Wastewater Treatment

Energy Saving Opportunity

Facultative Pond

Limitations / Challenges

- No aeration equipment
- Rely on wind for mixing
- Rely on algae for DO
- Short circuiting issues
- Sludge buildup
- Odors
- Loading typically 30-50 lbs/acre
- If can’t meet limits, need to have system evaluated / engineered

Partial Mix Pond

Limitations / Challenges

- Uses high HP aeration for DO
- Uses high HP for mixing
- Typically short on mixing
- Short-circuiting is still an issue
- Sludge buildup around aerators
- High energy / maintenance costs

Effluent Storage Pond

Limitations / Challenges

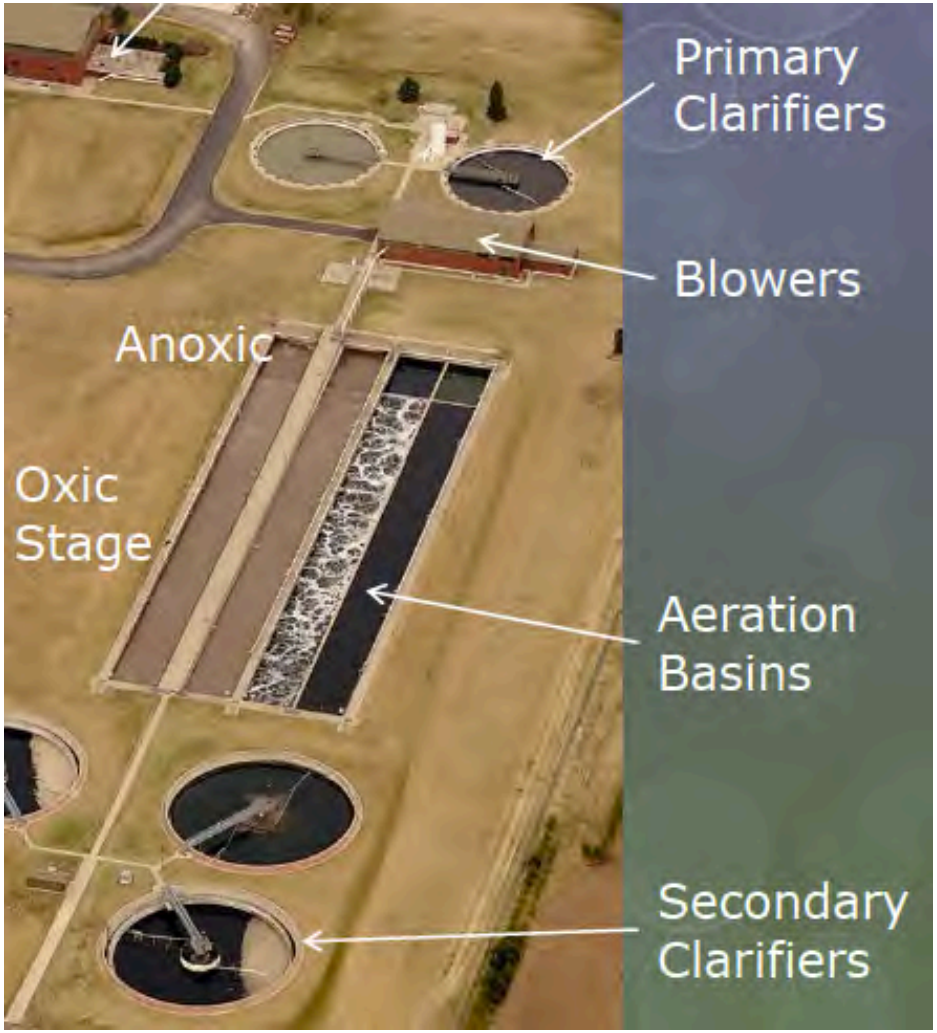
- Blue-green algae blooms
- Irrigation nozzle plugging
- Odor issues when irrigating
- Need mixing energy to try and control, typically high HP
- May need to comply with pH and DO limits

Sludge Storage Pond

Limitations / Challenges

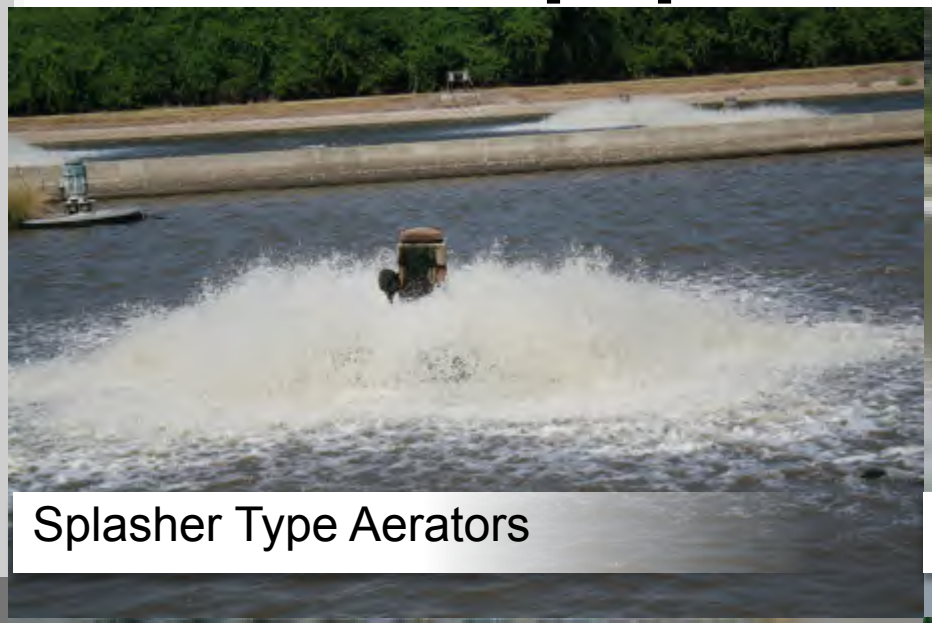
- Odors
- Typically use high HP brush aerators to try and provide an odor cap, (note small area of influence)
- Brush aerators are high maintenance / have struvite issues
- Need to allow sludge to settle to reduce water content
- Prefer to decant continuously

