

## The High-Tech of a Creek

The Biofilm Technology for  
Large Wastewater Treatment Plants.

discovered by  
**OURWATER**



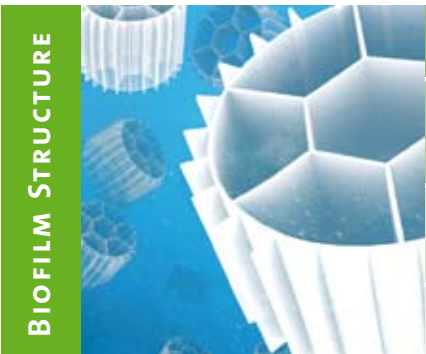


## Exceptional Treatment from 4 to 5000 Inhabitants.

The researchers from the Bergmann Gruppe in co-operation with the technical universities of Chemnitz, Cottbus and Dresden in Germany developed the new wastewater treatment process known as “Wirbel-Schwebbett-Biofilmverfahren” (WSB®) or “fluidized floating bed biofilm process” as translated into English. Developed for the small domestic treatment market, this unique wastewater cleaning process has proven itself around the world in over 20,000 residential installations. The advantages of this process have now been developed for the commercial market. WSB® clean pro is a pure biofilm process that combines the positive aspects of both suspended growth and fixed-film technology without any of the limitations.

### The Process.

The core of the process is the specially designed biofilm carriers that have a density slightly below that of water. Fine bubble diffusers transfer air into the liquid on an intermittent basis which causes the biomedica to completely mix within the bioreactor during aeration and float just below the water surface when off.



<b>LAMINAR INTERFACE</b>	The surface of the biofilm.
<b>AEROBIC LAYER</b>	Is responsible for the degradation of carbon compounds and the conversion of ammonium to nitrate.
<b>ANOXIC LAYER</b>	In the absence of dissolved oxygen, the bound oxygen is used to turn nitrate into nitrogen and oxygen (denitrification).
<b>ANAEROBIC LAYER</b>	Here sulfate is degraded.

*Microorganisms attach themselves to the biomedica, forming a biofilm.*

### **The clarification process of WSB® clean pro.**

Incoming wastewater travels by gravity through the sedimentation and pre-treatment stages. Coarse particles settle and are stored here along with return sludge from the final. The mechanically pre-processed wastewater is now fed to the biological stage. The biological clarification principle is based on the biofilm process. Microorganisms settle on plastic carrier media and consume the organic material in the wastewater. The carrier is made from polyethylene and has a very large protected surface area of 500 m<sup>2</sup>/m<sup>3</sup>. Oxygen is needed for the clarification process and is supplied by a compressor and distributed in the wastewater by fine bubble diffusers. Through procedure, surplus and/or dead micro-organisms are removed and settle in the final clarifier creating secondary sludge. The final clarifier consists of a cone or sloped area in order to collect and transfer the sludge back to the sludge storage.

Unlike activated sludge processes, secondary sludge is not returned to the bioreactors in order to maintain the bacterial culture. From the final clarifier, the biologically cleaned wastewater is ready to be discharged back into the environment.

### **Optimal operation with minimal energy consumption.**

WSB® clean pro is equipped with a control unit for the electrical supply and automatic control of the compressor and sludge return pumps. In order for optimal operation to occur at minimum energy consumption, the biological aeration occurs intermittently with flexible operation and rest settings. Actual operating parameters can be precisely defined to take into account the varying load time throughout the course of the day. The operation cycle of the sludge return pump is designed so that the final clarifier is completely clean of secondary sludge. As a result of nitrification, the formation of floating sludge may occur in the final clarifier. This material is removed through a floating skimmer and returned to the sludge storage chamber. Sludge is typically produced at a rate of 0.96 l per person per day – up to 55% lower than most activated sludge systems. Sludge Storage tanks are typically designed for three to four months of storage capacity. The precise sludge storage time is dependent on the degree of utilization and is subsequently determined during operation.

### **Specific process benefits.**

WSB® clean pro utilizes a very thin biofilm and high cell density as opposed to other biofilm process, such as trickling filters, rotating biological contactors, and fixed bed systems. Its specific properties are the basis for the following process benefits:

- + Nitrification at temperatures below 12° C
- + Simultaneous nitrification and de-nitrification of at least 30 to 50%
- + Media is self cleaning and never has to be replaced
- + Robust system able to handle shock loading and extremely long periods of low loading
- + Low sludge generation
- + Microbiological elimination of pathogenic germs
- + Low consumption of energy and minimal operating costs
- + Ability to adapt to toxic materials

# An Overview of WSB<sup>®</sup> clean pro.



## Control unit

The control unit controls the sludge return intervals and the air compressor.



### ① Sludge Storage

With the inflow of wastewater, the coarse particles settle here along with secondary sludge from the final clarifier.

