Appendix A

VEOLIA

LagoonGuard™ MBBR

Moving Bed Biological Reactor

WATER TECHNOLOGIES

LagoonGuard™ complete solutions

AnoxKaldnes LagoonGuard™

Today's municipalities and operators using lagoon based wastewater treatment facilities are facing the challenge of increasingly stringent wastewater effluent regulations. In conventional means of upgrades, either an earthen basin or fully mechanical plant, achieving the new regulations has both space and financial challenges. Veolia Water Technologies optimized the LagoonGuard™ technology to:

- Address stress areas in the existing lagoon infrastructure
- Fit within clients existing lagoon site as a complementary process
- Equal the operational requirements of an aerated lagoon
- Provide enhanced treatment for seasonal and continuous discharge facilities
- Guaranteed nitrification at temperatures as low as 0.50C

What is the LagoonGuard™?

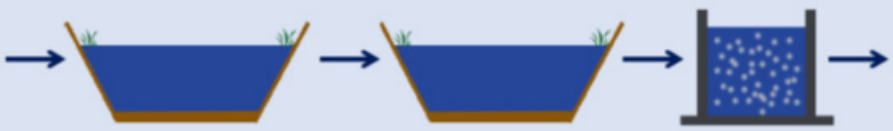
The LagoonGuard™ is built on the AnoxKaldnes™ MBBR platform. The process uses specialized media with a very high protected surface area. These carriers are designed for specific applications to ensure the best environment for biological growth and activity in the reactor. The LagoonGuard™ reactor can be placed at many locations within the lagoon process. Generally the following two are applied:

Enhanced BOD Removal

The LagoonGuard™ reactor can be placed as a primary treatment. It is capable of COD and BOD removal. The first stage application would require an upstream screen of 6mm to protect the process.

Ammonia Removal

Operating post lagoon, the LagoonGuard™ is capable of polishing sBOD and achieve the effluent ammonia objective. The lagoons remove large debris, thus upstream screening is not required.



LagoonGuard™ - Components

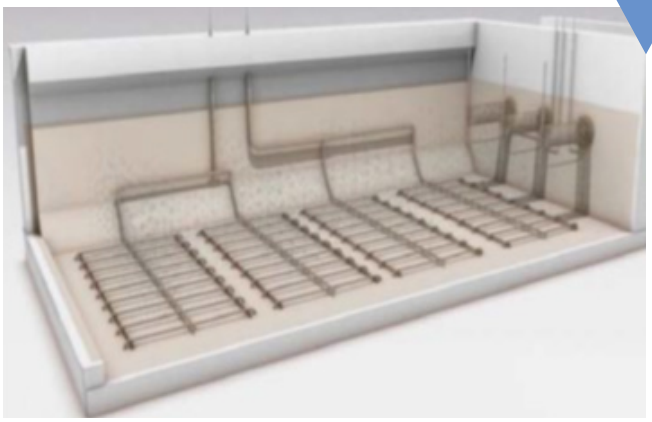
AnoxKaldnes AnoxK™ 5 Media

AnoxK™5 media provides the guardian structure for biofilm growth found in the LagoonGuard™. The media offers housing for the biolfilm with a protected surface area equivalent of 800 m²/m³.

The incredible amount of surface area provides a large biomass inventory that remains fixed in the reactor. This eliminates the risk of biomass washout (especially nitrifiers) and significantly reduces the retention time in the system. The hydraulic retention time in the LagoonGuard™ is in hours as compared to days in earthen basins.

Media volume can be up to 65% the reactor volume. Typical designs allow for significant expansion of the treatment capacity simply by adding media.

The AnoxK™ series are made of virgin high density polyethelyene. This media is built to last and proven the ability to be in operation for more than 20 years without degradation or media replacement.



LagoonGuard™ Reactor Cell

- LagoonGuard™ stainless steel air diffuser system is robust, non-clogging and maintenance free.
- Medium bubble air grids provide the oxygen and mixing needs for optimal biological performance. Diffusion through MBBR media results in increased oxygen transfer.
- Cylindrical sieves at the reactors effluent wall retain media, while allowing treated water to pass through. The sieves have a head loss of 50 mm per reactor at peak flow.
- Reactors are sized to allow for media addition, increasing the treatment capacity within existing cells.

LAGOONGUARD™ Systems Include

- Complete process design with equipment warranty and effluent guarantee
- Equipment: media, air grid, blowers, sieves, pumps, valves, meters & analyzers
- Controls: Veolia standard (A-B) or customized Control panel, PLC and HMI

Veolia's Added Value

TSS & Phosphorous Removal

Veolia is able to support the entire process train with in house expertise and a complete line of technologies.

