



## Bacteriophage Control in Dairy Processing with Pall Emflon® Filters

### Overview

Microbial starters play a vital role in the manufacture of yogurt, butter, cheese and other cultured dairy products. They produce the lactic acid that influences important quality characteristics such as flavor, aroma, and texture, and aid micro-flora control.

Bacteriophage are a group of viruses that attack the starter organisms, such as lactococci. Specific phage-host interactions can lead to the complete lysis of the starter cells and reduce culture yields.

Infection with bacteriophage is the major single cause of fermentation failure or slow-acid production problems in fermentation processes. Never-ending incubations or “dead” vats in cheese-making are typical.

Any phage contaminating the bulk starter milk can then inhibit starter activity, or kill strains with an essential function such as aroma production. These will have serious and detrimental effects on the quality of the final product.

### The Challenge

Bacteriophages are ubiquitous in the dairy plant, found in varying concentrations, from low levels in clean rooms, to high levels, as measured for example in the aerosols produced by separators. They are also identified in the outdoor environment, where air is often sourced for the compressed air network.

Since the development of basic principles of phage control in the early 1940s, and despite considerable effort in the industry devoted to prevention (dairy plant design, aseptic techniques, clean rooms), the dairy environment remains a constant reservoir for bacteriophage contamination. Most of these phages are not completely inactivated by standard processing conditions or equipment sanitation regimes.

Starter disruption by bacteriophage penalizes dairy manufacturers with additional processing costs of up to 5 times the cost / kg of final product.

- Product loss
- Downtime processing costs
- Additional costs for stringent cleaning and sanitation
- In some cases, reduced value of final product

Pall® technology can provide the solution.



### The Solution : Pall Emflon PFR Filters in the Sterile Air Blanket Supply

In addition to stringent measures for bacteriophage control, protective systems employing sterile air overpressure have been developed to completely eliminate such contamination.

Pall, recognized in sterile air filtration and venting in the bioprocessing and food industries, offers expertise and capabilities to optimize air quality in dairy operations cost-effectively.

Today most efficient blowing equipment for delivering a constant flow of filtered air to bulk starter utilizes Pall **Emflon** PFR sterilizing grade air filters. These can be combined with a user-friendly, high accuracy Palltronic® Flowstar integrity test instrument, for easy integration into a HACCP or general quality management program, and for further cost optimization.

The highly hydrophobic double-layer PTFE membrane of the Pall **Emflon** PFR filters provides the high retention removal required to prevent starters' specific contamination risk.



Pall **Emflon** filter cartridges

- Aerosol challenged with bacteria spores and bacteriophages at high air velocity and humidity, resulting in titer reductions greater than  $10^{11}$  to ensure the highest efficiency in industrial environments
- Aerosol challenged in dry gases with sodium chloride to demonstrate  $>0.003 \mu\text{m}$  particle removal rating
- Liquid challenged  $0.2 \mu\text{m}$  sterilizing grade, retaining  $>10^7$  cfu /  $\text{cm}^2$  of *Brevundimonas diminuta* per modified ASTM F838-83 and FDA guidelines, to ensure maximum process safety
- High flow rate characteristics resulting in economical filtration and reduced energy costs through the use of smaller installations with minimum pressure drop
- Options capable of withstanding steaming conditions in either the forward or reverse direction for the required numerous cycles of reliable and cost-effective operation
- Backed by a detailed validation guide to document filter performance.

Integrity testing of sterilizing grade filters at regular intervals provides verification for use throughout their operating life.



Palltronic Flowstar Integrity Test Unit

Palltronic Flowstar instruments, designed with direct measurement technology for integrity control of both air/gas and liquid membrane filters, which can be linked to microbial validation, offer automated, rapid and highly accurate testing of all membrane filters in the dairy plant. A unique Multiplex version is capable of testing up to eight filters sequentially and automatically, further saving operator time. The compact and splash-proof design is optimally suited to be used in production environments. .

## Benefits

Pall **Emflon** PFR filters provide air, which efficiently protects the metabolism and growth of the selected bacteria starters, and thus improves dairy manufacturers' economics. With the recommended enhancement of integrity testing, dairy operators can be assured of additional reliability and cost savings.

- Reduction of product losses and downtime, with increase of equipment capacity, by better control of lactic acid production rate and maximized process yield
- Reduction of time and labor-intensive sanitation procedures in case of contamination
- Reduction of non-conforming product cost due to taste or flavor modification
- Process safety enhancement due to fermentation control and user-friendly integrity measurement programs
- Avoidance of premature filter change-out cost due to overly conservative preventive maintenance programs, by use of integrity testing.

## About Pall Corporation

Pall Corporation is the largest and most diverse filtration, separation, and purification company in the world. Pall serves the food and beverage industries with advanced membrane filtration technology and systems engineered for reliability and cost-effectiveness. Our systems are easy to install, simple to use, and satisfy a wide range of filtration requirements. Our Total Fluid Management<sup>SM</sup> approach offers customers solutions to address the needs of an entire process, encompassing filtration products, systems, services and training.



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