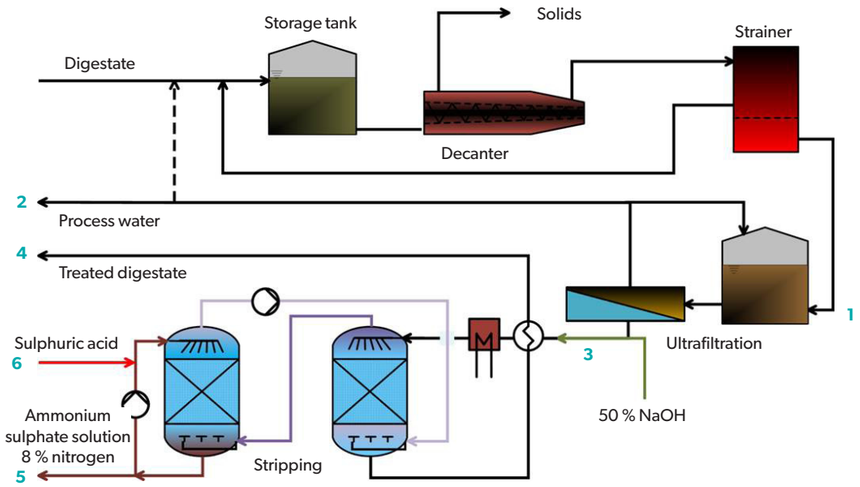
## Alternative to Elimination: Nitrogen Recovery

If certain criteria are fulfilled, nitrogen recovery might be a useful alternative to the biological elimination of nitrogen in the wastewater. The nitrogen is stripped from the wastewater and recycled as ammonium sulphate solution, a very convenient fertilizer for plants. For this purpose, WEHRLE has developed the BIOSCRUB® process which makes it possible to flexibly define the suitable pre- and post-treatment steps together with the client in order to achieve the required results.




Example for the process elements of the BIOSCRUB® process

## WEHRLE-WERK AG

### 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 wastewaters. 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.

WEHRLE is the uncontested technology leader on the market for the treatment of leachate, MBT centrate, sludge water, liquid manure and digestate, having built more than 200 references, the first ones being in operation for 25 years now. WEHRLE thus offers the most reliable technical solution and the most sustainable economic technology on the market.

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 45 countries and on 5 continents.

## Contact

WEHRLE-WERK AG
Bismarckstrasse 1-11
79312 Emmendingen
Germany
Tel.: +49 7641 585-0
info@wehrle-werk.de
www.wehrle-werk.de

Homepage

03/11/2021



# ELIMINATION OF NITROGEN FROM WASTEWATER

WEHRLE

## Liquid manure / Digestate / MBT wastewater / Landfill leachate / Return Liquor

Effluents from waste are extremely highly loaded and must be treated reliably and effectively before discharging them into a municipal sewage treatment plant or Nature. Conventional technologies often fail due to the high concentrations of organic substances, salts and especially nitrogen compounds which are harmful to the environment.

In order to properly eliminate the nitrogen compounds ammonium ($NH_4$) and nitrate ($NO_3$), which are particularly detrimental to the environment and have eutrophying and toxic effects and may cause significant odour nuisance, specific technologies and many years of operating experience with regard to the interactions of biological and physical-chemical processes are required.
For those complex applications, WEHRLE is your experienced partner and plant constructor. Our first plants for nitrogen elimination in landfill leachate have been in operation since 1991 already and still prove their reliability and cost-effectiveness every day.

## Overview Process Technologies

| | |
|---|---|
| **SBR**<br>Sequencing Batch Reactor | Basic technology for nitrogen elimination in batch processes – ideal for lowly loaded wastewaters with low salt concentrations, relatively constant loads and in stable climate zones |
| **BIOMEMBRAT®**<br>High-performance MBR | High-performance membrane bioreactor for a most reliable and effective biological treatment of highly loaded or saline wastewaters, also in case of frequent load variations reliable nitrogen elimination of up to 99 %! |
| **BIOSTREAM®**<br>Loop reactor | Energy-optimised high-performance bioreactor with loop / jet zone processes for very highly loaded wastewaters in case of extremely limited space or as nitrogen-eliminating alternative to anaerobic treatment processes |
| **BIOMOX®**<br>Deammonification | Deammonification process for an energy- and cost-saving treatment of very nitrous wastewaters by using anammox organisms, considerably reducing the aeration requirements and without adding external carbon sources, for example for return liquor treatment from digestion tanks |

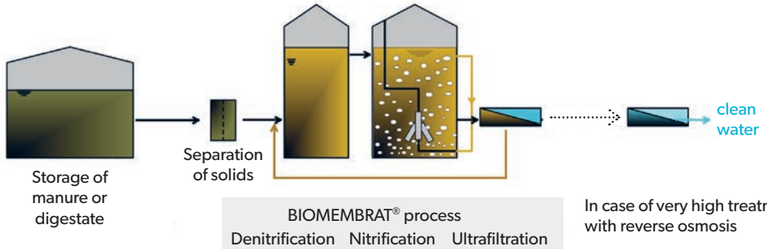
Energy Technology • Environmental Technology • Manufacturing

## Treatment of Liquid Digestate and Pig Manure

The treatment of pig manure and liquid digestate of different origins is one of the greatest challenges in wastewater treatment. The high organic loads which are typical for all effluents from waste but also the nitrogen compounds, salts and considerable quantities of solids require a sophisticated process combination and process control.

