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# CLEARTEC® TEXTILE FIXED BED





## AN OVERVIEW

Naturetech aims to improve the state of water in the world by bringing innovation to the forefront of the fight against pollution.

With vast experience and knowledge base, we along with our partners strive to bring you an economical and robust solution for optimal results. We operate on a custom design and delivery approach to ensure complete customer satisfaction while delivering organic results.

With our focus on Wastewater, we encourage all the stakeholders in the cycle (Govt, Private Enterprise and Households) to join us take the next step towards water recycling.

Win the fight  
**AGAINST POLLUTION.**

- Strong team of Professionals
- Experts from diversified field
- In house technical-commercial resources
- Tie up with financial institutions
- Close ties with Government and Public-Private organizations
- International Channel Partners for various technologies



## MATERIAL

### TEXTILE FIXED BED

#### The Material

Clartec® Biotextil is made of the material Polypropylene (PP) and used as textile media for micro-organisms 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 micro-organisms. Additionally, the large specific surface provides more protection for the biofilm.



#### 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 0,96 m.

One unit Clartec® 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 waste water as nutrients for energy and cell metabolism. By this, they contribute to limit eutrophication of waters.



STRIVING TO  
BRING YOU  
THE BEST IN  
TECHNOLOGY.



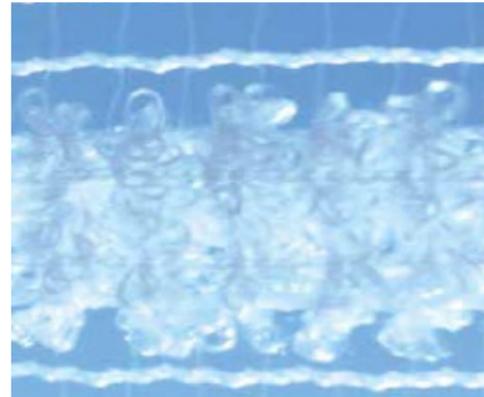


## BIOLOGICAL GROWTH

### FUNCTION AND PROCESS

Mostly the textile media is 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 creates a vertical flow, 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.

Therefore, the aeration, on the one hand, ensures ideal oxygen supply for active biomass and, on the other hand, regulation of predators due to textile flexibility.



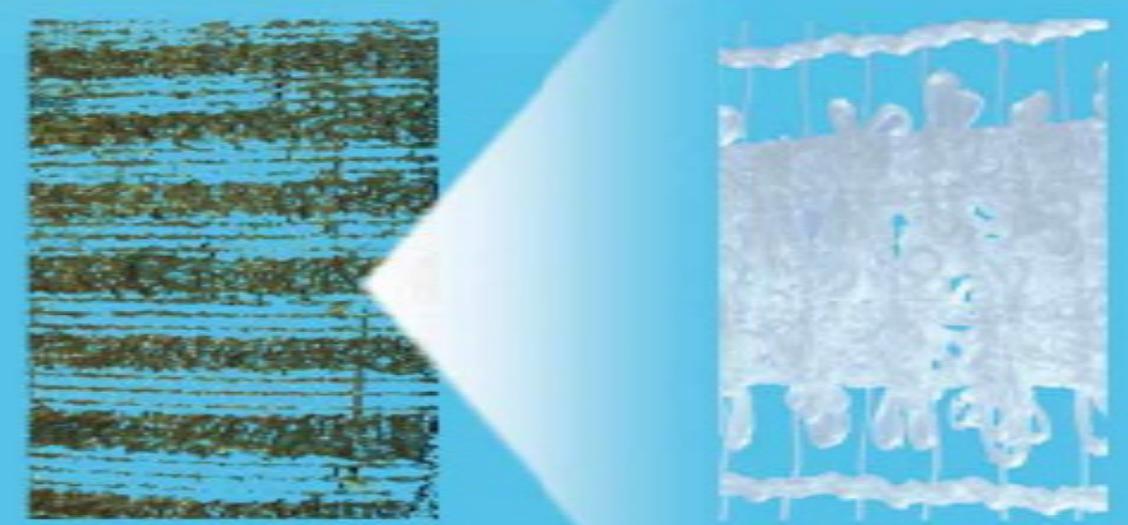
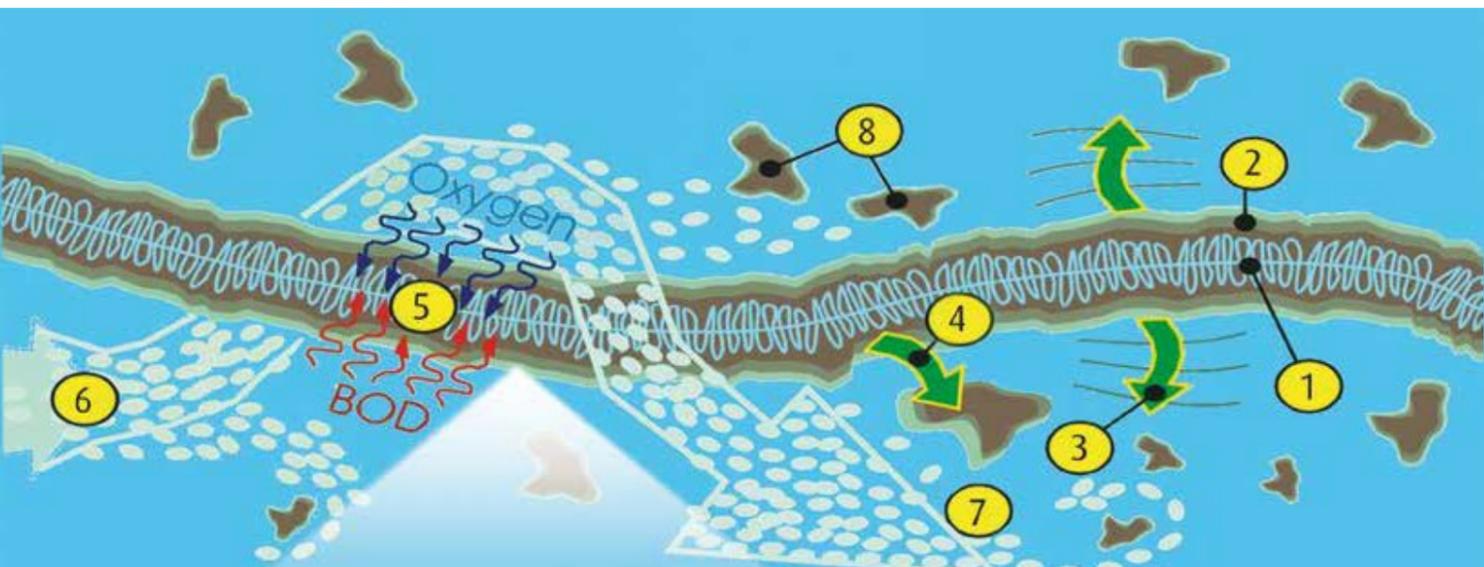
### IFAS

