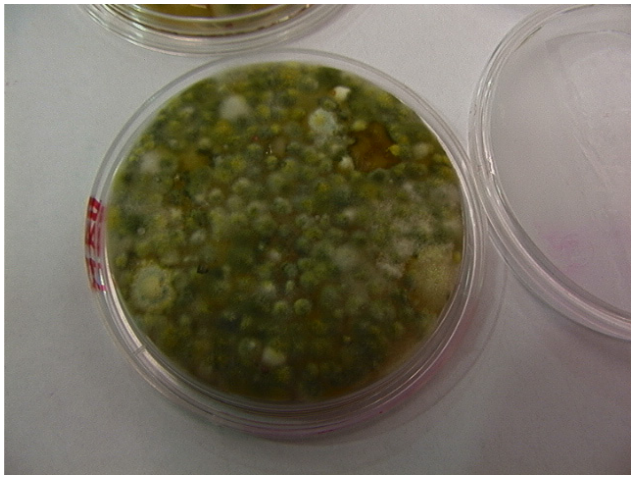
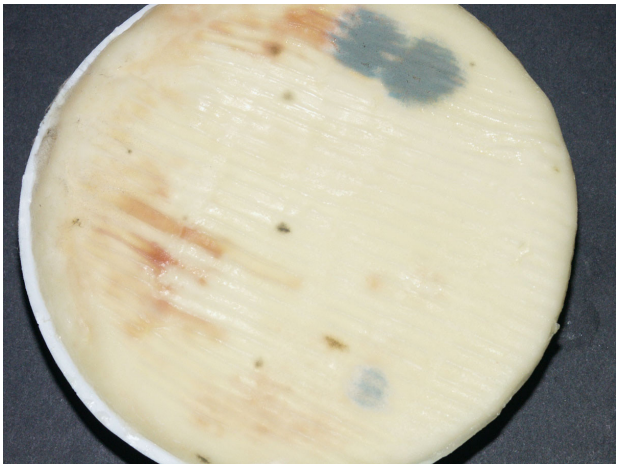


Micro organisms after incubation of a sampler of fresh air inlet in an air handling unit. Colonies usually live in the air conditioning system.



Contamination on cheese during ripening.

Sanitation is a fundamental problem in the food-processing industry as well as in the health sector and in all the fields in which contamination can be dangerous for health or for the shelf life of products.

In the USA, the Food and Drugs Administration estimates that 76 million people are hit every year by several types of food poisoning, toxic infections and pathologies due to alimentary causes, and consumers have been repeatedly made aware of the problems related to hygiene in industrial food-processing, directly through the mass media.

For food production companies, contamination control is a strategic issue. It has a direct impact on their products' health and safety characteristics and influences the brand's reliability and quality image in customers' minds.

Finally, contamination control has a direct impact on cost reduction and turnover, by minimising spoilage and increasing the shelf lift of products.

In the last 20 years, effective progress has been achieved in food preservation and packaging technologies as well as in plant sanitation, in particular, through the use of automatic CIP (Cleaning In Place) systems.

Limited progress however has been achieved in controlling airborne contamination and eliminating the potential related problems and risks in existing as well as in newly-built food-processing facilities.

