

Dairy Processing



kersia[®]
INVENTING A FOOD SAFE WORLD

Kilco[®]
HOLCHEM

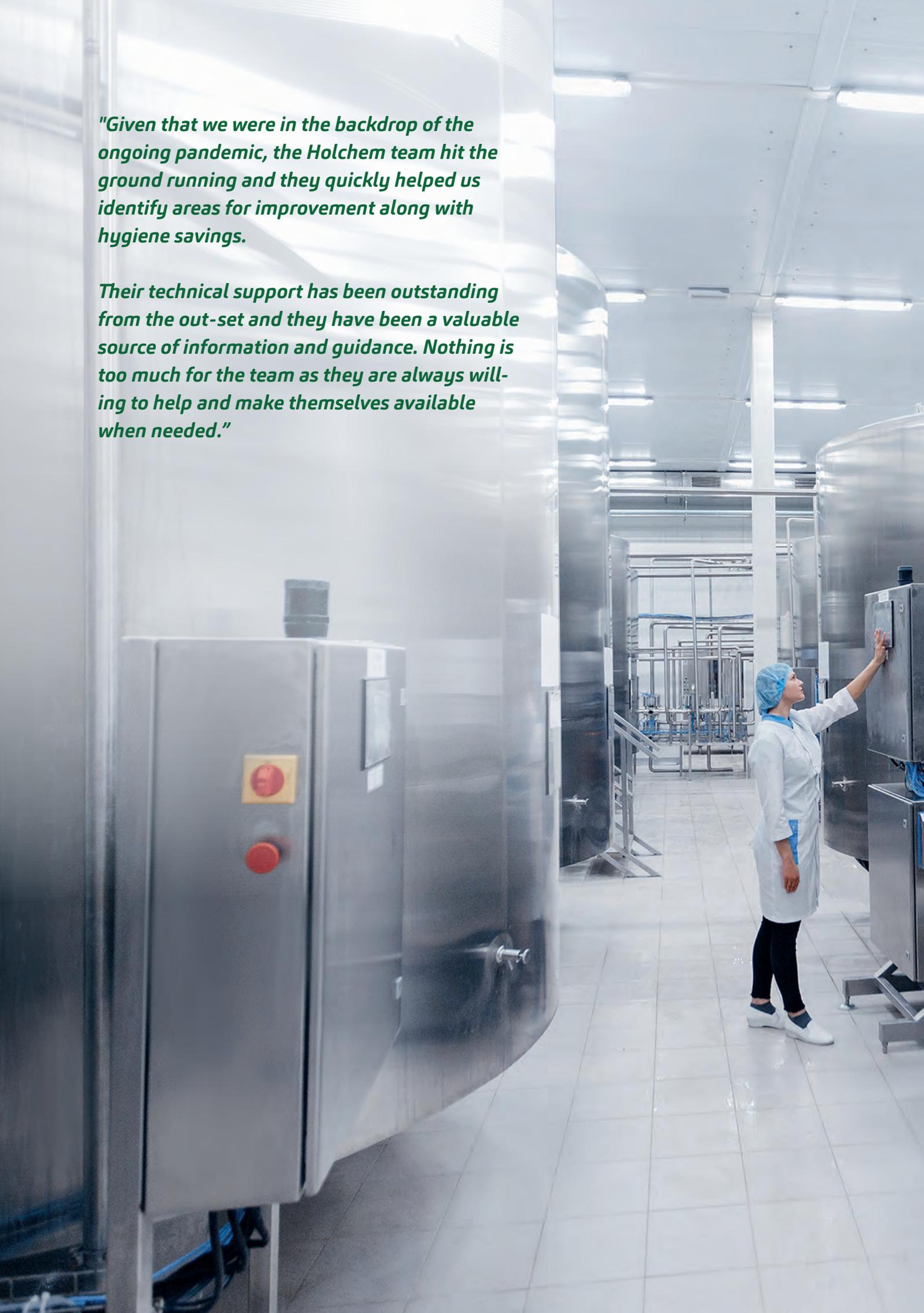


Contents

Industry Overview	1
Dairy Processing	2
Farm Dairy & Raw Milk	3
Liquid Processing	3
Aseptic Products	3
Powders	3
Butter	5
Cheese	5
Yogurt	5
Dairy Hazards	7
Cleaning & Disinfection	8
Cleaning	9
Soiling	11
Hygienic Design	11
Support Offering	12
Product & Supply Chain	12
Test Kits & Inspection Equipment	12
Washdown, Hygiene & Cleaning Equipment	13
Development & Validation of Cleaning Method	13
Cleaning Instruction and On-going Verification	13
Training	14
Audit & Review	14
Cleaning Advice & Problem Solving	14
Optimization	15
Emergency Support	15
Who we are	16
Our Values	16
Our Vision	17
Our Mission	17
Our Ambition	18
Corporate and Social Responsibility	18

"Given that we were in the backdrop of the ongoing pandemic, the Holchem team hit the ground running and they quickly helped us identify areas for improvement along with hygiene savings.

Their technical support has been outstanding from the out-set and they have been a valuable source of information and guidance. Nothing is too much for the team as they are always willing to help and make themselves available when needed."