Hydrotech™ Filtration

Similar to the new lower limits for ammonia removal, TSS and Total Phosphorus removal are becoming more stringent depending on the receiving water body. Thus, on a site specific basis a TSS and / or phosphorus polishing stage may be required after the LagoonGuard™ process.

Veolia's Hydrotech™ Discfilter is an operator friendly and low maintenance equipment to polish TSS and remove phosphorus to low levels. The Hydrotech™ Discfilter works exceptionally well following the LagoonGuard™ process. For TSS polishing only, the Hydrotech™ DiscFilter can typically achieve the regulation without chemicals. When the Hydrotech™ is used for TSS polishing and phosphorus removal, coagulant and polymer are dosed. The dosage can be optimized to maximize chemical efficiency based on the effluent requirement. The Hydrotech™ can achieve a lower limit of 0.1 mg/L TP.

HYDROTECH™ series 2200 & 2600

Filter size	5 & 10 – 1000 micron
Filtration area	2200 series 5 - 134 m² 2600 series 91 - 228 m²
Flow rates	2200 series up to 39 MLD 2600 series up to 103 MLD
Process	Inside out filtration
Installation	Semi-submerged (65%)
Head loss	≤ 300 mm
Backwash	1-2% of treated flow
Structure	S.Steel frame in concrete S.steel tank self standing
Features	Cover – electric opening BW Nozzles – self cleaning Filter – segmented panels
Effluent	TSS 5 mg/L, TP 0.1 mg/L

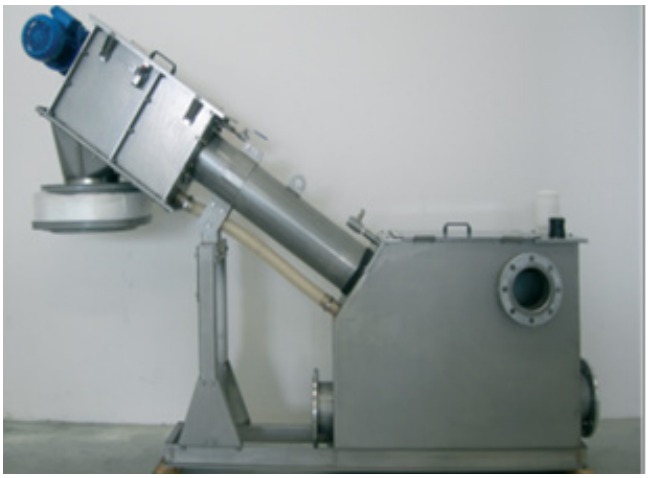
Influent Screening

If the LagoonGuard™ is placed in front of the lagoons for BOD removal or if the lagoon simply wants to eliminate large solids and debris from the lagoon, Veolia offers a full line of headworks equipment. The ROTARC screen can be installed in a channel or a tank. In typical lagoon applications, the bagged effluent is removed once per week and picked up curbside during collection.

Veolia's Added Value

JOHNMEUNIER - ROTARC® Type SB

Installation	Channel or s.steel tank
Screen type	6 mm perforated plate
Angle	45° channel & 35° tank
Channel	up to 3' wide x 5' deep
Flow rates	
Accessories	Washing system Bagger system Heat tracing Insulation wrap
Design support	Hydraulic profile, velocity, CAD, 3D



Automation

Veolia's in house automation team uses the Allen-Bradley controls platform in its standard package. Flexibility to meet your regional PLC standards is guaranteed. Our team has decades of experience in doing so across the country. Typical with LagoonGuard™ the entire treatment train can be operated from our central control panel and integrated into your SCADA system.

Veolia has developed the AQUAVISTA™ digital service as an optional feature to assist with plant operations. There are various levels of service with the goal to ensure you get the most out of your plant..

AQUAVISTA™
DIGITAL SERVICES

- > Securely stored in the Cloud
- > Private portal access
- > Access with any device, anytime, anywhere
- > Continuous optimization of plant performance
- > Savings areas; energy, chemicals, reporting hrs.
- > Compliance assurance with proactive and predictive tools

PHYSICAL SECURITY
Data acquisition

NETWORK SECURITY
Data transfer

CLOUD SECURITY
Data aggregation & data analysis

LagoonGuard™ - Commercial Demonstrations

The LagoonGuard™ for post lagoon nitrification research and development was performed in Canada for Canada.