Complete Mix Ponds / Activated Sludge Systems

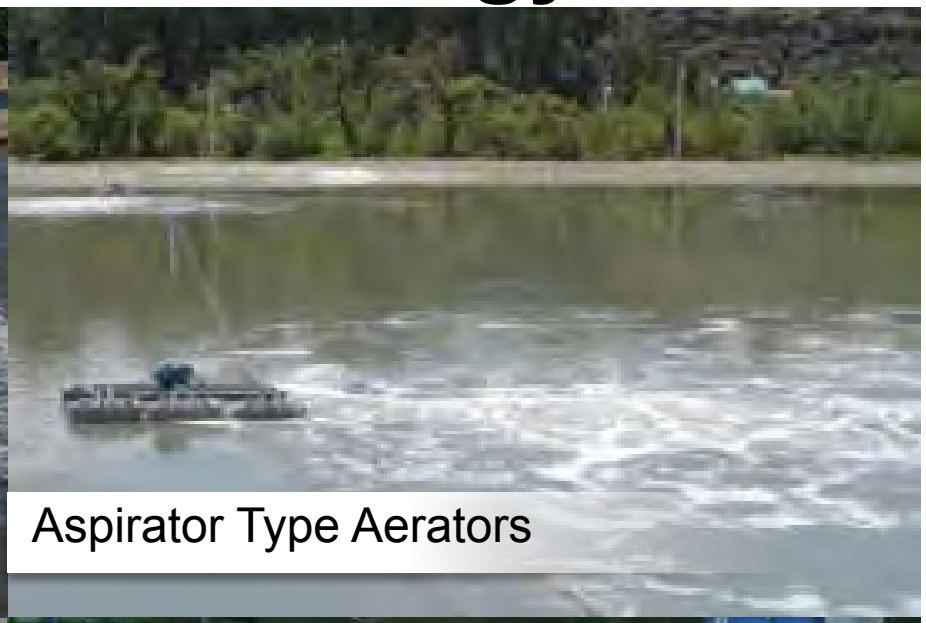


- **Main reactor basin**
  - Use high HP aeration for DO
  - Use high HP aeration for mixing
- **Complete Mix Ponds**
  - Use high HP aeration for DO
  - Use high HP aeration for mixing
- **Anoxic basin**
  - Need to mix without adding air

