

**Industrial effluent treatment and water recycling**

The use of decentralised and production-integrated wastewater treatment has considerably contributed to the reduction of water consumption in the production of the pulp and paper industry. Yet the reduced wastewater volumes contain a higher concentration of contaminants, which keep exceeding the discharge limit values for the wastewater, especially when producing wood-pulp paper, waste paper or pulp. Besides, the wastewater from the pulp and paper industry cannot be compared to conventional municipal wastewater due to the different products and production types, the acid sulphite or the alkaline sulphate process and lime precipitations.

Due to the disadvantages of conventional treatment systems, such as greater space requirement,

odour generation, increased chemical consumption, etc., they are getting replaced by modern processes, which are adapted to suit the changes in requirements in the industry.

In many cases, these modern processes also allow an easy upgrade for water recycling, i.e. recycling of process water, and therefore contribute significantly to an economical production.

WEHRLE has a wide range of experience and technologies in regard to raw water and effluent treatment and is able to use tailor-made processes or process combinations. Not only the technical solution but also the best possible cost-effectiveness of the plant is a priority to us.



**Overview Process Technologies**

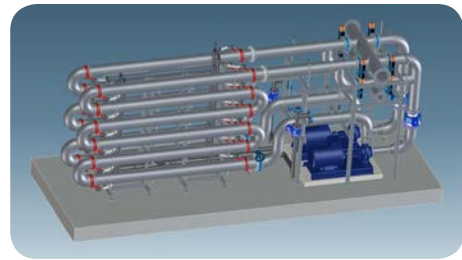
<b>MBBR</b> Moving Bed Biofilm Reactor	Standard technology for the treatment of wastewaters with low and medium loads in moderate climatic zones
<b>BIOMEMBRAT®</b> High-performance MBR	Versatile, robust and odourless treatment technology for rapidly changing wastewaters with easy upgrade option for recycling
<b>BIODIGAT®</b> Anaerobic bioreactor	Very compact and efficient treatment technology to reduce or avoid surplus sludge and to generate biogas from soluble COD
<b>BIOSTREAM®</b> Loop reactor	Energy-optimised aerobic treatment for the depollution of highly loaded wastewaters, as alternative to anaerobic treatment or in case of extremely limited space
<b>UF / NF / UO</b> Membrane technology	e.g. to obtain the quality for direct discharge in wastewater treatment or for recycling or demineralisation of process water and boiler feed water

## Aerobic Treatment of Wastewater

Aerobic bioreactors are the most common process technology for the treatment of effluents from the pulp and paper industry. Depending on the type of use, the different technologies available present certain advantages and disadvantages. The choice of the most suitable technology for each site depends on the greatest benefit for the operator:

- ▶ Conventional aeration tanks are not expensive, yet they require a lot of space, energy, consumables and tend to odour generation
- ▶ Moving Bed Biofilm Reactor processes (MBBR) have a good price/performance ratio but require further separate process stages, especially if the water is to be reused
- ▶ Membrane bioreactors are relatively expensive at purchase, yet require fewer chemicals and less space – and are the ideal choice for subsequent water reuse due to the particle-free outlet.

All in all, they are the most economical solution for wastewaters with COD loads. The WEHRLE BIOMEMBRAT® high-performance MBRs with external sidestream membranes ensure a maximum of flexibility and performance and require a minimum of space.



Flow rate	960 m <sup>3</sup> /d		
Component	Inlet	Outlet	Performance
COD	2,300 mg/l	< 150 mg/l	> 93 %
TSS	2,000 mg/l	< 30 mg/l	> 98 %

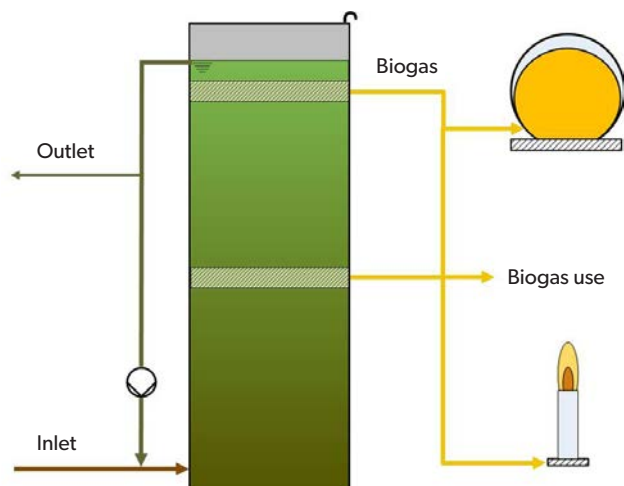
## Anaerobic Treatment of Wastewater

In case of highly loaded organic wastewaters, an anaerobic treatment may considerably reduce the operation costs or, combined with a CHP unit, transform wastewater treatment into profitable supply of heat and energy. Usually, the removal rates are over 80 %, which means that a subsequent aerobic treatment is often still necessary to achieve discharge limit values. Yet in this case, the aerobic treatment system is a lot smaller and saves more energy than without the anaerobic pretreatment.

