

Pioneering for You

wilo

Application brochure

Biological treatment with efficiency.
System expertise for your wastewater treatment plant.



Wilo

Pioneering for You.



We are at your service worldwide.

We at Wilo have been turning visionary ideas into intelligent solutions (which regularly set new standards in the industry) ever since 1872. The goal of our company founder, Caspar Ludwig Opländer, was to use his copper and brass goods factory to improve and facilitate water supply to people. It did not take long until the key step was made: in 1928, his son Wilhelm designed the world's first circulation accelerator.

We have been continuing this tradition ever since with pioneering innovations such as the world's first high-efficiency pump for the heating, air-conditioning, cooling sector, and at the same time we have proven our commitment to using valuable resources such as energy and water responsibly. Today the Wilo Group, headquartered in Dortmund, is represented all over the globe as a complete system provider of pumps and pump systems for water management.

Cooperative support you can rely on.

With over 7,500 employees and 60 subsidiaries all over the world, we personally see to it that our customers' and users' needs and requirements are met as completely as possible – whether they are specialist consultants, operators, or general contractors. This means making your life and work as easy as possible with our products, solutions, and services. “Pioneering for You” is our permanent pledge of a clear customer focus, a relentless pursuit

of quality, and our special passion for technology. In times of dwindling natural resources, using water responsibly is an extremely important duty – which is why we are committed to providing pioneering developments, sustainable product solutions, and cooperative support to ensure you can rely on our solutions for everyday water management. That's what we call Pioneering for You.



Daniel Busuioc, Head of Business Development Water Management,
WILO SE, Hof, Germany.

Together for higher water quality – WILO SE and GVA.

We have further strengthened our range so that we can support you in safeguarding limited water resources and water quality for future generations. Wilo GVA GmbH develops and supplies optimally-matched processes and technologies for biological sewage treatment of industrial and municipal sewage.

We will be using our complete know-how for your processes.

We will support you from design and configuration to commissioning and maintenance in order to optimise the efficiency of your biological cleaning stage. In doing so, we look at your wastewater treatment plant as an overall system. Our aim is to make your process operationally reliable and, at the same time, enable you to operate it energy-efficiently. The high-quality aerators, mixers, and recirculation pumps we use are individually tailor-made to suit your process – irrespective of whether you are planning a new wastewater treatment plant or wish to optimise your existing one in order to make it more energy-efficient.



The principle of biological sewage treatment.

Solids and fats can almost entirely be removed from the sewage during the mechanical cleaning stages in a wastewater treatment plant. However, what this process stage cannot enable is a significant reduction in the concentration of dissolved constituent materials. Carbon and nitrogen compounds can pass through this stage, for example, as can phosphate.

After the mechanical cleaning stage, this sewage is returned to the activated sludge tank of the biological cleaning stage. Here, the dissolved substances are converted into new biomasses, carbon dioxide, elementary nitrogen, and water with the aid of microorganisms – the so-called activated sludge.

There are two necessary process stages for the elimination of nitrogen compounds: the stage with oxygen entry (nitrification) and the unaerated phase (denitrification). During nitrification, microorganisms convert ammonium nitrogen into nitrate. In order for this to happen, oxygen must be added to the sewage with the aid of an aeration system. During the subsequent denitrification phase, nitrate is converted into elementary nitrogen and carbon dioxide by adding the carbon compounds contained in the sewage. During this process stage, no dissolved oxygen must be present in the sewage.

The oxygen introduced by an aeration system is essential for the sewage treatment. The energy requirements of the aeration system have a significant bearing on the energy required for the overall wastewater treatment plant. After the aeration system, the mixers have the second-largest energy requirement within the biological cleaning stage.

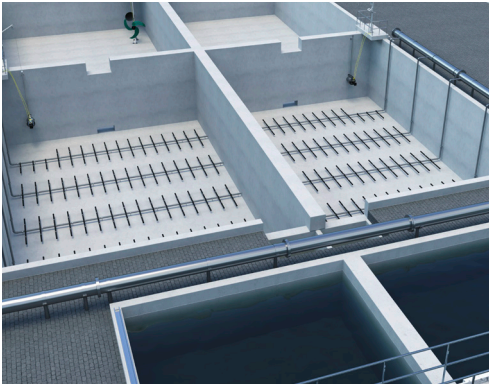
In the conventional activated sludge process, the mix of sewage and activated sludge flows out of the activated sludge tank into the downstream secondary clarifier. The activated sludge sediments in the secondary clarifier and the biologically cleaned sewage is then rerouted or returned to an additional cleaning stage. It is necessary that part of the sedimented activated sludge is returned to the activated sludge tank as return activated sludge to assist sewage treatment in the secondary clarifier. The other part is returned to sludge treatment as surplus sludge.



The SBR process at a glance. In every SBR reactor, conversion of the sewage constituents and sedimentation of the activated sludge required for this process takes place in a cyclical sequence.

The right solution for your process.

Wilo system expertise.

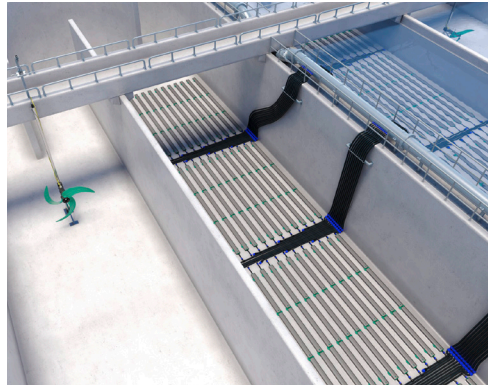


Upstream denitrification and cascade denitrification.