### ② Pre-Treatment

The remaining solids are removed from the wastewater with a minimum of 1.5 hours of residence time.

### ③ Biological

Biological clarification occurs in up to three stages. First for carbon decomposition and the rest primarily for nitrification. This allows a biofilm to be developed which is optimised to the conditions at each stage of the treatment process.

### ④ Final Clarification

The biologically cleaned wastewater is separated from surplus sludge. Pumps transport the sludge into the sludge storage and the water is now ready to be returned back into the environment.

### ⑤ Piping

Gravity flow through the treatment stages makes backflow impossible even in the event of power failure.



Experience the worldwide unique wastewater cleaning process WSB® clean pro and visit the interactive product show:  
[www.wsb-clean.com/pro](http://www.wsb-clean.com/pro)

# Every WSB® clean pro plant is designed specifically for each project

WSB® clean pro is not a standardized product, but an individually tailored solution. Each system is designed for the requirements of each site.

## Expansion for Improved Cleaning Performance.

In order to meet steadily rising wastewater treatment values, wastewater treatment systems must be flexible. WSB® clean pro offers diverse possibilities in order to expand the cleaning performance of existing plants. Individual modules can be added according to need – making the improvement of existing plants just as simple as new installations. In addition to the basic modules for carbon decomposition, separate expansions for de-nitrification, phosphorus removal and membrane filtration are available.

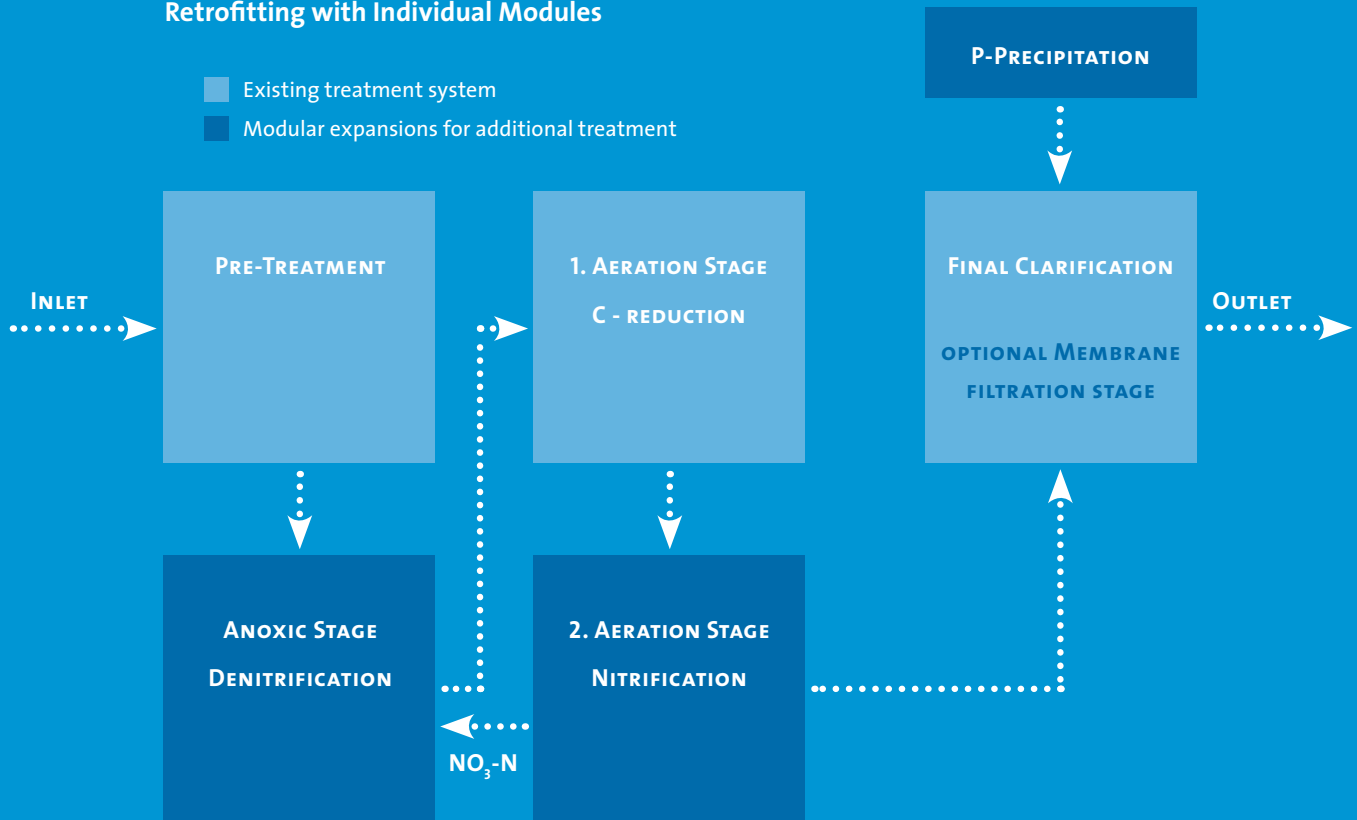
## Retrofit and upgrade Existing Plants.

