



**PAQUES**

# **ANAMMOX<sup>®</sup>**

## **Sustainable nitrogen removal**

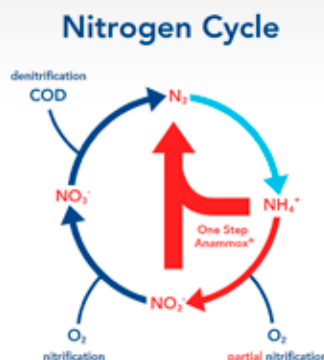
The ANAMMOX<sup>®</sup> process is a very cost-effective and sustainable way of removing ammonium from effluents and ammonia from waste gas.

revitalizing resources

# Cost-effective and sustainable nitrogen removal

The ANAMMOX<sup>®</sup> process is a very cost-effective and sustainable way of removing ammonium from effluents. Compared to conventional nitrification/denitrification savings on operational costs can reach up to 60%, while CO<sub>2</sub> emission is reduced.

The ANAMMOX<sup>®</sup> conversion is an elegant shortcut in the natural nitrogen cycle. Anammox bacteria convert ammonium (NH<sub>4</sub><sup>+</sup>) and nitrite (NO<sub>2</sub><sup>-</sup>) into nitrogen gas. Paques developed the process for commercial purposes in cooperation with Delft University of Technology and the University of Nijmegen. Since the first full-scale plant started up in 2002 (treatment of the rejection water of a sludge digestion of a municipal WWTP), many other ANAMMOX<sup>®</sup> plants were implemented.



## About ANAMMOX<sup>®</sup>

- Proven technology, > 10 years operational experience
- > 20 ANAMMOX<sup>®</sup> references worldwide
- Small footprint
- Robust system, handling high loading variations
- Saving on operational costs up to 60%
- Savings on excess sludge production
- Easy process control in one single continuously operated reactor unit
- No addition of organic carbon source (methanol) required

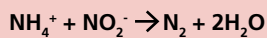
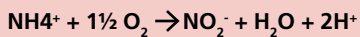
# ANAMMOX<sup>®</sup>

## Operation principle

The Anammox<sup>®</sup> reactor is a reactor system in which nitrification and anammox conversion occur simultaneously in one single process unit.

The natural nitrogen cycle involves various biological processes. Nitrification is the process where ammonium is oxidised to nitrite and nitrification is the process in which ammonium is fully oxidised to nitrate. Denitrification is the process which converts nitrate with addition of an organic carbon source to nitrogen gas. Anammox (anaerobic ammonium oxidation) conversion is an elegant short-cut in the natural nitrogen cycle where ammonium and nitrite are converted to nitrogen gas.

As the anammox process involves removal of ammonium over nitrite (NO<sub>2</sub><sup>-</sup>) rather than nitrate (NO<sub>3</sub><sup>-</sup>) less oxygen (O<sub>2</sub>) is required.



## Applications

The ANAMMOX<sup>®</sup> process can be used for the removal of ammonium from nitrogen rich effluents.

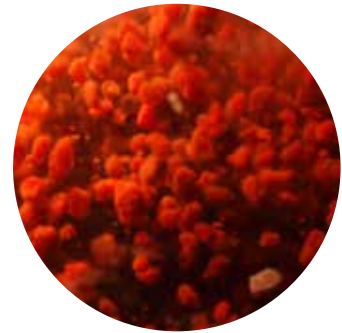
### These effluents are found in:

- Municipal waste water treatment (sludge rejection water)
- Organic solid waste treatment (landfills, composting, digestion)
- Food industries
- Manure processing industry
- Fertiliser industry
- (Petro) chemical industry
- Metallurgical industry
- Semi-conductor industry

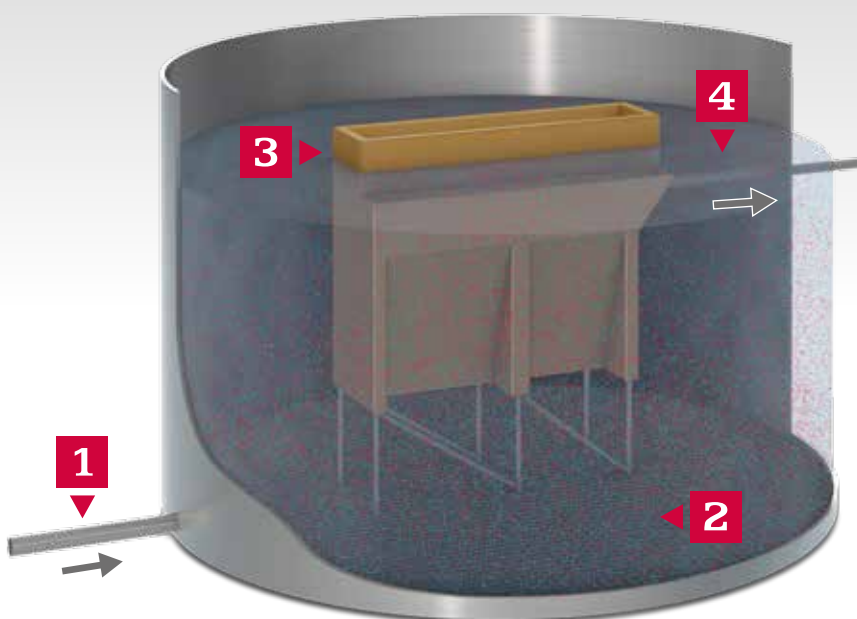
### CENIRELTA project (Low temperature ANAMMOX<sup>®</sup>)

In 2012, a pilot project has been started with ANAMMOX<sup>®</sup> bacteria functioning at a lower temperature. This process is more energy efficient, needs fewer chemicals and can be applied at temperatures between 6 and 16 degrees C.

After a successful lab scale performance, the pilot should demonstrate the possibilities on a larger scale. The CENIRELTA pilot is a EU LIFE+ project in cooperation with Waterboard Hollandse Delta, Paques, STOWA and Delft University of Technology.



Anammox bacteria converting ammonium and nitrite into nitrogen gas.



## ANAMMOX<sup>®</sup>, how it works

- 1 Ammonia-rich influent
- 2 Aerators for mixing and ammonia removal process
- 3 ANAMMOX<sup>®</sup> separator for biomass retention
- 4 Effluent exits the reactor



## Paques: leading in biological wastewater and gas treatment

Paques has over 30 years experience in helping industries and municipalities to reduce their water and carbon footprints and reclaim valuable resources. The cost-effective effluent purification systems produce energy from wastewater, whilst purifying the water and facilitating water reuse.

Since 1980, Paques realised more than 1800 references worldwide. Besides the headquarters in The Netherlands, Paques has subsidiaries and/ or production locations in China, Brazil, North America and India. In many other countries, the company is represented by licensed partners. This ensures local presence and the best service for clients worldwide.

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