In this procedure, the aerator and the mixer are normally installed in separate basins. In this case, the sewage flows out of the mechanical cleaning stage, and the return activated sludge from secondary treatment first flows into the denitrification basin and then from here into the downstream nitrification basin. The aeration system should be designed in such a way that it can be adapted to the typical inflow fluctuations. At the same time, the system must be capable of providing particularly efficient oxygen entry during medium loads in the wastewater treatment plant.

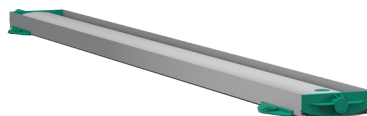


Wilo-EMU RZP for pumping of return activated sludge.

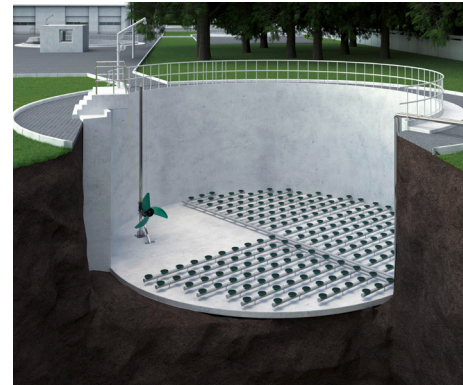


Simultaneous nitrification and denitrification.

Both process steps are usually combined in the circulation basin. In this case, the sewage circulates through the nitrification and denitrification zones. The design and operation of the aerators and mixers installed in one common basin and operated simultaneously influence each other reciprocally. Additionally-installed Wilo mixers can improve oxygen entry during simultaneous denitrification.



Wilo-Sevio AIR aeration system for optimised oxygen entry.

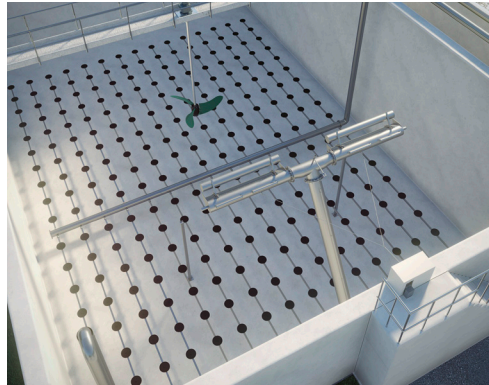
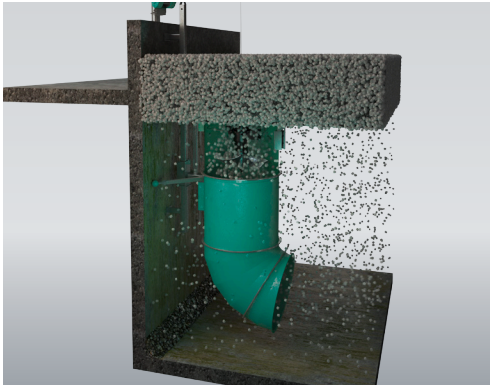


Intermittent denitrification.

Intermittent denitrification is often used in circular activated sludge tanks. The sewage normally only runs through one activated sludge tank during the biological cleaning stage before secondary treatment. The nitrification and denitrification phases are implemented with a time shift using time-controlled aeration. Depending on the system, it can be beneficial either to operate the aerator and the mixer at the same time during the nitrification phase, or the aerator on its own.



Wilo submersible mixers for flow dynamic requirements.



The MBBR process.

In addition to the process with suspended biomasses, there are processes in which the biomass is primarily attached to substrate materials. Thanks to this predominant immobilisation, the biomasses in the activated sludge tank can be considerably increased in comparison with the variation using only suspended biomasses. This makes sewage treatment possible even in very restricted spaces.

One efficient variation is the MBBR process with which the biomass is attached to movable substrate particles. Aeration or other circulation technology ensure that the substrate particles move through the basin. Strainers at the drain of the basin retain the substrate particles.



Wilo-Sevio ACT for mixing in the MBBR process.

The SBR process.

During the SBR (Sequencing Batch Reactor) process, the process stages for converting the sewage constituents and the sedimentation of the activated sludge required for this purpose run through a cyclical sequence in one basin.

The most important phases in a cycle are:

- Filling phase
- Mixing phase
- Aeration phase
- Sedimentation phase
- Clear water extraction
- Surplus sludge extraction
- Optional standstill phase

Decanting technology is also necessary for the SBR process, in addition to the aeration and stirring technology; it ensures reliable clear water extraction without activated sludge output.



Wilo SBR-DEKA decanter for reliable clear water extraction.

