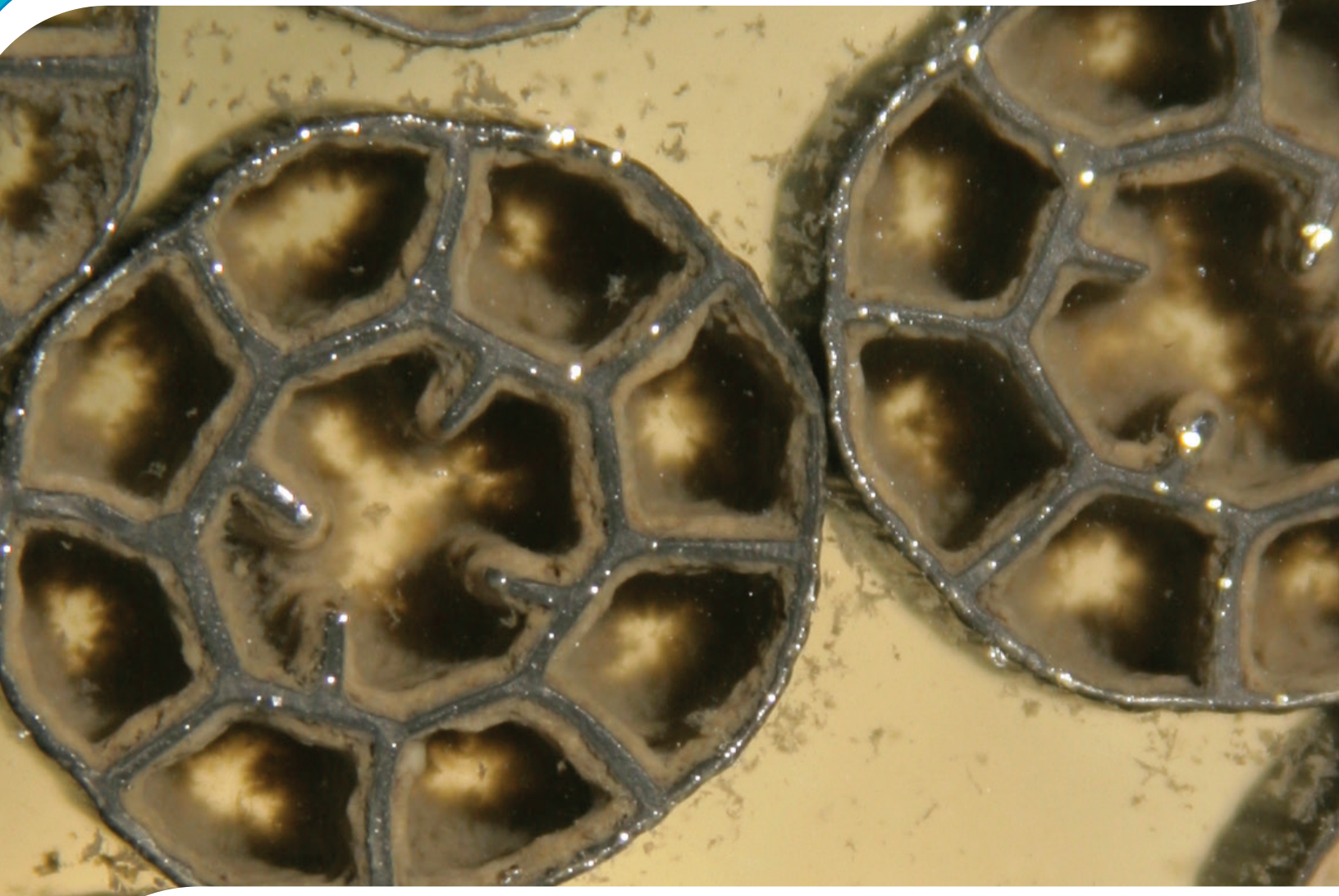
Headworks® INTERNATIONAL

ACTIVEMOX™
PN/A ANAMMOX

MBBR Solutions for High-Strength Ammonia Wastewater



Aiming Towards Carbon and Energy Neutrality

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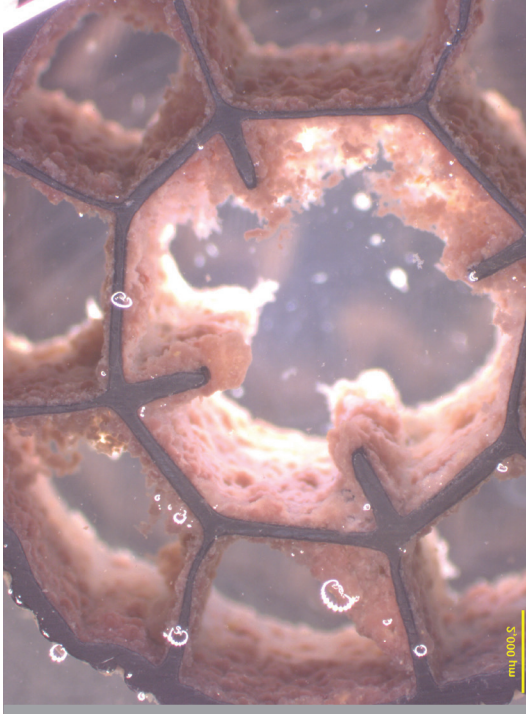
ACTIVEMOX™

An Efficient Nitrogen Removal Process

Headworks developed the ActiveMox™ process to treat wastewater for total nitrogen removal before discharge to confined receiving water bodies. This process ensures that concentrations of oxygen-depleting nutrients within these water bodies do not harm aquatic life.

ActiveMox™ is a single-stage ammonia and total nitrogen removal biofilm process based on the Moving Bed Bioreactor (MBBR) or Integrated Fixed-film Activated Sludge (IFAS) platform. It uses the ActiveCell™ media to nurture anaerobic ammonia-oxidizing bacteria (Anammox) and ammonia-oxidizing-bacteria-enriched (AOB) biomass for applications involving sidestream de-ammonification.

