and sanitation procedures considered essential to ensure the hygiene of the productions.

These procedures almost always consist of different applications, some of which can be automated (C.I.P. washing, tunnel washing, membrane filtration system washing) and other manual and not very standardizable applications, whose efficiency and effectiveness greatly depends on the training received by operators.

The typical contaminations of the sector are mainly made up of fats, carbohydrates, proteins, mineral salts and microorganisms, but the dirt present on the surfaces can have a different composition depending on whether or not they are thermised, so that each type of dirt requires a different operational approach and therefore a specific hygiene plan; this in particular due to the different processes within the same plant and between production realities of highly heterogeneous dimensions and automation levels.

For the above considerations, AQUOS has created this brochure to provide operators and distributors of cleaning products and technologies with a guide for the most suitable choice of their detergents and/or sanitizers formulated **for the following cleaning and sanitizing applications in the dairy sector:**

- ***Cleaning and sanitation of C.I.P. systems***
- ***Mechanical washing and sanitation of processing equipment and molds***
- ***Hygiene of open surfaces***
- ***Manual washing of surfaces and equipment***
- ***Hand hygiene of the operators***
- ***Floor washing***
- ***Hygiene of the production of butter and "pasta filata" cheeses***
- ***Washing of sheets in cheese processing***
- ***Cleaning and sanitizing of membrane filtration systems***
- ***Lubrication of conveyor belts***



Cleaning and sanitation of C.I.P. systems

In the dairy sector, the main application of detergency and sanitation is characterized by the washing of "CIP systems", which consist of a set of pipes, heat exchangers, pumps, storage tanks, pasteurizers and any other system connected in sequence, which come into contact with the raw material during the process of transforming it into the finished product. The term C.I.P. is the acronym for "Cleaning In Place", since with these systems it is possible to guarantee the cleaning of all the components without the need to disassemble them or transport them elsewhere, thus allowing cleaning operations to be carried out more effectively and efficiently.





In fact, the C.I.P. system allows to carry out, with a high degree of automation (by programming the conditions of temperature, pressure, concentration, recirculation times of the detergent/sanitizing and rinsing solutions), the cleaning and sanitizing operations of the parts of the system that are in direct contact with the product, freeing them from organic (fats and proteins) and inorganic (mineral encrustations) residues which, if not eliminated, could favor the development of unwanted microorganisms capable of causing alterations in the organoleptic characteristics of food and, in more serious cases, jeopardize the health and safety of consumers.

The washing and sanitation of the C.I.P. systems generally consists of the following operational steps which are performed in sequence:

- **pre-washing of the system with drinking water;**
- **alkaline washing phase with recirculating alkaline solutions for the removal of fats and organic substances;**
- **intermediate rinsing phase to remove the alkaline solution together with the removed contaminations;**
- **acid phase with recirculating acid solutions for the removal of the milk stone (calcium phosphate encrustations that form during the heat treatment of milk pasteurization);**
- **intermediate rinsing phase to remove the acid solution together with the dissolved mineral salts;**
- **system sanitation by recirculating suitable sanitizing solutions or by physical agents (heat/steam);**
- **eventual final rinsing phase to remove residues of sanitizing solution.**




This series of operational steps, characteristic of the traditional cleaning and sanitizing process, as you can easily imagine, is rather complex and requires onerous times (in particular for medium-small industrial realities); therefore, the AQUOS research and development sector has created some specialty products, intended for the dairy sector, which allow some of the aforementioned operational steps to be carried out in a single phase (single-phase washing) with a reduction of intermediate rinsing, in order to obtain a significant reduction in the time required for cleaning and in water and energy consumption, with a consequent reduction in costs and increased productivity.