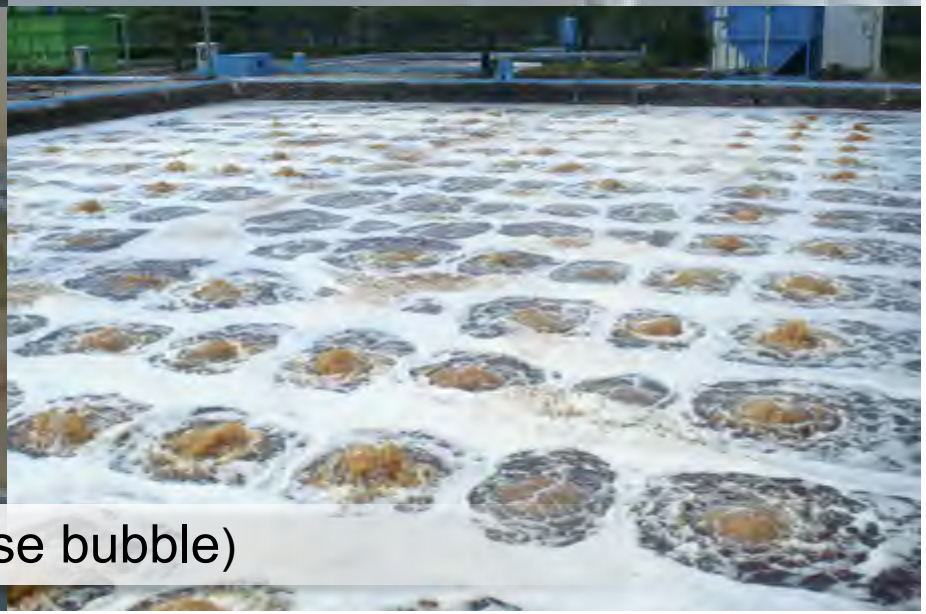
Aeration Equipment Technology



Splasher Type Aerators



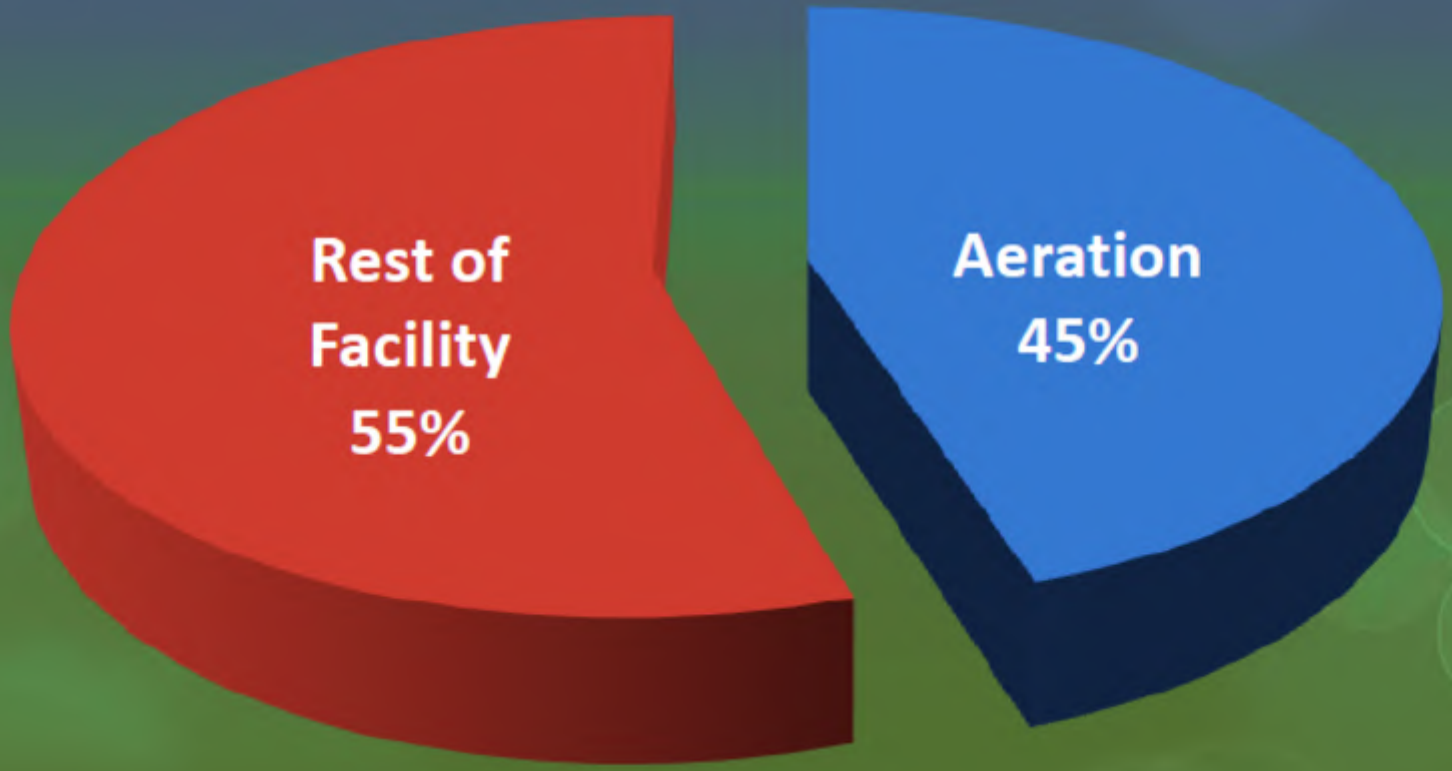
Aspirator Type Aerators



Diffused Air Aeration (fine bubble / coarse bubble)

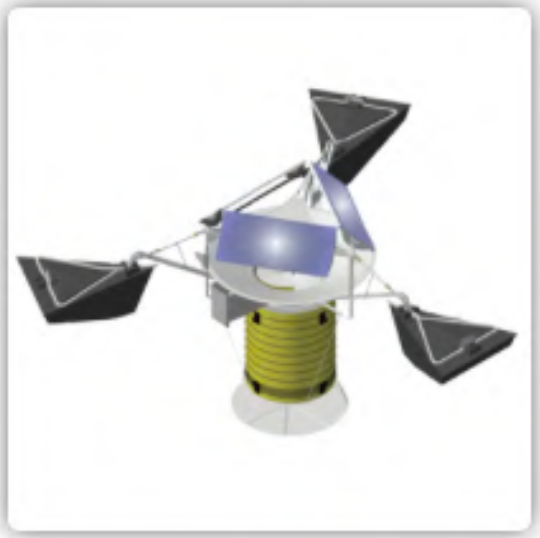
Example of Aeration / Mixing Overhead

- Aeration energy use accounts for 45% of facility energy use:



Solar, Electric, & Air Powered Mixers

Layered Water allows for Selected Mixing Depth & Long Distance Circulation



SolarBee SB Series

Solar Powered Mixers

GridBee GF Series

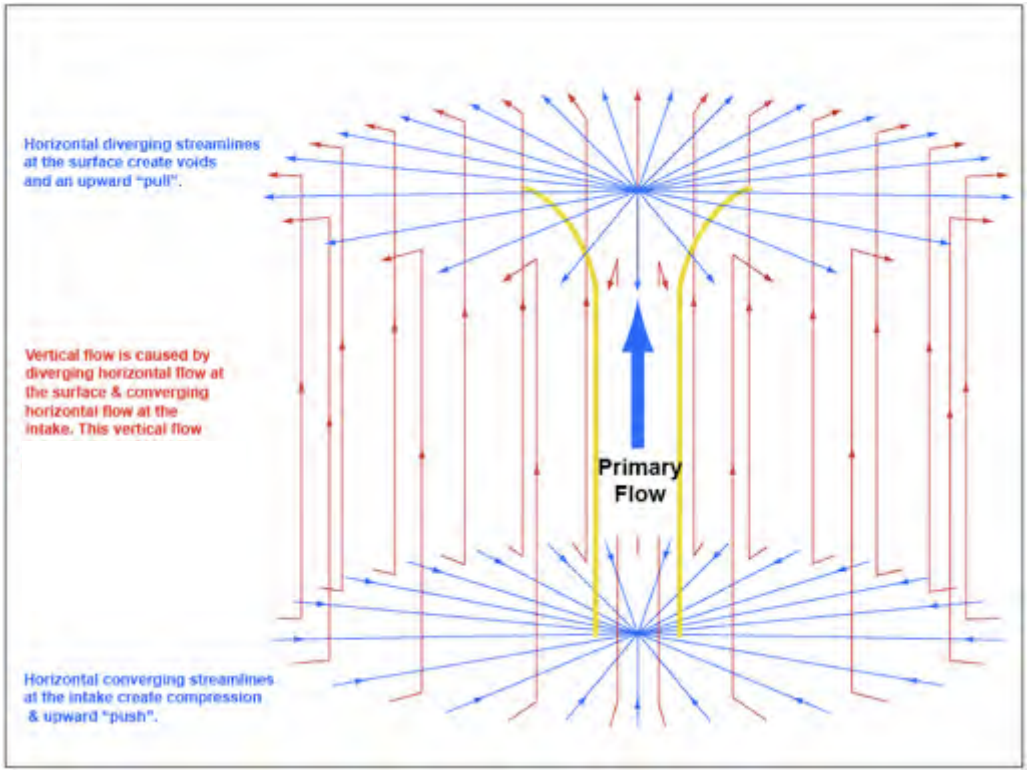
Electric Powered Mixers

GridBee AP Series

Air-Powered Mixers

Long-Distance Circulation / Mixing

Generates both horizontal and vertical flow



- Dish promotes near-laminar flow
- Different from wind mixing
- Moves 10,000 gpm
  - near zero lift = near zero HP
  - minimal friction loss
  - minimal HP requirement allows for solar or 100 watt electric power