From an operations and maintenance standpoint, ActiveMox™ is a simple and stable technology for treating centrate or filtrate from a conventional anaerobic digestion (AD) process or AD following a thermal hydrolysis process (THP).



Headworks' time-tested and proven ActiveCell™ biofilm media provides the robust structure to promote, protect, and sustain the build-up of Anammox bacteria.

The ActiveMox™ (PN/A Anammox) process removes nitrogen in a single reactor instead of multiple reactors in the traditional MLE process.

KEY FEATURES

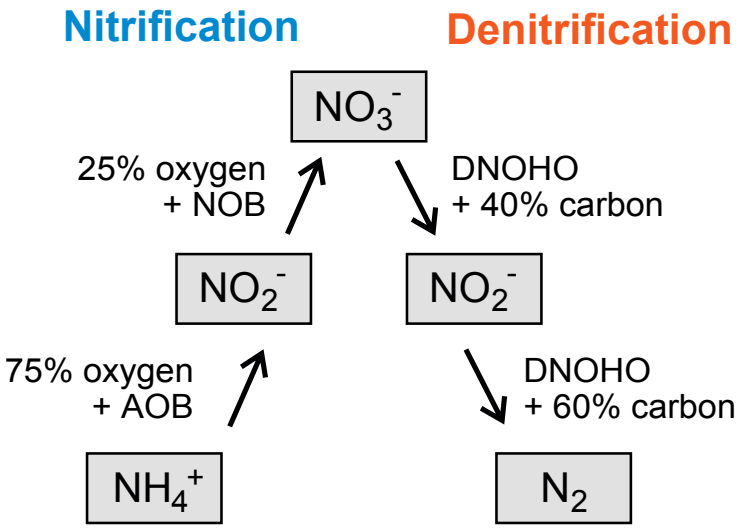
- Handles highly variable loads
- ActiveCell media are long-lasting, offering more than 20 years of service life
- Faster start-up compared to traditional Anammox processes
- Minimal maintenance required - media retention screens, drain screens, and the SS aeration system require no maintenance
- The media-based MBBR process eliminates the risk of Anammox washout, requiring no Anammox/MLSS separation equipment
- Allows for extended shutdown periods and quicker restarts.

