

→ AXENIS™ wastewater treatment system

THE LINDE GROUP

Linde

AXENIS™.

Sustainable solution for the reuse of wastewater.



How AXENIS™ helps your business. Cost-efficient wastewater treatment.

Based on the Oxygen Membrane Bioreactor (Oxy-MBR) from Linde, the AXENIS™ process treats wastewater to an exceptional standard which is suitable for reuse or discharge to a watercourse.



External view of the 33-foot-long AXENIS™ pilot plant

The process

The AXENIS™ system treats wastewater to an exceptional standard which is suitable for reuse or discharge to a watercourse. The process supports the high level of biomass required to biologically oxidize the Chemical Oxidation Demand (COD) without converting it to surplus biological sludge.

The biomass generates heat, raising the temperature, which accelerates the reaction rate. This leads to an increased demand for oxygen, resulting in oxidation of more COD, and dramatically reduces the amount of surplus sludge produced.

Confidence in the process through an on-site trial

Linde's containerized pilot plant, incorporating a small laboratory, allows for detailed trials at customer sites to determine the performance and the most appropriate membrane material. We work closely with our customers to ensure that we deliver an optimal solution to meet their needs.

Linde's wastewater technologists developed the AXENIS™ wastewater treatment system to significantly reduce the cost of wastewater treatment.

AXENIS™ is a patented process that combines innovative oxygenation equipment with best-in-class cross-flow membrane technology. The compact, reliable and robust design treats water to a high quality suitable for reuse, thereby saving money and helping your business achieve its sustainability goals.

The usual odor and foam-free processing seen in pure oxygen plants has now been combined with the cleanliness of the easily maintained external cross-flow MBR. The process produces less surplus sludge than comparable systems, reducing costs and helping reduce overall environmental impacts.

The treated water is suitable for reuse as well as river and coastal discharges, helping you meet national environmental requirements.

Benefits

- Produces high-quality, reusable water
- Reduces the cost of wastewater treatment
- Low energy requirements
- Sustainable process reducing your environmental impact
- Fast, clean and trouble-free
- Assists in meeting your legal obligations

AXENIS™: The full turnkey solution

Linde has partnered with Aquabio, who has unrivaled expertise in designing and building MBRs and water reuse schemes. A full turnkey service is available from trial work to building, training, remote monitoring, and operational assistance.

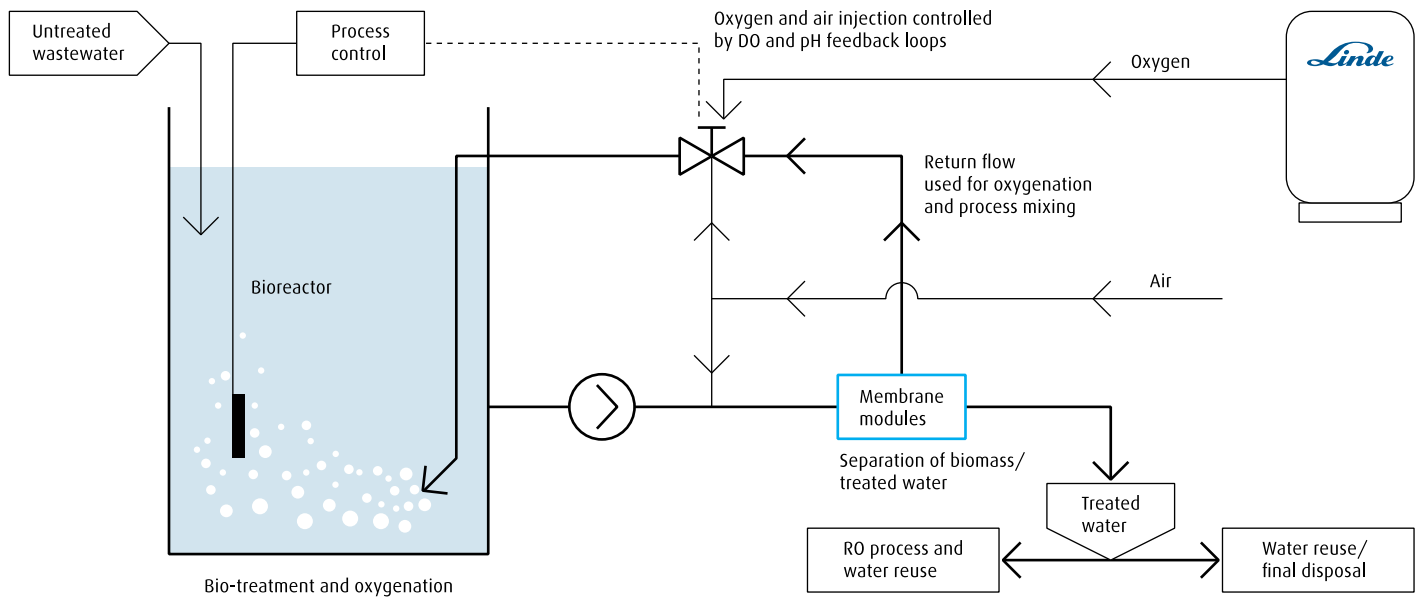
The full system design is based on specific requirements, such as effluent strength and final water purity. Linde also offers system commissioning and maintenance packages as well as oxygen supply and storage.