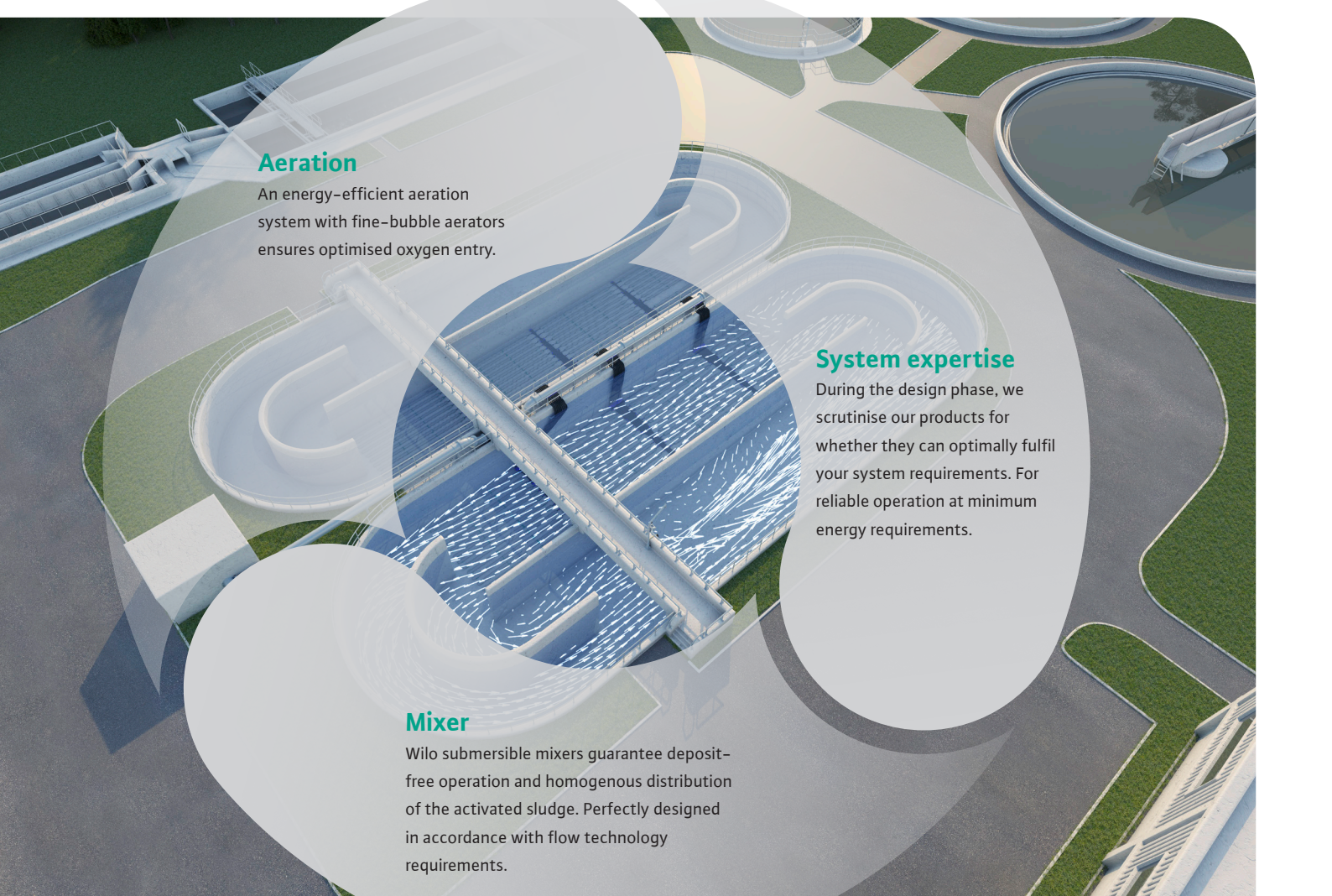
Biological sewage treatment.

Optimal system operation using modern design methods and system expertise.

The correct system-dependent design and installation of the mechanical technology is a basic requirement for efficient and operationally reliable biological sewage treatment. Wilo uses modern, software-supported design tools and methods. In order to select the right technology for your system, we use, amongst other things, the numerical flow simulation design method (CFD simulation).

In this precise analysis, we take into account your system-specific boundary conditions. This enables possible weaknesses to be detected in good time and optimisation approaches to be developed.

This means that you as the operator profit from a fully designed system in which all technologies and components are tailor-made and precisely aligned with each other to meet all requirements.



Aeration

An energy-efficient aeration system with fine-bubble aerators ensures optimised oxygen entry.

System expertise

During the design phase, we scrutinise our products for whether they can optimally fulfil your system requirements. For reliable operation at minimum energy requirements.

Mixer

Wilo submersible mixers guarantee deposit-free operation and homogenous distribution of the activated sludge. Perfectly designed in accordance with flow technology requirements.

Energy-efficient aeration for new and modernised systems.

With Wilo-Sevio AIR.

For optimised oxygen entry in your application.

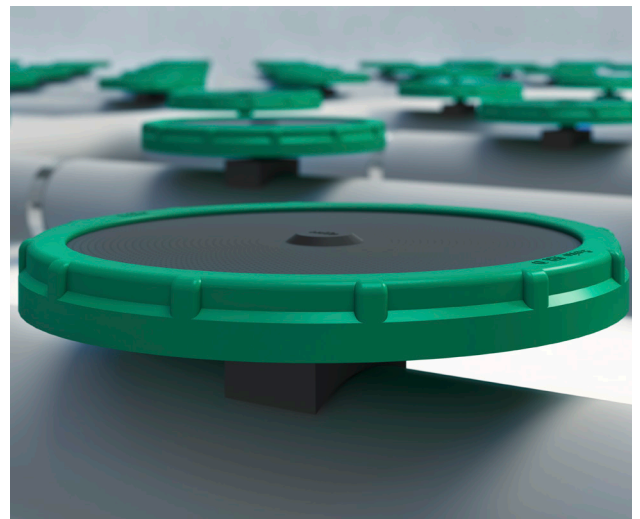
The aeration system has the largest energy requirements in a wastewater treatment plant, consuming between 60 and 80 % of the overall energy required. The right design of the aeration system with fine-bubble aerators is the basis for efficient operation of your wastewater treatment plant. There is often a high savings potential in existing facilities. This means that modernising your aeration system can significantly increase the overall efficiency of your system. Your overall system can be fully adapted to every need, in combination with Wilo mixers.