Industry Overview



Kersia UK & IE, through its businesses Kilco and Holchem, support the dairy industry from Farm to Fork.

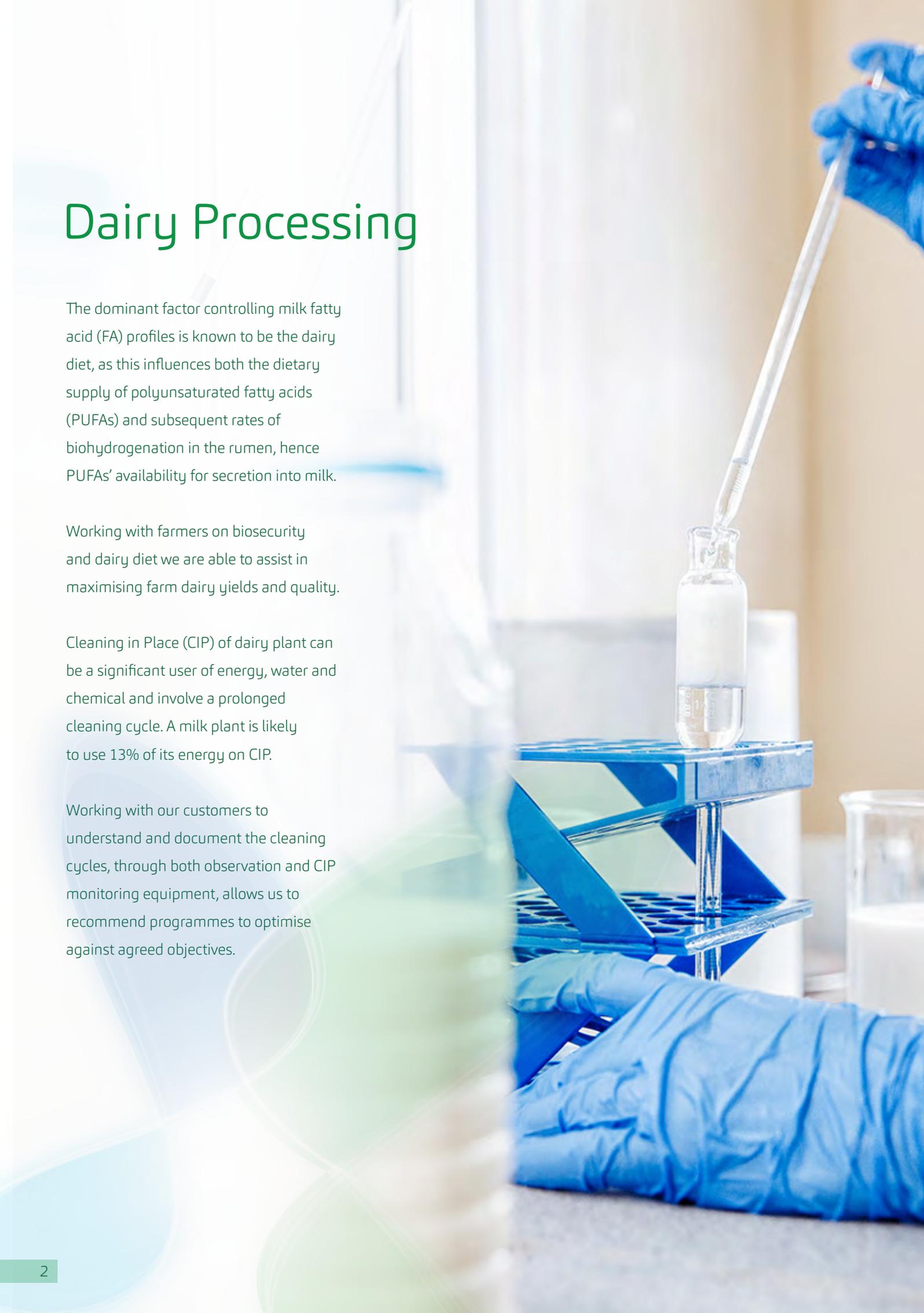
The understanding of all aspects of the supply chain and how farming can affect the processing dairy and products enables us to provide a holistic approach to dairy hygiene.

Food safety is our core field of expertise, recognised all over the world. Our products and services help prevent disease and contamination in both animals and humans.

Holchem, a partner to the processing dairy industry, provides expertise in detergent chemistry and hygiene allowing us to select product and methods for cleaning and disinfection at every stage of milk processing.

Kilco a partner to the dairy farmer, provides expertise, product and support to prevent: Metabolism disorders around lactation cycle, protect udder health, ensure water quality, and efficiently & effectively clean and disinfect parlour and dairy equipment.

Dairy Processing



The dominant factor controlling milk fatty acid (FA) profiles is known to be the dairy diet, as this influences both the dietary supply of polyunsaturated fatty acids (PUFAs) and subsequent rates of biohydrogenation in the rumen, hence PUFAs' availability for secretion into milk.

Working with farmers on biosecurity and dairy diet we are able to assist in maximising farm dairy yields and quality.

