WEHRLE

The treatment of complex effluents and water recycling

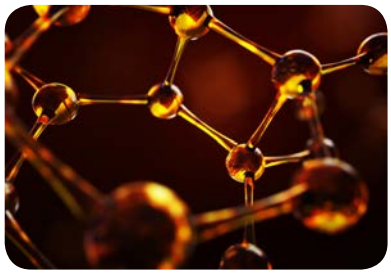
Exploring or producing petrochemical products, often generates wastewaters with very complex substances as a by-product. The purpose of wastewater treatment is often also the recovery of materials or, respectively, the reuse / recycling of the water, up to ZLD.

Yet this task is not trivial and incurs high operation costs if fulfilled with conventional treatment technologies:

- Produced Water contains a high level of dissolved solids (TDS) and heavy metals.
- Long-chain molecules lead to an unfavourable BOD/COD ratio and are difficult to decompose biologically.
- Toxic substances, such as phenols, cyanides and aldehydes, have a negative influence on the microbes which are supposed to decompose the pollutants biologically.
- COD peaks or "oil shocks" overstrain conventional biological sewage treatment plants and lead to an exceeding of the discharge limit values.

Nevertheless, for treating high COD wastewater, the biological treatment is the most economic and sustainable method. By using an intelligent combination with other processes, e.g. membrane technologies, treatment concepts designed for the respective application can be developed to fulfil those high requirements.

WEHRLE has proven this in numerous applications, such as refineries, gas generation, MTBE production, waste oil recycling, emulsion splitting or polymer etc. The high-performance processes, developed particularly for critical wastewaters, distinguish themselves by their reliability, the simple operation and an excellent efficiency.



Overview Process Technologies

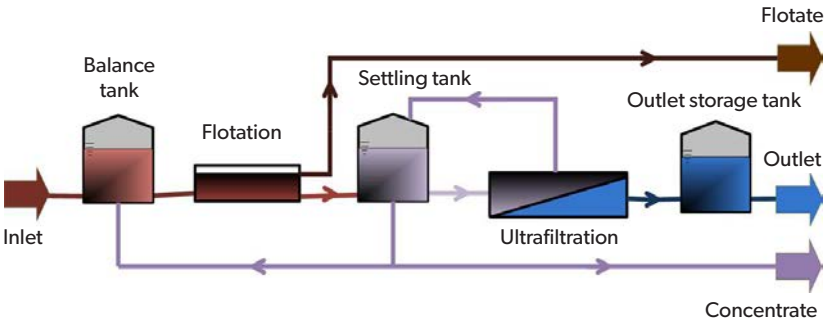
BIOMEMBRAT® High-performance MBR	Versatile, robust and compact biological treatment technology for highly loaded wastewaters with frequent load variations.
BIOSTREAM® Loop reactor	Energy-optimised biological treatment for the depollution of very highly loaded wastewaters, also for those containing toxic substances, and in case of extremely limited space.
UF / NF / RO Membrane technology	For the separation of water components, also for water cycle closing with very high degrees of purity, or the demineralisation of process water and boiler feed water.

Separation of Oil and Fat Mixtures by Using Membrane Technology

By using and combining different kinds of membranes and membrane interconnections, mixed and emulsified phases can be separated relatively easily. No matter if the purpose is emulsion splitting, oil recovery or others – due to the simple and reliable operation, membranes are more and more used for industrial applications.

For example **DECAL España S.A., Palos de Frontera Huelva / ES** – Ideally adapted process combination for the separation of oil and fat mixtures by using membrane technology for the wastewater treatment.

Flow rate	200 m³/d
Inlet / COD	3,500 mg/l
Outlet / COD	250 mg/l
Performance	> 92 %



