



JÄGER

Umwelt-Technik

CLEARTEC[®] TEXTILE FIXED BED

BIOLOGICAL GROWTH

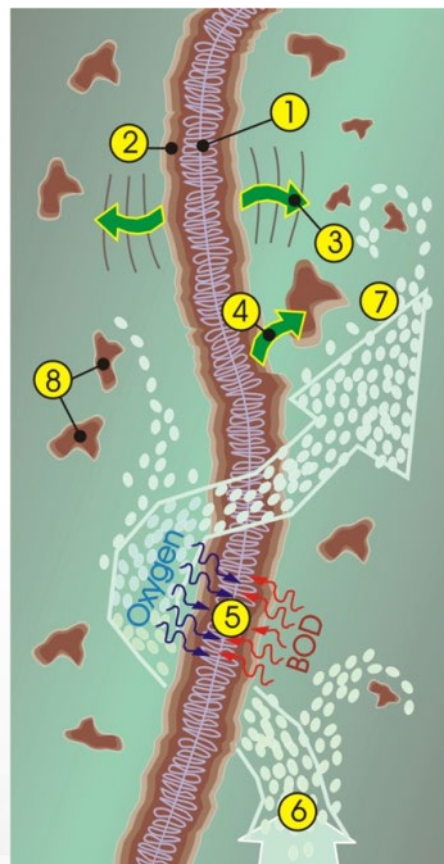
FUNCTION AND PROCESS

The patented technology Cleartec® develops its full performance when used in combination with suspended biomass (8). The growth stripes (1) are weaved with loop straps, which ensure an ideal habitat due to the existing high inner surface in the growth stripes. Thus, adhesion of bacteria increases.

The oxygen for biomass supplied by diffused aeration (6) creates a vertical flow (7), which, due to the flexibility (3) of the media, regulates the thickness of the biofilm (2) by constant removal of old biomass (4).

Abrasion of biomass occurs on the basis of bacterial metabolism processes (5). As a result new active biomass grows and boundary surfaces are renewed. The sheared biomass goes into the suspension, where it becomes a highly effective „third biomass fraction“ with very good settling properties in the system.

Therefore, the aeration, on the one hand, ensures ideal oxygen supply for active biomass and, on the other hand, a regular removal of the biofilm from the surface, which is made possible by the flexibility of the textile. Consequently, an enrichment (maintenance) of the high-performance and easily settlable third biomass fraction takes place.





BIOLOGICAL GROWTH

FUNCTION AND PROCESS

IFAS

In conventional WWTP's the sedimentation volume in secondary clarification is the limiting factor of the content of biomass in aeration tanks. The so-called IFAS process (Integrated Fixed Film Activated Sludge) combines suspended and sessile biomass by installing a synthetic media as growth surface for additional biomass in aeration tank. This combination enables a much higher concentration of biomass and, as well, a higher sludge age compared to conventional operation. IFAS allows a performance increase of biology up to 100% or more without any constructional measurements for volume enlargement of aeration tanks or of secondary clarifiers.

Comparison of different types of IFAS

In contrast to other IFAS systems, Cleartec® needs no restraining measures to prevent flush-out of growth material from the aeration tank. Due to the modular structure, flushing out the media is impossible.

With its high mechanical resistances, replacement of fabric is rare. No additional energy is required to mix the growth media or to prevent blockages. Aeration is only necessary to supply the biomass with oxygen and the required air input is also sufficient to shear off the biofilm.

MATERIAL

TEXTILE FIXED BED

With Cleartec® Biotextil and BioCurlz the Jäger Group of Companies expands its portfolio in the field of wastewater technologies.

The advantages of the structured surface as well as the flexibility of textiles can be used and combined with the reliable biofilm technology from wastewater treatment.

The material

Cleartec® Biotextil is made of the material Polypropylene (PP) and used as textile media for microorganisms in municipal and industrial WWTP's as well as for special applications. BioCurlz are made of PP and Polyvinylidenchlorid (PVdC).

The highly structured growth stripes have a high surface roughness and therefore they are ideal for settlement of microorganisms. Additionally, the large specific surface provides more protection for the biofilm.