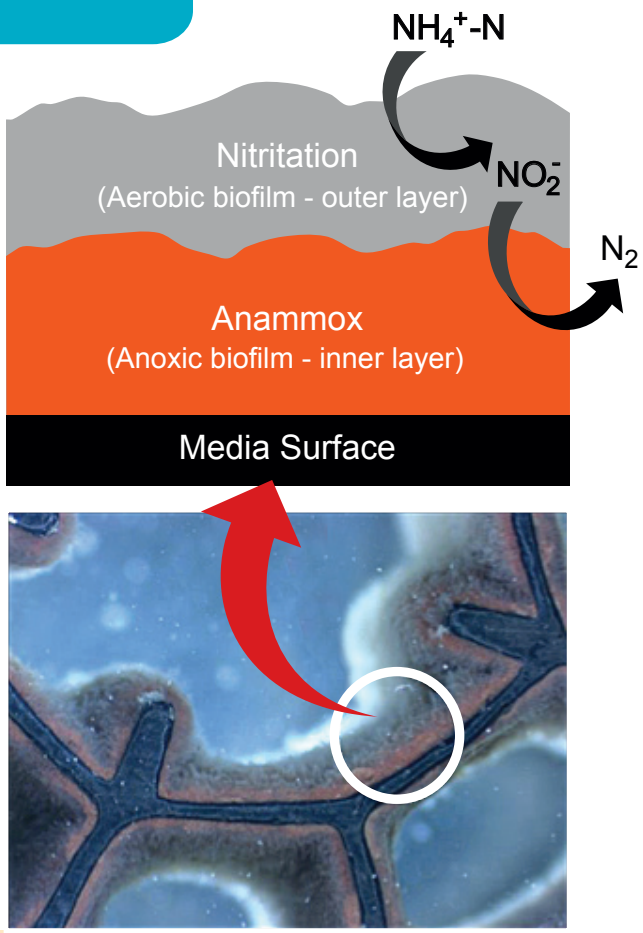
Advantages Of ActiveMox™ vs. Conventional Nitrogen Removal Process

- 75% lower total cost per kg of nitrogen removed
- 60% less energy consumption
- 90% less sludge production
- 50% smaller footprint
- Reduced OPEX due to lower operating DO and alkalinity consumption
- No external carbon source required
- Overall lower carbon footprint.

Why Partial Nitritation?

The traditional nitrogen removal process by nitrification-denitrification (shown below) requires multiple steps to convert ammonia to nitrogen gas – an energy-intensive process.

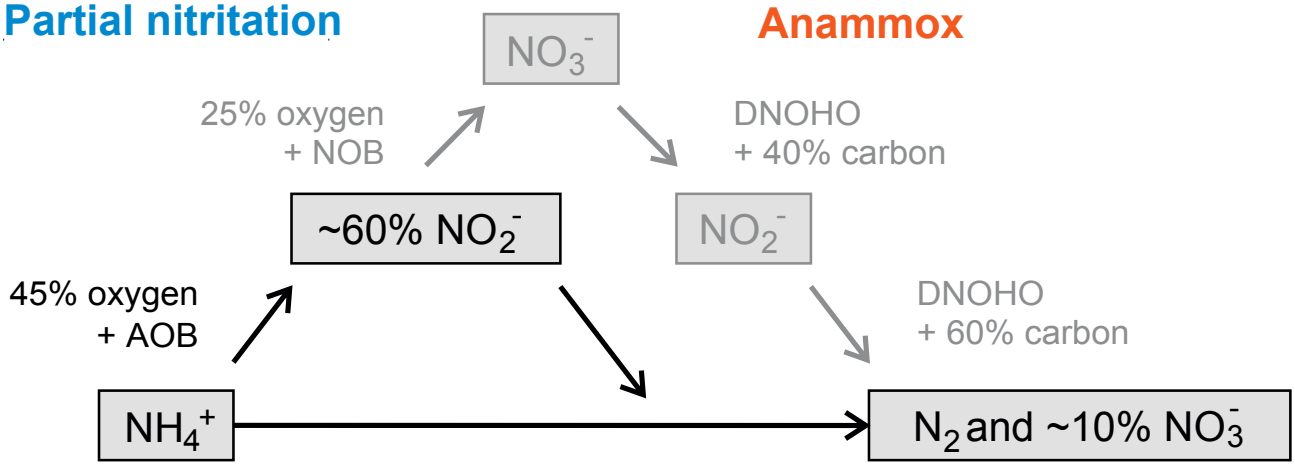




Biofilm Layer - A Close-Up

The PN/A Anammox process depicted below effectively short-circuits the default process of breaking down ammonia into nitrogen and water, resulting in fewer steps.