Largest Energy Saving Opportunity

Partial Mix Ponds

- Need DO and mixing to get the DO mixed into the pond
- Use high HP aeration to both mix & oxygenate
- Typically requires more HP for mixing than oxygenation

- This imbalance creates an operational inefficiency
- Excessive grid-power consumption
- Increased greenhouse gas emissions

- **SB and GF mixers can provide mixing while reducing energy**
- **Each SB / GF mixer can displace ~ 40hp of in-efficient mixing**
- **Payback is typically 0.5 years to 3 years, less with incentives**
- **Bonus, reduces organic sludge buildup in the pond**

Other Energy Saving Opportunities

Facultative Ponds

- SB and GF mixers can help avoid the need to add high HP aeration equipment when the BOD loading increases over time
- Bonus, reduces organic sludge buildup in the pond

Complete Mix / Activated Sludge Basins

- Use high HP aeration to both mix & oxygenate
- Anoxic basins need mixing without adding DO

AP air powered mixers provide mixing while reducing energy and add little air, which helps to maintain an anoxic zone. Supplemental mixing can enhance the process.

LDC Energy Saving Mixer

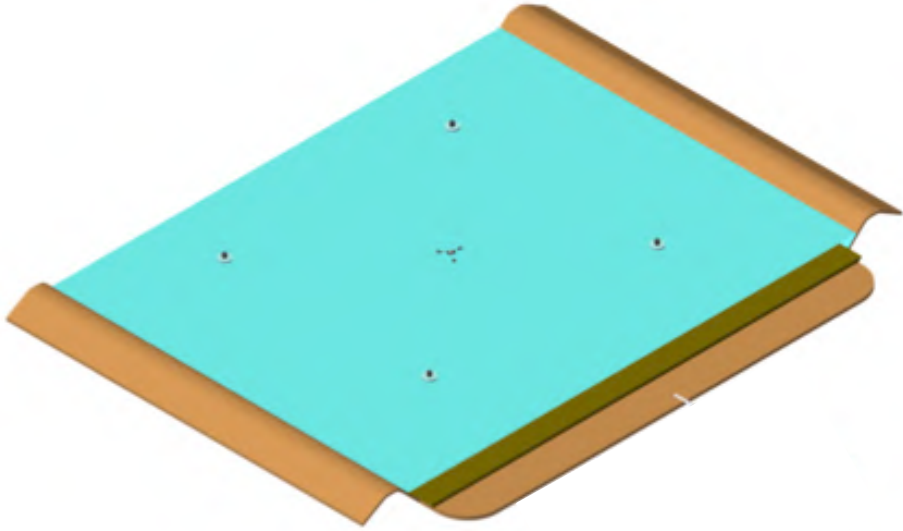
Wastewater approach

- LDC technology is a **circulator / mixer, not an aerator**.
- Very efficient **long-distance mixing device.**
- Partial-mix wastewater ponds typically need much more aeration HP for mixing than for DO production. With the SB and GF series wastewater mixers doing the mixing, the aeration / mixing system can be dialed back to provide just the needed DO. The typical payback is 1-3 years, with $$$ millions of dollars of energy savings over the 25 year machine life.
- Leave the aerators in place, run them less hours, often just at night.
- *Each Energy Savings Mixer can typically displace 30-50 hp of aeration mixing hp. At $0.10 per kwh, savings per energy saving mixer is approx. $750,000 over 25 years! With (6) mixers installed, save approx. $4,500,000 over 25 years.*

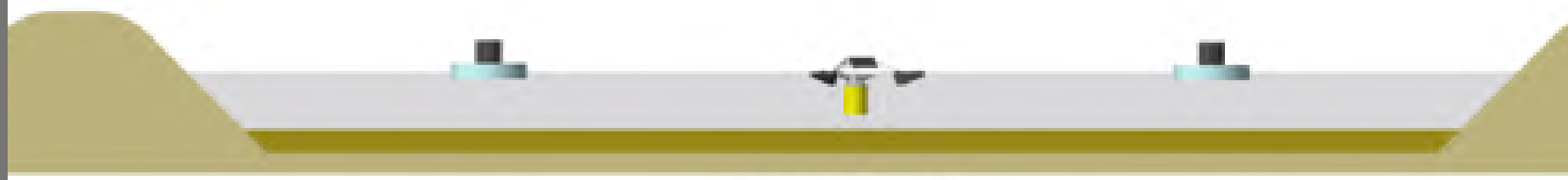
LDC Technology

& Existing Aerators

LDC positioned between aerators, pulling water from under and around the aerators

