

# ByoFlex<sup>®</sup> Nitrogen Recovery Stripper System

Boosting the circular economy via a proven, robust and revolutionary ByoFlex<sup>®</sup> stripping system, **part of NSI resource recovery**, recovering ammonia from highly contaminated substrates into a valuable circular resource.



# Resource recovery from ammonia

With the rising demand for circular solutions to reduce nitrogen emissions and reduce the carbon footprint, stripping technology can be applied to turn waste streams into valuable resources.

The ByoFlex® - a system from NSI Byosis - recovers ammonia from highly contaminated substrates. This can optimize biogas production while reducing discharge costs simultaneously. In addition, it can reduce OPEX-cost of a biological wastewater treatment system, while reducing the carbon footprint.

NSI Byosis combines and translates its extended knowledge of digestion and fermentation processes into practical and feasible solutions. Byosis offers solutions that improve the efficiency of the digestion process. Our stripping systems are a perfect alternative for biological wastewater treatment technologies such as the anammox-system.

## Your ByoFlex® benefits

- + **Reduces** N<sub>2</sub>O and CO<sub>2</sub> footprint: avoid conventional nitrogen oxidation.
- + **Reduces** the risk of clogging due to a robust and patented design.
- + **Reduces** discharge and treatment costs for nitrogen to a sewage system or surface water.
- + **Removes** ammonia from (polluted) wastewater, (sludge) digestate or manure.
- + **Reuses** centrate water to control the ammonia level in a biogas digester.
- + **Recovers** a valuable liquid circular fertilizer: ammonium sulphate or ammonium nitrate.

«The ByoFlex® system reduces discharge costs and recovers nitrogen to be used as a valuable fertilizer»



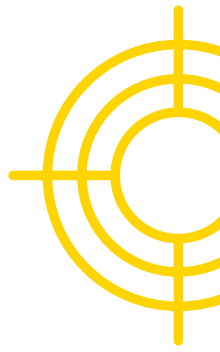
# Turn nitrogen challenges into a solid **circular** business case

“A 5-step approach to solve your nitrogen challenges”

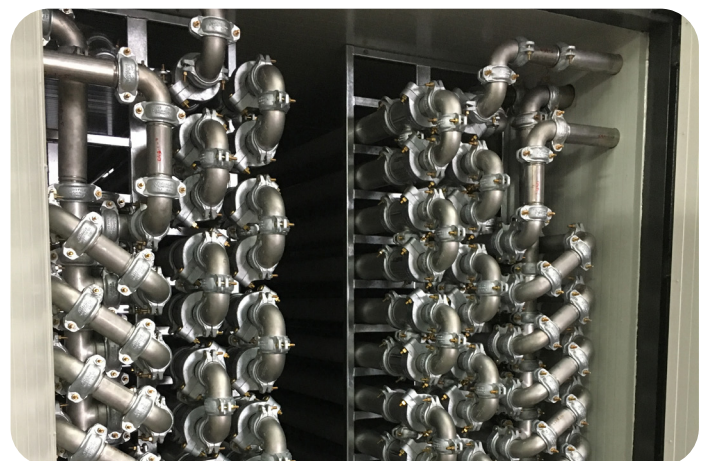
- 1 Investigate the current situation: new build or existing plant?
- 2 Solve ammonia, energy and/or system challenges.
- 3 Optional: pilot and/or mobile water solution.
- 4 Design and build ByoFlex® system.
- 5 Smart operation and maintenance to reduce OPEX costs.

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## ByoFlex® Process Description



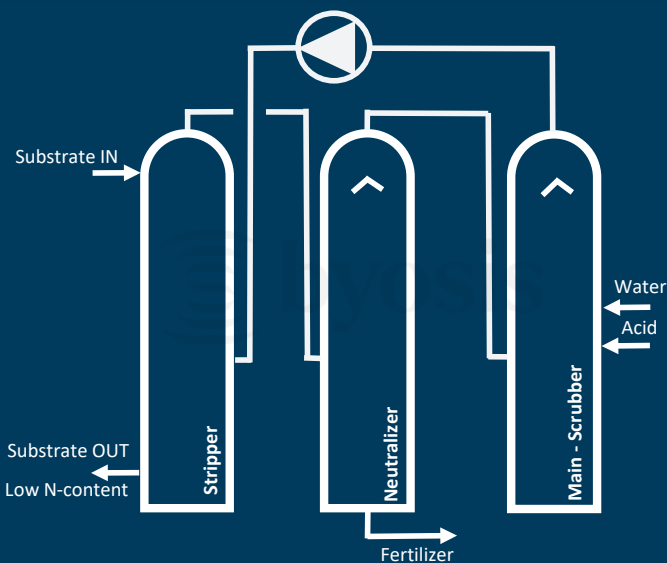
- After heating, the substrate is pumped into the top of the stripper, where air is blown through the substrate in counterflow mode. Ammonia ( $\text{NH}_3$ ) is captured by the air.
- In a wet environment, the gaseous ammonia ( $\text{NH}_3$ ) is in equilibrium with ammonium ( $\text{NH}_4^+$ ). At higher temperatures or higher pH-values, the equilibrium shifts to ammonia that can be captured by the air.
- The air, (partially) saturated with water vapor and ammonia, is blown through a series of two ammonia scrubbers. There, the ammonia is removed from the air with sulphuric acid and water to form ammonium sulphate or, alternatively, nitric acid can be used to produce ammonia nitrate. The air is reused to save energy costs. Only a very small bleed stream is applied to prevent the build-up of undesired components.
- With the ByoFlex® system, a transparent, liquid, pH neutral ammonium sulphate with 8% nitrogen and 40% dry matter is produced. This is a high-quality fertilizer. The clean, yet moist, air is fed back to the stripper. In case of ammonia nitrate, a fertilizer with >15% N is possible.
- If desired, the heat can be recovered by exchanging incoming and outgoing substrate streams to and from the ammonia stripper. NSI Byosis has developed a special type tube-in-tube heat exchanger, 100% modular, demountable and expandable.