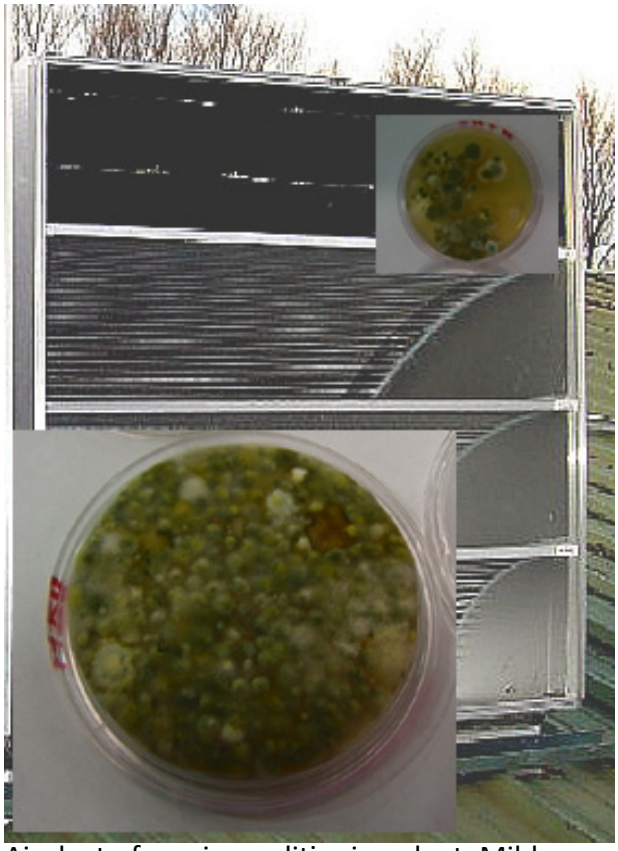
The technologies available for airborne contamination control are generally based on mechanical filtration or on the C.I.P. concept. This means that for the mechanical filtration, bacteria and micro-organisms are just captured, but still alive and growing in the filter fibres.

The C.I.P. does not allow the contamination control during operation.

In spite of the close ties between the spread of secondary contamination and air conditioning and ventilation systems, many food-processing companies have not taken into consideration the permanent decontamination of the air in their HACCP system.

The photographs immediately below illustrate a recurring situation: the result of absence of regular cleaning and disinfection inside the ducts of an air conditioning system.

The absence of sanitation enables bacterial colonies to grow at exponential speed in favourable humidity and temperature conditions.



Air duct of an air conditioning plant. Mildew and bacteria lie concealed on the walls. Their presence, density and nature can be easily and clearly determined through plate cultures.

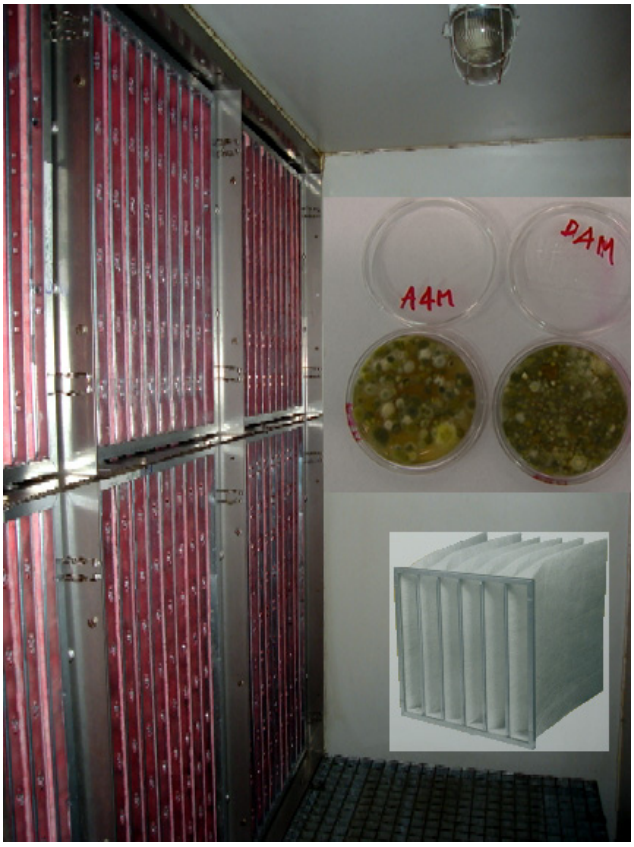


Plate cultures on a Petri dish, after surface contact on the inner wall of an air handling unit. Incubation: 72 hours.

Some manufacturers propose systems with washable units and ducts, to be cleaned with detergent solutions and disinfectants, but this type of sanitation remains a complex operation, which turns out to be partial and incomplete.