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% and more without any constructional measurements for volume enlargement of aeration tanks and secondary clarification.



### 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 is impossible. Because of high mechanical resistances, replacement of fabric are rare. Additional energy input to mix up the growth material or to prevent clogging is not necessary. Aeration is required only for the biomass' oxygen supply.





## SYSTEM

### THE CLEARTEC® MODULE

Cleartec® is used 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®.

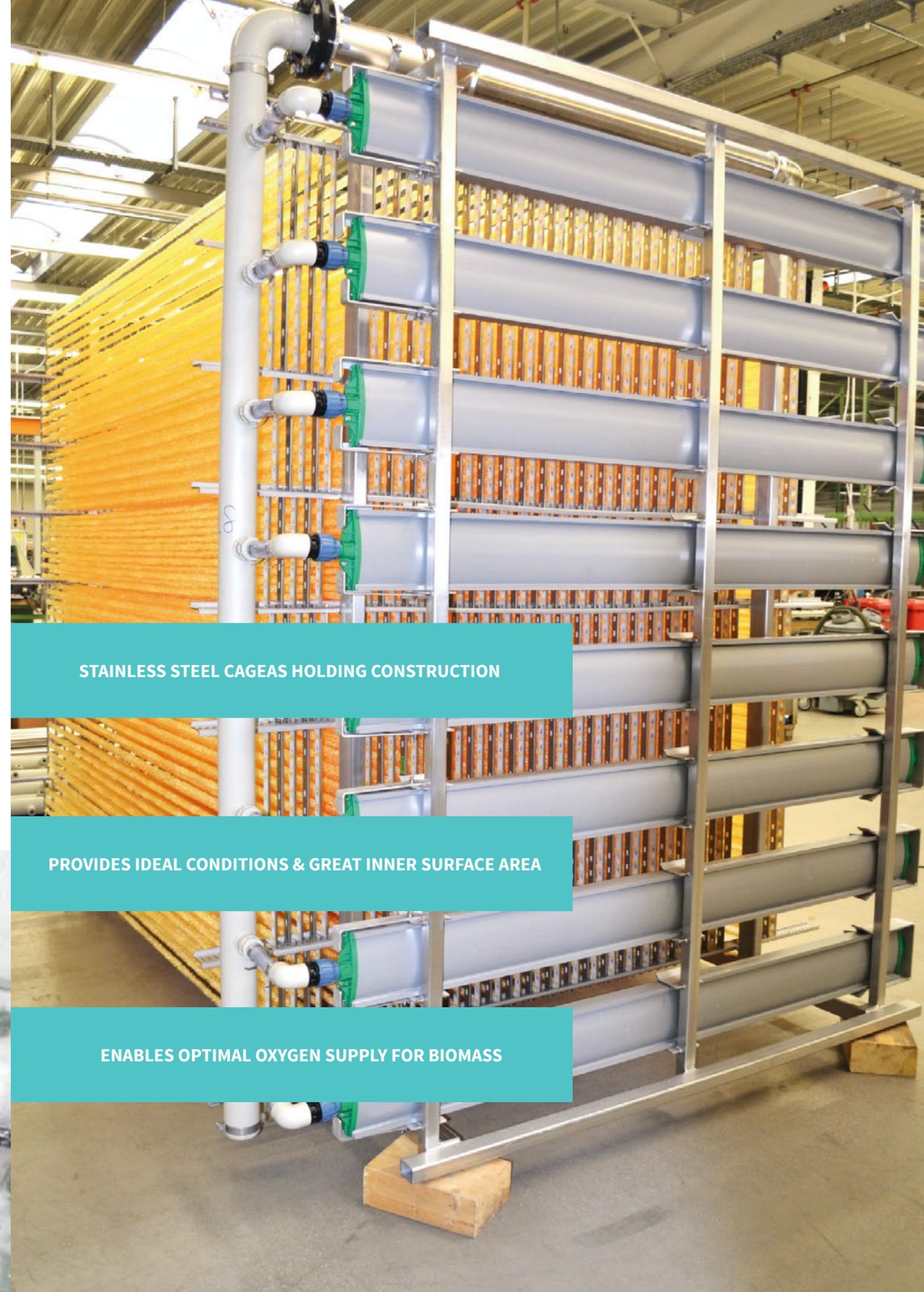
