

EXPLORING THE MAJOR BENEFITS OF THE MUTAG BIOCHIP™



Multi Umweltechnologie AG (MUTAG) has more than 20 years of experience working with various types of MBBR carrier media from around the world. Experience used when we developed the Mutag BioChip™. In the following sections, we will highlight the key advantages of the product.

HIGH REMOVAL PERFORMANCE

The Mutag BioChip™ features an impressive, protected surface area of up to 5,500 m²/m³. In comparison, most competing products, as indicated by their respective suppliers, offer a significantly smaller surface area ranging from 500 to 800 m²/m³. Considering this specific aspect alone, the Mutag BioChip™ demonstrates a significantly higher removal performance per m³ of carrier media. Furthermore, the Mutag BioChip™ possesses additional distinctive features that enhance its removal performance.

DISTINCTIVE FEATURES

The biofilms inside the pores remain exceptionally thin, thanks to self-cleaning action caused by shear forces acting on the carrier's outer surface due to its movement in the wastewater. Thin biofilms are essential for optimal substrate and oxygen transfer from the water to the microorganisms in terms of biofilm diffusion depth. When tested alongside conventional media in comparative trials, the Mutag BioChip™ achieved biodegradation rates up to 6-10 times greater, despite having similar bulk volumes to conventional carriers.

THE PORE STRUCTURE

The Mutag BioChip™ features an extensively designed pore system, and it is worth noting that the biofilms develop within these pores. This unique pore structure offers protection to the biofilms, shielding them from potential mechanical disturbances, such as those caused by shear forces.

The motion of the carrier elements within the wastewater generates shear forces on the outer

surfaces of the Mutag BioChip™ carriers. These shear forces consistently wear away the biomass that grows from the pores. As a result, the biofilms remain consistently thin, ensuring optimal transfer of substrate, nutrients, and oxygen from the wastewater to all biofilm layers.

NO CLOGGING

Unlike numerous tube-shaped carriers that frequently encounter the problem of unintended and unregulated microorganism proliferation, referred to as clogging, the Mutag BioChip™ effectively avoids this issue thanks to its unique shape and motion attributes.

In contrast, clogged carrier elements are characterized by thick biofilms that hinder the supply of substrate, nutrients, and oxygen to the deeper biofilm layers. Consequently, these deeper layers are either minimally or not biologically active at all and furthermore, the thick biofilms reduce the available surface area for the attachment of active microorganisms, leading to a decrease in biodegradation capacity.



Clogged conventional carriers and unclogged Mutag BioChip™.



Unclogged Mutag BioChip™. Biofilm is only inside pores

WASTEWATER TREATMENT PLANTS

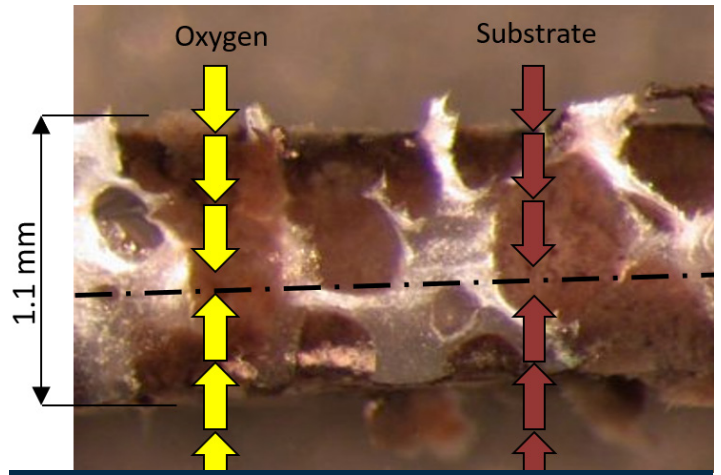
Since 2008, when it was introduced to the market, the Mutag BioChip™ has been operating effectively in numerous wastewater treatment plants across various countries. Since then there have been no reported instances of clogging issues associated with these systems. If desired, arrangements can be made to visit operational large-scale reference WWTPs for firsthand observations.

