A Case Study:

Improved Worker Safety and Increased Energy Efficiency while providing Odor Reduction and Sludge Management for a wastewater lagoon in Alberta

**VAM (Venturi Air Manifold) Technology**

Exclusive Distributor: Norwood Waterworks AB
Agenda

- Introduction
- Products
- How it works
- Case Study
- Summary
- Questions

Solving Specialty Waste Water Problems with Innovative Green Technology!
Our Goals

- Delivering the max O2 into the water column.
- Providing the maximum mixing & de-stratification
- Dramatic reduction in energy consumption
- 90% reduction in maintenance.
- Dramatic improvement in worker safety.

Solving Specialty Waste Water Problems with Innovative Green Technology!
Our Goals

• Water Disinfecting.
• Reduction of water temperature.
• Odor Reduction
• Reduction or elimination of chemicals.

Solving Specialty Waste Water Problems with Innovative Green Technology!
Our Products

- **The Digester**
  - Lift Stations & Wet Wells
- **Floating Mixer**
  - Small Lagoons and Large Tanks
- **Submersible Pod**
  - Lagoon Winter Application
- **Floating Aerator**
  - Lagoons & Treatment Plants

Solving Specialty Waste Water Problems with Innovative Green Technology!
The Digester
Floating Mixer
Submersible Pod
Floating Aerator/Mixer
VENTURI AIR MANIFOLD TECHNOLOGY (VAM)

Solving Specialty Waste Water Problems with Innovative Green Technology!
What is VAM Technology

Venturi Air Manifold or VAM is a unique design using a combination of fine air and coarse air diffusion to create an AIR LIFT Device for maximizing oxygen transfer.

Solving Specialty Waste Water Problems with Innovative Green Technology!
What VAM Can Do!

- Highly energy efficient aeration
- Thorough mixing and de-stratification
- Sludge control
- Water temperature reduction

Solving Specialty Waste Water Problems with Innovative Green Technology!
What VAM Can Do!

- Odor control / H2S /Ammonia/ Mercaptans
- Energy efficient disinfection, water born diseases, pathogens
- Algae control including toxic algae blooms
- Water treatment: Storm water / Industrial Wastewater

Solving Specialty Waste Water Problems with Innovative Green Technology!
Video 1: The Digester

Solving Specialty Waste Water Problems with Innovative Green Technology!
Mechanical Aeration

- High energy costs
- Good surface DO
- Reduces water temperature
- Poor deep water DO
- Poor mixing
- High maintenance
- High capital costs
- Detrimental to worker safety

Solving Specialty Waste Water Problems with Innovative Green Technology!
Video 2: How It Works!

Solving Specialty Waste Water Problems with Innovative Green Technology!
Oxygen Transfer

- Efficient aeration will deliver the maximum amount of O2 into the water.
- The least energy consumed based on Kgs of O2/HP Hour
- Uses a combination of fine and coarse air bubbles.
- Norwood aerators work in the upper 1/3 of the basin where the bubbles have expanded to their optimum size and surface area to transfer oxygen,

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Mixing and Cooling

• The Venturi Affect (Air Lift) pulls water up from over 4m deep providing excellent mixing and cooling of the water.
• Evenly spaced diffuser heads create turbulence when air is released.
  – Keeps solids in suspension allowing biological action
  – Eliminates sludge build up.
• Energy used to deliver air to the bottom is now used for mixing.

Solving Specialty Waste Water Problems with Innovative Green Technology!
Adding AOP (Ozone)

• **Advanced Oxidation Processing** - the generation of hydroxyl radicals (HO+) to oxidize contaminants in the air and water.

• Hydroxyl Radicals are generated by combining ozone and water in the presence of germicidal U.V.

• This system is compact and produces a concentrated and more effective oxidation process when applied using Norwood/DO2E Waste Water Technology.

Solving Specialty Waste Water Problems with Innovative Green Technology!
Adding AOP (Ozone)

- When ozone reacts with B.O.D., C.O.D., F.O.G., and combined halogens it reduces contaminates to inert compounds or carbon dioxide and water.
- Ozone removes ~
  - most heavy metals such as iron, manganese, zinc, and copper etc.
  - It breaks down pharmaceuticals, kills bacteria (E-coli) and viruses such as the three forms of hepatitis.

Solving Specialty Waste Water Problems with Innovative Green Technology!
Adding AOP (Ozone)

• A.O.P. or Ozone combined with hydroxyl radicals, are 100 to 200 times more effective when properly injected directly into the water column where the hydrogen sulfide is produced.

• This hybrid ozone carries a half-life of 2-5 minutes.

• We inject ozone or concentrated oxygen into the water column using a combination of coarse and fine bubble diffusion.
Adding AOP (Ozone)

This patented hybrid ozone allows us to:

a) Reduce the amount of ozone normally required.
b) Address many more complicated applications especially in very large commercial, industrial, and municipal waste water cleanup projects.

• A.O.P. combined with the Norwood/DO2E delivery technology, can now be used to address a variety of difficult and previously impossible cleanup applications as it applies to waste water treatment and environmental issues.

Solving Specialty Waste Water Problems with Innovative Green Technology!
Video 3: Floating Aerator

Solving Specialty Waste Water Problems with Innovative Green Technology!
Case Study: M.D. of Bonnyville – Fort Kent

• Goals:
  – Odor Reduction
  – Break up of floating solids
• Single Phase 100 amp service

Solving Specialty Waste Water Problems with Innovative Green Technology!
Cell #1 - Before
8 Units
Delivery
Installation
Cell #1
The Team
Maintenance Considerations

• No moving parts in Basin
• Constructed of high grade PVC – no corrosion
• Only moving part is land based electric Blower
• AOP Filter to be cleaned once a year

Solving Specialty Waste Water Problems with Innovative Green Technology!
Technology Summary

• Reduces power consumption up to 80% or more
• Virtually maintenance free
• NO moving parts in the lagoon
• Runs on low pressure, high volume air (no heat)
• Venturi effect pulls water up from over 4m
• Provides excellent oxygen transfer, up to 3.20 lbs. per HP/hr
• Aeration occurs at the optimum depth of 48” and remains in the water column longer

Solving Specialty Waste Water Problems with Innovative Green Technology!
Technology Summary

- No costly compressors
- Water Curtain Technology de-stratifies
- Cools effluent water
- Compatible with AOP (Ozone)
- VAM Technology does not require the use of chemicals or additives

Solving Specialty Waste Water Problems with Innovative Green Technology!
Technology **Summary**

- It is an air driven, **GREEN** technology
- Low capital costs, typical ROI is less than 1 year
- Reduces maintenance costs by more than 90%
- Low noise level - Quiet Technology!

Solving Specialty Waste Water Problems with Innovative **Green** Technology!
QUESTIONS

Solving Specialty Waste Water Problems with Innovative Green Technology!
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