A perfectly-designed aeration system with fine-bubble aerators is a prerequisite for efficient operation.

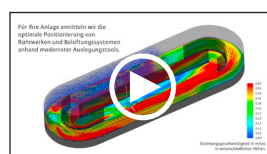
Adaptable.

Our efficient aeration systems can be adapted to existing systems. This means that we are able to modernise your system so that existing components can continue to be used. This reduces the cost during conversion of existing pipework and reduces modernisation costs overall.



Resistant and durable.

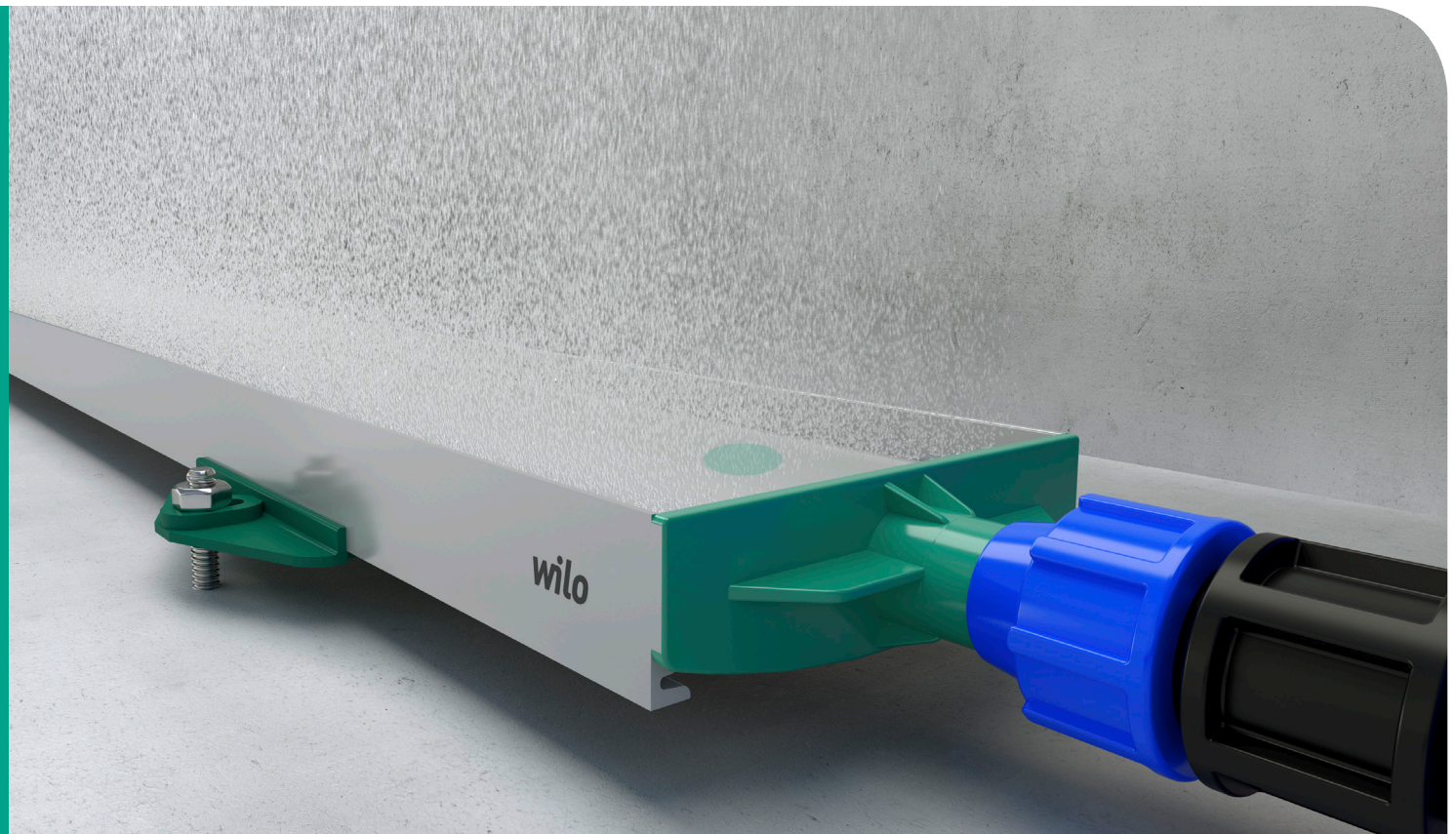
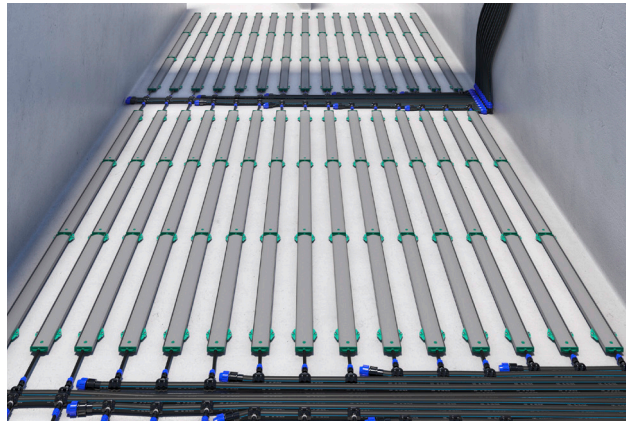
Together with you, we will select a suitable diaphragm material depending on your industrial or municipal sewage properties. This will ensure efficient oxygen entry over many years.