Cleartec® Biotextil has up to four retaining straps – depending on the total length. Cleartec® Biotextil can be fixed into the cage by inserting pipes into retaining straps. Similarly, BioCurlz are fixed into the cage by metal reinforced holding bars. This cage construction can be hoisted out of tank 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

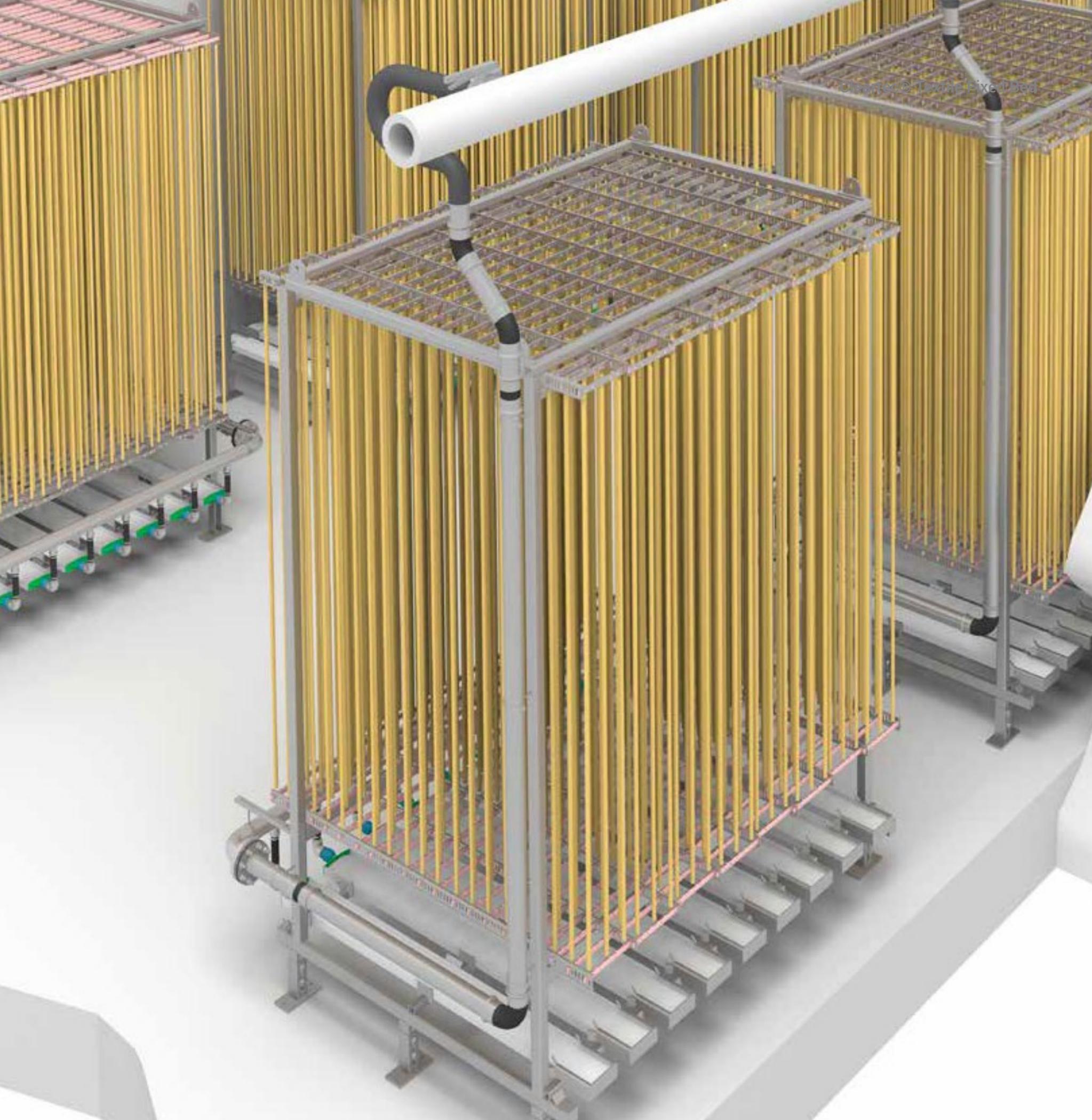
Aeration of textiles enables an optimal oxygen supply for biomass. Additionally, it provides great flow conditions to keep the flexible textile in motion and contributes to abrasion of biomass. Furthermore, clogging can be prevented.



