RH2O

wsb® clean pro

WSB® clean pro – the solution for commercial and communal wastewater treatment.

Exceptional, efficient and reliable performance, flexible and modular designs.

The model for WSB® clean: nature.

WSB® clean is an advanced wastewater treatment system developed by the researchers from the Bergmann Group in co-operation with the technical universities of Chemnitz, Cottbus and Dresden in Germany. The treatment process is modeled on the natural purification of a creek or stream. In nature, the stones and rocks in the stream act to support a biofilm consisting of micro-organisms that consume organic material. Instead of the stones in a creek, the WSB® clean system uses specialized plastic carrier media to provide an ideal housing for micro-organisms that grow as a thin biofilm on and within the media to treat the wastewater.

Self-cleaning media at the core of WSB® clean.

The core of the process is the specially designed biofilm carrier media contained in the biological reactor. Constructed out of high density polyethylene (HDPE), the unique design of the carrier and aeration system ensures the media is self-cleaning, will not clog, and does not require replacement. Optimum growth conditions on and within this material promote the development of a robust and diverse biofilm matrix which facilitates complex and efficient decomposition of wastewater contaminants, even at winter wastewater temperatures as low as 4°C.

The layer structure of the WSB® clean biofilm.

Laminar interface	The surface of the biofilm.
Aerobic layer	Responsible for breaking down carbon compounds and the conversion of ammonium to nitrate.
Anoxic layer	In the absence of dissolved oxygen, the bound oxygen in nitrate is used to turn nitrate into nitrogen gas and oxygen (denitrification).
Anaerobic layer	Responsible for breaking down sulfate.

The benefits of WSB® clean pro for the treatment of municipal and commercial wastewater.

WSB® clean pro functions according to the fluidized floating-bed principle which

+ efficiently removes carbon and ammonia in a small footprint.
+ significantly reduces the energy consumption for aeration.
+ promotes a diverse community of micro-organisms in the biofilm.

WSB® clean pro systems are designed with a high degree of operational flexibility which

+ allows variable aeration settings to provide year-round operational stability and long term reliability.
+ allows for gravity flow between individual treatment stages (eliminates reliance on pumps).
+ allows increased aeration settings and/or amount of carrier media to respond to changes in loadings.

WSB® clean pro is a pure biofilm process which

+ operates without returning sludge to the biological stage.
+ adapts to the properties of the wastewater.
+ is highly resistant to hydraulic and organic shock loads.

WSB® clean pro functions using automated controls with remote management which

+ provides 24/7 remote monitoring with instant notification of alarms via email.
+ data logging and record keeping of all events, settings, and operating times.
+ reduces operation and maintenance costs.

Applications for WSB® clean pro.

Every WSB® clean pro system is uniquely designed to the needs of each project. The flexibility of the process allows the use of existing tanks which can significantly reduce capital investment. Tanks can be constructed in concrete, fiberglass, polyethylene, and be installed underground or above grade.

Examples of applications are:

+ Rural Communities
+ Campgrounds, RV and Mobile Home Communities
+ Schools, Churches, and Institutional Facilities
+ Resorts and Marinas
+ Commercial Plazas and Malls
+ Restaurants, Rest Areas, and Truck Stops
+ Wineries, Breweries, and Food Industry
+ Funeral and Memorial Facilities

wsb® clean pro

New installations
for municipal and commercial applications

Addition of system modules
for additional wastewater treatment (denitrification, phosphorus removal, disinfection)

Retrofit/Upgrade existing installations

Expansion and replacement of existing installations

A unique approach: The **WSB®** fluidized floating-bed biofilm process.

Alternating fluidized and floating bed reactor.

The WSB® clean biofilm carrier media was engineered to have a density slightly below that of water. Fine bubble diffusers transfer air into the liquid of the biological stage on an intermittent basis, causing the media to completely mix within the bioreactor during aeration and float just below the water surface when off. During the aeration phase, the wastewater is completely mixed around the biofilm carriers and the fluidized bed is formed. During the non-aerated operating phase, the carrier media are buoyant, having a lower density than the surrounding wastewater. The carrier media thus acts as a floating bed filter. The wastewater flows through this floating bed, such that proper biological treatment is ensured at all times. This unique design of the media and aeration system ensures a constant balance of new growth and sludge detachment such that the media is completely self-cleaning.