Take a look at this video, which demonstrates how to design your system efficiently – thanks to modern Wilo design tools. Visit wilo.com/watermanagement or our YouTube channel.

Energetically efficient.

- Micro-perforation for fine-bubble aeration. This means that oxygen can be added with the lowest possible air volume flow.
- Highest possible aeration level for different basin geometries. Each individual aerator is only subject to a low load and therefore operates efficiently.
- Wider control range for load-sensitive oxygen requirements.



Fine-bubble Wilo-Sevio AIR P aerator for extremely high energy-efficient oxygen entry thanks to micro-perforation and maximum bubble retention time.



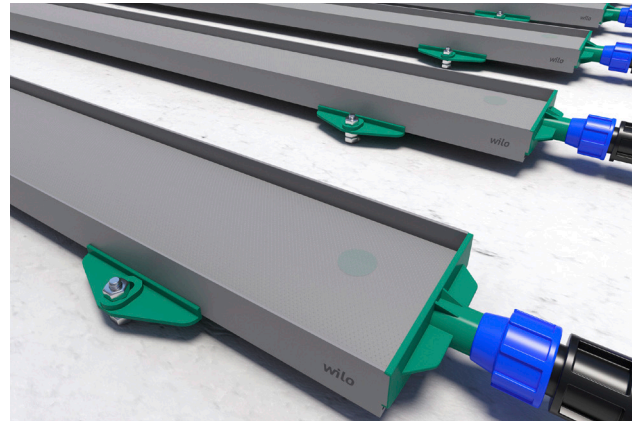
Wilo has the right aerator to meet any requirements for both industrial and municipal applications.

Bandwidth of products for fine-bubble aeration.

Wilo offers a wide range of products which are precisely designed to meet the requirements of your facilities as a system with panel, tube or disc diffusers. Furthermore, special solutions for systems with a lift-out design can be implemented.

Wilo-Sevio AIR P

- Maximum energy efficiency. Thanks to micro-perforation and a large diaphragm surface area.
- High system efficiency. Thanks to maximum loading levels and increased retention of air bubbles through installation near the floor.
- Extremely process-reliable. Low-wearing, blockage-free diaphragm and integrated non-return valve.
- Convincing operational reliability. Using division into smaller aerator fields.
- Extremely flexible in system control. Thanks to large variations in air inflow.



Wilo-Sevio AIR P. The panel diffusers.

Wilo-Sevio AIR T

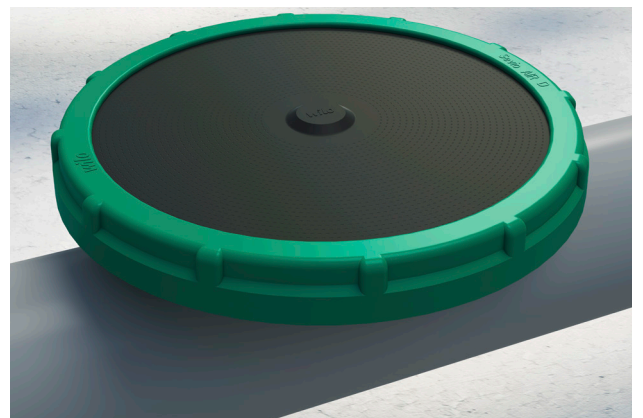
- Extremely flexible design. Thanks to different construction lengths permitting full-area allocation.
- High oxygen entry with low pressure loss. Thanks to optimised perforation of the diaphragm.
- Long service life in municipal and industrial applications. Thanks to the availability of different diaphragm materials.
- Easy to install – also due to adaptation to existing pipework.
- High operational reliability, even in non-aerated phases. Thanks to special pipe design.



Wilo-Sevio AIR T. The tube diffusers.

Wilo-Sevio AIR D

- Extremely efficient system. Thanks to largest possible allocation density in various basin geometries.
- Extremely flexible in system control. Thanks to a wide control range.
- Long service life in municipal and industrial applications thanks to a wide range of available diaphragm materials.
- Reduced installation costs and lower conversion costs in cases of existing pipework thanks to adaptability.



Wilo-Sevio AIR D. The disc diffusers.

For targeted flow. Slow-running Wilo submersible mixers.

An efficient process thanks to system expertise.

In the biological treatment process, Wilo submersible mixers have the task of optimally supporting the microbiological process. They safeguard the necessary basin flow in non-aerated zones or periods. This guarantees deposit-free operation and homogenous distribution of the activated sludge. At the same time, the mixers prevent short-circuit flows between the inlet and outlet. This guarantees the retention time of the inflowing mixture of sewage and activated sludge in the basin.

Wilo submersible mixers are not normally influenced by the typical inflow fluctuations from upstream, cascade, or intermittent denitrification. They can be designed in such a way that they are operationally reliable at all times and can meet dynamic flow requirements energy-efficiently.