# Industry Applications

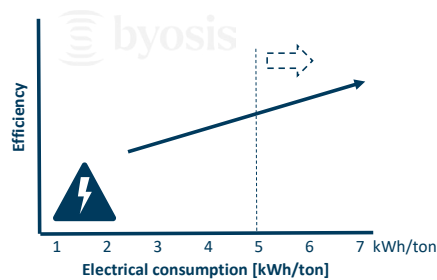
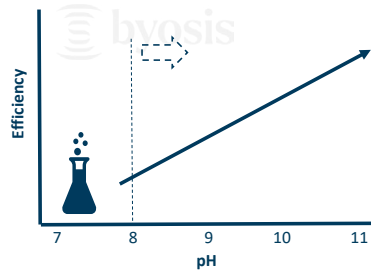
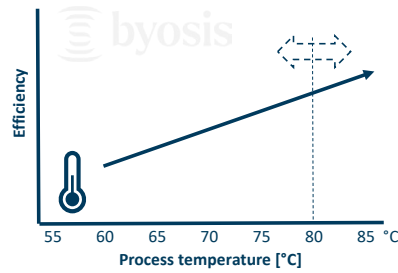
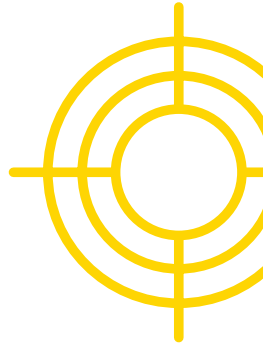
“ Addressing the needs of municipal and industrial wastewater treatment plants to turn nitrogen challenges into a true circular business case, through recovery of a valuable fertilizer”

- Industrial wastewater treatment plants
- Municipal wastewater treatment plants
- Food waste and manure digesters



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# ByoFlex® Process Overview

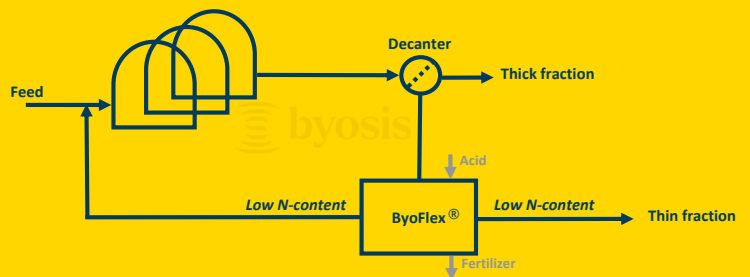


Typically, a removal and recovery rate of 70-85% N-NH<sub>4</sub> leads to the best ratio between CAPEX and OPEX, but higher recovery/removal percentages are also possible.

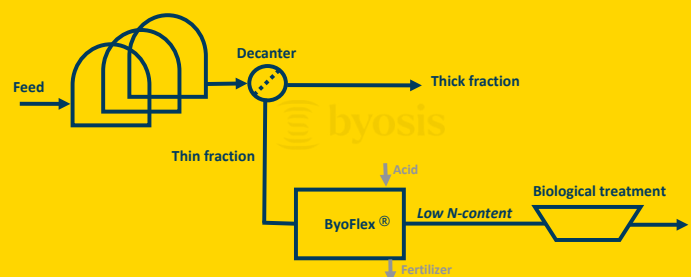
The stripping efficiency is strongly dependent on the temperature and pH-level of the substrate and the fan's electrical energy consumption.

## ByoFlex® configuration examples

**Reduce operational cost:** Controlling the N-content in the digester



**Reduce treatment cost, reduce N-content:** back-end treatment



# ByoFlex® Success Stories | Contact Us

Discover our reference book and case studies

**ByoFlex® 5**



**Sewage sludge**  
Germany

**ByoFlex® 4x20**



**Poultry manure**  
The Netherlands

**ByoFlex® 2x10**



**Food waste & manure**  
Italy

**ByoFlex® 2x10**



**Poultry manure**  
Northern Ireland



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**NSI Byosis B.V.**  
The Green East, Drosteweg 8, 8101 NB Raalte  
The Netherlands

+31 851 30 23 82  
[info@byosis.com](mailto:info@byosis.com)  
[www.byosis.com](http://www.byosis.com)

Rev. 2 - April 2026