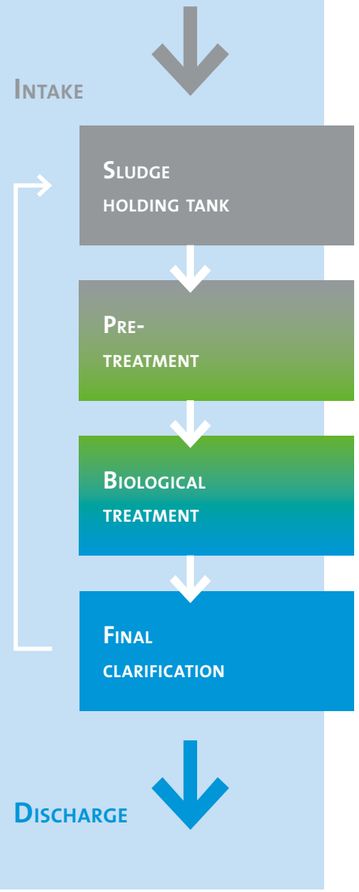
The benefits of the process.

Compared to other biofilm processes, for example fixed film or trickling filters, the WSB® process results in a biofilm with a minimal layer thickness but high cell density. The specific properties of this biofilm, paired with our innovative process, guarantee the following benefits:

- + Full capability to handle reduced loads
- + Permanent immunity to hydraulic shocks without loss of biomass
- + Simultaneous nitrification and denitrification even at low wastewater temperatures
- + Adaptation of the micro-organisms to the wastewater to be treated
- + Self-cleaning media doesn't clog or need replacement
- + No measuring and control systems required
- + Elimination of system components requiring intensive maintenance
- + Elimination of wear-prone mechanical parts

The individual treatment steps of WSB® clean pro.

The WSB® clean pro treatment process begins with mechanical / physical pre-treatment of the raw wastewater. This stage consists of settling tanks (primary clarification or pre-treatment) that retain separable matter and coarse particles present in the wastewater. From here, the pre-treated wastewater passes by gravity to the biological treatment stage, the WSB® reactor. Here, the biofilm established on the carrier media consumes the organic compounds in the wastewater.



Separation of biomass and biologically treated wastewater.

The WSB® process runs in an aerobic environment wherein compressed air supplied by blower(s) is diffused into the wastewater as fine bubbles and serves as the oxygen supply for the micro-organisms of the biofilm. The biological treatment of wastewater produces surplus biomass (secondary sludge). At the subsequent final clarification stage, which is designed as a settling tank with sludge hopper, the suplus biomass is separated from the biologically treated wastewater.

The secondary sludge collects at the bottom of the tank, from where it is returned to the sludge storage tank by way of submersible pump(s). The sludge storage tank can be integrated at the start of the process or as a separate off line storage. From the final clarification stage, the treated wastewater is ready to be discharged back into the environment or for further treatment.

Efficient operation and minimal energy consumption.

An automated control system for WSB® clean pro takes care of the electrical power supply and the control of all electrical equipment, e. g., the blower(s) and submersible pump(s). Thanks to the intermittent operation of the blower(s) and automated control of the sludge removal pumps, WSB® clean pro is extremely energy-efficient. One typical feature of a biofilm process is the very small amount of secondary sludge produced. The provision for combined primary and secondary sludge holding reduces the cost for sludge disposal compared to other biological treatment processes.

Overview of the basic treatment process using WSB® clean pro.

System inlet
Raw wastewater is delivered to the pre-treatment stage.

Biological treatment (WSB® reactor)
Breakdown of organic carbon and nitrogen compounds in the wastewater.

Final clarification
Separation of the secondary sludge, which is then returned to the pre-treatment stage.

Pre-treatment (sludge holding and primary clarification)
Retention and holding of the primary and secondary sludge. Separation of fine particles.

Control unit
Operational control of the pump(s) and blower(s), etc. including the Click + Clean® remote management system.