Reduced energy and operating costs. Thanks to Wilo submersible mixers with clogging-free blade geometries and IE3/IE4 motors.

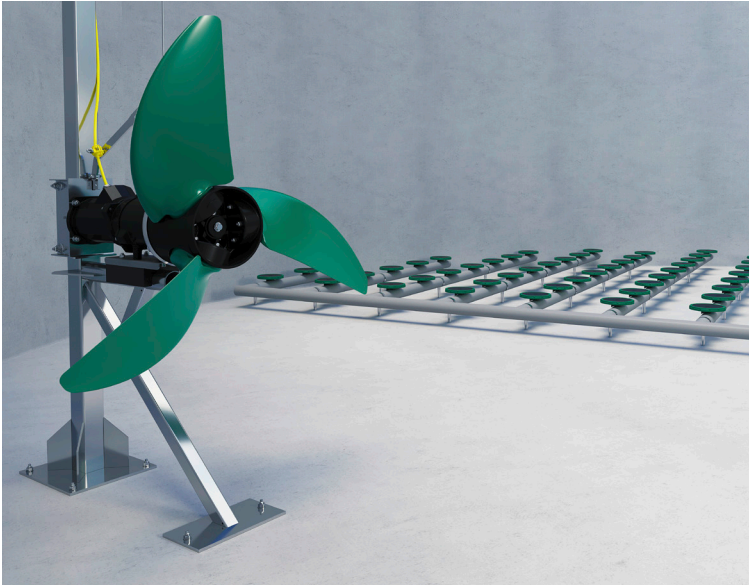


The right mixer for your system.

Wilo has a wide range of slow-running Wilo submersible mixers, allowing you to obtain a tailor-made, highly operationally reliable mixer solution for your system. Together with your specialists, we will design the most efficient mixers in terms of type, quantity, and positioning to match the boundary conditions of your system. If there are unfavourable inflow conditions in your system, we recommend Wilo submersible mixers with three propeller blades. This version reduces changing bending and torsion loads on the mixer and the lowering device for positioning the mixer in the activated sludge tank.

This guarantees high operational reliability even in unfavourable inflow conditions.

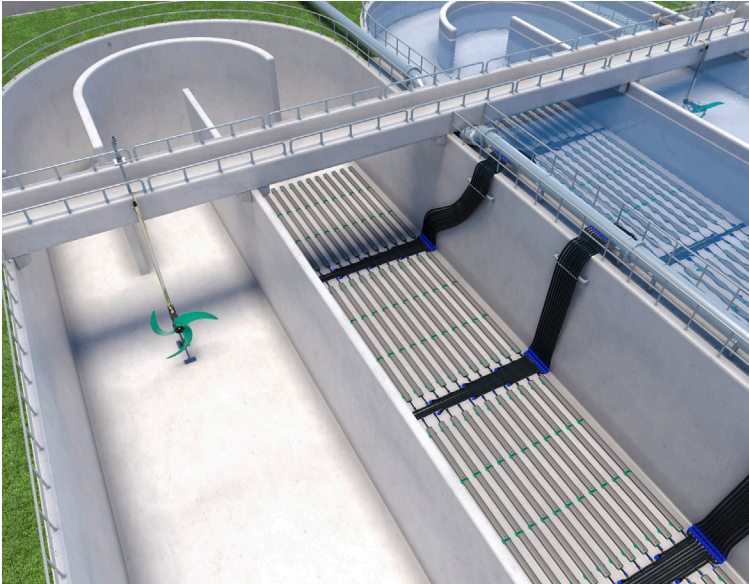
Slow-running Wilo submersible mixers are designed in accordance with dynamic flow requirements. This means that they can meet both operational safety and energy efficiency demands.



Efficient mixers for operating your system.

The mixer thrust applied is decisive for the induced flow rate level. This can be created using low acceleration of a large mass flow with slow-running submersible mixers, or through high acceleration of a small mass flow with fast-running submersible mixers. However, it is generally more efficient from a hydraulics perspective to induce low acceleration in a large mass flow with slow-running mixers. In addition to a plant-specific selection of the mixer, the selection of the right installation site is also relevant for an efficient flow induction.

Wilo submersible mixers provide the necessary basin flow, while running smoothly at all times – even with unfavourable inflow conditions and high-induced thrusts.



During simultaneous denitrification, the mixer thrust significantly influences retention of the mixture in both the aerated and non-aerated zones. Furthermore, the mixer-induced circulation speed increases oxygen entry due to a reduction in the air-induced vertical circulation flow and the associated extension of air bubble retention time.



This video will demonstrate how efficient and operationally-reliable biological sewage treatment using Wilo system solutions can be. Visit wilo.com/watermanagement or our YouTube channel.

Efficiency, smooth operation and operational reliability.

The geometry of the propeller blade is decisive for high-efficiency and clogging-free operation of the hydraulic system. In addition, our efficient IE3 or IE4 motors reduce your operating costs over the long-term. And they remain noticeably smooth-running even in unfavourable inflow conditions.

Thanks to balanced propeller loading, in combination with a two-stage planetary gear as a connection to the submersible motor, long-term operational reliability is provided for all high-quality system components.



Wilo vertical mixers for efficient circulation and mixing in both square and rectangular basins.



Reduced maintenance costs: the Wilo submersible mixer can simply be pulled out of the basin for maintenance.