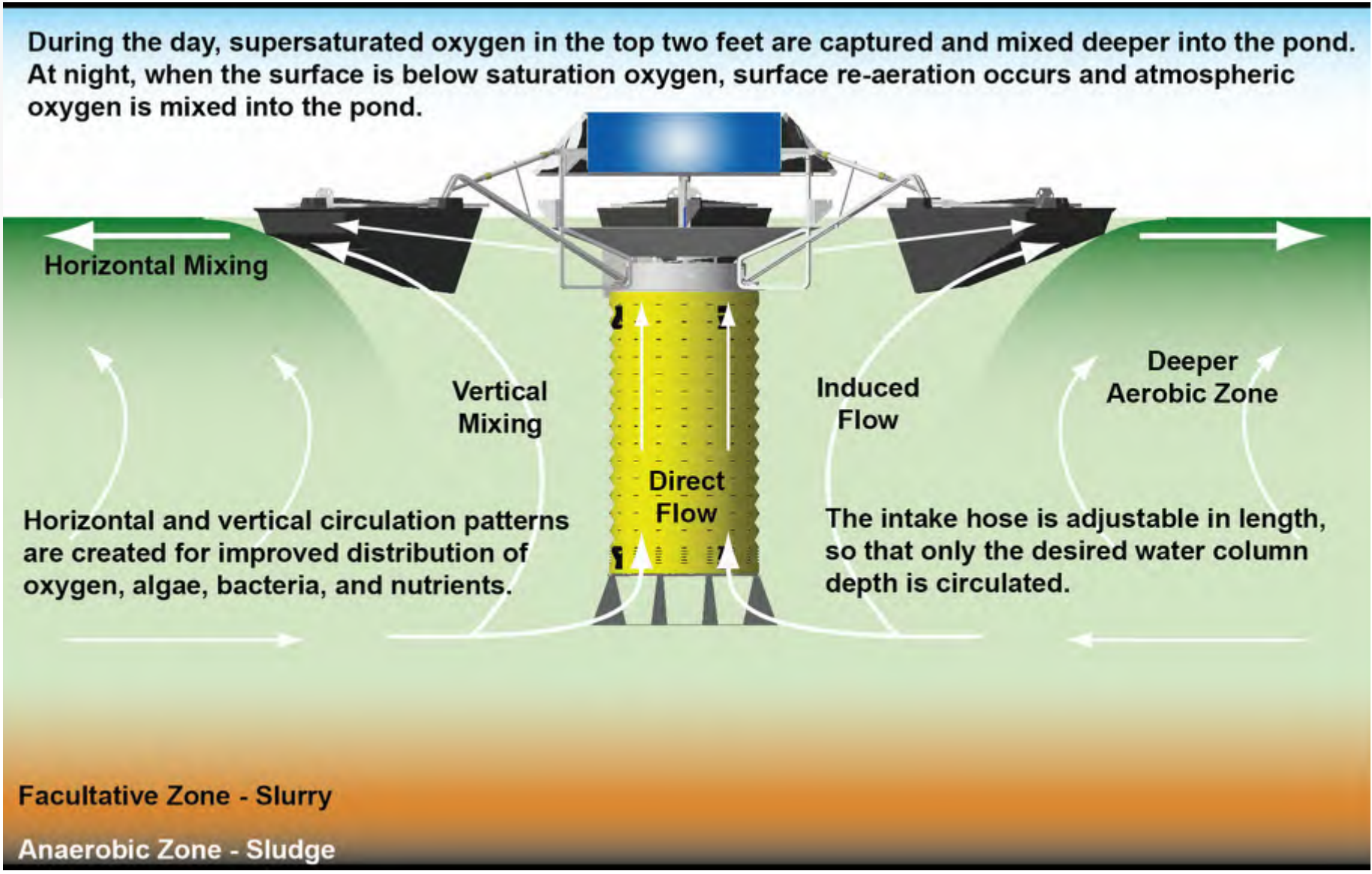


DO produced by aerators is distributed throughout the pond over entire surface area