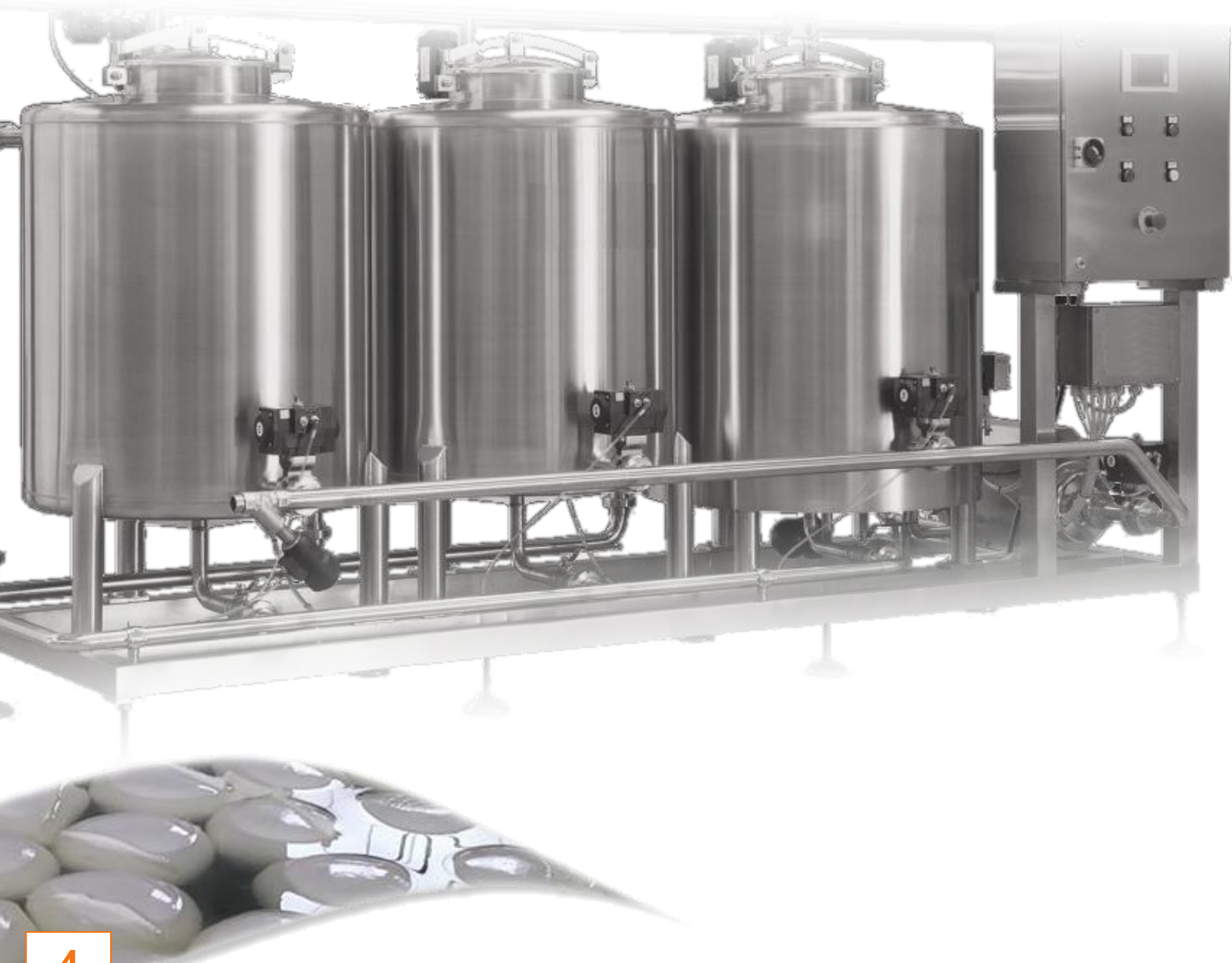
The following table shows the AQUOS detergents and/or sanitizers suitable for single-phase washing of C.I.P. systems for the sanitation of surfaces and equipment such as tanks, pipes, recirculation pumps, pasteurizers, filling machines, etc.:

Product	Features	Sequence of operations
Aquaflow SF 	Concentrated alkaline detergent, with high sequestering and anti-foaming action, for single-phase washing. <i>It is applied in processes where a specific anti-foaming action is required.</i>	- Initial rinse - Recirculating washing with a 2 ÷ 4% solution of Aquaflow SF - Final rinse - Periodic acid washing
Aqualon SP 	Additive for alkaline washing solutions in single-phase washing with sequestering, surfactant and anti-foaming action. <i>In alkaline solutions it forms solutions equivalent to those of Aquaflow SF.</i>	- Initial rinse - Recirculating washing with Aqualon SP in an alkaline solution (2 ÷ 10% of the quantity of soda or potash used in the preparation of washing solutions) - Final rinse - Periodic acid washing
Aquaflow IG 	Concentrated alkaline detergent, with degreasing, sequestering and sanitizing action, for single-phase washing. <i>In addition to the action of Aquaflow SF, the product also performs a specific sanitizing action that avoids the further passage with sanitizing solutions.</i>	- Initial rinse - Recirculating washing with a 2 ÷ 4% solution of Aquaflow IG - Final rinse - Periodic acid washing
Aquaflow PWD 9112 	Strongly alkaline powder detergent for all C.I.P. washings in the dairy sector. <i>Particularly suitable for washing of self-cleaning skimmers.</i>	- Initial rinse - Recirculating washing with a 2 ÷ 4% solution of Aquaflow PWD 9112 - Final rinse - Periodic acid washing

To avoid potential recontamination of the systems during the downtime between one production and the next or during weekends, it is possible to fill the systems with suitable sanitizing solutions. For this type of application AQUOS offers some products with a high sanitizing action based on non-residual sanitizing active ingredients such as peracetic acid, peracetic acid or chlorine dioxide solutions. These products sanitize thanks to their oxidizing action against microorganisms and, unlike traditional biocides such as chlorine-active agents, they are not corrosive to the surfaces of the plants with which they come into contact and are easily removed with a simple rinse with drinking water.