Cleaning in Place (CIP) of dairy plant can be a significant user of energy, water and chemical and involve a prolonged cleaning cycle. A milk plant is likely to use 13% of its energy on CIP.

Working with our customers to understand and document the cleaning cycles, through both observation and CIP monitoring equipment, allows us to recommend programmes to optimise against agreed objectives.

Farm Dairy & Raw Milk

Raw milk from a healthy animal has low or zero microbial levels; however, an animal with infection will produce milk with a high somatic cell count and a high bacterial count.

High somatic cell counts, bacterial contamination and antibiotic contamination of milk will result in the processing dairy rejecting the milk because of quality standards, regulation and processing issues.

Milk is sensitive to the risk of contamination by microbes or chemicals during milking and storage at the farm dairy, transfer to the processing dairy and at the processing dairy. As a result, the dairy industry is subject to increasingly stringent regulation with regards to process and hygiene standards, control of allergens and chemical residues (antibiotics, chlorate and Trichlormethane TCM being of concern).

Liquid Processing

Processing of milk leads to the deposition of soiling on surfaces. Processes such as separation, homogenisation and pasteurisation all develop soiling on the process equipment which require specific detergent chemistry to successfully remove.

One of the main concerns of the liquid processing is pathogenic bacteria and spoilage organisms. Pathogenic bacteria include: *Salmonella spp.*, *Listeria monocytogenes*, *Escherichia coli*, *Staphylococcus aureus*, *Bacillus cereus*, *Campylobacter jejuni*, *Clostridium spp* and *Mycobacteria*. In milk, microorganisms principally involved in spoilage are psychotropic organisms, which are destroyed by pasteurisation temperatures; however, some like *Pseudomonas fluorescens* and *Pseudomonas fragi* can produce enzymes which are heat stable and capable of causing spoilage.

Some species and strains of *Bacillus*, *Clostridium*, *Cornebacterium*, *Arthrobacter*, *Lactobacillus*, *Microbacterium*, *Micrococcus*, and *Streptococcus* can survive pasteurisation and grow at refrigeration temperatures which can cause spoilage.

Aseptic Products

UHT processing of milk or milk products combined with aseptic packaging was introduced to produce a shelf stable product with minimal chemical damage compared to in-container sterilised products. With aseptic packaging equipment, we need to reduce the risks of contamination by making sure we clean and disinfect surfaces that touch the product thoroughly, effectively and regularly.

Powders

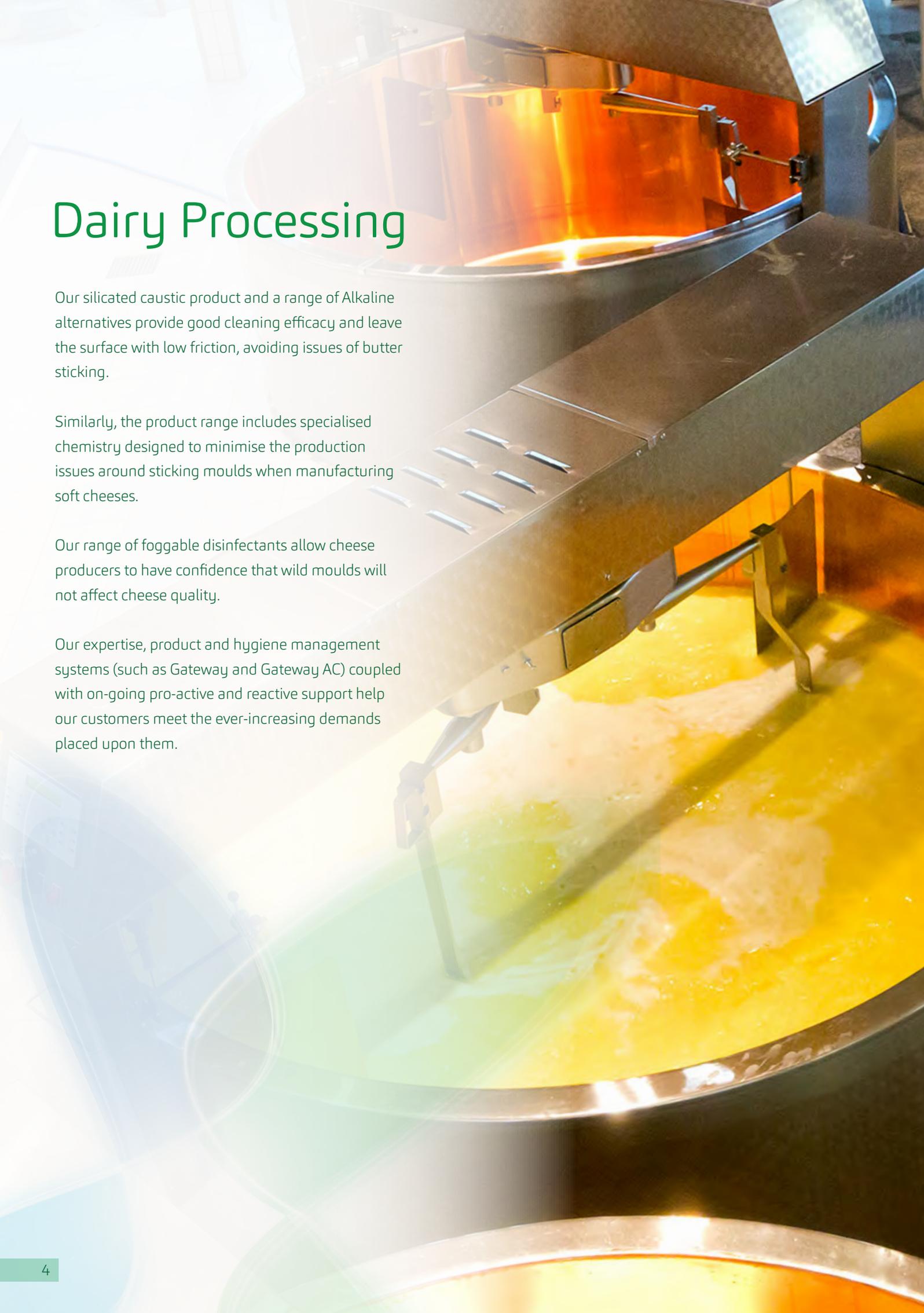
Milk drying is accomplished in a 2-step process:

Boiling milk under vacuum in falling film evaporators in the first instance aims to optimise water removal at temperatures that are favourable for maintaining the wholesomeness of milk while maximising the concentration of milk solids.

The resulting milk concentrate is then spray-atomised in a hot air stream to facilitate final mass transfer of moisture vapour.

With reduced water activity, dry powder products such as WMP (whole milk powder) and whey powder are less susceptible to growth of moulds, yeast and bacteria. However, the presence of pathogens with the ability to survive in dry environments, particularly *Salmonella spp.* and *Cronobacter sakazakii*, are a potential issue.





Dairy Processing

Our silicated caustic product and a range of Alkaline alternatives provide good cleaning efficacy and leave the surface with low friction, avoiding issues of butter sticking.

Similarly, the product range includes specialised chemistry designed to minimise the production issues around sticking moulds when manufacturing soft cheeses.

Our range of foggable disinfectants allow cheese producers to have confidence that wild moulds will not affect cheese quality.

Our expertise, product and hygiene management systems (such as Gateway and Gateway AC) coupled with on-going pro-active and reactive support help our customers meet the ever-increasing demands placed upon them.

Butter

Butter is the most common form of concentrated milk fat. It is valued for its delicate flavour, its melting characteristic in the mouth and its keeping quality. Butter is commonly made from pasteurised cream; however, unpasteurised butter is also available.

The common food safety risk associated with butter is pathogen contamination. For pasteurised products this is normally due to cross contamination or poor hygiene standards.

Due to its consistency, butter requires a cleaned surface to have a low friction coefficient. Cleaning will often leave a surface with high friction coefficients, therefore the choice of cleaning solution to include a substantive silicate to reduce friction during production is important both in continuous butter plants and smaller batch churns.

Yoghurt

The flavour and texture of yoghurt is determined by the impact of a relatively high heat treatment on the milk protein system and by the action of bacterial starter cultures on the milk carbohydrate system (predominantly lactose).

Bacteriophages often referred to just as "phage" are a group of viruses that attack the yoghurt starter organisms. Phages are the most likely cause of extended incubations.

Cheese manufacturing and the subsequent whey handling are prime sources of phage. 'Phage' can normally be found in the drains and floor gullies of a dairy producing cultured product. Poor hygiene and a lack of general housekeeping increase the risk of cross contamination.