Mapleton, Ontario Commercial Demonstration

Operational Time: Dec 2018 to April 2019

Application: Post-Lagoon Nitrification

Discharge: Seasonal

Effluent Ammonia Objective: < 1 mgTAN/L and non-acutely lethal to rainbow trout

- Minimum WW temperature 1.1 °C
- Effluent ammonia objective met
- Effluent passed acute lethality testing 0% mortality
- LagoonGuard™ provides an estimated capital **savings of more than $2M** compared to the alternative

Casselman, Ontario Commercial Demonstration

Operational Time: Dec 2017 to April 2018

Application: Post-Lagoon Nitrification

Discharge: Seasonal

Effluent Ammonia Objective: < 7.5 mg TAN/L and non-acutely lethal to rainbow trout

- Minimum WW temperature 0.9°C
- Effluent ammonia objective met
- Effluent passed acute lethality testing 0% mortality
- Process robust to changing conditions
- LagoonGuard™ and Hydrotech™ Discfilter preselected for upgrade

Compact, robust and **cost-effective solution**

LagoonGuard™ - Commercial Demonstrations

Neepawa, MB Commercial Demonstration

Operational Time: Dec 2016 to April 2017

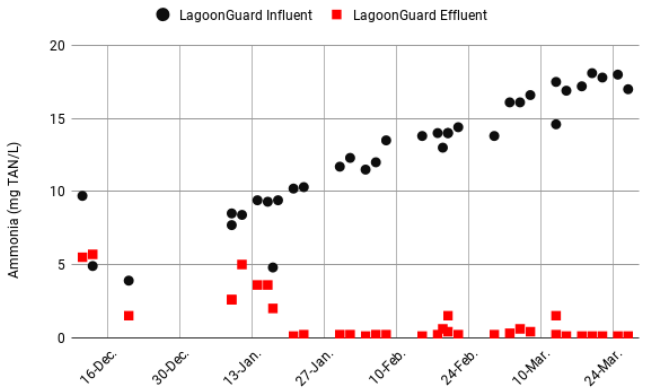
Application: Post-Lagoon Nitrification

Discharge: Continuous

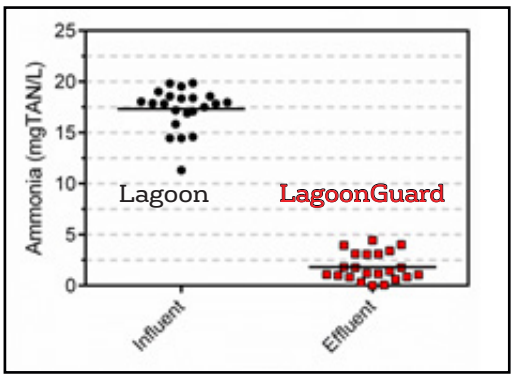
Effluent Ammonia Objective: < 5 mgTAN/L and non-acutely lethal to rainbow trout

- Minimum WW temperature 0.6°C
- Effluent ammonia objective met
- Effluent passed acute lethality testing 0% mortality
- Process robust to changing conditions
- LagoonGuard™ preselected for upgrade

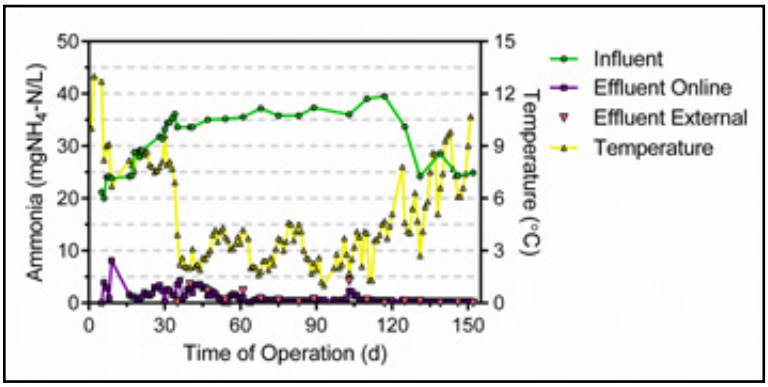
Ammonia removal



Mapleton, ON



Casselman, ON



Neepawa, MB

Total solutions to leverage existing lagoons and respect regulations

Resourcing the world

Veolia Water Technologies
2000 Argentia Road, Plaza IV, suite 430 • Mississauga, Ontario • L5N 1W1 Canada
tel: 905-286-4846 • fax: 905-286-0488
salescanada@veolia.com • www.veoliawatertechnologies.ca