STAINLESS STEEL CAGEAS HOLDING CONSTRUCTION

PROVIDES IDEAL CONDITIONS & GREAT INNER SURFACE AREA

ENABLES OPTIMAL OXYGEN SUPPLY FOR BIOMASS



Cleartec® Textile Fixed Bed



## 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 therefore maintenance-free. Cleartec® modules assure low maintenance, what is demonstrated by several reference plants processing since over 17 years. Only the time for control and maintenance of aggregates has to be considered.

# ADVANTAGES OF IFAS

01

## GREAT INNER SURFACE AREA

Due to the structured growth stripe, bacteria adhesion increases. In comparison to other types of fixed bed, with Cleartec® nitrification proceeds faster.

02

## IMPROVED SLUDGE CHARACTERISTICS

In a combined process activated sludge shows better sedimentation due to shearing biomass. With the textile fixed bed a lower sludge volume index of about 75-90 ml/g can be achieved, whereas SVI in a conventional process is 110-150 ml/g on average. Furthermore, less bulking sludge is produced due to lower percentage of filamentous bacteria in activated sludge. Compared to other systems, applying chemicals is not needed.

03

## 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 decompose pollutants. Depending on the structure, an increase of capacity of more than 100% can be reached without even loading the secondary clarification.

04

## PERFORMANCE INCREASE

In comparison to conventional operation the IFAS system works with suspended and sessile biomass. Along with the increase of biomass proportion the sludge age increases at the same time. Therefore, more nitrificants 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.

05

## 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 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; by 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.

Moreover, the process offers the possibility to operate with an entirely sessile process and is ideal for plants, which cannot facilitate return sludge.



#### 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 usage Cleartec® growth media are flexible products, 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 worldwide. 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.





## SELECTED REFERENCES



ARA Kelleramt / Switzerland			
Max. Flow	Capacity	Operation	Treatment
5.900 m <sup>3</sup> /d	21.300 PE	aerated	Nitrification, Partialdenitrification, P-precipitation



Komarno / Slovakia			
Max. Flow	Capacity	Operation	Treatment
12.500 m <sup>3</sup> /d	55.000 PE	upstream Denitrification	Complete N-Elimination, 1. configuration level



Terrassa / Spain			
Max. Flow	Capacity	Operation	Treatment
80.000 m <sup>3</sup> /d	450.000 PE	Bardenpho, C-addition	Nitrification, Denitrification, P-precipitation (Fe)



Geiselbullach / Germany			
Max. Flow	Capacity	Operation	Treatment
80.000 m <sup>3</sup> /d	250.000 PE	upstream Denitrification, Bio-P (add. P-precipitation)	Nitrification, Denitrification, Bio-P



Gorizia / Italy			
Max. Flow	Capacity	Operation	Treatment
1.700 m <sup>3</sup> /d	8.000 PE	intermitting	Nitrification, Denitrification



Mukwonago / USA			
Max. Flow	Capacity	Operation	Treatment
5.700 m <sup>3</sup> /d	12.500 PE	aerated	Performance increase, Nitrification



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