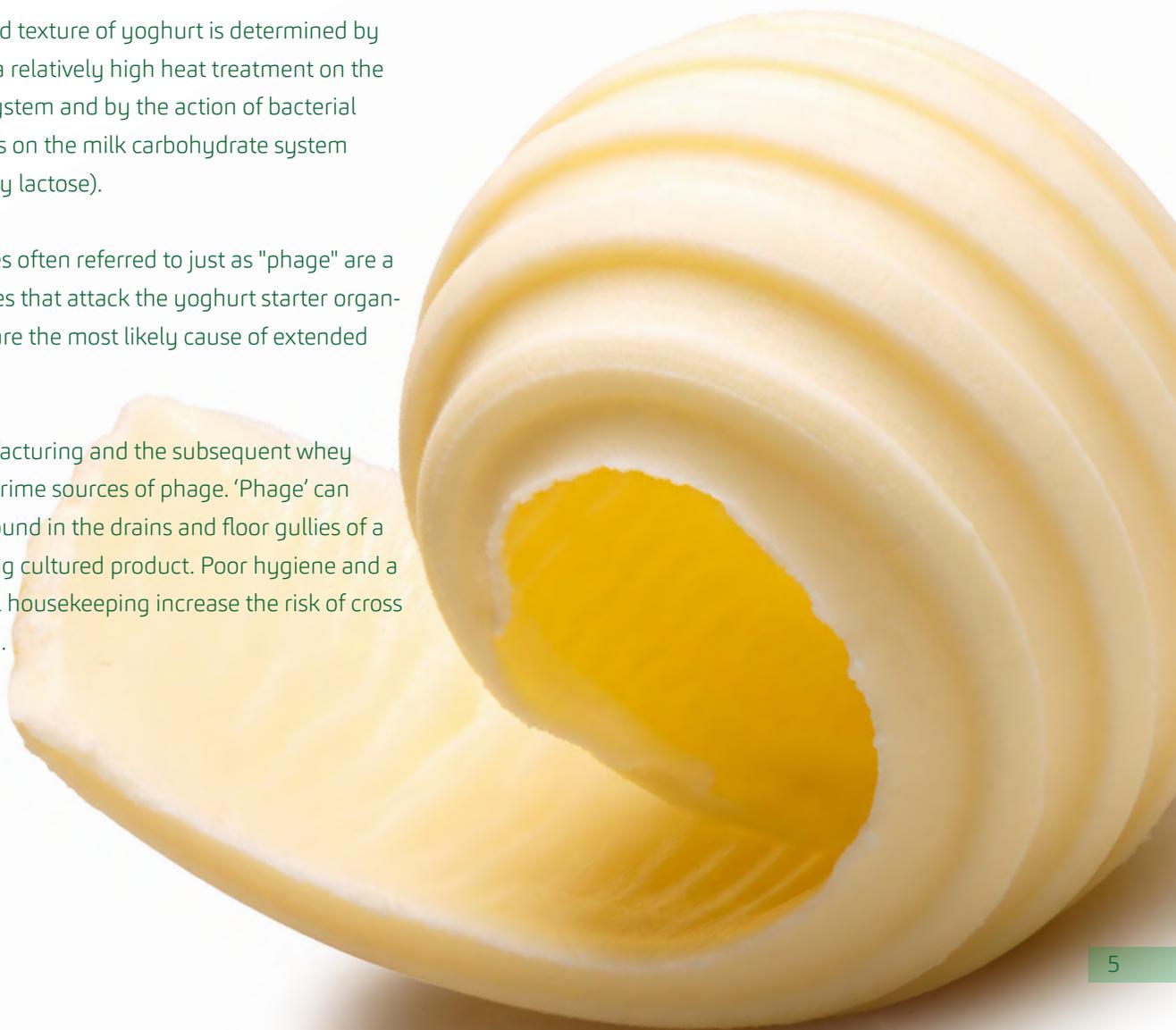
Cheese

Cheese is the concentrated form of milk protein and milk fat produced by the coagulation of milk and the subsequent separation of the curds and whey. Cheese is often an important aspect of a country's culture and the literally hundreds of varieties reflect centuries of regional differences.

With many different types of cheeses being produced there can be many different issues affecting cheese production. For soft cheeses sticking on the mould during turning or demoulding can be an issue that creates waste and loss of product.

With blue cheese production, wild moulds in the production environment can affect the quality of the finished product.

Our experience, engineering support and chemical range support sites to implement suitable fogging regimes to reduce wild moulds.





Dairy Hazards

Hazards

Traditionally, the most significant hazards in milk and dairy product processing have been microbiological in nature. The established methodologies for controlling them include:

- The application of the **hazard analysis critical control point** (HACCP) system to manage specific food safety hazards which require real time control.
- The adoption of **standardised hygienic practices** (Good Manufacturing Practices - GMPs or, as they are increasingly called, Pre-requisites) to establish general levels of clean plant, premises, people and products.

Examples of potential dairy plant contamination hazards

Biological	Chemical	Physical
<i>Salmonella spp.</i>	Natural toxins	Glass
<i>Listeria monocytogenes</i>	Topical treatments (Teat dips)	Wood
<i>Escherichia coli</i>	Drug residues (antibiotics)	Plastics
<i>Staphylococcus aureus</i>	Cleaning residues	Metal fragments
<i>Bacillus cereus</i>	Pesticide residues	Equipment seals
<i>Campylobacter jejuni</i>	Allergens	Insect parts
<i>Clostridium spp</i>	Cleaning chemicals	Personal item
<i>Mycobacteria</i>		

Soiling

With all food production processes, equipment and surfaces become contaminated with food residues, foreign bodies and microbial contamination.

In a dairy plant there is a clear difference between soil created on surfaces that are cold, i.e. below 60°C, and soil created on hot surfaces that are over 60°C.

Examples of cold surfaces include milk reception tanks,

pumps and transfer pipes. Heated surfaces are those that have been exposed to temperatures above 60°C; for example, pasteurisers and UHT equipment.

On a heated surface, reactions take place between milk components such as protein, fat and minerals. Protein denaturation and aggregation take place and minerals (calcium phosphate) precipitate. Several other reactions may also take place.



Dairy Cleaning



As a rule, dairy plant should be cleaned at the same temperature as the processing stage. If a higher cleaning temperature is used, then reactions in the soil layers, such as denaturation and crosslinking, may be induced thereby making the soil harder to remove.

