



ANITA™ Mox

AnoxKaldnes™ MBBR and IFAS



Solution for High Strength  
Ammonia Streams  
Anammox Process

**WATER TECHNOLOGIES**

# The Principle of the ANITA™ Mox Process - MBBR

ANITA™ Mox is a single-stage nitrogen removal process based on the MBBR (Moving Bed Biofilm Reactor) technology. The ANITA Mox process is used for treatment of streams highly loaded in ammonia, such as effluents from anaerobic sludge digestion, drying condensates, industrial wastewaters, and landfill leachates.

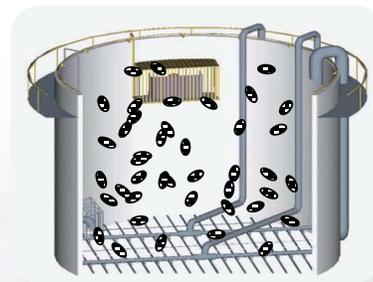
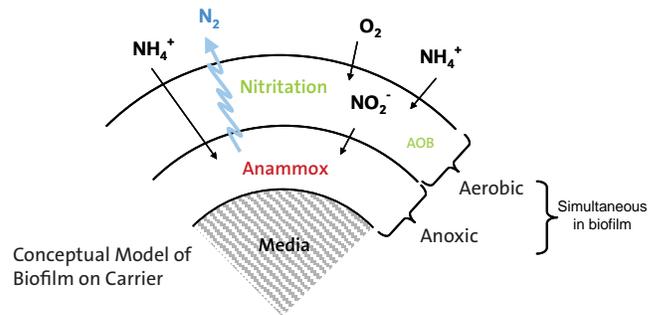
The ANITA Mox process combines aerobic nitritation and anoxic ammonia oxidation (anammox).

The two steps take place simultaneously in different layers of a biofilm. Nitritation (aerobic) occurs in the outer layer of the biofilm. A portion (55%) of the influent ammonia is oxidized to Nitrite ( $\text{NO}_2^-$ ). Anammox (anoxic) activity occurs in the inner layer. In this step, the nitrite produced and the remaining ammonia are utilized by the anammox bacteria and converted to nitrogen gas ( $\text{N}_2$ ) and a small amount of Nitrate ( $\text{NO}_3^-$ ).

The aerobic and anoxic reactions occur in a single MBBR reactor equipped with specially designed plastic carriers that support the biofilm, thereby preventing washout of the bacteria from the reactor.

The ANITA Mox process, using a single-stage MBBR with a proven aeration control strategy, achieves ammonia removal up to 90% and total nitrogen removal in the range of 75 to 85% without external carbon addition and with lower energy costs compared to conventional nitrification-denitrification.

Process conditions in the reactor are monitored and maintained to provide the optimal environment for the combination of bacteria.



*The ANITA Mox effluent screens provide a positive barrier to loss of anammox bacteria, since they keep the media and biofilm in the reactor.*

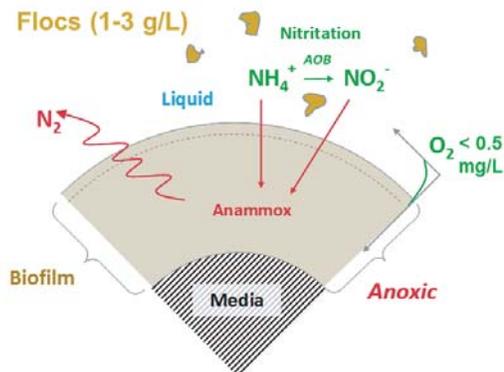
## Operating Parameters, Ammonia Removal in Digester Dewatering Stream

Parameter	Conventional Nitrogen Removal	ANITA™ Mox
Oxygen Requirement (lb $\text{O}_2$ /lb N)	4.6	1.9
Methanol Consumption (lb /lb N)	3.0	0
Sludge Production (lb VSS /lb N)	0.5 - 1.0	0.1

# The IFAS Advantage

IFAS (Integrated Fixed Film Activated Sludge) technology using suspended carriers has been a proven application of the MBBR process for more than 20 years. Applying the same concept to ANITA Mox has shown some significant benefits.

As with any IFAS system, the suspended growth is retained using a clarifier. In IFAS ANITA Mox, the return of biomass to the system shifts much of the nitrification step from the biofilm to the suspended phase, where the conversion of ammonia to nitrite takes place more rapidly. IFAS ANITA Mox can achieve higher volumetric removal rates than any other anammox process, thereby reducing the size of the biological reactor. This results in a tremendous advantage in equipment sizing, reactor footprint, and overall value. Still, the choice between MBBR and IFAS ANITA Mox is site-specific. With IFAS ANITA Mox, our expert team now has two highly efficient ANITA Mox processes to offer in a complete solution.

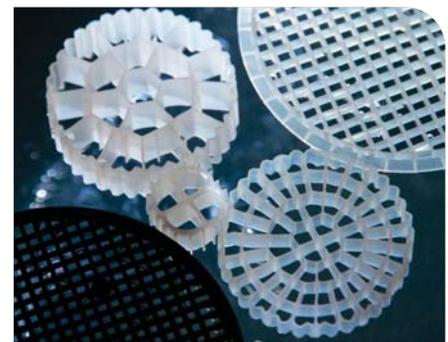


## A Key Element of the ANITA™ Mox Process: The Carriers

A key element of the MBBR/IFAS technology is the AnoxKaldnes™ carriers, also called media. The very slow growth rate of the anammox bacteria makes their retention a critical objective of the process. Compared with other technologies, the ANITA Mox effluent screens provide a positive barrier to loss of anammox bacteria, since they keep the media and biofilm in the reactor. The media is also designed to provide a large protected surface area for the biofilm and optimal conditions for biological activity.

### IFAS Benefits Include:

- Volumetric Nitrogen removal rates have shown to be 2-3 times higher, thereby further reducing the footprint
- The operational DO in IFAS ANITA Mox is lower than in MBBR ANITA Mox which results in energy savings
- IFAS ANITA Mox has been shown to better handle the presence of influent COD and higher polymer residuals



- Robust
- Compact
- 60% less oxygen requirement
- No external carbon needed
- Reduced sludge production

Highest volumetric loading (up to 3.0 kgN/m<sup>3</sup>/d)

Energy consumption as low as 1.1 kWh/kgN-rem

Robust, continuous process minimizes operator attention and equipment wear and tear