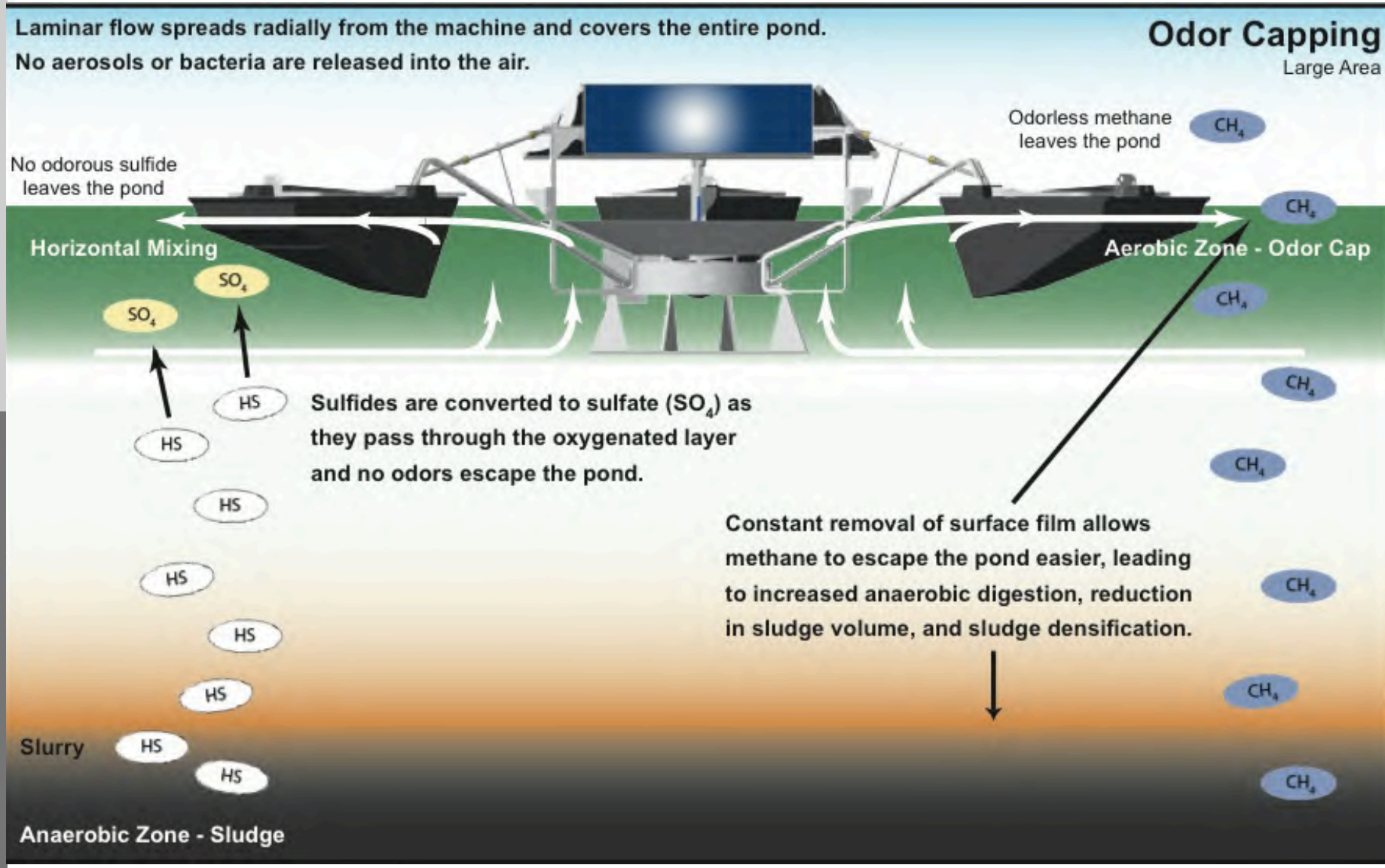


Generic Profile

Wastewater – Adjustable intake design



Odor Capping Intake Design



LDC Circulation

Mixing in Wastewater Ponds / Basins

Study Site - Rochester, NH

Pre-SPC

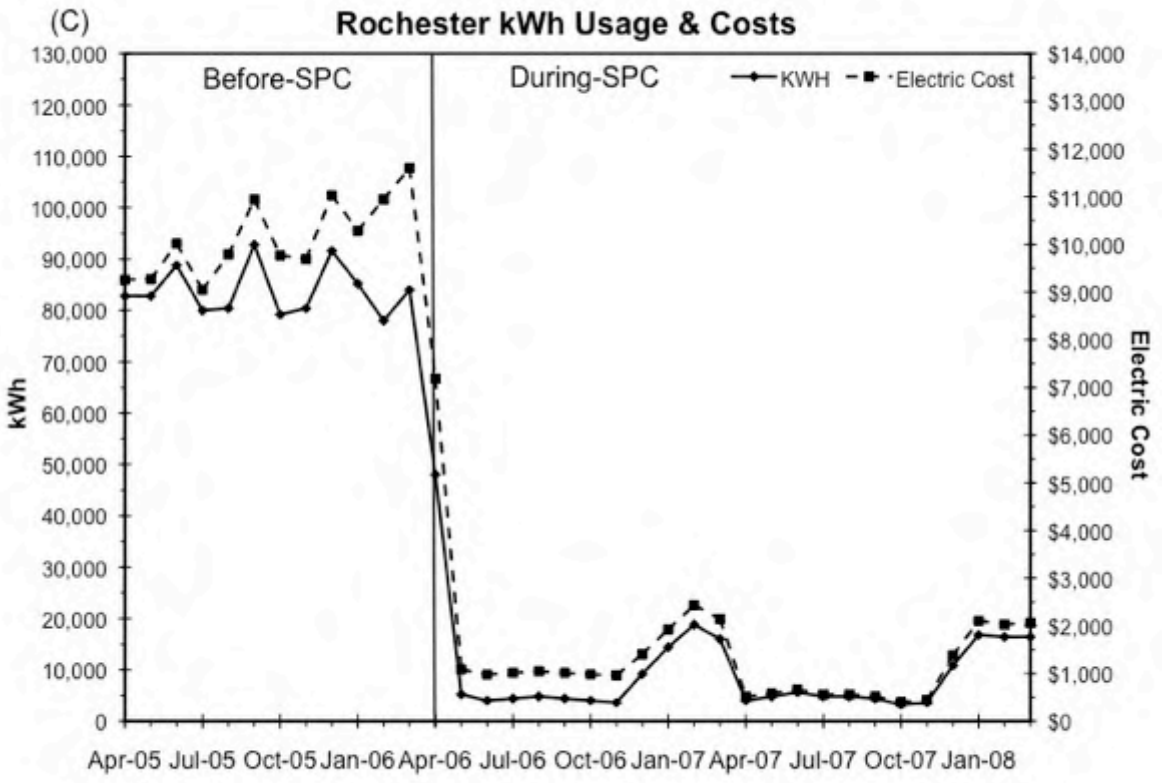
Lagoons with 116 kW - fine bubble blower system

During-SPC

Converted to equalization basins receiving sludge, raw septage, backwash & raw sewage

Activated sludge, advanced tertiary-treatment plant

Rochester - kWh Usage & Cost



Carbon Footprint Reduction = 1,180,336.0 lbs CO_2/yr

Energy Reductions

kWh = 74,150/mth
= 889,803/yr
= 88.5%

Cost = $8,722/mth
= $104,658/yr
= 86%

Pay back period
= 1.9 yrs

St Helens and Boise Paper WWTP – St. Helens, OR

- Seven (7) circulators in WWTP secondary - 33% municipal / 67% industrial
- Partial grant from Bonneville Power Energy Smart Industrial Program
- 1st year, aeration usage decreased approx. 52% from 568 hp/day to 266 hp/day
- 3rd year, aeration usage decreased approx. 68% from 568 hp/day to 182 hp/day
- DO in the pond is monitored and the units are monitored via SCADA
- **68% reduction in energy - DO is averaging 3-4 ppm - seeing sludge reduction**

BEFORE

AFTER

GridBee® AP Series

Air-Powered Mixers

Wastewater • Lakes / Raw Water Reservoirs • Stormwater • Industrial

- AP500 version is designed for wet wells, lift stations and industrial tanks / basins.
- AP2000, AP4000 and AP7000 versions are designed for use in lakes, stormwater ponds, wastewater ponds, activated sludge basins, industrial tanks / basins.
- AP8000 version is designed for use in activated sludge aeration basins and anoxic basins.
- Customer can use their own air source or an optional air unit.

