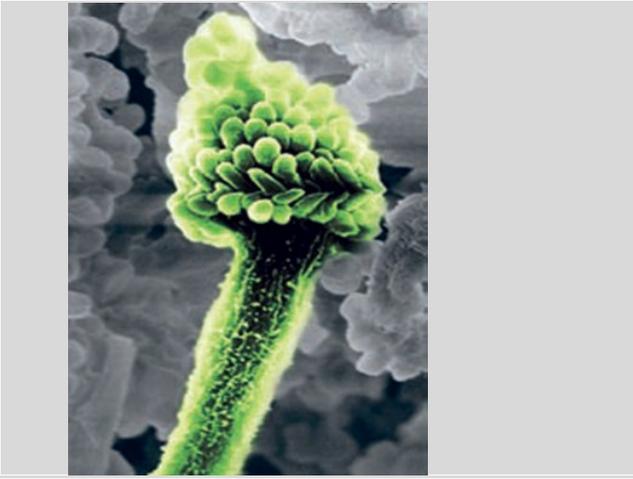


DISINFECTION IN THE DAIRY INDUSTRY





Advanced Air Hygiene disinfection systems—innovative solutions for the dairy industry

In the production of milk and dairy products, microorganisms in the air or on surfaces e. g. packaging material can cause product contamination.

High air humidity in production areas causes fungi to multiply on surfaces, for example filters of air conditioning systems operated with recirculating air.

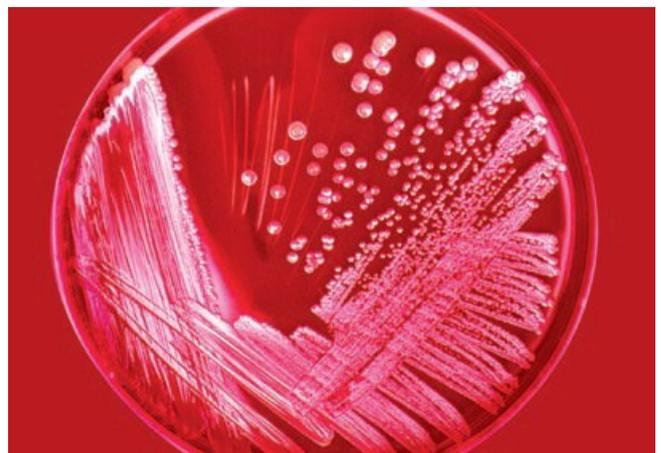
Moulds produce mycotoxins and spores that can be spread around the whole production area by an air conditioning system. This can lead to serious health risks for staff.

The disinfection systems from Advanced Air Hygiene provide an efficient remedy to this problem. At the heart of these systems are UV-C emitters with a primary emission wavelength of 253.7 nm.

The particular advantage of these systems is that they produce no ozone.

UV-C technology – the most natural form of disinfection

UV-C radiation is a natural component of sunlight. The anti-bacterial effect of this radiation has been known for a long time. A wavelength of 253.7 nm triggers changes in the genetic material of the microorganisms, causing them to die. Unlike other systems, no thermal or chemical treatment is necessary.



Spoilage of dairy products

Milk is one of the most nutritionally valuable foodstuffs as it contains a large number of vitamins and minerals as well as proteins.

However from a microbiological perspective milk is one of the most critical foodstuffs there is as it contains a naturally high number of bacteria. This microorganism flora is very diverse. Raw milk fresh from the cow contains species such as *Micrococcus*, *Lactobacillus*, *Lactococcus*, *Microbatrum*, *Staphylococcus*, *Streptococcus*, *Corynebacterium*, *Clostridium* and *Bacillus* as well as several types of yeasts.

The air in the cowshed and general poor hygiene in companies that process the milk can lead to secondary contamination with pathogenic microorganisms, some of which even survive pasteurisation processes. As milk is a problematic product in microbiological terms, it is pasteurised in so-called 'ultra-clean' conditions and ultra-high temperature-treated under aseptic conditions.

These processes take place in a closed system. Chemical processes such as H₂O₂ and also UV-C radiation are used to disinfect surfaces



Dairy products

1. Fermented milk products

These include yoghurt, buttermilk, kefir, sour cream, crème fraîche etc. Pasteurised milk is fermented to produce the corresponding products with the help of special starter cultures. Various species of *Lactobacillus*, *Streptococcus*, *Bifidobacterium* and *Lactococcus* are mainly used for this. The activity of the lactic acid bacteria causes the milk protein casein to coagulate, giving the product a more or less firm consistency. The starter cultures are also responsible for the holes and aroma development in cheese products, for example. These extremely important starter cultures are put at risk by bacteriophages that are widespread in the dairy industry. Outside air, air in the processing plant and also whey aerosols play a decisive role in the contamination of starter cultures. UV-C technology can be used to disinfect the air here as bacteriophages are reliably inactivated by UV-C. The filling and packaging of fermented milk products also takes place in closed machines where the inside of the machine is supplied with sterile air. Nevertheless, These products are time and again contaminated by yeasts and moulds that are also able to thrive in a sour environment. Yeast species found include *Saccharomyces*, *Candida* and *Rhodotorula* and mould species include *Penicillium*, *Mucor*, *Fusarium*, *Aspergillus* and *Alternaria*.