MATERIAL

TEXTILE FIXED BED

Structure

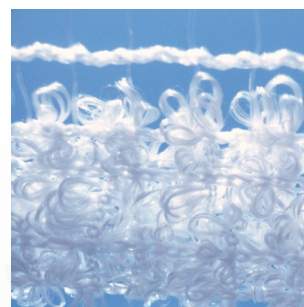
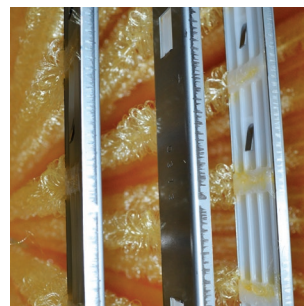
High fabric density (growth stripes) alternates with loose structured zones in the design of textile. As standard, one textile consists of 16 growth stripes with double-sided special-knitted synthetic loops and has a width of one meter.

One unit Cleartec® BioCurlz consists of six strings with holding bars made of plastics with metal reinforcement. The yarns are woven around the strings and thus build a three dimensional structure. BioCurlz are variable in its length.

This structure offers ideal growth conditions for biomass and best flow conditions for wastewater and oxygen.

Biofilms are considered as the archetype of life and consist of an accumulation of different microorganisms. In the biological waste water treatment biofilms are used in several forms: suspended as flakes in the activated sludge suspension or sessile on a provided media.

Microorganisms use pollutants from our wastewater as nutrients for energy and cell metabolism. By this, they contribute to limit eutrophication of waters.





SYSTEM

THE CLEARTEC® MODULE

Cleartec® works as a system. The textile is fixed into a stainless steel cage, which can be assembled with aerators if required. A complete Cleartec® module consists of:

1. Stainless steel cage

The stainless steel cage is used as holding construction for Cleartec®. Cleartec® Biotextil has up to four retaining straps – depending on the total length. Cleartec® Biotextil can be fixed into the cage by inserting pipes into retaining straps. Similarly, BioCurlz are fixed into the cage by metal reinforced holding bars. This cage construction can be hoisted out of tank even while operating.

2. Cleartec® growth media

The structure of Cleartec® Biotextil and BioCurlz provides a great inner surface area and ideal conditions for the growth of biofilm. The loops are used for fixing the textile into cage construction. The textile itself can move flexibly in the flow, which provides a steady abrasion of biomass.

3. Diffuser

Aeration of textiles enables an optimal oxygen supply for biomass. Additionally, it provides great flow conditions to keep the flexible textile in motion and contributes to abrasion of biomass. Furthermore, clogging can be prevented.

SYSTEM

THE CLEARTEC® MODULE

Advantages Cleartec® module

Optimal conditions for growth

With perfectly matching components the modular construction guarantees ideal flow conditions within the fixed bed, optimal oxygen supply for the biomass, a steady abrasion for surface renewal and control of higher microorganism concentration while operating. Thus, several advantages of diverse biofilm processes are combined.

Easy handling

During operation, single modules can be hoisted out, e.g. for diffuser maintenance. The modular construction provides a flexible application and can be customized. Furthermore, the module's structure facilitates control of the system concerning predators.

Longevity and time-saving

The textile growth media is resistant against chemical and mechanical influences and is therefore maintenance-free. Cleartec® modules assure low maintenance, which is demonstrated by several reference plants, some operating for over 17 years. Only the time for control and maintenance of aggregates has to be considered.



ADVANTAGES IFAS

ALL ADVANTAGES AT A GLANCE

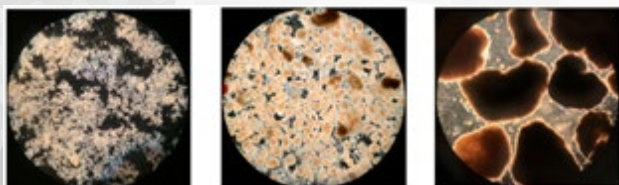
Great inner surface area

Thanks to the structured growth stripe, bacteria adhesion increases. Thus, the biofilm is composed of specialists and a high density of common microorganisms. After the biofilm has been sheared off, the active surface area increases, which boost the degradation capacity.