WEHRLE has different anaerobic technologies and chooses the most suitable for the respective purpose.



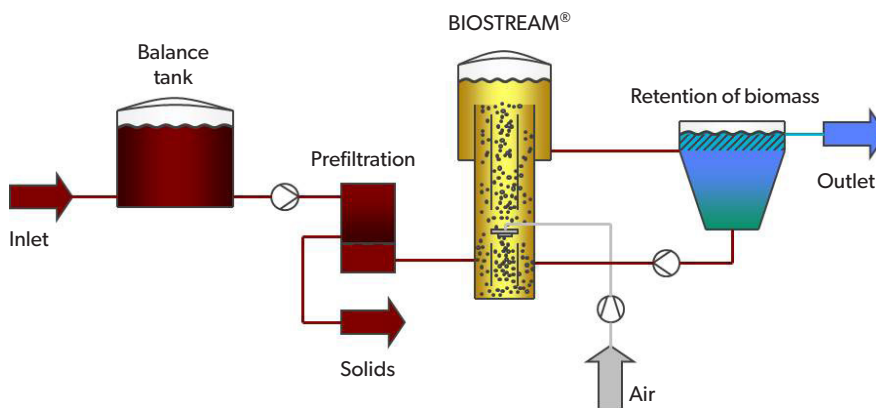
Flow rate	8,088 m <sup>3</sup> /d
COD / Conc.	3,251 mg/l
COD / Load	26,294 kg/d



## BIOSTREAM® – the Energy-Optimised Alternative to Anaerobic Treatment

For clients who need a treatment for highly loaded wastewater but do not want to install an anaerobic treatment system for reasons of plant flexibility, space requirements, compliance with the discharge limit values or the effort linked to biogas generation, WEHRLE offers the BIOSTREAM® process technology which reduces the operation costs to a minimum due to an energy-optimised aeration technology. Compared to anaerobic technologies, the BIOSTREAM® can also decompose ammoniacal nitrogen and particularly distinguishes itself by a very high flexibility in case of load variations.

For example **Ajin Paper & Packing Co. Ltd., Daegu / KR** – Treatment of 4,100 m<sup>3</sup>/d and 5,200 kg/d BOD with only 2 x 320 m<sup>3</sup> BIOSTREAM® loop reactors.

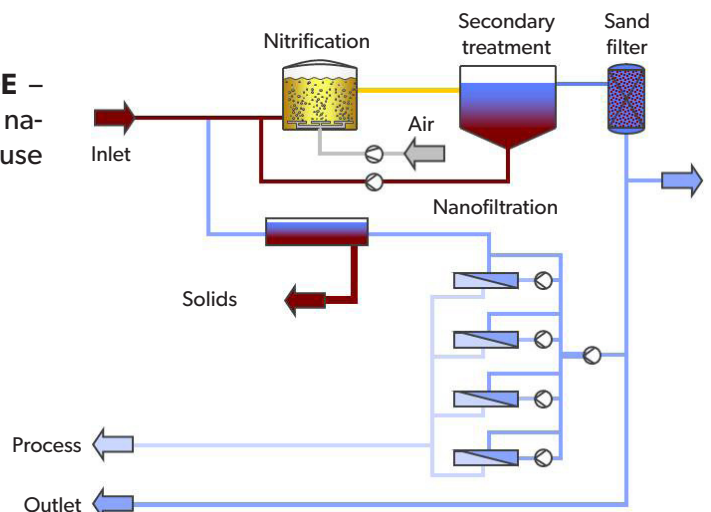


<b>Flow rate</b>	4,100 m <sup>3</sup> /d
<b>Inlet / BOD</b>	1,500 mg/l 5,200 kg/d
<b>Outlet / BOD</b>	< 225 mg/l
<b>Performance</b>	> 85 %

## Membrane Technologies

No matter if raw or process water treatment, separation and retention of solids or dissolved matters are necessary or if a polishing unit is required for industrial effluent treatment – membrane technologies are indispensable for today's water technology. The number and diversity of available membranes is still increasing from year to year. Yet eventually, the membranes are not the treatment solution but the engineering of the entire plant is. The important aspects are know-how and long-time experience.

For example **Palm Paper Mill, Eltmann / DE** – already in 1999, WEHRLE built the world's first nanofiltration plant on industrial scale for water reuse – which is still in operation today!



<b>Flow rate</b>	4,320 m <sup>3</sup> /d
<b>Inlet/ COD</b>	300 mg/l
<b>Outlet / COD</b>	50 mg/l
<b>Performance</b>	> 85 %
<b>Recovery rate</b>	> 75 %

## 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.



## 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 seasonal production or changes of product lines) 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 reu-

se / 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.

## Contact

WEHRLE Umwelt GmbH  
Bismarckstrasse 1-11  
79312 Emmendingen  
Germany  
Tel.: +49 7641 585-0  
info@wehrle-umwelt.com  
www.wehrle-umwelt.com



Company video