The right accessories for your requirements.

Even Wilo submersible mixers can only induce efficient flows and play their role in increased overall efficiency if they are optimally positioned – and this applies to almost any basin geometry.

Lowering devices.

For optimal positioning. Wilo lowering device for simple, safe mixer installation under the system-specific boundary conditions.

Auxiliary lifting devices.

For safe, easy maintenance. Safe raising and lowering of Wilo submersible mixers (or Wilo recirculation pumps out of the basin) is possible at any time using LGA-approved auxiliary lifting devices made by Wilo.

For optimum outflow qualities in the SBR process. Wilco decanting technology.

Wilco SBR-Deka decanter. Specially developed for SBR systems.

Reliable clear water extraction without sludge downthrust is extremely important for optimum outflow qualities using the SBR process. This is because only cleaned water may reach the outflow, not the sedimented or floating activated sludge.

To prevent this from happening, we have developed a decanting technology which is universally adaptable to the process technology. In this process, the horizontal decanter extraction pipe is only submerged during clear water extraction. It is positioned above the maximum water level during other phases of a cycle.

This means that the activated sludge cannot flow into the extraction pipe.



Advantages of the Wilco decanter:

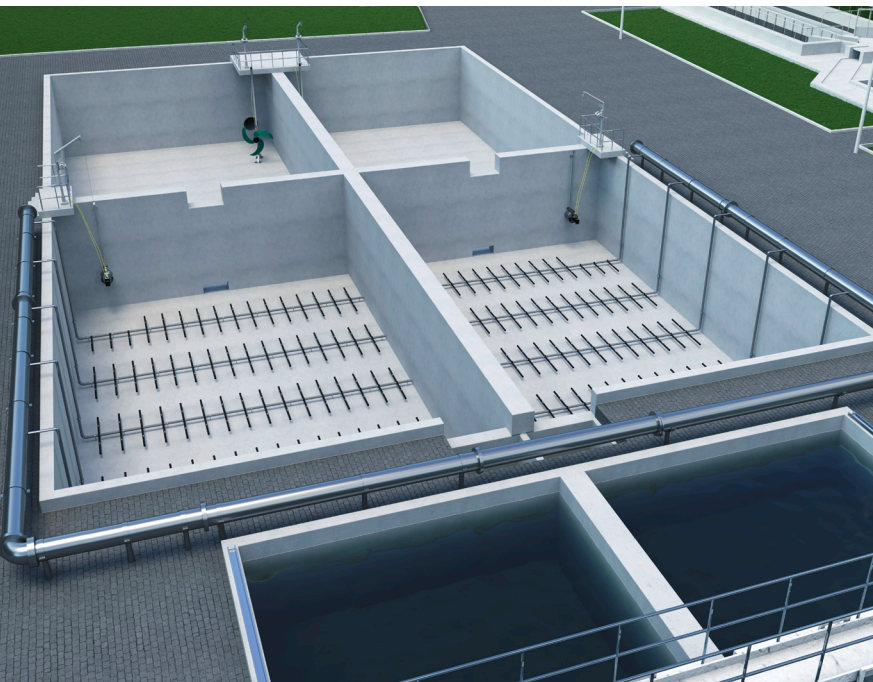
- High process reliability owing to a permanently installed extraction system which is decoupled from the water.
- Effective clear water extraction through holding back floating matter.
- Universally adaptable and modifiable decanting technology thanks to a design that is individually tailored to your project.
- No contamination thanks to adaptable lowering speed, e.g. using clocking or frequency converter.



The SBR process with decanting technology is a space-saving, flexible process which can easily be adjusted to suit inflow fluctuations.

Efficient return flow between various basins. With Wilo-EMU RZP.

During the upstream denitrification process, part of the nitrate is returned to the denitrification basin, together with the return activated sludge. Since the nitrogen elimination achieved is normally insufficient, an additionally-installed recirculation pump transports the nitrogen-rich water out of the nitrification basin back into the denitrification basin in normal cases. Irrespective of the process, Wilo-EMU RZPs efficiently transport the return activated sludge necessary for the process out of the secondary treatment back to the activated sludge tank. Their efficient, reliable pumping of large volume flows at low delivery heads is extremely impressive. They are also not susceptible to clogging thanks to self-cleaning stainless steel or PUR propellers.



Homogeneously distributed biomass substrate particles.

With Wilo–Sevio ACT.

Evenly-distributed mixing for efficient operation.

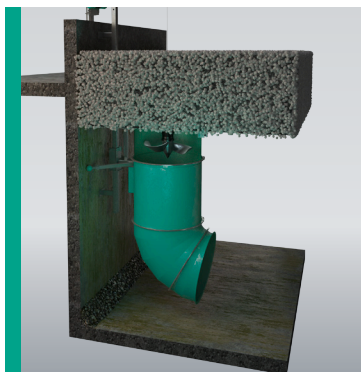
Conventional sludge activation requires plenty of space. This is where the MBBR process with biomass substrate particles can demonstrate its strengths to the fullest. It uses the advantages of both traditional sludge activation and the biofilm process. The Wilo–Sevio ACT with its telescopic suction pipe and the freely configurable outlet angle supports this process sustainably. An innovative system which sucks in biomass substrate particles continuously from the surface and gently returns them below the water surface. Using this technology, which is only available from Wilo, you can ensure a homogenous distribution of substrate particles at considerably reduced energy requirements for your mechanical technology in your MBBR process.