Packaging material is a further source of contamination. Surface disinfection by means of UV-C technology is strongly recommended here. Packaging materials such as pots, foil covers, lids etc. can be treated with UV-C radiation. This can stabilise or prolong the shelf life, thus reducing product losses and saving costs. UV-C disinfection can replace chemical disinfection processes such as H₂O₂ disinfection. Furthermore, the reduction of microorganisms in the ambient air by means of UV-C technology in filling and packaging areas also leads to a general improvement in plant hygiene.

2. Cheese

For the production of cheese, milk from different kinds of animals is pasteurised and thickened with rennin and Proteolytic enzymes. The resulting jelly is separated into small



pieces into so-called curd. This is then processed by 'pressing, turning and shaping'. Different kinds of starter cultures are used in these processes, depending on the desired end product. The types of cheese initially produced are cream cheese, quark, cottage cheese etc.

Like fermented milk products, these 'non-maturing' types of cheese are filled and packaged immediately after production. UV-C irradiation of containers and packaging foils can increase the microbiological reliability of the manufacturing process.

Advanced Air Hygiene disinfection systems—for the protection of your products

The maturing cheese types are divided into hard cheeses (Chester, Emmental, Alpine cheese etc.), semi-hard cheeses (Gouda, Edam etc.), soft cheeses (Camembert, mould cheeses such as Roquefort etc.) and sour curd cheeses (Harz cheese, Mainz cheese etc.).

For hard cheese, semi-hard cheese and soft cheese air disinfection can be used in the maturing areas and cutting departments. Here, systematic disinfection of the air in the room can prevent the risk of cross-contamination. Hard cheese is one of the few products whose surface can be irradiated with UV.

In the production of sour curd cheese, cultures that cause the cheese to ripen are sprayed in the air of the

ripening room. Of course the air in these ripening rooms cannot be disinfected, however disinfection of the air in adjoining areas can be very important as this can prevent possible cross-contamination.

Spoilage, cheese problems

Many different starter cultures are used for ripening and processing dairy products e. g. mould cultures for Camembert. Of course these are desirable for the product in question, however they can be undesirable or even damaging for other products as they can cause the taste to change e. g. through incorrect fermentation. The most frequently occurring types of microbiological spoilage are listed in the following table.

Types of microbiological spoilage of dairy products

Type of micro-biological spoilage	Symptoms	Main microorganisms involved	90% disinfection mWs/cm ²	99,9% disinfection mWs/cm ²
Premature swelling	Spongy, swollen up cheese	Coliform bacteria, <i>Klebsiella aerogenes</i> <i>E. Coli</i>	3.0	9.0
Late swelling	Butanoic acid fermentation, gas formation	<i>Clostridium tyrobutyrium</i> <i>C. butyricum</i> <i>C. sporogene</i>		
Bitter taste	Unpleasant bitter taste	Multiplication of proteolytic enzymes foreign to the product, disturbed ripening conditions		
Foreign mould	Foreign mould growth on cheese surface, Mycotoxin formation	<i>Penicillium</i> <i>Aspergillus</i> <i>Mucor</i> <i>Rhizopus</i>	13.0 – 50.0 44.0 – 66.0 17.0 – 65.0 111.0	39.0 – 150.0 132.0 – 200.1 51.0 – 195.0 333.0
Formation of holes	Formation of outside holes	Propion acid bacteria; lactic acid bacteria	6.0 – 10.0	18.0 – 30.0
Discolouration	Orange to red discolouration	Pigment-forming bacteria e. g. <i>Micrococcus</i>	6.0 – 10.0	20.0 – 30.0



UV-C disinfection in the yogurt filling area



UV-C disinfection of foil covers

Disinfection systems – preventing complaints about quality

Installing our disinfection systems helps you achieve a high product quality and prevent complaints that can damage your reputation and image. No company can afford frequent complaints, particularly if they cooperate with large retailers. Potential consequences are the loss of listings and a large fall in sales. The disinfection systems supplied by Advanced Air Hygiene ensure that you comply with the requirements of consumer protection laws and hygiene and air management legislation. The systems contribute to the fulfilment of HACCP concepts.

Areas of deployment:

Cheese maturing rooms, cheese cutting areas, filling and packaging

Research and development

At our partner's research and development centre in Germany, specialists are constantly working on improvements and innovations – naturally in dialogue with customers and suppliers.

UV-C disinfection systems

- especially for the production of milk and dairy products

Key benefits:

- ⇒ **The shelf-life of products is greatly increased**
- ⇒ **Complaints are effectively reduced**
- ⇒ **Hygiene standards are safeguarded**
- ⇒ **Product quality as a whole is increased**

Safety – the utmost priority

All systems, equipment and components comply with the highest safety standards. Thorough checks, training and commissioning by our specialist staff are a matter of course whenever equipment is installed.