Improved sludge characteristics

In a combined process activated sludge shows better sedimentation due to sheared biomass. With the textile fixed bed a lower sludge volume index (SVI) of about 65-85 ml/g can be achieved, whereas SVI in a conventional process is 110-150 ml/g on average. Through an adapted operation management, Cleartec® positively influences the granulation process, which enables a further reduction of the SVI.



Capacity increase

It is not necessary to enlarge basin volume for performance increase, if the biological stage runs with sessile biomass. The IFAS system leads to a higher concentration of biomass, which is used to remove pollutants. Depending on the plant structure, an increase of capacity of more than 100% can be reached without added load to the secondary clarifier.





ADVANTAGES IFAS

ALL ADVANTAGES AT A GLANCE

Performance increase

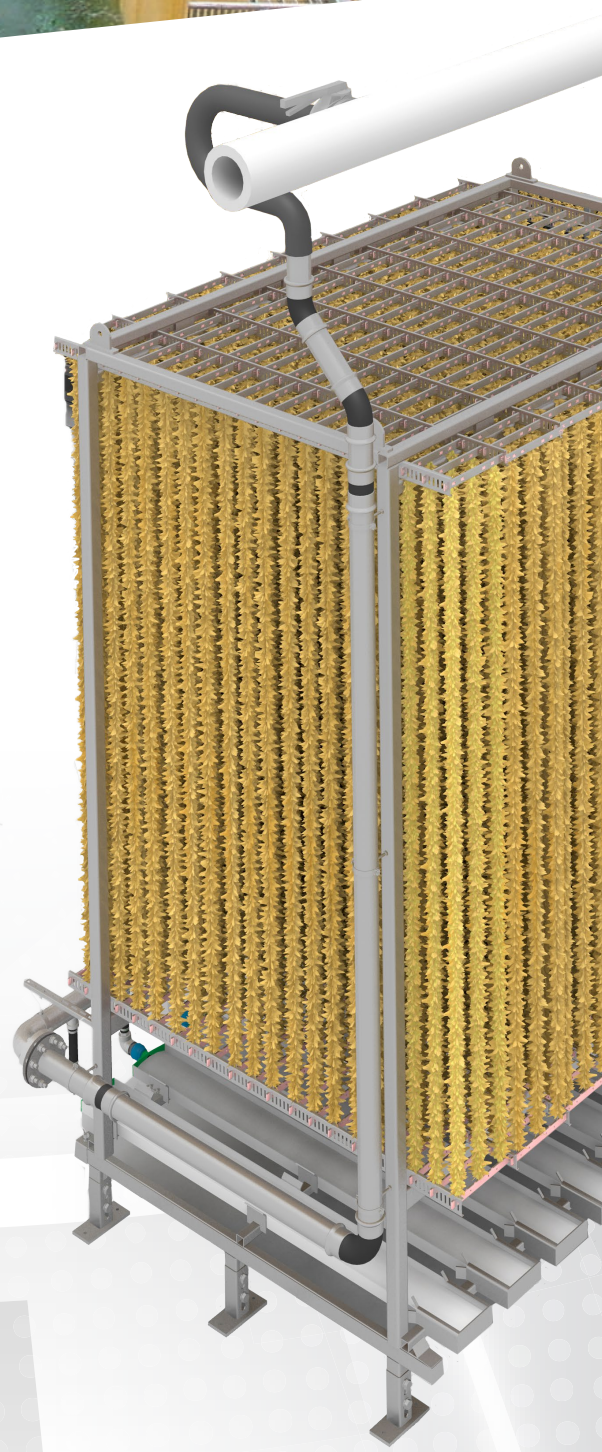
In comparison to conventional operation the Cleartec®-IFAS system works with conventional suspended, sessile and shear-off biomass. Along with the increase of biomass the sludge age increases at the same time. Therefore, more Nitrifiers accumulate, which eliminate Nitrogen more efficiently.

