Mutag BioChip™
- high-performance MBBR carrier media for biofilms -

Major benefits at a glance

First of all, it has to be pointed out that Multi Umwelttechnologie AG’s staff has more than 15 years of profound experience with nearly each type of MBBR carrier media available on the global market. The different shortcomings of these carriers had been taken into consideration when the Mutag BioChip™ was developed by company Multi Umwelttechnologie AG. In the following, the major benefits of the Mutag BioChip™ are explained more in detail.

High removal performance due to specific carrier characteristics:

The Mutag BioChip™ has a protected active surface area of 3,000 m²/m³, which has been scientifically certified, whereas the most competing products provide only between 500 and 800 m²/m³ as per the statements of the respective suppliers. Taking into consideration only this particular point, the removal performance of the Mutag BioChip™ is correspondingly higher per m³ of carrier media. Moreover, the Mutag BioChip™ has further specific characteristics which increase the removal performance: the biofilms which establish inside the pores are kept very thin due to self-cleaning by shear forces which work on the outer side of the carrier (resulting from the carrier’s movement in the wastewater) whereas, with regard to the diffusion depth of biofilms, thin biofilms are essential for an optimal substrate and oxygen transfer from the water to the microorganisms. In conjunction with the particular motion characteristics, measured biodegradation rates of the Mutag BioChip in comparative trials with “conventional” media were up to 10 times higher than those of conventional carrier, considering the similar bulk volume of the different carrier types.
No clogging:

The Mutag BioChip™ has a very fine and detailed pore system which provides the large surface area of 3,000 m²/m³. In fact, the biofilms on the Mutag BioChip™ establish inside the pores. Inside the pore system, the biofilms are protected from any mechanical influence, for example resulting from shear forces. Clogging shall mean the unintended and uncontrolled growth of microorganisms as it can be observed with many conventional tube-shaped carriers, particularly in wastewater with high loads of readily biodegradable COD. The Mutag BioChip™ is prevented from clogging due to its specific shape and motion characteristics: The movement of the carrier elements in the wastewater creates shear forces at the outside of the Mutag BioChip™ carriers, which permanently abrade the biomass growing out of the pores. Consequently, the biofilms are permanently thin and the optimal transfer of substrate, nutrients and oxygen from the wastewater to all biofilm layers is ensured. Clogged carrier elements (please refer to the picture below) are characterized by thick biofilms which do not allow for the deeper biofilm layers being supplied with substrate, nutrients and oxygen. Consequently, these deeper layers are not at all or only hardly biologically active, whereas the thick biofilms reduce the surface area purposed for the attachment of active microorganisms, resulting in a decrease in biodegradation capacity.

Since 2008 (market launch after several years of R&D), the Mutag BioChip™ is successfully operated in a vast number of WWTP’s in countries all over the world without any reports related to clogging effects. On request, it is possible to visit large-scale reference WWTP’s in operation.
Constant removal rates = high process stability:

Due to the fact that the optimally thin biofilms on the Mutag BioChip™ are controlled in their thickness by the aforementioned self-cleaning effect due to shear forces, the removal performance is maintained at a highly constant level (no decrease in performance caused by thick biofilms as with “conventional” tubular carriers). Especially for the end-customer and authorities, the stability of the biological treatment process is a highly important criterion in order to not exceed the required effluent parameters at any time.

Smaller footprint of the reaction tanks = savings in construction expenses:

The high biodegradation performance of the Mutag BioChip™ carrier allows for using less carrier volume than with “conventional” carriers since there is less Mutag BioChip™ volume required for providing the similar protected active surface area. This fact is highly beneficial for customers as they can save money due to smaller tank volumes and it is a crucial feature when there is only limited space available when building a new WWTP.
Reserve capacity = easy and quick upgrade at any time:

If similarly large tank volumes are applied as with “conventional” carriers or if conventional carriers are replaced with Mutag BioChip™, the media filling degree will be very low (due to the higher surface area per m³ of carriers). The lower media filling with Mutag BioChip™ allows for maintaining a media filling degree reserve which can be activated by simply adding more carriers until the same filling ratio is reached as with competing carriers. This fact is interesting in a situation where a WWTP has to deal with higher loads and/or volume flows, for example resulting from a production increase in the connected industrial plant. With conventional carriers (which provide no reserve capacity; 60% media filling is considered to be the maximum), a suchlike simple upgrade of the treatment capacity is not possible and there have to be built additional reaction tanks = very costly for the customer.

Energy savings potential:

The special shape and specific gravity of the colonized Mutag BioChip™ provide particular motion characteristics which require less agitation energy in the form of process air supply in order to keep the carrier suspended in the wastewater. By using the Mutag BioChip™ WWTP operators have the possibility to benefit from significant savings in OPEX (operational expenditure).

Low transport costs due to less required carrier volume:

As mentioned above, the Mutag BioChip™ is exported by Multi Umwelttechnologie AG to countries all over the world. It is obvious that the transport costs are significantly lower than with “conventional” carriers which need to be delivered in higher volumes in order to provide a similarly large surface area.
Favorable price - surface area ratio:

The Mutag BioChip™ offers a price-to-surface area ratio which is more favorable than many other carrier types. In order to properly evaluate offers for carrier media, it is required to compare prices of different media not per m³ but per m² provided by any type of carrier media, since each media has a different m²/m³ ratio. For this reason, it needs to be taken into account that the protected active surface area (in m²/m³) and not solely the volume (in m³) of carrier media which is crucial for the removal performance.

Comparison of the protected active surface areas of different types of MBBR carrier media
Abrasion and wear:

One single element of the Mutag BioChip™ media has a very low mass compared to its size. Consequently, the impulse transferred in the case of contact with another carrier element is that insignificant that each kind of abrasion and wear is maximally reduced. Contrary to that, it is not a rarely occurring phenomenon that several tubular carrier types (often injection-molded and heavy related to their size) break after a certain time in operation and subsequently, the broken carrier parts can be found on the water surface in the clarifiers of the WWTP.
Cube-shaped carrier made of foam

- new carriers - cubic shape -

- same type of carriers after operation - abraded -