Example: **Chistogorsky, SPC, Ltd. (OOO), Chistogorsk / RU**
Treatment of 4,000 $m^3$/d of pig manure by using a BIOMEMBRAT® high-performance MBR with upstream denitrification.

| Component | COD | $NH_4$-N | TN |
|---|---|---|---|
| **Inlet** | 15,000 mg/l | 2,000 mg/l | 2,100 mg/l |
| **Outlet** | < 500 mg/l | < 10 mg/l | < 100 mg/l |
| **Performance** | > 95 % | > 99 % | > 95 % |



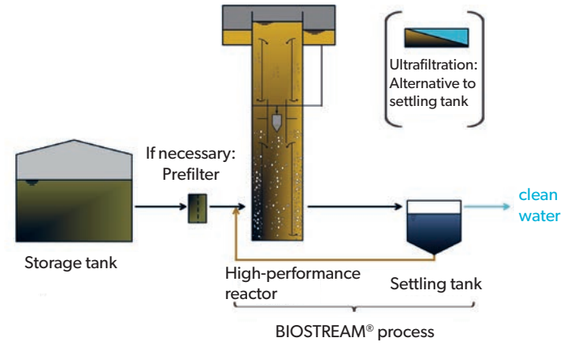

## Treatment of Nitrous Industrial Effluents

Nitrous industrial effluents are, for example, produced in steel production, animal rendering, the chemical industry and the production of fertilizers. Yet, due to attendant substances which are harmful to the environment, those effluents can usually not be spread as fertilizer on fields; they have to be treated.

Due to the high oxygen need for the oxidation of nitrogen and other pollutants, the optimisation of the oxygen injection is of particular importance. For this purpose, WEHRLE offers an energy-optimised loop reactor process which only needs < 1.2 kWh/kg $NH_4$-$N_{elim.}$.

Example: Treatment of effluents from the production of fertilizer with toxic content, **Namhae Chemistry Co., Yeosu / KR**, using a BIOSTREAM® Jet Loop Bioreactor.

| Flow rate | 1,700 $m^3$/d |
|---|---|
| **Component** | **TKN** |
| **Inlet** | 800 mg/l |
| **Outlet** | < 70 mg/l |
| **Performance** | > 90 % |




## Wastewater from MBT*) & Landfill Leachate

Processes for the treatment of effluents from MBTs, waste bunkers or from landfills have to be able to cope with very high concentrations of solids and must be capable of

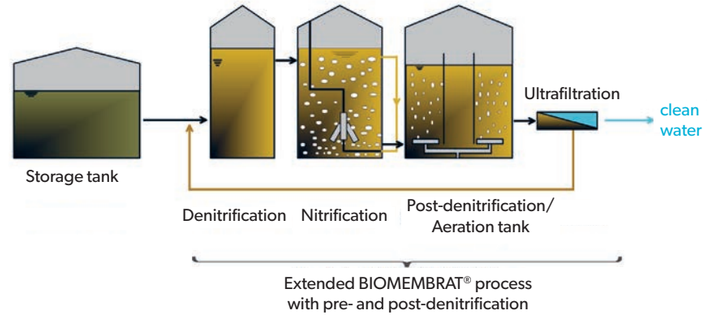
- effectively decomposing very high concentrations of organically bound nitrogen (TKN) and $NH_4$-N,
- dealing with seasonal variations of water volumes or water composition,
- tolerating salt precipitations from waste (e.g. struvite).

Such requirements make highest robustness and flexibility indispensable.

Example: **UTE Montcada, Ecoparc 2, Barcelona / ES** with high-performance MBR BIOMEMBRAT® with additional downstream DN/N stage.

| Flow rate | 140 $m^3$/d | |
|---|---|---|
| **Component** | **COD** | **$NH_4$-N** |
| **Inlet** | 30,000 mg/l | > 5,000 mg/l |
| **Outlet** | 1,500 mg/l | < 10 mg/l |
| **Performance** | > 95 % | > 99 % |

*) Mechanical- biological waste treatment



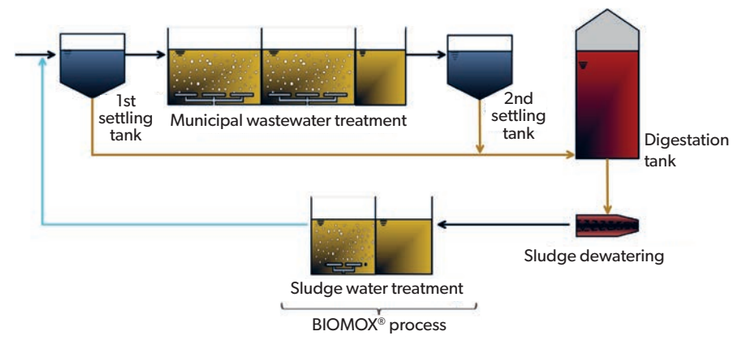

## Treatment of Sludge Water from Digestation Tanks

Digestation towers in sewage treatment plants: the return liquor produced when dewatering digestation sludge contains high ammonium loads, which increases the N load by up to 25 % when recirculating the water into the sewage treatment plant and thus the costs.

By inserting a BIOMOX® stage, the sludge water can be treated directly. The deammonifcation process requires 60 % less energy than conventional processes. The anammox bacteria operate without adding a C source.

WEHRLE offers two deammonification processes:

| | Process | N Concentration | N Elimination rate |
|---|---|---|---|
| 1 | Batch / SBR | < 1,000 mg/l | > 80 % |
| 2 | Continuous / CFR | > 1,000 mg/l | > 90 % |




Example:
Sewage treatment plant
**Badajoz / ES**
with BIOMOX® CFR

| Flow rate | 495 $m^3$/d |
|---|---|
| **Component** | **$NH_4$-N** |
| **Inlet** | 820 mg/l |
| **Outlet** | < 80 mg/l |
| **Performance** | > 90 % |