GridBee® AP Series

Air-Powered Mixers

AP7000F

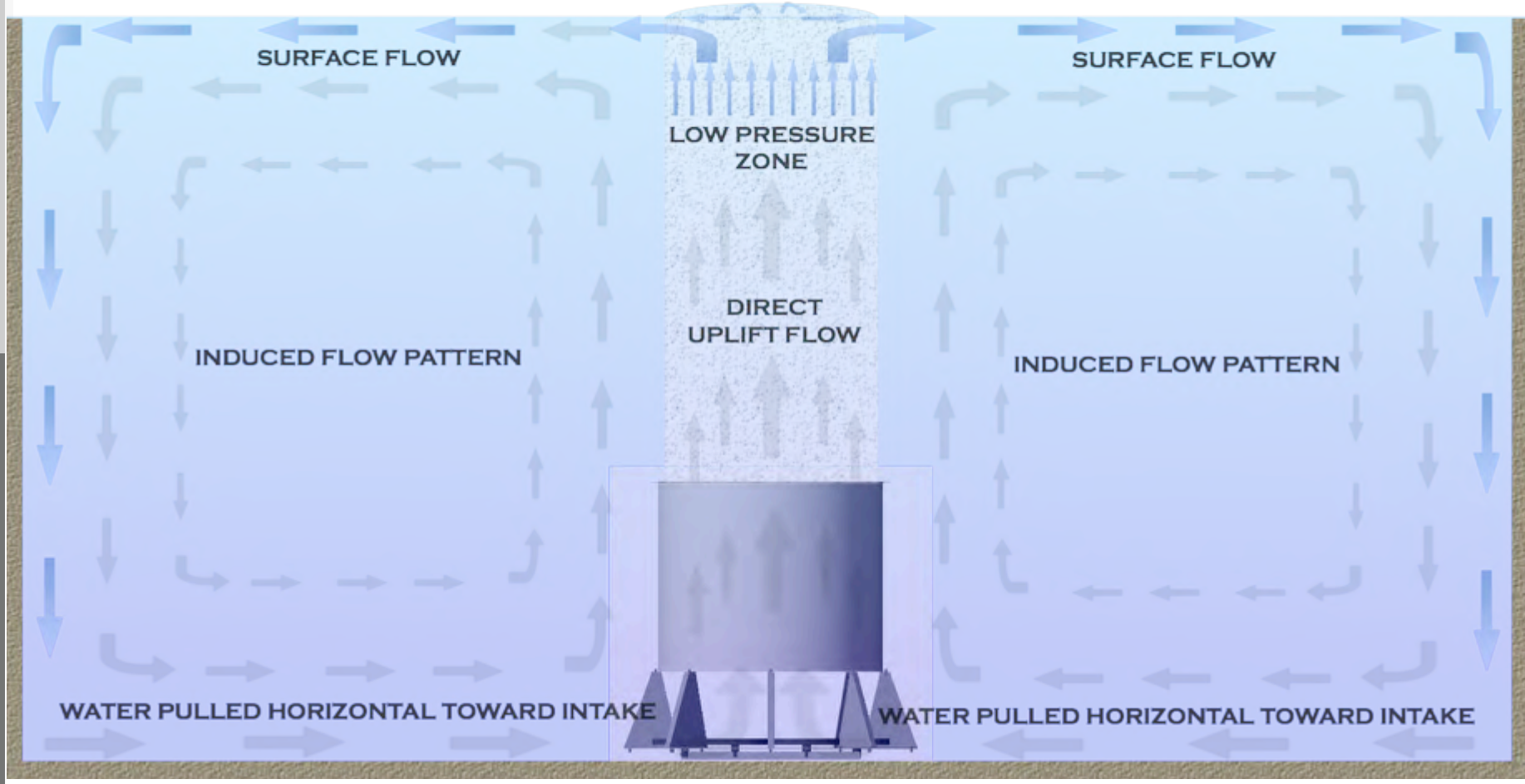
Same patented intake design as floating SolarBee and Gridbee machine, but air-lift not impeller driven. Clog free design for better solids handling, and no moving parts in the water,