This hygienic process i.e. the “classical sanitation system” is unwieldy, creates production breaks and requires the organisation of a specific cleansing and maintenance cycle: it is necessary to remove or get access to the ducts regularly for washing, and to wash internally the air conditioning units and the air conveying ducts.

Often this is not possible as ducts built in technical premises are usually not equipped for this type of operation.

Set of spray balls to wash the inside components of an air treatment unit: the air cooling or heating coils in this case. Contamination restarts as soon as the unit starts working again.

Air filtration with mechanical high-efficiency filters up to a level of absolute filtration, might represent a method to control contamination by moulds and micro-organisms that prosper in the air conditioning system.

Absolute filtration however requires frequent filter substitution and substantial power inputs in order to obtain air circulation..

Moreover, these filters do not eliminate the risks of contamination because:

a. mechanical filters accumulate micro-organisms and moulds able to spread in the ducting system or air treatment units when filters are replaced during normal maintenance operations;

b. decaying dead micro-organisms captured by mechanical filters produce endotoxins able to contaminate continuously the ambient air. Mechanical filters are unable to withhold or destroy these endotoxins.

THE SOLUTION

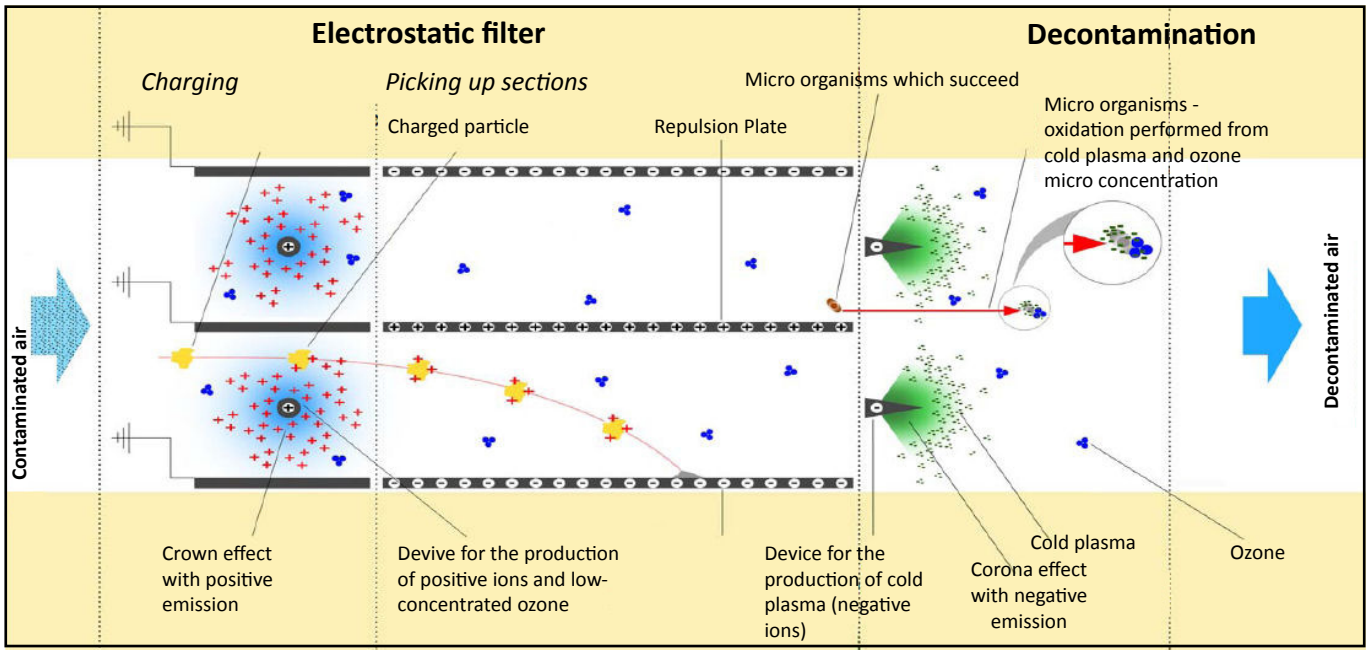
An innovative solution has been studied and developed to eliminate the problem at the origin:
The system is self-cleaning during normal functioning.