Especially, elimination of carbon and nitrogen reaches very high specific degradation rates. The number of specialists also increases due to the high sludge age. This enables the removal of persistent substances from industrial waste water.

Operation stability in biological process

The biofilm provides the ideal basis for existence and, due to its structure, adequate protection for microorganisms with high generation times. The combination of sessile and suspended processes additionally increases the total biomass content. Thereby, a year-round nitrification performance can be achieved.

This application ensures stable effluent during hydraulic peak loads as well as during toxic loads and variation in pH. Peaks, such as nitrogen shocks during rainy weather and draining rainwater overflow basin, are removed without "conspicuity in effluent".





FIELDS OF APPLICATION

MUNICIPALITY AND INDUSTRY

Municipality

IFAS has been especially proved in municipal sector. Great Nitrification performance and high operation stability, which are reached with IFAS, are important for municipality.

If legal requirements regarding effluent quality (e.g. nitrogen elimination) are stringent, the performance of an existing plant needs to be increased; with IFAS without conventional enlargement. That offers a special alternative in case of space shortage for plant expansion.

Due to low-maintenance or maintenance-free operation Cleartec® Systems offer a further advantage for decentral applications: The Biological process needs no complex technology and process control and still fulfills the required cleaning performance. Thus, it ensures reliability of plant.

Industry

Industry has the choice to treat waste water as direct discharger or indirect discharger. Companies who take care of their own biological and hazardous substances in compliance with legal standards are allowed to discharge the treated waste water directly into natural watercourses.

Indirect discharger drains waste water in sewers and through a municipal WWTP into waters. However, waste water of industry contains pollutants, which are not allowed to be discharge a directly into drainage. These substances have to be removed from waste water. Municipality takes on removal of biological pollutants.

Depending on the composition of waste water, the charging rate for waste water treatment and legal requirements, it can be useful for both possibilities to run an own WWTP with a biological stage.

Cleartec® with its hybrid process of sessile and suspended biomass is suitable for this application. The defined biofilm offers optimal conditions for settlement of specialists with high generation times. Thereby, a biocenosis, adapted to specific solids, can be developed.

Cleartec® fixed bed systems are appraised for carbon elimination. Therefore Cleartec® has already been established as media in food, textile and pharmaceutical industry.



SPECIAL APPLICATIONS

NUMEROUS APPLICATIONS

Due to modular installation Cleartec® growth media is flexible, which makes it suitable for miscellaneous fields. The media are available in variable lengths and widths and thus applicable for different installations.