The following table shows the AQUOS sanitizers suitable for the above application:

Product	Features	Method of use and concentration of use
Spectrum PA5 	Solution based on 5% stabilized peracetic acid. Suitable as a terminal sanitizer in all C.I.P. systems automated.	<ul style="list-style-type: none"> - For recirculation or potting with solutions at 0.2 ÷ 0.5% (handle safely). - Final rinse with drinking water.
Spectrum PC 	Percitric acid based solution. More easily manipulated than Spectrum PA 5 as it is a reduced exhalation product.	<ul style="list-style-type: none"> - For recirculation or potting with solutions at 0,6 ÷ 1,5% (handle safely). - Final rinse with drinking water.
Bioxyl 1000 	Stabilized solution of chlorine dioxide at 1000 ppm. Lipophilic in nature, it removes the biofilm and prevents its formation.	<ul style="list-style-type: none"> - For recirculation with solutions at 1 ÷ 2% (handle safely). - Final rinse with drinking water.



Mechanical washing and sanitation of processing equipment and molds

In the dairy sector, the production process of milk derivatives, such as cheeses, requires the use of different equipment that can serve to give the product its typical shape (molds, shapes, etc.) or serve for seasoning or for harvesting and moving the product in the various stages of processing such as tables and processing trolleys. All these equipment, as well as all other types of surfaces that come into contact with the dairy product, are susceptible to potential microbial contamination that can alter the organoleptic qualities and the hygienic safety of the product, therefore they must be cleaned and sanitized with specific solutions and technologies suitable to meet the high hygienic standards typical of the sector.







Obviously, the techniques applied depend on the needs of the single production plant and consequently on the size and extent of the productions for which, in companies of a certain size, the need to reduce the time and manpower necessary to carry out the procedures washing and sanitizing of molds and equipment has increasingly pushed the management of companies to implement washing automation technologies through the use of equipment such as "tunnel washing machines".

In these equipments it is possible to apply a multi-stage washing procedure (with an alkaline product and one acid) or use a single-phase solution (acidic or alkaline) a recovery in order to allow, as for the C.I.P. systems, a significant reduction of water consumption, as the molds and the dirty equipment is introduced from the entrance to the washing tunnel and, through the appropriate belt, run through the various "sections washing" where the following steps take place:

- **initial rinse;**
- **washing with hot detergent solution;**
- **intermediate rinse;**
- **sanitation;**
- **final rinse.**



For this type of application, the choice of the type of detergent and the concentration of use depend on the processed product (type and tenacity of the dirt), on the hardness characteristics of the water and above all on the type of material from which the equipment is made; therefore, **the following table shows the AQUOS detergents to be chosen according to the above parameters:**

Application	Type of material	Product to be used	Method of use and concentration of use
Washing of the boards	Steel, wood	To be evaluated based on the condition of the wood and the specific washing needs.	
Washing of processing trolleys	Steel, wood	Aqualon SF 	Single-phase washing with concentration 1 ÷ 1.5% and temperature of 55 ÷ 65 °C.
Washing of molds, shapes, etc.	Steel, polyethylene, polyethylene terephthalate, teflon	Aqualon SF 	Single-phase washing with concentration 1 ÷ 1.5% and temperature of 55 ÷ 65 °C. Periodically perform an acid wash.
		Alufos 	Single-phase washing with concentration 1 ÷ 1.5% and temperature of 55 ÷ 60 °C.
Self-washing of washing machine	Steel	Alufos 	Periodically wash the machine with a concentration 1 ÷ 1.5% and a temperature of 55 ÷ 60 °C as maintenance activity.
Sanitation	Steel, polyethylene, polyethylene terephthalate, teflon	Spectrum PA5 	Washing with concentration 0.18 ÷ 0.5% and temperature of 15 ÷ 30 °C
		or Spectrum PC 	or washing with product solution at concentration 0.3 ÷ 1% and temperature of 15 ÷ 30 °C.

To automatically dose the detergents, a control unit can be used that proportionally mixes the product with the water or a conductivity probe that activates the replenishment pump as a function of concentration (proportional to the conductivity) of the solution.

The open surfaces are made up of all the visible areas of the dairy plant and all parts of the production plants that can be easily reached with simple disassembly operations; such as the walls, floors, external surfaces of tanks and production equipment, equipment, worktops, cheesmaking machines, belts, moulders, trolleys, etc.

For all these surfaces that still require careful cleaning and sanitation, for which recirculating washing is not applicable, there are so-called low pressure systems that allow washing and/or sanitation to be carried out by distributing foaming products.

The "foam applications" have the advantage of allowing the product to reach even the hidden points of the plant and, above all, of ensuring that the detergent and/or sanitizing solution remains clinging also to the vertical surfaces resulting in a longer contact time the active ingredients and the surfaces treated.