Dairy protein fouling consists to a large degree of whey proteins that have denatured and aggregated through various crosslinking reactions. When sodium hydroxide (NaOH) meets the protein fouling, the alkali cuts the crosslinks holding the protein fouling together. However, if the concentration of NaOH is too high it can induce even more crosslinking, which can make the fouling even harder to remove. Due to this behaviour of milk protein fouling, there is an optimum NaOH concentration for cleaning.

In practice, cold processing surfaces are cleaned with simple chelated caustic formulations at 0.5 to 1.0% wt/wt NaOH at 60°C to 80°C.

Heated surfaces are cleaned with specialised highly chelated, caustic formulations at 1.0 to 2.5% wt/wt NaOH at 70°C to 90°C for pasteurisers and 90°C to 140°C for UHT plants.

Depending on process requirements, water hardness and soil type, an acid detergent stage may be added in the CIP cleaning cycle.

The Fluxclean range of products was developed to meet the requirements of membrane cleaning in the Dairy sector. The products and associated cleaning regime are designed to successfully return the membrane plant to its operating flux within the shortest cleaning time while ensuring the membrane remains fully protected.

Cleaning

Cleaning is an essential and integral part of the production process as it removes food residues, foreign bodies and microbial contamination. It must be carried out effectively and efficiently to deliver the desired results.

The timing and frequency that cleaning is carried out must be determined by risk assessment of the product and process, as well as analysing the potential cross-contamination risks from the cleaning itself.

Detergent products tend to be grouped by their main chemical characteristic, such as alkaline, acidic, caustic, chlorinated or neutral. There are many products within

each group that are developed to meet the varied soils and conditions encountered.

The roll of the hygiene support company is to use their experience and technical knowledge to best match and optimise the cleaning regime to the cleaning requirements of the equipment or area. Although there will often be specific best solutions for individual pieces of equipment or areas, it is often not feasible or sensible to have several different cleaning methods in an area. Again, the skill of the support company working with the site hygiene team, is utilised to develop a simple and manageable cleaning programme for the site.





Specialised Equipment

Specialised equipment may require very specific cleaning routines to maintain production efficiency and to ensure compatibility with materials of construction.

One example is membrane filtration. In the dairy industry, membrane technology is principally associated with:

- Reverse Osmosis (RO) – concentration of solutions by removal of water.
- Nanofiltration (NF) – concentration of organic components by removal of part of the monovalent ions like sodium and chlorine (partial demineralisation).

- Ultrafiltration (UF) – concentration of large and macro molecules, for example proteins.
- Microfiltration (MF) – removal of bacteria, separation of macro molecules.

The membranes used, by their nature, have a porous surface, where soil can be easily deposited.

Membrane materials are generally made from various polymers, which are prone to stress cracking if they come into contact with certain categories of surfactant. Also, surfactants can change the polarity of the membrane pores, which can modify the permeability of the membrane and alter the specification of the product being processed.

Hygienic Design

Hygienic Design is design to facilitate cleaning, prevent the accumulation of hazards and prevent the growth of harboured microorganisms.

Contamination may originate from the raw materials, but the product may also be contaminated with micro-organisms during processing and packaging.

If equipment is of poor hygienic design, it will be difficult to clean. Residues (soil) may be retained in crevices and dead areas, allowing the micro-organisms which they harbour to survive and multiply. These may then cross-contaminate subsequent batches of product.

Although a primary objective of design remains that the equipment can fulfil its engineering function, sometimes the requirements of hygiene will conflict with this.



Kersia technical teams are routinely involved with EHEDG helping to develop best practice guidelines for hygiene and hygienic design.



Support Offering

Product & Supply Chain



Innovation is central to the Kersia group's DNA and its mission, 'Inventing a food safe world'. It is an intrinsic element of the group's business and the driver for every member of the Kersia group.

Our offering is focused on three complementary approaches: traditional chemistry, biological / enzyme solutions and digital solutions.

The supply chain starts with product development by a team of experienced scientists who not only understand the product requirements but also the legislative, environmental and sustainability aspects of the product and its raw materials.

The fully integrated "recipe" driven production facility has a range of blending vessels enabling efficient operation

but with flexibility to meet customer demands.

Most orders are picked from stock enabling a short lead time, from receipt of order to delivery, of typically 7 days.

We operate our own fleet of wagons, bulk tankers and vans with our own trained drivers providing great flexibility and response to our customers. Proven and long-established third-party carriers provide backup allowing flexibility for emergency deliveries. Urgent deliveries are made in agreement with the customer; this may involve a charge if an outside carrier for next-day or same-day is required.

By reusing 25 litre kegs, drums and IBC's as well as palletised containers, we go further than solely meeting our obligations under legislation and minimise the impact

Test Kits & Inspection Equipment

Hygiene tasks required to control microbiological and allergenic hazards require validation to demonstrate that they are fit for purpose. Such controls also need frequent monitoring and verification to demonstrate their on-going effectiveness.

One of our aims is to ensure our customers are provided with effective and reliable test kits and equipment for the validation, verification and on-going monitoring of cleaning and hygiene tasks, to ensure acceptable levels of performance are achieved.