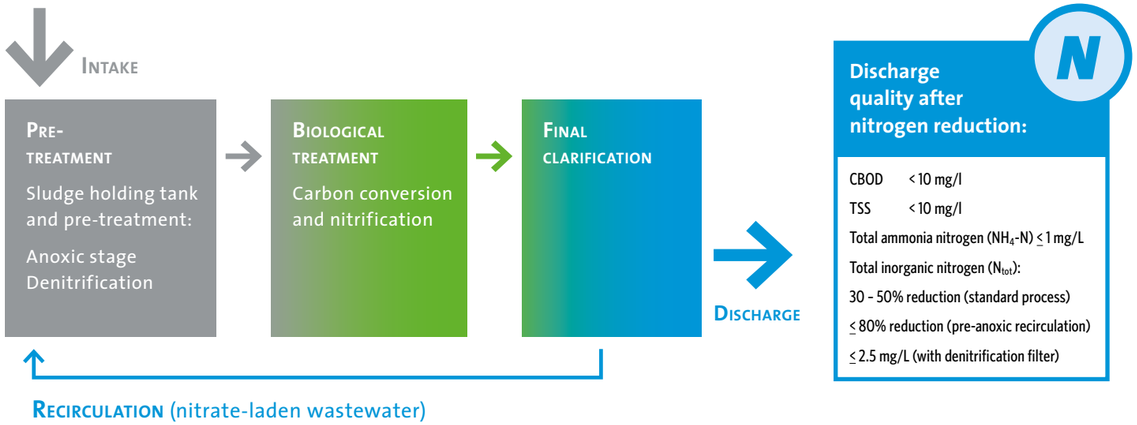
System discharge
Gravity discharge of the treated wastewater into a subsurface discharge system, surface water outlet, or alternate.

Modular processes for enhanced wastewater treatment.

As effluent discharge standards become more stringent, additional wastewater treatment is becoming increasingly important. This primarily refers to demands for nitrogen and phosphorus removal, as well as disinfection of the wastewater. As a system technology, WSB® clean pro includes a range of flexible treatment modules and process concepts. These modules can be retrofit easily to an existing installation, or else integrated as expansion modules for tertiary wastewater treatment in new projects.

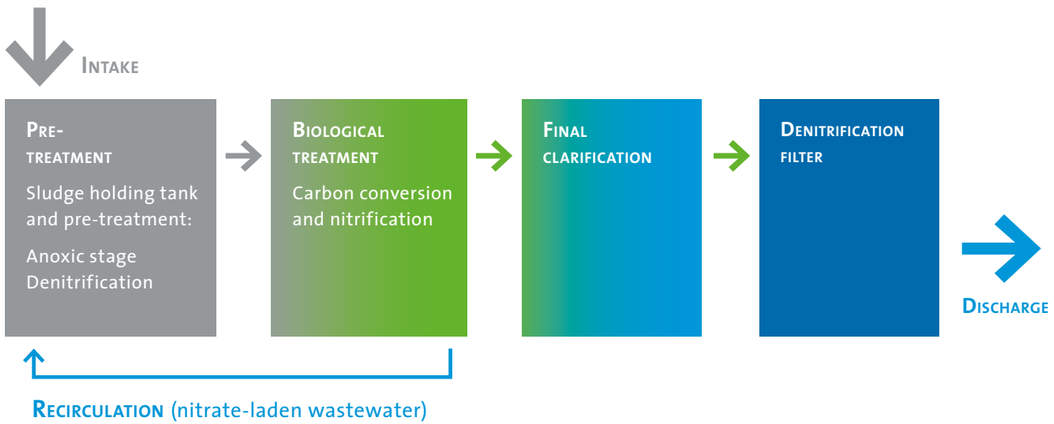
The process concept for nitrogen removal.

Nitrogen compounds are removed by various means including simultaneous denitrification in the WSB® bioreactors, pre-anoxic denitrification (recirculation) in the pre-treatment stage with or without supplemental carbon addition, side-stream treatment using a denitrification filter or enhanced tertiary treatment. This treatment concept can be modified to meet individual project requirements.