Information and invitation

We organise seminars on the subject of 'Disinfection in the Food Industry' at our partner's Centre for Disinfection Technology in Germany several times a year for interested professionals such as managers, production/plant managers, hygiene representatives, quality managers and QA experts.

The seminar shows how innovative UV-C radiation technology can make a decisive contribution to improving hygiene standards in food processing companies and how this can contribute to the efficient optimisation of quality assurance.

The speakers look at the characteristics and significance of microorganisms, UV-C radiation technology, hygiene regulations for air conditioning systems in accordance with VDI 6022 and the project planning and maintenance of our disinfection systems.

All seminars are free of charge one-day seminars that take place from 10 a. m. till 4.30 p. m.





Planning, consultation and analysis

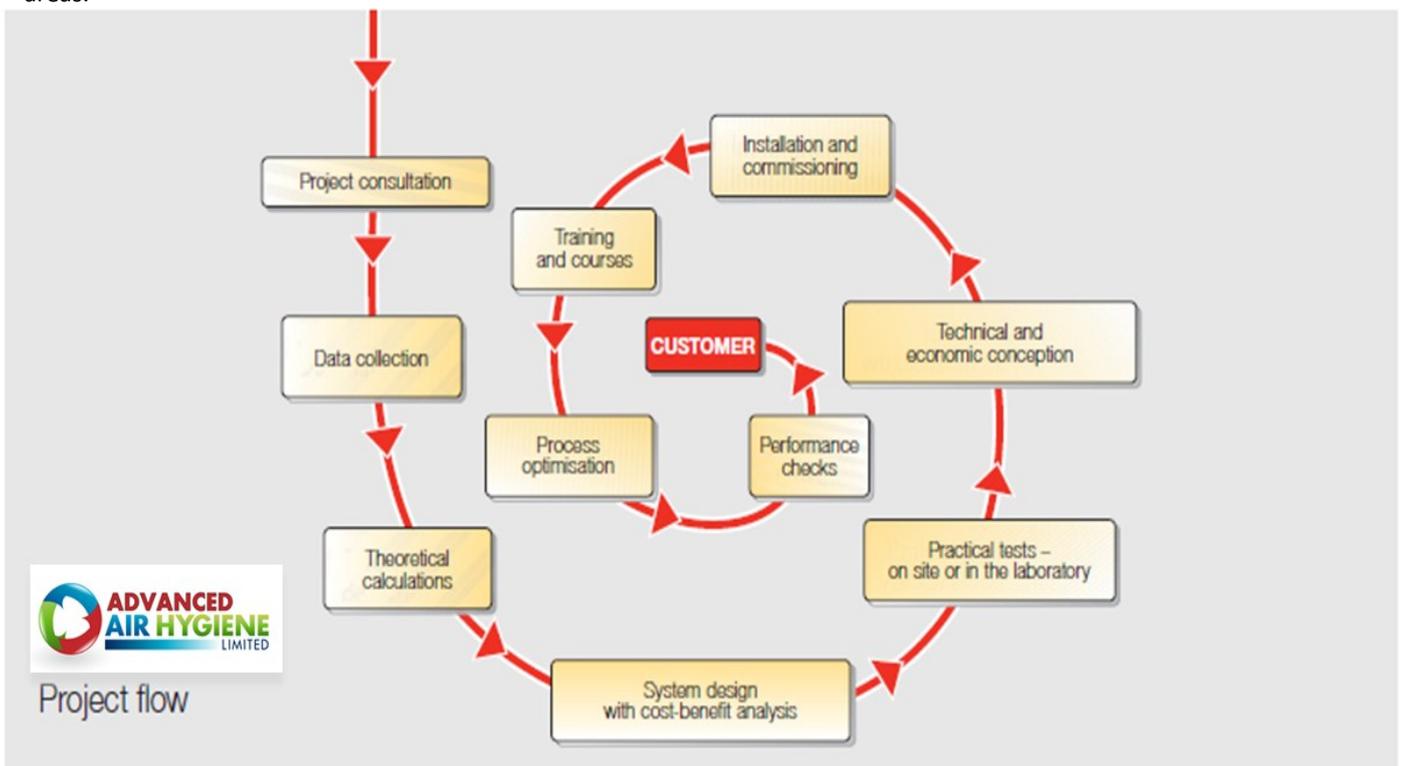
Our application specialists advise you and help you to plan your system in order to find the right solution. We are the expert at your side, starting with on-site measurements through laboratory tests, feasibility studies and right up to the installation.

Our analysis will show you which areas of your production are contaminated with microorganisms. The analysis will result in specific recommendations to solve the problem. You can request a full analysis of all your production stages or individual areas.

Service

Our aim is to ensure that your investment pays off. This is why we look for further opportunities to reduce your costs and optimise processes – even after installation of the equipment.

In the case of malfunctions, our service team will be there to assist you as quickly as possible.



Please contact us and we'll arrange for one of our specialists to visit your site and evaluate your individual requirements.



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