Information about the equipment can be found in our Test Kits & Inspection Equipment Brochure or on our web site:

<https://www.holchem.co.uk/shop/test-kits-and-inspection-equipment/>



Washdown, Hygiene & Cleaning Equipment



The storage, transfer, dosing, application and rinsing of cleaning products should be carried out in a controlled and defined manner. A range of equipment is available to allow all these processes to be carried

out safely and efficiently. Information about the equipment can be found in our Washdown, Hygiene & Cleaning Equipment Brochure or on our web site

Development and Validation of Cleaning Method



The Kersia team, from sales to scientists, work closely with businesses to advise on all aspects of hygiene including: the selection and application of cleaning and disinfection products, dosing and control, pathogen management, allergen management and cleaning advice.

We aim to ensure that all customers are aware of what

would be regarded as cleaning and disinfection best practice for their circumstances.

Our teams provide advice on how best to validate these recommended cleaning methods which can then be defined and recorded within the Hygiene Management System utilising our Gateway or Gateway AC software.

"The changeover went very well with a smooth transition from old chemicals to new. The chemicals are very good with improvements on the general day to day open plant cleaning detergents. Time savings have also been seen within the RO Plant for the CIP clean. The user-friendly Gateway system allows changes to be made quickly and easily by site or by Holchem. They have assisted in some CIP optimisation projects over the past few months."

Cleaning Instruction and On-going Verification



Legislation and codes of practice dictate that businesses must provide the cleaning instructions for all equipment and surfaces on site, including a system of control to show cleaning has been carried out according to the correct method. Our hygiene management system is used for Open Plant Cleaning (OPC) and for Cleaning in Place (CIP). The system is tried and tested and complies with all known third-party standards and best practice. Gateway is a web-based CIC creation

and maintenance system that allows both Kersia and our customers quick access for easy creation and amending of the cleaning instruction card system.

In addition to the functionality of Gateway, Gateway AC provides the user with the ability to plan their hygiene programme for a rolling 12 months and create paper task sign off sheets or digitally record who completed the cleaning tasks.

Training



We provide many training options to enhance the theoretical and practical knowledge of a business's workforce with experts on hand to deliver and evolve that knowledge base.

Our focus is to supply a range of courses that benefit, primarily, the roles of hygiene and technical teams directly involved in the management of hygiene on their sites.

The courses are classed as Level 2, 3 and 4 reflecting broadly equivalency to the City and Guilds structure.

The training where appropriate is HABC (Highfield Awarding Body for Compliance) accredited.

Information about the courses including eLearning can be found in our Training Brochure or on our web site: <https://www.holchem.co.uk/shop/training-courses-2021/>

"The content of the course was relevant, detailed and concise. The course trainers were able to communicate the course material in a way which all delegates found engaging and educational. An excellent balance was struck between learning by rote and allowing all attendees to work together to find solutions using information presented."

Audit & Review

Maintaining good standards of food safety and hygiene is dependent, in part, on regular and critical self-assessment of the food businesses operational standards and practices.

Our teams work with our customers to establish a pro-active independent audit or inspection of your procedures and standards. Our audits are compiled taking into consideration legislation and the British Retail Consortium and Retail (BRC) and Retailer Standards; and carried out in conjunction with site personnel by experienced and audit trained teams.

Cleaning Advice & Problem Solving

By working with customers and building long-lasting relationships Kersia strive to provide tailor made cleaning solutions, delivering real results. The teams provide on-going reactive and investigative technical advice. Our field-based teams have in-depth knowledge of their customers, delivering optimum cleaning solutions but also responding to customers' challenges by delivering new product solutions that respond to a business issue or need. They understand the industry and your sector and have often held technical or hygiene support roles in similar businesses. The Technical Centre team back up the field-based teams with analytical and problem-solving expertise for our customers and is staffed by scientists with experience in a wide range of fields, including Product Development, Scientific Investigation, Chemical Legislation and Quality Control.

Kersia are members and supportive of the activities and/or committees of the British Association for Chemical Specialities (BACS), the European Hygienic Engineering Design Group (EHEDG), the Society of Food Hygiene and Technology (SOFHT), the Society of Dairy Technology (SDT) and Campden BRI. Kersia also work closely with ZERO2FIVE, the Cardiff Metropolitan University's Food Industry Centre and other universities.

Optimisation

The food & drink industry in the UK accounts for:

- 14% of energy consumption by UK businesses and 7 million tonnes of carbon emissions per year.
- 0% of all industrial use of the public water supply.
- 10% of the industrial and commercial waste stream.
- 25% of all HGV vehicle kilometres in the UK.
- 12.5% of the UK's workforce.
- A milk plant is likely to use 13% of its energy on CIP.
- A food and beverage plant will spend 20% of each day cleaning equipment.

Optimisation of production processes and the cleaning and disinfection routines can help sites reduce energy, waste and water and meet their Corporate and Social Responsibility (CSR) targets. Kersia can assist customers with optimising cleaning and disinfection and things to consider include:

- There needs to be a commitment to undertake it; it can take a long time.
- Improving the performance of CIP systems is more than just manipulating the four cleaning parameters.
- Cleaning is not an isolated event but integrated into the whole production cycle.
- Decide on the hierarchy of objectives and tackle in order.
- Ensure that after a change to the system it is re-validated; consider over how long a period (days, weeks, months) this re-validation (usually 3 cleans) is carried out.
- Review the change and whether it has met the objective.