The equipment consists of a device which combines electrostatic filtration with ionic negative oxygen emission in the air. Electrostatic filtration is highly efficient, and consumes little energy.

The system patented in Europe and in the United States by a partner company, works with particularly high concentrations of negative air oxygen ions in the entire ventilation system, and produces a negligible quantity of ozone, without any danger for human health.

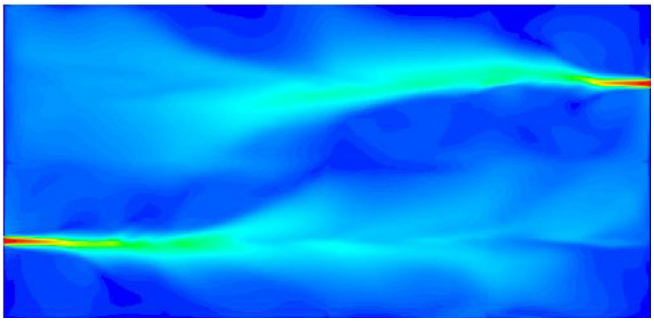
The high concentration of negative oxygen ions creates a hostile environment that kills moulds and bacteria.

The equipment requires limited maintenance: cleansing of electrostatic cells twice yearly and substitution of emitting electrodes once a year.



Automatically sanitised air treatment unit equipped with electrostatic filters and ionisers installed in a large food processing plant of a multinational company in Northern Europe.

Removable electrostatic filter - detail.



Flow of negative air ions generated by the corona effect produced in a deep diffusion cheese storage system.

The air treated by the system is practically free from dust particles and microbiological life even with high humidity levels and medium positive temperatures normally considered as a risk for secure hygienic conditions.

Ozone production in the system is negligible, with the result that the treated air is perfectly safe for human health. Treated air is perfectly free of endotoxins.

Comparison with mechanical particles filtration
The quality of the air produced by the system studied and developed, considering exclusively the reduction of particles, complies with air specifications for H12 mechanical filters (HEPA filtration classification).

The system is therefore recommended as a pre-filtration device for clean rooms from class ISO 7 to class ISO 3, in accordance with ISO 14644-1 norms i.e. from class 1,000 to class 1 when referring to F.S. 209 E.

The system can be used as a complete single filtration device (including final filtration) for applications requiring ISO 8 specification (equivalent to class 100,000). In both cases, with the following advantages, with respect to the use of traditional mechanical filters:

- continuous sanitation of equipment and ducts and permanent growth inhibition of micro-organisms
- elimination of endotoxins
- absence of contamination during the substitution of the filters
- increase of the life of absolute filters (ULPA o HEPA)
- reduction of maintenance and operating costs
- killing of micro-organisms and elimination of particles. Filtration class equivalent to H12/H13 according to the new European Norms 1822
- high air quality standard, with ozone concentrations well within usually applicable European or US safety standards
- energy savings due to:
  a. reduced pressure losses
  b. increase of processing temperatures due to a better control of contamination
- cost reductions due to:
  a. constant and automatic sanitation without the need to interrupt production cycles
  b. reduced periodic maintenance; a remarkable progress in the overall quality of hygiene in all premises of a plant and particularly in the critical points where food processing, maturation and aseptic packing take place
- a positive impact on the organoleptic qualities of numerous fresh products and products to be processed and preserved fresh. This advantage is a direct consequence of the possibility to optimise in a more flexible way temperature and relative humidity in all the rooms where products are stored or matured
- an increase of the “shelf life“ of fresh products due to a better control of the air in processing and storage areas.