The washing and sanitizing procedure of the open surfaces must be started immediately after the end of the production cycle to avoid the drying of residues on the surfaces and involves the following operational phases:

- **mechanical removal of the coarser residues**
- **first rinse with hot water to eliminate the most soluble residues (low-melting fat residues)**
- **cleansing phase with the foaming product**
- **waiting for the necessary contact time between chemical product and surfaces (about 10 minutes)**
- **second rinse with water and drainage of residual solutions from the floors**
- **sanitation phase by nebulization**
- **rinsing, when necessary, with drinking water at room temperature**








The following table shows the alkaline and acid foaming detergent products, some also with a sanitizing action, that AQUOS offers to operators in the sector for washing and sanitizing open surfaces:

Product	Features	Concentration of use
Aquafoam HA 	Alkaline foaming detergent with high degreasing and emulsifying power. Do not use on aluminum and light alloys.	Use in a 3 ÷ 5% solution.
Hyposan 	Chloroactive alkaline foaming detergent. In a 1% solution it develops 375 ppm of active chlorine. Not suitable for aluminum and light alloys.	Use in a 3 ÷ 5% solution at temperatures below 40 °C.
Cloractive FC 	Chloroactive alkaline foaming detergent. In a 1% solution it develops 525 ppm of active chlorine. Not suitable for aluminum and light alloys.	Use in a 3 ÷ 5% solution at temperatures below 40 °C.
Aquafoam Acid 	Foaming acid cleaner. To be used periodically as a descaler for the removal of calcareous and inorganic deposits in general.	Use in a 3 ÷ 5% solution.
Ultrafoam Acid 	Acid foaming detergent with high descaling capacity. Suitable for removing limescale deposits due to the direction of the water and other mineral deposits.	Use in a 3 ÷ 5% solution.
Foam K Chlor 	Chloroactive foaming detergent, with low alkalinity. Suitable for aluminum and light alloy surfaces.	Use in a 3 ÷ 5% solution at temperatures below 40 °C.
Aquafoam Ampho 	Foaming alkaline detergent with sanitizing action based on amphoteric biocides. Not suitable for aluminum and light alloys.	Use in a 3 ÷ 5% solution at a temperature of 45 ÷ 60 °C.
Aquafoam Plus 	High alkalinity foaming detergent suitable for the removal of carbonized fats. Specific for smoking rooms or ovens.	Use in a 3 ÷ 5% solution.

Hygiene of open surfaces

When washing is carried out with alkaline or acid foaming products that do not contain active ingredients with a sanitizing action, the phase of sanitizing the open surfaces can generally be carried out using sanitizing solutions applied by spraying or by immersion depending on whether the surfaces are fixed or made up of removable parts.

The following table shows the AQUOS products for sanitizing applications of open surfaces:

Product to use	Description	Method of use and concentration of use
Spectrum PA5 	Solution based on stabilized peracetic acid	By immersion at 3% solution
Spectrum PC 	Percitric acid based solution	For immersion at 0.6 ÷ 1.5% solution Also suitable for nebulization
Triameen D10 	Solution based on amphoteric biocides	Use at 1 ÷ 2% Suitable for both spraying and immersion
Spectrum AT 	Solution based on alcohols and quaternary ammonium salts	Use as it is for nebulization
Aquaflow CLK 	Chloroactive alkaline product Not suitable for aluminum and light alloys	Use at 1.6% for a contact time of 30 ' Use at 4.2% for a contact time of 5 ' Suitable for both immersion and single-phase sanitizing washing
Spectrum Bio 	Solution based on amphoteric biocides	Use at 1.5% for a contact time of 20 ' Use at 10% for a contact time of 5 ' Suitable for both immersion and nebulization
Bioxyl 1000 	Solution based on chlorine dioxide	Use at 1 ÷ 2% for nebulization







Manual washing of surfaces and equipment

In some industrial realities of the dairy sector, in particular the medium-small ones, the lack of availability of plants for automatic washing of processing equipment entails the need to perform manual washing procedures; the same is true in the case of complex and / or delicate surfaces, which cannot be washed with pressure systems. In these cases, for the non-removable parts that cannot be reached with the lances, it is possible to wash by dispensing the detergent solution by means of nebulizers or sprayers and then mechanically act on the dirt through the manual use of sponges or brushes to which it is followed by a rinsing phase with drinking water. For all the removable parts, and in particular for small equipment, it is preferable instead to carry out the washing with a first phase of immersion of the objects to be washed in special tanks containing the detergent solution followed by a manual washing using sponges or brushes.

In both modes it is the synergy between the chemical action of the detergent, the manual mechanical action exerted by the operator with a sponge or brush and the temperature of the detergent solution that determines the effectiveness of the cleaning procedure in guaranteeing the correct hygiene of the surfaces and equipment intended for subsequent contact with food products during the manufacturing process; it is therefore recommended to respect the concentrations and methods of use shown on the labels and technical sheets of the detergents used.

For this type of application, AQUOS offers to operators in the dairy sector some liquid and powder detergents for degreasing, descaling and manual sanitation of surfaces and equipment:

Product to use	Description	Concentration of use
Tensiol 390 	Concentrated neutral foaming detergent for manual use	2 ÷ 5% by weight depending on the degree and type of contamination to be removed.
Tensiol P 	Concentrated foaming detergent in powder form for manual use	2 ÷ 5% by weight depending on the degree and type of contamination to be removed.
Foam K-Chlor 	Chloroactive foaming detergent for cleaning and sanitizing aluminum and light alloy surfaces	2 ÷ 4% by volume according to the degree and type of contamination to be removed.
Fosfonet 	Acid descaling detergent for the removal of limestone residues from surfaces and production equipment (foaming at room temperature)	3 ÷ 10% by weight in water at 40 ÷ 50 °C (little foaming at these temperatures). For stubborn calcareous dirt, use as it is, leave to act for 5 ÷ 10 minutes, then rinse.