The fluidized floating bed biofilm process is easy to retrofit in existing systems. Due to the large biologically effective surface area of the carrier media, existing treatment plants can upgrade with media and receive increased flows while achieving higher clarification quality – all without having to expand. Depending on the upgrade requirements, the individual modules of WSB® clean pro may also be upgraded with minimal construction and engineering costs.

For WSB® clean pro, with the patented biofilm technology, the following design options are available:

- + New installation for commercial, community, and industrial applications,
- + Solutions for additional wastewater purification for de-nitrification, phosphorus removal and membrane filtration,
- + Retrofit for municipal wastewater treatment plants for up to 1,000,000 Litres per day,
- + As well as the modernization of existing treatment plants.

## Retrofitting with Individual Modules



### Nitrogen removal with WSB® clean pro

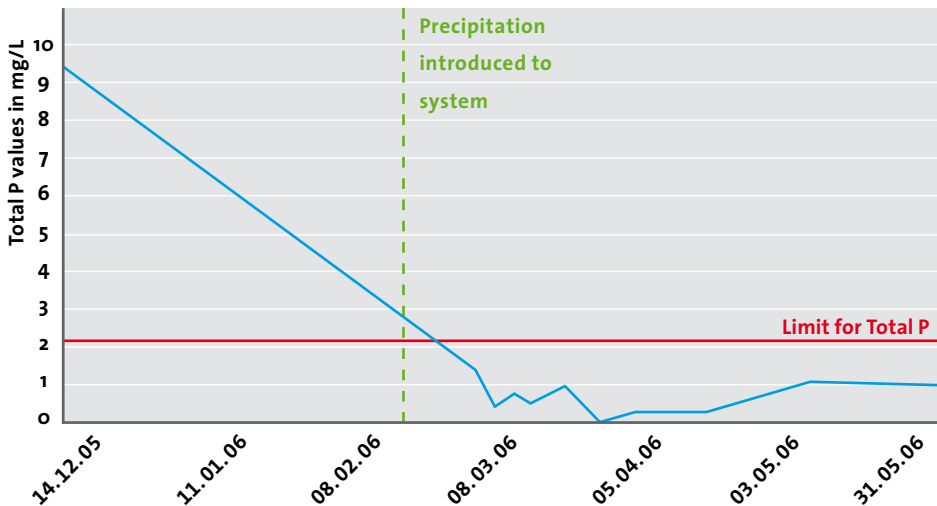
The elimination of total nitrogen is realized with the simultaneously intermittent aeration in the biological stage as well as the preceding de-nitrification stage. To ensure de-nitrification year-round, an anoxic stage precedes the aerobic biofilm stages. The anoxic stage utilizes a proprietary mixer, the hydrodynamic impulse accelerator eddy® developed by the Bergmann Gruppe, which protects the carrier material from damage in the anoxic reactor.

### Phosphorus removal with WSB® clean pro.

Phosphorus is removed from wastewater by precipitation with metal salts. In order to reduce the possibility of re-dissolution of phosphorus in the anaerobic sludge storage, aluminum salts are primarily used. Phosphorus elimination can be used as an additional module independently of the performance of the preceding wastewater treatment. Precipitation occurs simultaneously in the biological cleaning stage or downstream in the transfer water to the final clarifier.



#### PHOSPHORUS REMOVAL IN A WSB® CLEAN PRO INSTALLATION



### Membrane Filtration for WSB® clean pro

The membrane filtration modules for WSB® are primarily inserted in the final clarifier but can also be used downstream. Unlike traditional membrane systems, these ceramic membranes reduce operating costs through reduced maintenance and avoid toxic chemical cleaning. The membranes utilize a novel cleaning process using the WSB® carrier media to clean the surface of the membrane. The distance between each filter plate allows the carrier media to self-clean and permanently avoid blockage. Membrane filtration provides a physical barrier to solids – producing quality effluent suitable for reuse applications.

