Being in biocontrol

State-of-the-art microbial control is the key to improving product safety and quality in paperboard manufacturing. Here, the expertise of your chemical supplier is crucial. That is why BIM Kemi offers its own one-stop-shop: BIM Biocontrol!

On a board machine, microbes can cause runnability problems, as well as various quality defects in the final product, such as holes and spots. Microbes can also compromise the hygiene of the final product. The risk is most significant when carton board is used for food packaging.

"There are a significant amount of brand owners among food manufacturers using carton packaging, for whom it is extremely important that the end product they produce is completely safe for the consumer to use," says Juha-Pekka Järveläinen, Head of BIM's Paper & Board Segment Team.

Site-specific control program needed

Bacteria are a common type of microbe in board machines. They often enter the process either through the air, raw materials such as pulp, pigments and starch, or with the water. As bacteria multiply in the process, they form a biofilm. A microbiological, mucilaginous entity begins to develop when a base layer consisting of, for example, wood extractives and dissolved interfering substances is formed on an initially clean surface.

"As the biofilm matures, it sloughs off, which can lead to equipment malfunctions and production disruptions such as line stoppages. In the final product, biofilm shedding can cause quality and production problems such as discolouration, holes and track breaks. Loose biofilm is also a hygiene risk," says Järveläinen.

The numbers and species of microbes that may be present on the board machine depend on the conditions.

There is no single microbial control program that is suitable for every mill, so the choice must always be made on a site-by-site basis!

"In microbial control, a chemical supplier with in-depth knowledge of the process is usually the best expert to tell you which method is best suited to the specific conditions," says Ossi Mäenpää, Head of Sales at BIM Finland.

The answer: BIM Biocontrol!

For years, BIM Kemi has worked in the way that Mäenpää describes. But recently, it has been formalised, rendering the full palette of the BIM Biocontrol available to everyone, everywhere!

BIM's labs lead the way!

Food carton manufacturers monitor the hygiene quality of their products through laboratory measurements carried out by an external lab. The challenge is the delay before the results are available. By then, the analysed batch has often already been delivered to the customer.

"Our strength is that we can reliably and quickly determine the number of bacterial spores in our own laboratory. When we offer our customers microbial protection, it is also our responsibility to ensure that the limit values are not exceeded," says Mäenpää.

More than 200 microbial samples are analysed every week in the BIM Finland laboratory in Kouvola alone.

BIM BRiDGE over troubled waters in the mills

Thanks to intelligent systems such as BIM BRiDGE and BIM BRiDGE BOX, the prediction, modelling and localisation of germination have taken a big step forward.

"So far, intelligent systems are still in the role of supporting the activity, not driving it. But the pace of development is very fast," says Mäenpää.

BimTwin2

BIM's BimTwin2 is a biocontrol program with stabilised chlorine that is well suited to utilise the hydrogen peroxide residue from the pulp bleaching process to kill off bacteria. The stabilised chlorine penetrates the cell wall of the bacterium and disrupts the internal functions of the cell, leading to the death of the bacterium.

This is a so-called total kill-program, which aims to eliminate microbes completely. The program operates over a wide pH range and is easy to manage and control by measuring the chlorine residual.
The program does not react adversely with fibre or other chemicals and can be supplemented with conventional biocides if required.

Catalase enzyme is an enzyme produced by bacteria that breaks down hydrogen peroxide, converting it into its elements, water and oxygen.

"One kilogram of catalase breaks down 300 kilograms of hydrogen peroxide per second. If the catalase enzyme is not controlled, the disinfection efficiency of hydrogen peroxide can be significantly reduced," says Järveläinen,

BIM BRiDGE and BIM BRiDGE BOX,

When a total kill program like BimTwin2 is in place, ideally the bacteria count is so low that the catalase enzyme does not cause problems. However, problems can occur in unstable situations, such as ramp-ups following a shutdown.
Halogenated oxidisers are chemicals containing halogens such as chlorine. They are strong oxidants and have, therefore, long been used for microbial control on board machines.
The popularity of halogenated oxidisers is based on their effectiveness, as even low concentrations can kill a wide range of microbes. They have a short duration of action, allowing a rapid response to microbiological problems.

"The use of halogenated oxidisers is based on the total kill method, where the bacterial count is quickly reduced to zero by the use of a biocide," says Järveläinen.

The versatility of halogenated oxidisers makes them suitable for a wide range of processes, and in many cases their use is cost-effective. However, improper dosing of halogenated oxidisers can expose equipment to corrosion.

"Volatile chlorine compounds are often associated with corrosion problems in the drying section. This risk is typically due to the evaporation of haloamines. In BimTwin2, this is taken into account in many ways, and chlorine-based chemistry is not dosed into the short cycle at all," says Mäenpää.

Järveläinen points out that the risk of corrosion must always be considered when halogenated acids are used in microbial control.
"We dose the halogenated oxidizers far away from the short cycle area and monitor the chlorine content of the drying section with CMV online sensors. With continuous information on the chlorine content of the process, our modern dosing equipment allows us to adjust the dosing automatically."

Bimogard curbs biofilm formation

Bimogard is a non-biocidal, lignin-based sanitation method. Its effectiveness is based on biodispersal, a process that prevents microbial accumulation in precipitates.

The Bimogard method uses three dif-

ferent mechanisms to control biofilm. Chemically, it combines a surfactant component and a non-biocidal lignin polymer derivative.
The surfactant component of Bimogard prevents or inhibits the development of a basal growth medium formed by the extractives. Subsequently, the lignin-based derivative of Bimogard prevents the attachment of micro-organisms to the substrate and interrupts the formation of sticky EPS.

Finally, the Bimogard lignin polymer derivative prolongs the delay before microorganism regrowth.

"Bimogard is suitable for process conditions where oxidative microbial removal is not possible, as well as for situations where species changes are made between brown and bleached pulps. It is also suitable for processes where short-cycle chlorine residues need to be kept low to minimise the risk of corrosion," says Järveläinen.

The traditional method is currently undergoing a revival. The use of organic biocides for microbial control in paperboard manufacturing has been restricted both in Europe and globally, which has increased the demand for non-toxic control methods such as Bimogard.

"Nature is the strongest force around, so why work against it if you don't have to? Caring rather than killing!" says Jan Hagnell, Technical Product Responsible for BIM's Bimogard products.

BIM Biocontrol – so much more

We at BIM could go on forever about how to control the microorganisms in pulp & paper mills.

What you have read above is just an appetizer to what any papermaker needs: direct contact with BIM's skilled biocontrolers!

Juha-Pekka Järveläinen
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