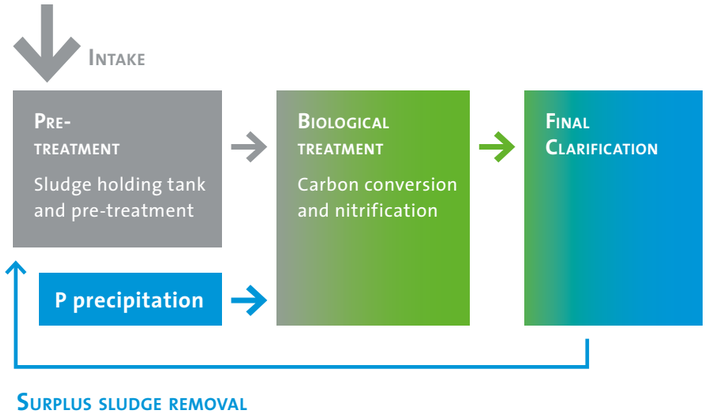
Discharge quality after nitrogen reduction:

CBOD	< 10 mg/l
TSS	< 10 mg/l
Total ammonia nitrogen (NH_4-N)	≤ 1 mg/L
Total inorganic nitrogen (N_{tot}):	
30 - 50% reduction (standard process)	
≤ 80% reduction (pre-anoxic recirculation)	
≤ 2.5 mg/L (with denitrification filter)	



The modular phosphorus removal stage.

Phosphorus is removed from the wastewater through chemical precipitation with the aid of metal salts, such as polyaluminum chloride. This reduces the risk of re-release of the phosphorus in the anaerobic sludge holding tank. This additional module can be used independently of the preceding wastewater treatment process. Precipitation is achieved either simultaneously in the biological stage, or by way of a separate precipitation reactor upstream of the final clarifier.



Discharge quality after phosphorus precipitation

$P_{tot.}$	≤ 1.5 mg/L (simultaneous with biological process)
$P_{tot.}$	≤ 0.5 mg/L (separate flocculation reactor)
$P_{tot.}$	≤ 0.3 mg/L (with tertiary filter)

The modular disinfection stage.

WSB® clean pro offers two alternative processes for disinfection of the biologically treated wastewater. The choice of process depends on the end use/discharge of the treated wastewater. If the effluent is to be discharged to surface water, the UV disinfection module is used. If it is to be reused, for example for toilet flushing, chlorine disinfection may be applied with or without UV or in combination with tertiary membrane filtration. Various disinfection technologies can be incorporated as required, independent of the previous process of biological wastewater treatment.

Discharge quality after disinfection (single stage)

E. coli / fecal coliform	
≤ 200 CFU/100 mL (with UV)	
≤ 2.2 CFU/100 mL (with membrane filter and UV)	

Click + Clean® remote management provides Peace of Mind for your WSB® clean pro.

Click + Clean® is a web-based secure monitoring system specifically designed to provide full operational surveillance of each system with instant notification sent via email and SMS. The information is stored on a web based database providing a historical report on each system. Click + Clean® allows complete remote control from the service provider to remotely have access and change settings.

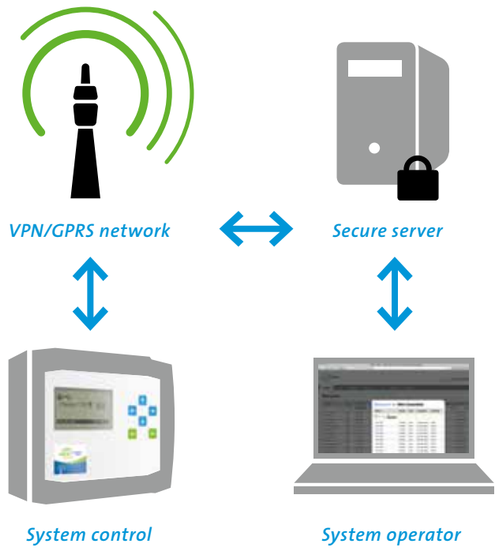
Benefits in operation.