"With our previous chemical supplier, the ultrafiltration plant clean took about 7 hours and three cycles. With Holchem we can do it in 4 hours and one cycle, which is a massive improvement in cost, in time and for the first time we met our chemical budget."

Emergency Support



In addition to our field and head office support teams we operate an emergency service that provides out of hours advice for accidents and spillages involving our products that pose a threat to the environment, or human health, or require immediate first aid advice. Phone: +44(0) 7050 265597.

Note: This number will not accept non-emergency calls, e.g. order queries or calls dealing with equipment breakdowns.



Who we are

Kersia, the world leader in food safety, acquired Kilco in July 2018 and the Holchem Group Ltd in May 2020. All Kersia companies share common values via their strong focus on customer support, the environment and social responsibility. The integration of the competencies and complementary expertise of international players in biosafety solutions has allowed the creation of a group capable of meeting the challenges that continually emerge all over the world.

Continual investment in the best technical solutions ensures the company leads the field with an holistic approach through farm, food processing, brewery & beverage, dairy, and foodservice & facilities.

By working with customers and building long-lasting relationships, Kersia provide tailor made cleaning solutions, delivering real results. The company philosophy of “do what you say you are going to do” remains unchanged since the business was started and the family values of hard work, innovation, trust and professionalism underpin every aspect of our business.

"I've been in this business for 37 years & have never known anyone like Holchem. Their 'can do' attitude combined with fantastic customer support – means they go above and beyond every time. To sum them up in one word - brilliant!"

Our Values

Around the globe, our employees are sharing and cultivating the fundamental values of Transparency, Sharing, Proficiency and Foresight.

These values represent our very essence and form the basis of our relationship with you, our customers and partners.

Focused on the future, we help our customers anticipate changes, protect the reputation of their operations and companies, and maintain their sustainable performance.

"We have a very strong relationship with Holchem. The reason why we rate Holchem is because as a business they share the same values as us; which is innovation and customer focus."

Our Vision



From farm to fork, food safety is today the number 1 concern within the food sector. With the emergence of new sources and forms of contamination, the immunisation of certain bacterial sources and the desire to move away from the use of antibiotics, pesticides and chemical preservatives, the challenges are immense. Preventing risks associated with the transmission of bacteria, viruses and other pathogens to operators and to consumers is the primary concern throughout the food chain. Everyone involved - farmers, veterinarians, suppliers to the farm industry, food processing plant operators and retailers have a stake and a responsibility in the safe production and processing of food. Failure at any stage means putting the life of consumers and staff at risk. Failure can have disastrous short and long-term consequences for a business. Failure can also engage the personal legal responsibility of managers and staff.

Our Mission

Everyone involved in the food chain needs a business partner with the scientific expertise and field experience to deliver customised answers having identified the risks and critical control points. Food safety is our core field of expertise, recognised all over the world. Our products and services prevent disease and contamination in both animals and humans.

Our global solutions approach delivers food and farm biosecurity. They are constantly reinvented and optimised from the sharing of results obtained on the ground and the findings of our R&D efforts, to guarantee full compliance with new regulations. We offer unique skills based on deep-rooted science developed globally and twinned with an empirical approach at local level to tailor our proposals to individual needs. We improve farm performance and add value to the food industry.





Our Ambition

100% dedicated to food safety, we intend to lead the way as the world benchmark operator and most trusted partner to our customers. Helping our clients solve today's food safety issues is not enough. Enabling them to stay one step ahead will be our ongoing goal, both at a local and a global level.

Focused on the future, we will help them anticipate changes with innovative and far-sighted solutions that improve consumer and operator safety, preserve their company's reputation and boost the sustainable perfor-

mance of their business.

Our highly committed employees are passionate about our mission and take pride in its noble objective. Exclusively focused on this ambition and supported by an engaged shareholder, we will devote all our resources, energy, regulatory and R&D effort to food safety. We are convinced that this is the best road to create value for all our stakeholders (end-consumers, clients, public authorities, employees, shareholders...) and for society.

Corporate and Social Responsibility

In light of its mission of "Inventing a food safe world", in 2016 our group made a commitment to sustainable development and corporate social responsibility (CSR). "ACT FOR POSITIVE IMPACT" is the name of our group CSR programme. It is a participative, constructive approach to doing things differently, better and to achieve a three-fold performance objective with economic, environmental and social dimensions. Our goal is for our business and all our production to be part of a fully circular economy and to move towards a situation of zero impact on the planet.

Reflecting the Group's four values – Transparency, Sharing, Proficiency and Foresight – every employee makes an active contribution to this change, alongside all our stakeholders: customers, suppliers, local communities, the authorities and shareholders.

Further information is available on our web site:

<https://www.kersia-group.com/about-us/corporate-social-responsibility>

Gateway House
Pilsworth Road
Pilsworth Industrial Estate
Bury
Greater Manchester
BL9 8RD

Telephone: 01706 222288

Web: www.holchem.co.uk