Hand hygiene of the operators

In the food industry, and in particular in the dairy sector, attention to staff hygiene is essential to ensure the control of contamination within the production departments, especially in the processing of fresh products such as dairy products and creamy cheeses and in general in all artisan dairies where most of the processing is carried out with a high degree of manual skill by the master cheesemakers. In these contexts, particular care is required in the correct hygiene of the operators' hands in order to avoid cross-contamination that can irretrievably pollute the dairy product causing its rapid perishability and possible consequences in terms of health and safety of end users.

For these reasons it is also essential to properly train the operators on the procedures for cleaning and sanitizing hands using detergents with sanitizing action, formulated with active ingredients with a soothing action, able to effectively control product contamination and, at the same time, preserve the skin from irritation even after frequent washing.

The following table shows the detergents/sanitizers made by AQUOS for the hygiene of the hands of the operators:






Product to use	Description	Concentration of use
Dexodin 	Sanitizing detergent based on chlorhexidine, surfactants and dermoprotective components	As it is
Spectrogel 	Alcohol-based sanitizing gel and skin-protective components, can also be used in the absence of water	As it is



In the dairy sector, as well as in all sectors of the agro-food industry, flooring plays a fundamental role in the correct execution of the working processes due to the resistance they must offer to the static or dynamic loads that production activities determine on the company surfaces and because it is necessary to guarantee the safety of workers during daily operations; in fact, in the case of food companies, the floor is often wet due to the numerous spreading of the processing water and, in particular in the dairy industries, it can be extremely slippery due to contamination due to the grease that forms during the production of the butter or some cheeses.

The methods of washing the floors in a dairy plant essentially depend on the type of activity performed in the various company premises: generally, for the storage warehouses and for all the areas free from machinery used for production and packaging, it is preferred to carry out the cleaning using washer-dryers especially to speed up cleaning operations while, for production rooms (wet areas), low-pressure cleaning systems are widely used with the aid of lances or with high-pressure cleaners.

The following table shows the main AQUOS detergent and/or sanitizing products suitable for cleaning and sanitizing the floors of the various departments within a dairy plant:

Product to use	Description	Concentration of use
Queen 890 	Slightly alkaline detergent suitable for cleaning moderately dirty floors. Applicable using washer-dryers (does not generate foam).	0.5 ÷ 5.0% by weight depending on the degree of dirt to be removed
Magma K + Spectrum Oxy 100  	Strongly alkaline and solvent-based detergent suitable for cleaning dirty floors (production areas) Sanitizer based on hydrogen peroxide suitable as a booster for the sanitation and whitening of the treated surfaces	3.0 ÷ 5.0% by weight depending on the degree of dirt to be removed 0.2 ÷ 2.0% by weight
TK 11 + Spectrum Oxy 100  	Non-caustic, solvent-based alkaline detergent suitable for cleaning floors with rubber marks and mineral oil residues (storage areas/warehouses) Sanitizer based on hydrogen peroxide suitable as a booster for the sanitation and whitening of the treated surfaces	3.0 ÷ 5.0% by weight depending on the degree of dirt to be removed 0.2 ÷ 2.0% by weight



Hygiene of the production of butter and “pasta filata” cheeses

Hygiene in the production of butter

The butter making process consists of a set of operations that transform the cream (emulsion of fat in water) into butter, consisting instead of an emulsion of water into fat (phase inversion).

In a first phase, the cream undergoes a pasteurization process that takes place at temperatures higher than those typical of milk pasteurization, this is because the higher viscosity of the product hinders the process of homogenization of the temperature throughout the creamy mass and the high concentration of lipids acts as a thermal insulator protecting microorganisms from heat and also because cream has a higher microbial load than milk. After the pasteurization of the cream, the crystallization phase follows at low temperatures where the solidification of the fats takes place and, subsequently, the maturation phase by inoculating selected bacterial cultures that act as acidifying and flavoring. The maturation phase takes place in closed steel tanks where the mass is kept in motion at a constant temperature.

For the entire cream treatment and maturation line, the sanitation of the lines and plants is performed with the same type of washing foreseen for the C.I.P. systems therefore, for AQUOS detergent and/or sanitizing products applicable, please refer to the instructions given in the paragraph "Cleaning and sanitation of C.I.P. systems".



The maturation phase is followed by **the buttermaking process which can take place discontinuously inside machines called churns or with a continuous process using buttermakers.**

In both plants the milk cream is beaten quickly to obtain phase inversion (transformation into emulsion of water in fat) and this determines the phenomenon of adhesion of the butter formed on the internal walls with consequent difficulty in detaching the product.

To avoid adhesion of the product to the walls, churns and butter machines they are sanitized using specific products which, thanks to their active ingredients, in addition to degreasing and sanitizing, form a monomolecular film which adheres to the internal walls of the equipment, facilitating the detachment of the butter in subsequent production.