#### Discharge values WSB® clean pro +D



- CBOD ≤ 10 mg/L
- TSS ≤ 10 mg/L
- Ammonia ≤ 5 mg/L
- Total Nitrogen ≤ 25 mg/L

#### Discharge values WSB® clean pro +H



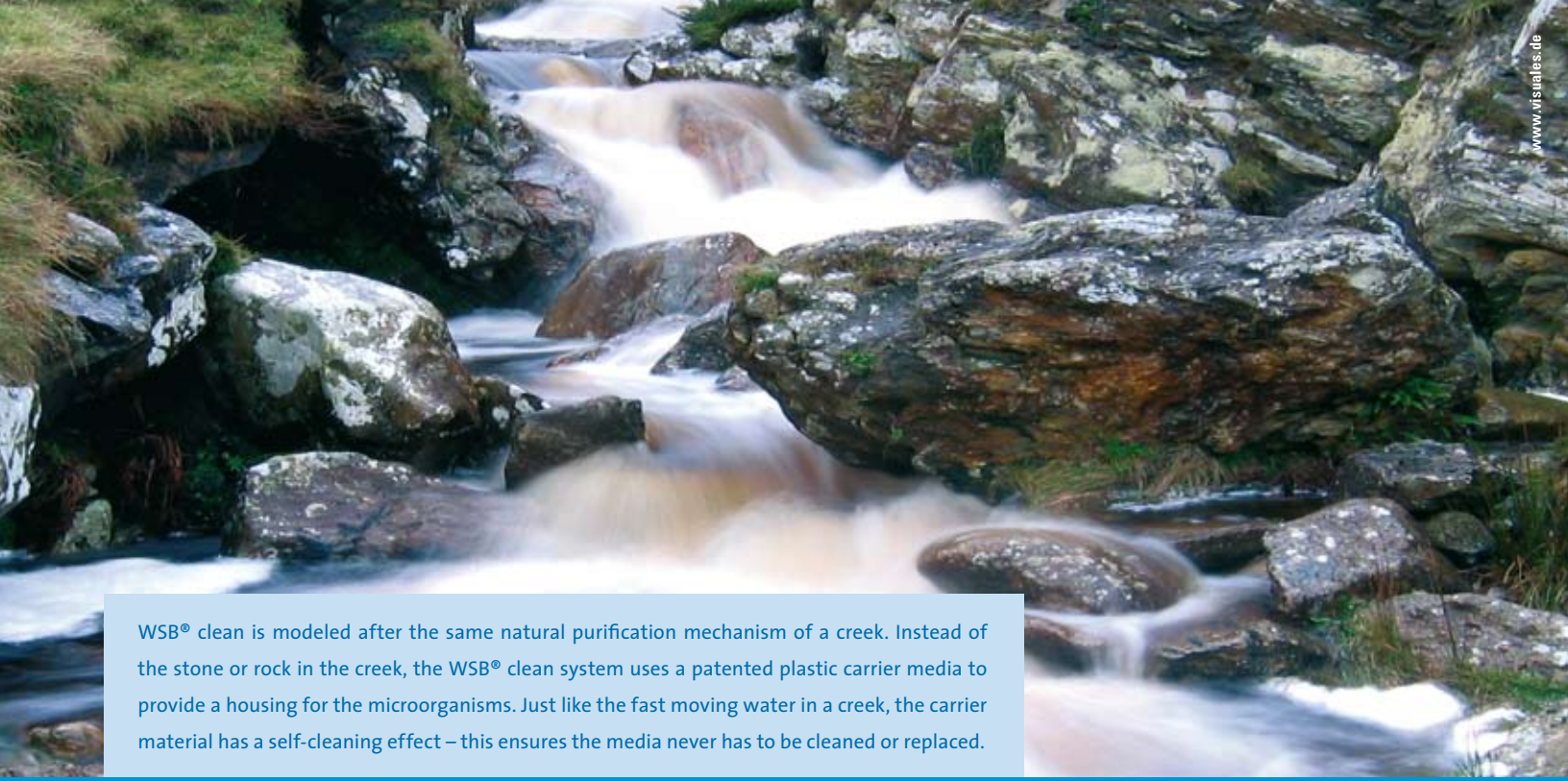
- Fecal coliform ≤ 100 / 100 ml
- Turbidity ≤ 0.2 NTU
- Phosphorus ≤ 1 mg/L
- CBOD ≤ 5 mg/L
- TSS ≤ 5 mg/L

Non-Detectable results are achievable

#### Discharge values WSB® clean pro +P



- Phosphorus ≤ 2 mg/L



WSB® clean is modeled after the same natural purification mechanism of a creek. Instead of the stone or rock in the creek, the WSB® clean system uses a patented plastic carrier media to provide a housing for the microorganisms. Just like the fast moving water in a creek, the carrier material has a self-cleaning effect – this ensures the media never has to be cleaned or replaced.

## BERGMANN Gruppe

Since 1990, the Bergmann Gruppe has been researching solutions for decentralized wastewater treatment plants. With a long tradition of engineering quality products, the Bergmann Gruppe is now one of the leading suppliers of wastewater treatment technologies in the world.



RH2O is proud to be the exclusive manufacturer of WSB® clean in North America. RH2O North America's team and licensed partners are eager to provide you with the advice you need to select the right wastewater treatment solution. We ensure through our distributors and service programs that we are keeping our promise to produce a clean tomorrow by protecting today's water resources.



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