Remote monitoring ensures a reliable working system and saves money on operation and maintenance while remaining virtually invisible to the property owner. Further benefits are:

+ Real-time error and event notification from the system
+ Time- and location-independent adjustment of operating parameters (settings)
+ Data logging for operating parameters, event messages and measured values (runtimes, sensors, etc.)
+ Optional system visualization of display modules, input/output status, and measured values
+ “Live” function for direct system operation
+ Enhanced operating stability thanks to permanent self-monitoring of the system
+ Increased reliability through improved tracking of operating processes and early intervention should any unusual events be detected
+ Remote diagnosis for all electrical functions (amp draw, digital and analog sensors, etc.)
+ Battery backup for alarm notification in case of power failure

For new systems, retrofits and pump stations.

The Click + Clean® control system is ideal for not only new systems but can be easily upgraded for existing systems. Click + Clean® supports control of other water and wastewater technologies and wastewater collection systems (i.e. pump stations).



RH2O® North America provides wastewater treatment and water conservation systems for residential and commercial applications. With over 100 years of combined experience in the wastewater industry, and products proven worldwide, RH2O® delivers sustainable solutions to protect our most important resource – water. RH2O North America 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.

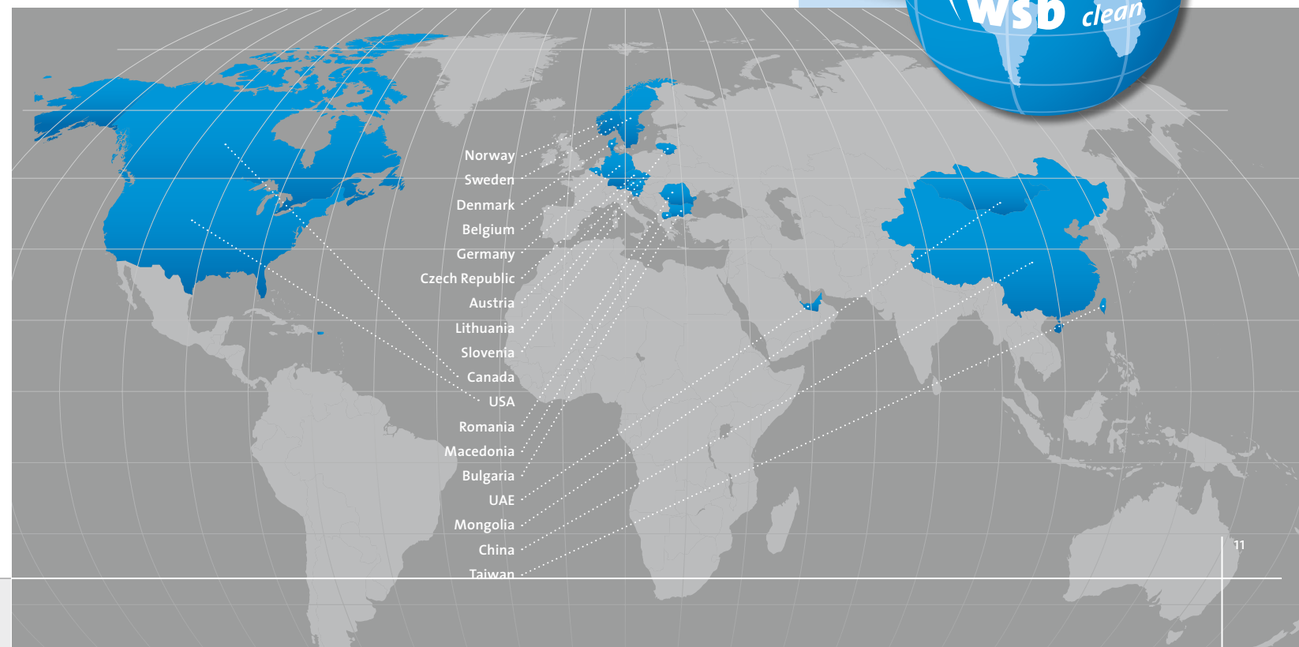
Our commercial and residential solutions include:

+ Wastewater Treatment Systems (WSB® clean MBBR process)
+ High Strength Wastewater Treatment, Phosphorus Reduction
+ Nitrogen-Reduction Systems, UV Disinfection Systems
+ Commercial Greywater Recycling Systems
+ Rainwater Harvesting Systems
+ Control Panels, Remote Monitoring Solutions