The following table shows the recommended detergents / sanitizers by AQUOS for the hygiene of churns and butter machines:



Product to use	Description	Applications and concentration of use
Butter CLL 	Chloroactive alkaline liquid sanitizing detergent. Based on silicates, sequestrants and chlorine, it acts as a degreaser and sanitizer and facilitates the detachment of the butter in subsequent processing.	Use at 2 ÷ 5% by weight for washing churns, butter machines, packaging machines and surfaces that generally come into contact with butter
Butter CLP 	Chloroactive alkaline powder sanitizing detergent. Based on silicates, sequestering agents and chlorine, it acts as a degreaser and sanitizer and facilitates the detachment of the butter in subsequent processing.	Use at 2 ÷ 5% by weight for washing churns, butter machines, packaging machines and floors

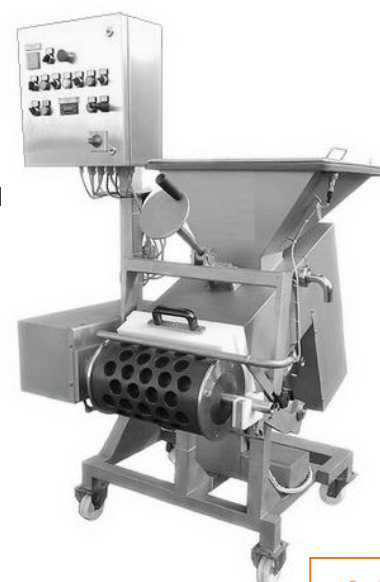
Hygiene in the production of “pasta filata” cheeses

The production process of the "pasta filata" cheeses" (mozzarella, fiordilatte, provola, scamorza, caciocavallo, etc.) is characterized by the use of some machinery, such as the moulder and the spinner, not present in other dairy productions.

The surface of these machines in direct contact with the curd is teflon-coated to avoid the adhesion of the latter and favor its expulsion and, if recently built, have constructional characteristics that allow their sanitation by washing processes C.I.P. recovery in order to reduce excessive consumption of water and detergent and/or sanitizing solution.

In the case of machines of the previous generation, since automatic washing is not possible, it is necessary to carry out low pressure foam washes or manual washing with the aid of sponges, brushes, pipe cleaners, etc. Finally, to preserve the teflon-coated surfaces, it is preferable to carry out the C.I.P. washing with low alkalinity detergents.

For the washing and sanitizing of these equipment, please refer to indications given in the paragraphs "Cleaning and sanitation of C.I.P. systems", "Hygiene of open surfaces" and "Manual washing of surfaces and equipment".







In the dairy sector, the production of some cheeses (parmesan, provolone, soft cheeses, etc.), in particular the artisanal ones, uses linen fabrics for the collection of the curd and to favor, during the composition and draining, the drainage of the whey before moving on to the subsequent stages of maturation.

This shows the need for effective washing and sanitizing of the sheets in order to ensure the hygiene and safety of dairy products that reach consumers' tables; in fact, since the sheets come into direct contact with a product with a high humidity rate, this environmental condition can favor contamination by microorganisms responsible for unwanted fermentation processes which, inevitably, can compromise the organoleptic qualities of the product and, in the case of pathogenic microorganisms, compromising the health and safety of consumers.

The cleaning and sanitation of the sheets can be carried out manually, by immersion or mechanically through the use of washing machines using specific products effective in removing organic dirt (residues of the dairy product itself) and inorganic dirt (calcareous dirt and other mineral encrustations normally defined "milky stone") and, at the same time, capable of preserving the fibers of the fabric from possible deterioration caused by the necessary frequent washing of the sheets.

The following table shows the AQUOS detergents recommended for washing the sheets:

Product to use	Description	Concentration of use
Aquaflow SF 	Single-phase alkaline cleaner. Particularly suitable for washing in a washing machine as it does not generate foam at washing temperatures.	20 ÷ 30 g/Kg depending on the degree of dirt to be removed
Proxyl Special 	Powder detergent particularly suitable for heavily soiled fabrics. Its silicate content gives the product anticorrosive and alkalizing activity.	15 ÷ 25 g/Kg depending on the degree of dirt to be removed
Tensiol 390 	Concentrated liquid neutral detergent for manual washing of sheets. Particularly effective on greasy and protein dirt, gentle on the fibers and safe for operators.	1 ÷ 3% by weight depending on the degree of dirt to be removed
Alufos 	Liquid detergent, based on phosphoric acid. Used in the soaking phase of the sheets to remove fat and mineral residues (milk stone).	0.5 ÷ 3% by weight depending on the degree of dirt to be removed



Cleaning and sanitizing of membrane filtration systems

In some production processes of the dairy industry it is necessary to use some membrane filtration technologies in order to obtain the concentration of the different components of milk and whey through their separation based on the different molecular weight characteristic of the filtered molecules. Depending on the components to be concentrated, four different membrane filtration processes can be used which differ in the different size of the pores present in the structure of the filtration membranes:

- **microfiltration (MF)** is used for the removal of bacteria, spores and fat particles from the milk stream and for the fractionation of skimmed milk;
- **ultrafiltration (UF)** separates the product, which can be skimmed milk for example, into two flows permeable to water, dissolved salts, lactose and acid in both directions, not allowing (and therefore concentrating) proteins and fats ;
- **nanofiltration (NF)** allows the separation of a range of minerals from a liquid, allowing only the fluid and some monovalent ions to pass through the membrane;
- **reverse osmosis (RO)**, finally, uses membranes with narrower pores allowing only the passage of water and therefore all the dissolved and suspended material is rejected, concentrating the total solids.