RELIABLE PERFORMANCE FOR PROCESS STABILITY

The removal performance stays consistently high, all thanks to the naturally regulated thin biofilms on the Mutag BioChip™, as previously explained, which are maintained at this optimal thickness through the self-cleaning action of shear forces. This means there is no decline in performance due to the formation of thick biofilms, as often seen with conventional tubular carriers. This stability in the biological treatment process is of paramount significance, particularly for end-customers and regulatory authorities, as it guarantees the consistent attainment of the necessary effluent parameters without any exceptions.



Pore system of the Mutag BioChip™, ensuring durably thin biofilms for optimal diffusion of substrate, oxygen and nutrients into all layers. Any biomass expanding out of the pores is permanently removed by shear forces.



Mutag BioChip™ cross section; substrate and/or oxygen can diffuse into the biofilms down to a depth of approx. 0.5 mm on both sides of the chips. This is possible due to the chip thickness of approx. 1.1 mm.

REDUCED TANK SIZE, LOWER CONSTRUCTION COSTS

The exceptional biodegradation performance of the Mutag BioChip™ carrier enables the use of a smaller carrier volume compared to conventional carriers, as it offers a similar protected active surface area with less volume. This advantage is financially beneficial to customers, resulting in cost savings through reduced tank volumes. Furthermore, it proves to be a vital feature in situations where space for constructing a new WWTP is limited.

SEAMLESS UPGRADES THANKS TO RESERVE CAPACITY

When utilizing tank volumes of similar magnitude as those used with conventional carriers and replacing conventional carriers with Mutag BioChip™, the media filling level tends to be quite low due to higher surface per m³ of carriers.

The advantage of this lower media filling is that it allows for the maintenance of a reserve media filling capacity. This reserve can be activated effortlessly by adding more carriers until the same filling ratio is achieved as with other carriers.

RESERVE CAPACITY FOR WASTEWATER PLANT FLEXIBILITY

This feature becomes particularly valuable in situations where a wastewater treatment plant faces increased loads or higher volume flows, possibly resulting from an uptick in production at an associated industrial facility. With conventional carriers, which lack such reserve capacity (as 60% media filling is considered the maximum), achieving a straightforward upgrade of treatment capacity becomes impractical. The only option in such cases would be to construct additional reaction tanks, resulting in significant costs for the customer.

UNLOCKING ENERGY SAVINGS POTENTIAL

The unique shape and specific density of the Mutag BioChip™, when colonized, result in distinct motion characteristics that demand less energy for agitation, such as process air supply. To keep the carrier suspended in wastewater. Utilizing the Mutag BioChip™ presents wastewater treatment plant operators with the opportunity to achieve substantial expenditure (OPEX) savings.

UNDERSTANDING ABRASION AND WEAR

Each element of the Mutag BioChip™ media possesses a remarkably low mass relative to its size. Consequently, when these elements interact with one another, the force transferred is so minimal that it effectively reduces the possibility of abrasion and wear to a minimum.



Foam carriers before and after operation - abraded.



Abrasion of carrier media in operation.



Clogged tube-shaped carrier.



Tubular carrier types.

MORE THAN JUST PLASTICS: OUR EXPERTISE

The development of the Mutag BioChip™ was based on extensive experience gained from operating various types of conventional biofilm carrier media. Additionally, MUTAG has amassed a substantial database of process data through numerous pilot trials and the operation of numerous large-scale plants that utilize this high-performance carrier.

Leveraging extensive data, MUTAG provides valuable resources to carrier media clients, including design calculations, equipment advice, technical support, and after-sales service for various processes like MBBR, IFAS, or Anammox. Additionally, the company specializes in engineering wastewater treatment plants using Mutag BioChip™ carriers, covering both basic and detailed aspects.

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