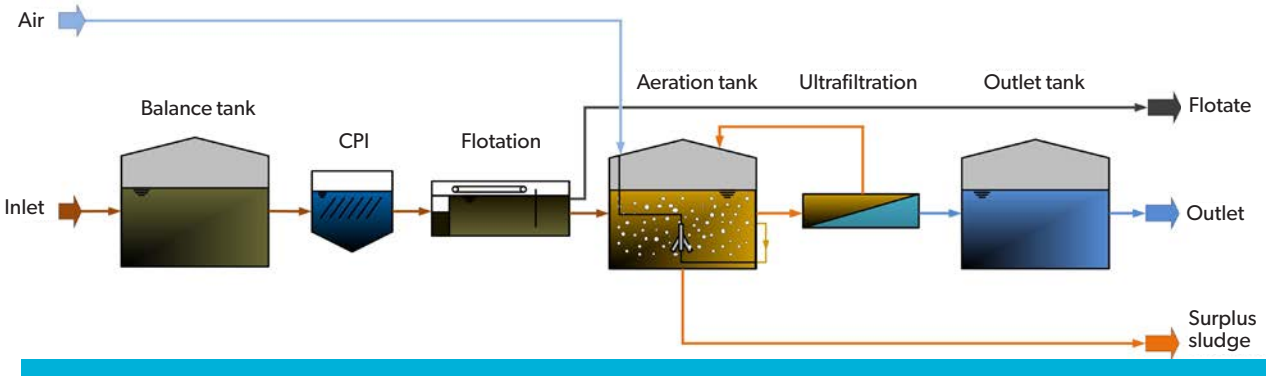
Performance Increase of Conventional Biological Sewage Treatment Plants

In case of highly loaded wastewaters, it may be more economic to eliminate organic compounds instead of separating them.

A very economic method is the biological elimination using a high-performance Membrane Bioreactor containing specialized microbes. Due to its high efficiency and the related compact construction, this technology can, for example, be integrated in existing buildings. The biological elimination of pollutants significantly reduces the wastewater disposal costs and may serve as pretreatment step for water recycling.

For example **IRPC Public Company Limited, Rayong Province / TH** – Refinery and petrochemical product development: Modernisation and performance increase of a conventional sewage treatment plant by using a space-saving BIOMEMBRAT® high-performance MBR.

Flow rate	6,500 m³/d		
	Inlet	**Outlet**	**Performance**
COD	1,200 mg/l	< 100 mg/l	> 91 %
NH_4-N	50 mg/l	< 5 mg/l	> 90 %
Phenols	120 mg/l	< 5 mg/l	> 95 %

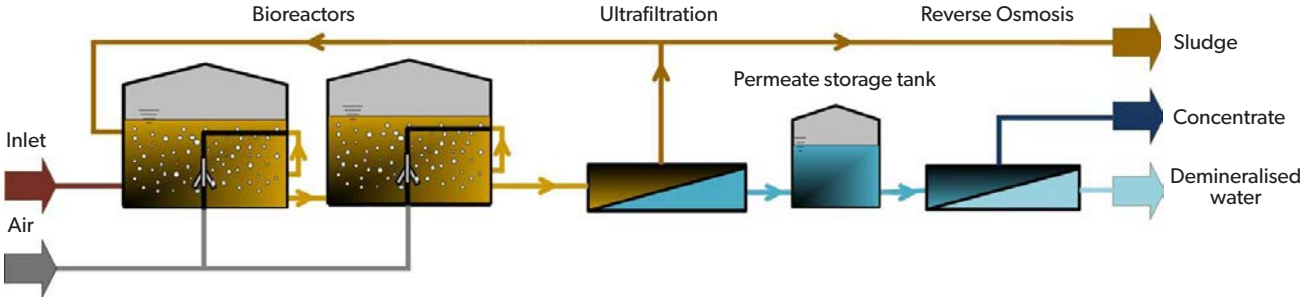


Combined Biological Effluent Treatment with Water Recycling

A WEHRLE BIOMEMBRAT® high-performance MBR for biological effluent treatment can easily be upgraded at a favourable price to a water recycling plant. Compared to a conventional sewage treatment plant, the BIOMEMBRAT® MBR considerably reduces the quantities of chemicals necessary for the subsequent membrane stage and significantly increases the lifetime of the membranes.

For example **DUGAS – Dubai Natural Gas Co., Ltd. in Dubai / UAE** – Water recycling by using a WEHRLE MBR/RO combination: Water reuse of the treated wastewater with a BOD/COD ratio in the inlet of < 10% as demineralised water. The compact container plant allows a simple and quick assembly on site!