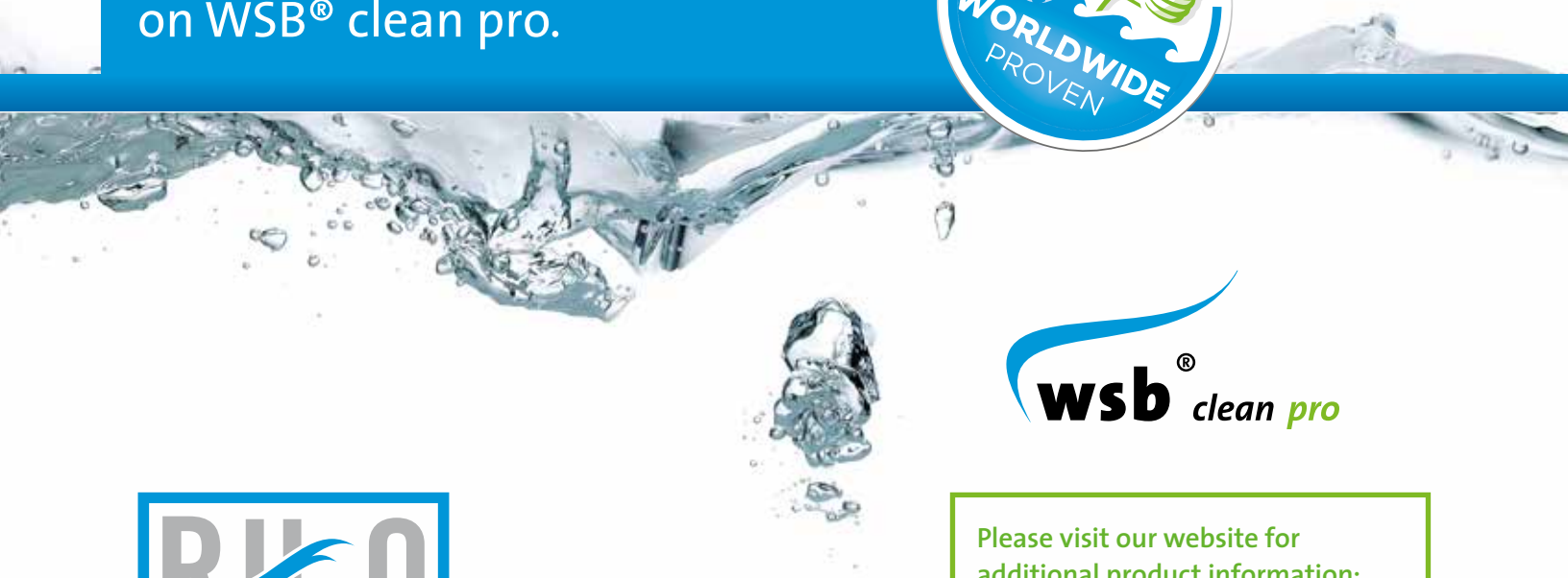
Over 60,000 installations of WSB® technology worldwide.

WSB® clean was developed in Germany but now has treatment solutions all over Europe, as well as North America, Asia and the Middle East. Over 60,000 wastewater treatment systems have been constructed to date – from small-scale installations to municipal treatment plants achieving a wide spectrum of discharge criteria. Over the years, we have gathered a wealth of experience which is put to use for each new project. Contact our team of experts for the advice you need to select the right solution for your project.

60,000 installations **worldwide.**



Further information on WSB® clean pro.



wsb® clean pro

RH2O

Have additional questions?

We're always available and happy to answer your questions.
Please contact RH2O at (519) 648-3475 or your local partner.

RH2O North America Inc.
268 Woolwich St. S. | Breslau, Ontario, Canada | N0B 1M0
Phone: (519) 648-3475
Fax: (519) 648-3585
info@rh2o.com | www.rh2o.com

Please visit our website for additional product information:

- Latest news and product updates
- Case studies and reference projects on how others have used the WSB® clean system
- Video and animations illustrating how the system works

www.rh2o.com