The AXENIS™ wastewater treatment system: easily monitored and controlled

Which types of effluent are treatable using AXENIS™?

The AXENIS™ system can treat industrial wastewater within the food, beverage, pharmaceutical, or chemical industries. A final water quality with Biological Oxygen Demand (BOD) and suspended solids figures of < 5000ppm is readily achieved. By including a reverse osmosis stage, river discharge and water recycling to potable water become much more viable.



Typical layout of an AXENIS™ wastewater treatment system



Internal view of the AXENIS™ pilot plant

How AXENIS™ measures up

The AXENIS™ wastewater treatment system was developed from Linde's VAIROX patent which allows the injection of oxygen and air into a pumped sidestream to control both DO levels and pH. A cross-flow membrane is incorporated into the VAIROX system, enabling biomass separation at the same time as oxygenation, aeration, and mixing without additional energy.

Using pure oxygen for wastewater treatment in bioreactor tanks enables the process to operate at higher biomass and DO concentrations than air-based MBRs or conventional activated sludge plants. This leads to faster COD oxidation, resulting in less COD conversion to surplus biomass, which would otherwise require costly tankering off-site. This means that the bioreactors can typically be half the size of an air-based MBR, thereby reducing the unit's footprint.



Bioreactor and membrane sidestream pump

Less undissolved gas leaves the surface of AXENIS™ reactors (about 1% of the volume of normal aeration systems), which results in minimal foaming and less heat loss to the atmosphere, leading to more active biomass.

Mixed Liquor Suspended Solids (MLSS) concentrations can be up to 30,000 mg/l without adversely affecting flux rates. The MLSS are pumped through externally-located membrane banks to ensure the biomass is retained within the bioreactor and also provide easy access for maintenance. This eliminates the need to pump down the bioreactor to access the membranes, which saves valuable time and energy.

Biomass returned to the bioreactor is used to dissolve oxygen and is controlled by DO probes. The pH is continuously measured and a feedback system controls the addition of air to strip out dissolved carbon dioxide to maintain a neutral operating pH regime.

Precise and independent control of both DO levels and pH enables the biological process to perform at levels far above those of conventional air-based systems. The Ultra Filtration (UF) membranes also produce final effluent water with exceptional quality standards.

Linde has over 200 operating plants worldwide serving a diverse range of industries. When it comes to designing reliable and robust industrial wastewater treatment plants, Linde has the experience and expertise you can rely on.

Contact

Please contact us through your local account manager if you would like to get further details on the AXENIS™ wastewater treatment system.

Getting ahead through innovation.

With its innovative concepts, Linde is playing a pioneering role in the global market. As a technology leader, it is our task to constantly raise the bar. Traditionally driven by entrepreneurship, we are working steadily on new high-quality products and innovative processes.

Linde offers more. We create added value, clearly discernible competitive advantages, and greater profitability. Each concept is tailored specifically to meet our customers' requirements – offering standardized as well as customized solutions. This applies to all industries and all companies regardless of their size.

If you want to keep pace with tomorrow's competition, you need a partner by your side for whom top quality, process optimization, and enhanced productivity are part of daily business. However, we define partnership not merely as being there for you but being with you. After all, joint activities form the core of commercial success.

Linde – ideas become solutions.

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