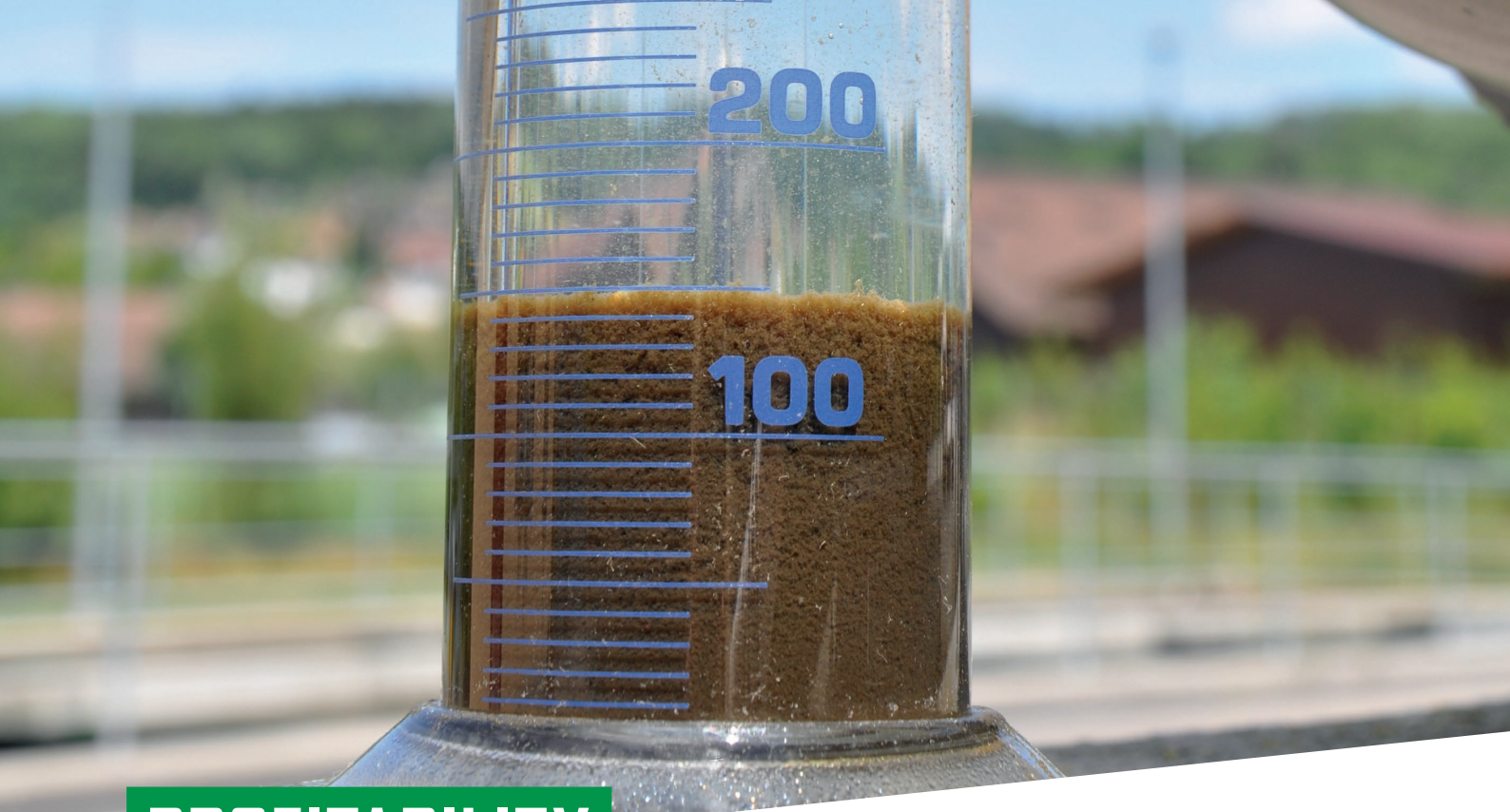
Pond treatment plants

Pond treatment plants are used for waste water treatment world- wide. Cleartec® is optimal to increase treatment efficiency. Due to flexible installation options Cleartec® is ideal for applications in a limited space.

Beside a pond treatment plant Cleartec® Biotextil is also installed in a cleaning plant of a water cycle at the zoo in Zurich.

Floating reactor

A further project with Cleartec® is the floating reactor for improving water quality in flowing and standing urban waters. Thereby, the textile is fixed in a type of swimming cage and applied into waters. The application benefits from the high performance of Cleartec® fixed bed media, which allows great efficiency with simple technology.



PROFITABILITY

CAPACITY INCREASE

Profitability and performance

If a capacity increase of an existing plant is necessary, there is an alternative to conventionally enlarging a plant by realizing a capacity increase with Cleartec® of more than 100% without constructional measures.

In contrast to conventional enlargement, retrofitting to a Cleartec® IFAS process results in a performance increase with lowest CAPEX.

Cost comparison of a plant targeting capacity increase by maintaining the same cleaning performance.

Conditions

Municipal WWTP

$V_{AB} = 2.000 \text{ m}^3$

Biomass (MLSS-Content): 4 kg/m^3

Request

Kapazitätserhöhung der biologischen Stufe um 75% bei gleichbleibender Reinigungsleistung.