Flow rate	155 m^3/d		
	Inlet	**Outlet**	**Performance**
COD	2,800 mg/l	< 50 mg/l	> 98 %
NH_4-N	< 50 mg/l	< 10 mg/l	80 %

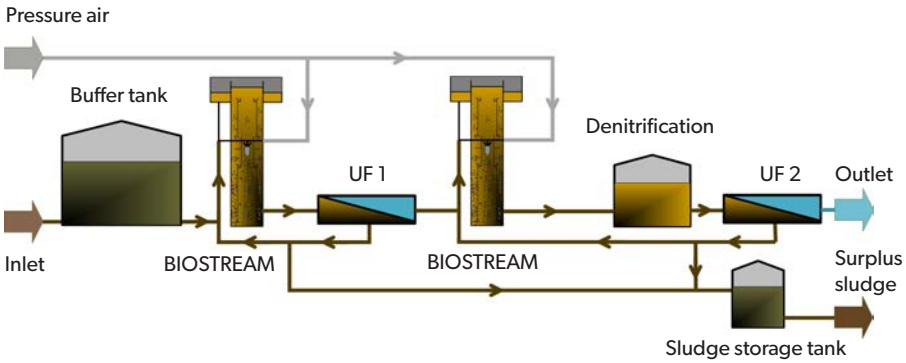


Elimination of Toxic Substances

Actually a contradiction - but not impossible: For WEHRLE, the biological treatment of effluents containing toxic substances is a solvable task. Phenols, aldehydes, cyanides, etc. are by-products of various petrochemical processes and are also part of the effluent to be treated. For this kind of applications, WEHRLE offers the BIOSTREAM® process technology which treats those wastewater substances efficiently and properly and reduces the operation costs to a minimum by using an energy-optimised aeration technology. Due to the compact Bioreactor design, the BIOSTREAM® is suitable also in case of extremely limited space.

For example wastewater from the gas scrubbing of coke oven gas: efficient and cost-effective biological degradation of toxic phenols and cyanides in the effluent by using a BIOSTREAM® loop reactor.

Flow rate	720 m^3/d		
	Inlet	**Outlet**	**Performance**
COD	3,000 mg/l	< 165 mg/l	> 94,5 %
Phenols	800 mg/l	< 0.3 mg/l	> 99 %
Cyanides	100 mg/l	< 0.2 mg/l	> 99 %



Complete Systems and Service Packages from One Source

WEHRLE's approach developing the plant concept ensures, that all aspects are considered - from suitable and aligned pretreatment technologies, the consideration of internal production processes and shutdown periods, the inclusion of existing assets into the design, as well as a modern plant automation, which allows to subcontract the plant operation.

As additional services, we offer concept development and feasibility studies to identify the right process technology for a specific wastewater or to upgrade an existing installation, laboratory tests and on-site pilot trials, and open-ended consultancy comparing different treatment options for the client.

Further information concerning similar wastewater treatment plants can be found in our flyer for the chemical, pharmaceutical and cosmetics industry.
Besides wastewater treatment, WEHRLE also develops concepts and builds plants for the generation of biogas from liquid and solid substrates.

WEHRLE Umwelt GmbH

Plant engineering and services from one source

Since 1982, WEHRLE sets benchmarks as pioneer and technology leader for the treatment of very difficult and complex wastewater. The wide range of available process technologies allows intelligent process combinations to fulfil the requirements and expectations of the client in the best possible way. WEHRLE consults, plans and builds plants and also offers corresponding services such as piloting, efficiency optimisation and retrofit of existing plants.

Especially for applications in the industry also factors beyond the used technology are important: a reliable performance in case of possible variations of wastewater volume and loads in the industry (e.g. caused by COD peaks or production changes) and by all climate conditions, as well as a modular design for future upgrades of the production and easiest operation, to enable a simple outsourcing of the plant operation. The stable high effluent quality of WEHRLE plants allow an easy, optional upgrading, e.g. to use the treated water for reuse / recycling and therefore, to save costs for process water, heat energy and possible softening.

WEHRLE is dedicated to the company's history: As family-owned company reliability, longevity and openness with clients and partners are our top priorities. The clients of WEHRLE trust in this philosophy – in over 40 countries and on 5 continents.

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Company video

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