In other words, membrane cross-flow filtration systems allow, in the dairy sector, the differential or total recovery of all the noble components dissolved in whey and milk, leaving their properties unaltered and without causing any phenomenon of denaturation; it is thus possible, for example, to concentrate the whey in order to recover the whey proteins to increase the yield in the production of cheeses with the same quantity of raw milk or to filter the brine to keep it chemically and bacteriologically stable longer, reducing the periodic frequency of the its replacement.

Membrane filtration systems consist of a tank that contains the product to be filtered, delivery pumps that convey the product to be treated in the filtration modules containing the semipermeable membranes and finally two outgoing lines, respectively one for the permeate (filtered fluid) and one for the concentrate (the part containing the noble components to be recovered).

During the filtration process, on the surface of the filtering membranes in contact with the product to be treated, there is an accumulation of the components to be separated and therefore the progressive obstruction of the membrane pores; this involves a gradual reduction of permeability with a loss of plant efficiency and consequent lengthening of process times.

To restore the effectiveness of the process it is therefore necessary, periodically, to regenerate the membranes by means of washing procedures whose effectiveness is a function of the recovered permeability. The recovery percentage is calculated by comparing the measurement of the “liters of permeate/m² x hour” obtained at the end of the washing by carrying out a test with water with the theoretical value indicated by the membrane manufacturer.

Obviously, this percentage of recovery tends to decrease with the aging of the membranes and therefore the loss of efficiency increases proportionally with the increase in the operating hours of the membranes.

It is for these reasons that, in order to keep the system efficient for as long as possible, it is necessary to carefully evaluate the products to be used for washing and sanitizing the membranes based on the material they are made of, as well as to correctly carry out the procedures for washing in terms of temperature, pressure and pH conditions indicated by the manufacturer. In conclusion, the choice of detergents/sanitizers and washing procedures depends on the construction characteristics of the membranes, their life, the product to be filtered and the operating conditions suitable for the regeneration process.





The washing and sanitizing procedure of membrane filtration systems in the dairy sector is characterized by the following operational phases:

- **Rinsing phase**
- **Alkaline washing phase**
- **Intermediate rinse phase**
- **Acid washing phase**
- **Intermediate rinse phase**
- **Phase of sanitation and potting of the lines**

With regard to the aforementioned phases, it should be noted that in the treatment of whey the acid washing phase must be carried out before that of the alkaline washing while, in the case of products containing a high concentration of lipids, it may be necessary to carry out a new alkaline phase after the acid phase.

The AQUOS detergent/sanitizing products recommended for the regeneration of the filter membranes used in the typical production cycles of the dairy sector are shown in the table on the next page.

Cleaning and sanitizing of membrane filtration systems

Product to use	Washing phase	Characteristics
Aquasafe 700 K 	Alkaline phase	Caustic detergent particularly suitable for the removal of organic and mixed contamination typical of the dairy sector.
Aquasafe CLR 	Alkaline/sanitizing phase	Chlorinated alkaline detergent particularly effective in removing protein contamination in the dairy sector. The chlorine contained increases its detergent activity and that of removing protein residues.
Aquasafe AC2 	Acid phase	Descaling detergent based on phospho-nitric suitable for the removal of inorganic and protein residues.
Spectrum PA5 	Sanitizing phase	Sanitizing solution based on 5% stabilized peracetic acid.



Lubrication of conveyor belts

In the dairy sector, as well as in all agro-food sectors in general where liquid products are bottled, conveyor belts are widely used to move the containers before and after bottling along the productive line. Conveyor belts can be made of different materials (steel, plastic, etc.) and can handle containers or bottles made of many different materials such as glass, plastic, poly laminate cardboard, metal, etc.




In order for the handling of the product containers along the conveyor belts to be efficient, rapid and above all not to cause their accumulation in certain areas of the conveyor belt, the conveyors must be correctly lubricated with specific products made to optimize their coefficient of friction on the basis of the type of material they are made of and the type of containers to be handled.

Furthermore, in order to avoid the formation of calcareous deposits due to the hardness of the water used for the dilution of the lubricant along the conveyor belt and the formation of silt which can be a source of microbiological contamination and bad odor, these lubricating products must have a good sequestering power of the hardness as well as an effective sanitizing action.