The advantages at a glance:

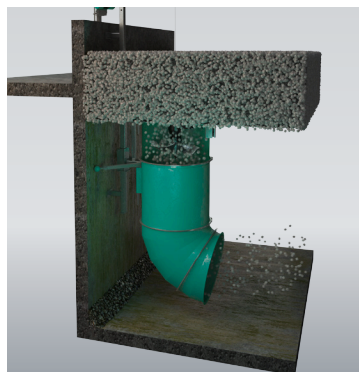
- Reduced energy costs thanks to efficient circulation.
- Low investment costs.
- High process reliability.
- Uniform mixing of substrate particles and reduction of deposits.
- Easy installation.



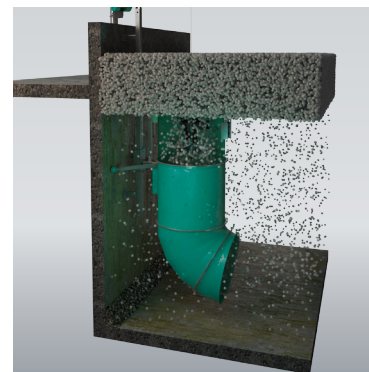
This is how efficient circulation and homogenous distribution of the substrate particles in the MBBR process works.



Floating top layer of biomass substrate particles.



Applying suction to the biomass substrate particles.



Uniform distribution.

A full-service package for you as our partner.

Wilo services.

With Wilo as your partner, you cannot only be sure of choosing high-quality product solutions, but also of benefiting from a comprehensive, worry-free package of well-thought-out services. This means that we reliably support you in every project phase from design and configuration, right through to commissioning and maintenance. In our seminars, we tell you about the very latest technologies and trends. And when it comes to attractive conditions for your projects, we also have just the right package on offer.

In short: Wilo is always by your side. In person and on-site. With local services in over 60 countries and more than 1,200 Wilo engineers worldwide.

We make the design and selection process simple for you.

We don't want you to choose just any old solution – we want you to find the one that meets your exact requirements. As a result, we will work through your requirements with you before the purchase and, on this basis, we'll prepare the individual product solution that is most economical for you.

Pre-sales services for your tailor-made choice:

- On-site support
- Consulting support
- Product selection
- Select programme
- Numerical flow simulations
- Flow calculation
- Piping calculation
- Installation drawings
- Documentation

→ Training and seminars.

We want you to be able to use Wilo's innovative technologies and products optimally and integrate them perfectly into your work processes. With this goal in mind, we offer expert-led seminars designed for the specific needs and applications of your industry.

→ Wilo-Energy Solutions.

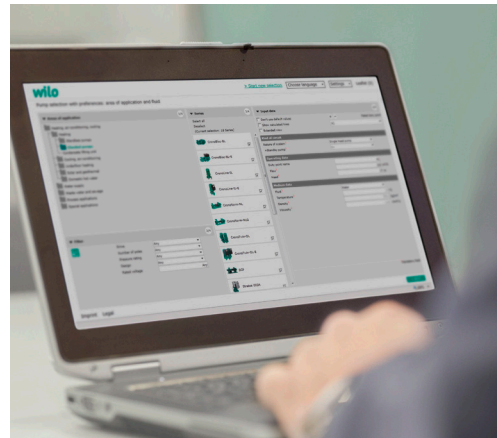
Our initiative for greater economy and sustainability. It includes the proactive replacement of pumps and pump systems which are still working but inefficient with Wilo high-efficiency technology. For municipal and industrial sewage treatment which is operationally reliable and more energy-efficient.



**“Services
which provide
comprehensive
and reliable
support.**

**That's what we call
Pioneering for You.”**

For more information, go to
www.wilo.com/en/watermanagement



Get your purchase right with Wilo.

Once you've made your choice, we provide you with thorough advice on your investment. What's more, we don't just deliver your solution, we continue to support you – from certification right through to commissioning. For example, qualified plant engineers with years of experience will carry out an extensive test and training phase with our pumps.

Sales services which really work for you.

- Certification
- Acceptance testing at the plant
- Commissioning
- Start-up

→ **Wilo-Financial Services.**

We can help you with the financial implementation of your projects, and we'll gladly create a quotation specially tailored to your investment.



→ **Wilo-Try & Buy.**

Try & Buy lets you play safe with your investments. Choose a no-risk trial for up to six months to convince yourself of the quality of Wilo's products.



We are at your service. Even after the purchase.

Our tailor-made service solutions cover the entire lifecycle of your Wilo products – including what comes after your purchase. That is why we have professional service engineers available for you locally and globally so that we can supply spare parts quickly and reliably at any time, and why we provide targeted training courses among other things to enhance your expertise.

And we continually strive to improve our services.

After-sales services with real added value for you.

- Customised, reliable maintenance concepts
- Rapid repair service
- Fast spare parts solutions
- Efficiency checks to determine the economic efficiency of existing pumps and suitable replacement pumps
- Specific training courses
- Service packages

→ **WiloCare.**

Guarantee your cost security and operational reliability with WiloCare. The service package provides you with monthly reports on the current status of your system, energy consumption, possible optimisation measures, and pending maintenance intervals. Individual options can be adjusted precisely to your requirements, all at a fixed monthly price, if required. Choose the version that fits you best: Basic, Comfort, or Premium.



wilo



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