	Cleartec® Biotextil	Conventional enlargement of 75%
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Total costs	380.000,00 €	680.000,00 €
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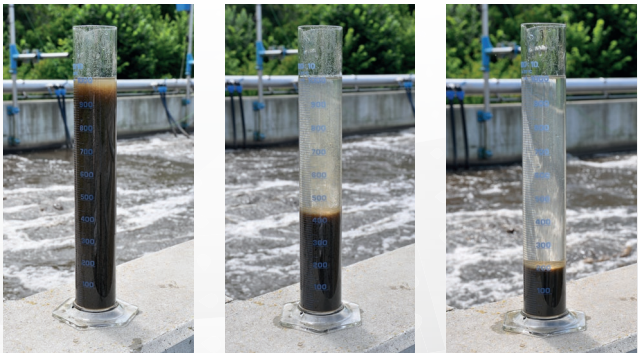
Saving in	44 %
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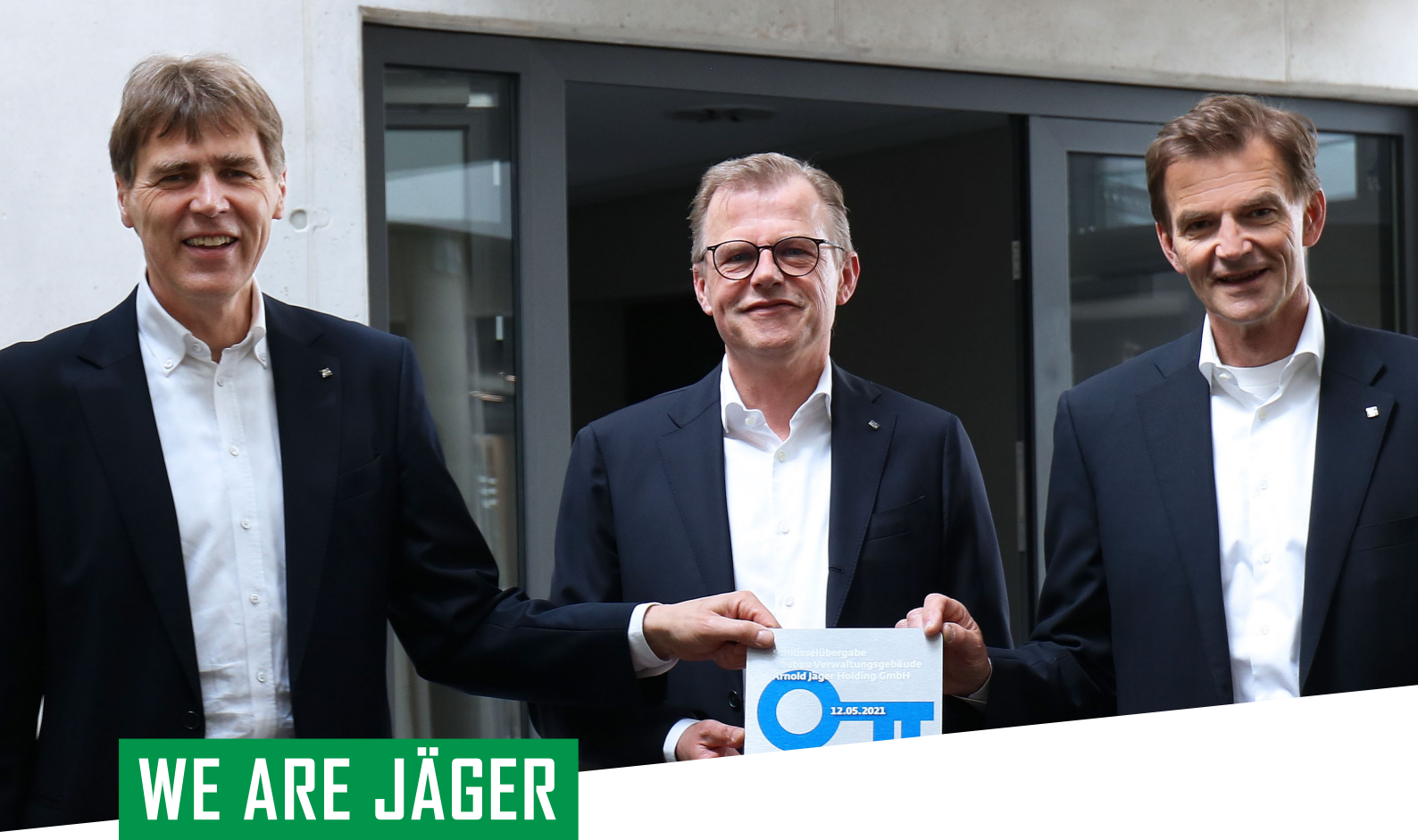
Capacity increase of a municipal WWTP

By installing of fixed bed in the aeration basins the total biomass (additional sessile and suspended biomass) has increases about 70 % in addition to suspended biomass. The increase of total biomass leads to a lower sludge load.