ActiveMox™ requires:
60% less oxygen
90% less carbon

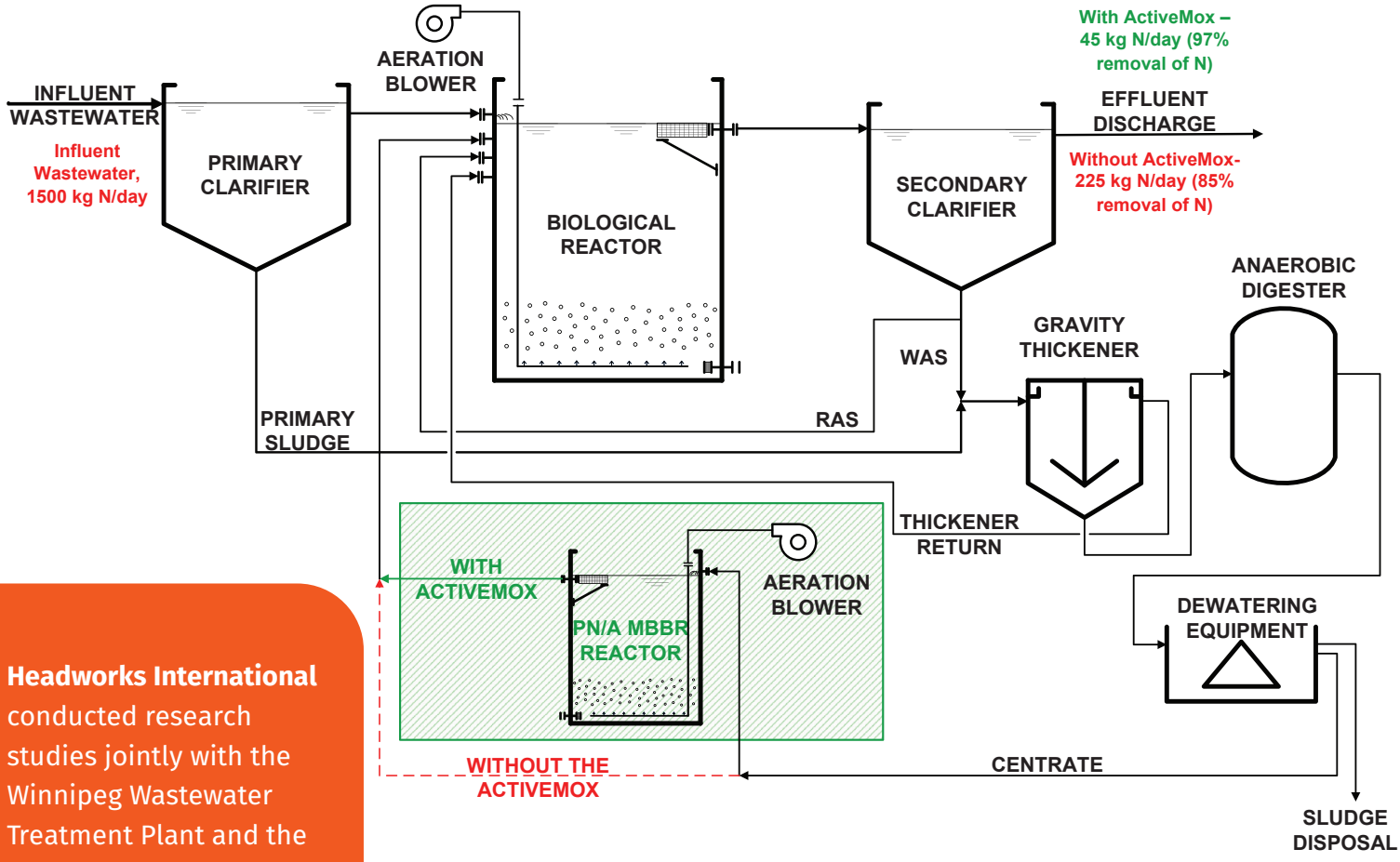


ACTIVEMOX™

As a Sidestream Application – an Overview

The ActiveMox™ process requires elevated temperatures (~30-35 deg C), high concentrations of ammonia (>500 mg/L), and a low COD ammonia-N ratio (~1). The return stream from the anaerobic digestion centrate fulfills these requirements and is ideal for this treatment process. The return stream from the anaerobic digester represents up to 30-40% of the total nitrogen load of the entire treatment process.

Implementing ActiveMox™ for the sidestream process treatment will significantly reduce the treatment plant's operating cost and carbon footprint.



Headworks International conducted research studies jointly with the Winnipeg Wastewater Treatment Plant and the University of Manitoba, Canada, on an MBBR-based PN/A Anammox process.

The team effort achieved start-up and process stabilization within 60 days, much quicker than the six months typical for a conventional Anammox process.

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