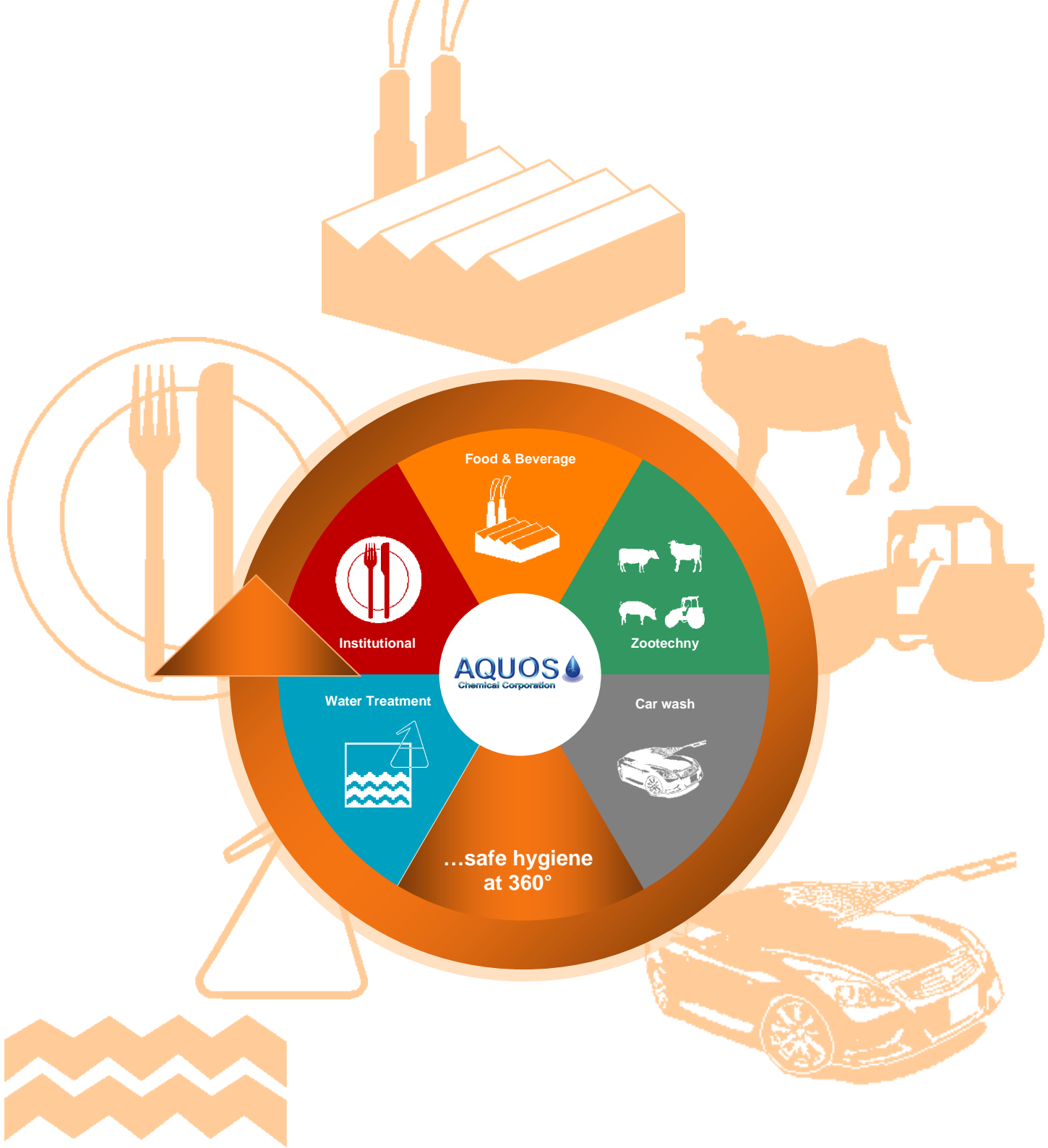
The types of lubricants suitable for the dairy sector are the following:

- **Soap-based lubricants**
- **Amine-based lubricants**
- **Silicone-based lubricants**

For the aforementioned types of lubricants for conveyor belts used in the dairy sector, AQUOS offers the specific products listed in the following table:

Application	Product to use	Description	Concentration of use
Spray lubrication for glass containers on steel conveyor belt	Luboquant CLS 	Cleaning lubricant based on soaps and surfactants. Suitable for soft and medium-hard waters.	1 ÷ 2% by weight depending on the application, the hardness of the water and the degree of contamination. Dosing by automatic dosing control unit.
Lubrication with amine-based products	Luboquant AM 50 	Amine-based lubricant. It has a sanitizing activity and is not affected in the least by the hardness of the dilution water.	0.2 ÷ 0.5% by weight depending on the application. Dosing by automatic dosing control unit.
Lubrication for plastic bottles and cardboard packaging	Luboquant S 	Silicone based lubricant. It has sanitizing activity, is completely free of foam, avoids the formation of black residues on the bottom of the containers and does not cause cracking phenomena.	0.2 ÷ 0.8% by weight by means of an automatic dosing control unit or once a day by means of a sponge soaked in the product as it is or by spraying it directly on the belt.





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