At the displayed example the aerobic sludge load has been decreases by approx. $0,1 \text{ kg BOD/kg MLSS} \cdot \text{d}$.

Due to the biofilm on the textile, which has a much higher sludge age, more Nitrifiers enter the system. The shearing off of the biofilm and the resulting boost of activity due to the increase in surface area, lead to a much better performance in terms of $\text{NH}_4\text{-N}$ degradation.





WE ARE JÄGER

WE GREW UP WITH RUBBER

Since 1942, when Gummi-Jäger, the parent company of Jäger Umwelt-Technik GmbH, was founded, application-oriented advisory service, material-oriented construction and system related development are the key for the Jäger Group's success.

Our competence and performance have continuously grown with the customers' requirements. Our success is based on continuous product innovation, material-independent consulting as well as a friendly, competent service and zero-defect philosophy.

The family business in its third generation operates worldwide and is a qualified partner in the field of automotive, environmental and agricultural industry as well as in machine and plant engineering and oil exploration. Over 1.000 employees working in more than 20 sites in Europe, the USA and China aim to ensure that.

Our Philosophy

Thinking across departments and corporate boundaries as well as generating competitive advantages for one's own company, customers and suppliers: Due to these guiding principles the Jäger Group of Companies is a professional partner in all branches of machine and plant engineering.

Confidence in cooperation

Successful customer relationships are based on trust. For us, this means reliability in our promises and actions, fairness in equal partnership and the trustworthiness of the Jäger entrepreneur family.

Liability in partnership

Joint work with the most various suppliers guarantees competitive advantages for our customers.

Understanding in problem solution

By the combination of the most different materials and the integration of various functions in a system component we guarantee our customers a lasting advantage in competition.



40 YEARS OF INNOVATION

WE ARE THE ORIGINAL

At the beginning of the 1970's aeration systems did not longer meet the requirements of waste water treatment entirely. 40 years ago Arnold Jäger developed, cooperating with the leading German wastewater treatment plants, the first rubber membrane diffuser. Since that time, the innovative rubber EPDM-membrane diffusers save energy and processing costs.

Since 1975, Gummi-Jäger produced more than 25 million membranes and diffusers for the leading manufacturers of waste water companies all over the world. During the last four decades, Arnold Jäger and his sons took out more than 30 patents on aeration technology in Europe and the USA.

The development team of the Jaeger Group of Companies perpetually works to improve the aeration technology. In order to meet the growing importance in the field of aeration systems, all Jäger activities concerning waste water treatment have been transferred to Jäger Umwelt-Technik GmbH in 2007.

Our core competence is providing unique aeration solutions for biological wastewater treatment.

Our success is based on continuous product innovation, friendly, competent service and zero-defect philosophy

Well-engineered

The used materials and production processes reflect our decades of experience. JetFlex® diffusers' HD, CBD, TD and SD performance data fulfill all requirements. Due to the broad range of accessories our JetFlex® diffusers may replace any existing systems on any available aeration grids.

Innovative

In addition to our standard product range we implement our customers' ideas and demands into tailor-made membranes and diffusers. Many renowned waste water companies effectively use our experience of waste water resistant materials, innovative production technology and complete quality control. In that way they benefit from distinctive energy efficient designs and, thus, produce sustainably competitive advantages.

We enable our customers to comply with almost every effluent specification and project-specific life cycle cost requirements. State of the art engineering tools (CAD, CAM, FEA), in house medium scale testing and evaluation facilities and the close cooperation with research organizations such as the Leibniz University of Hanover or the German Institute for Rubber Technology (DIK) ensure further continuous improvement and innovation.



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