Pedestal Version

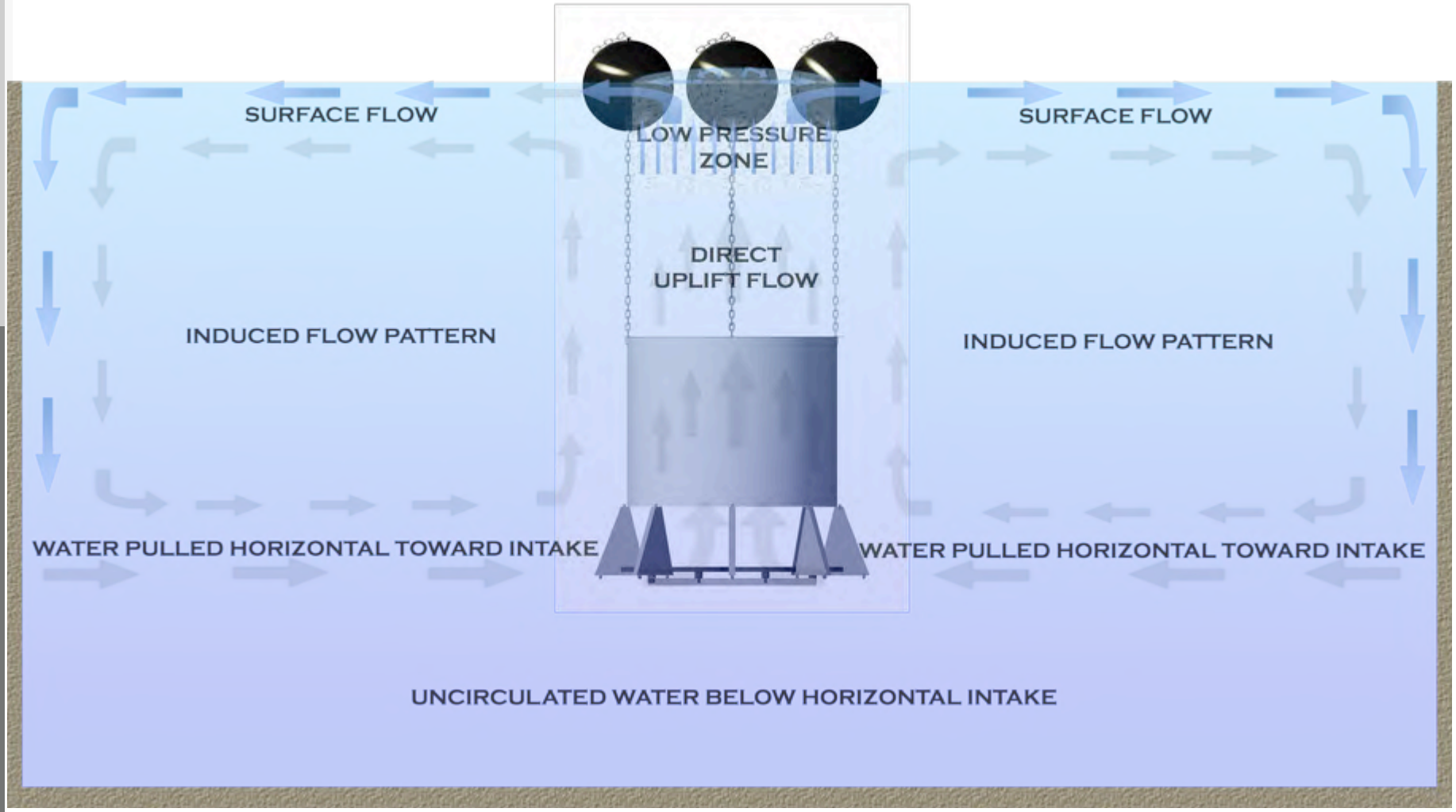
AP8000

GridBee® AP Series

Pedestal Mixer Flow Pattern



GridBee® AP Series



EQ Basins - AP Mixers

Customer Installation Photos

Diffuser System Before

EQ Basins - AP Mixers

Customer Installation Photos

AP2000 Units After

EQ Basins - AP Mixers

Customer Installation Photos

AP2000 Units After

EQ Basins - AP Mixers

Customer Installation Photos

After – Replaced (3) 75hp air units with (2) 25hp air units

Air-Powered Mixers and Circulators

Customer Installation Photos

AP7000F Floating Style Mixer in basin, recently started

Air-Powered Mixers and Circulators

Customer Installation Photos

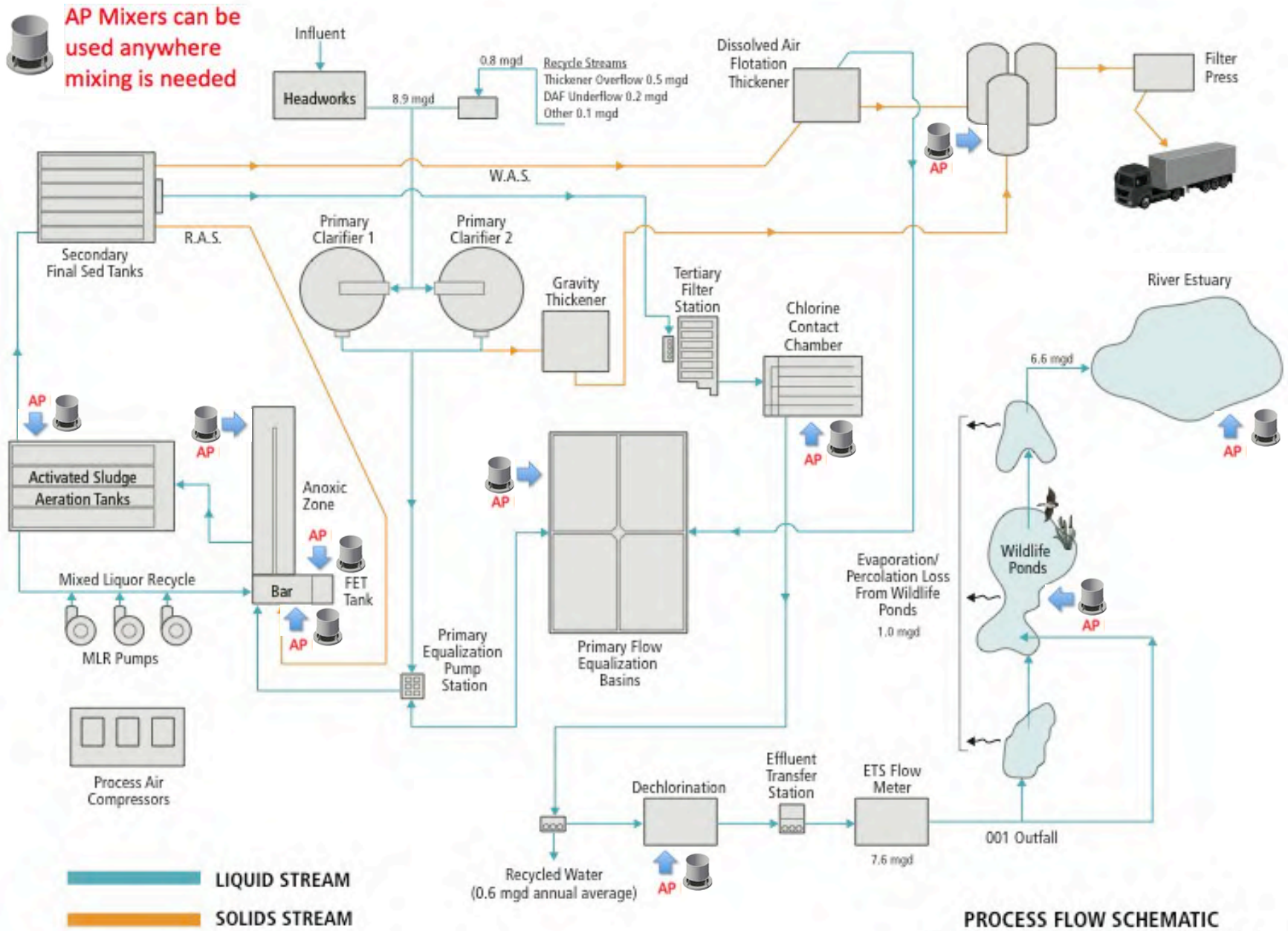
AP7000F Floating Style Mixer in basin, after 2 days

Air-Powered Mixers and Circulators

Customer Installation Photos

Customer has installed AP8000P mixers in the back end of four parallel aeration basins and they turned off approx. 50% of the bottom diffusers (90 diffusers per basin) to start the de-nitrification process sooner. The AP8000P mixers are using approx. 3hp of air per basin versus the 50hp of air per basin to maintain mixing in the back half of the basin. They were able to reduce their Nitrates from around 10 to 6 mg/l.

GridBee AP Series Air Powered Mixers - Activated Sludge Project



AP500 Air-Powered Mixer

(includes mixer, air unit, and accessories)

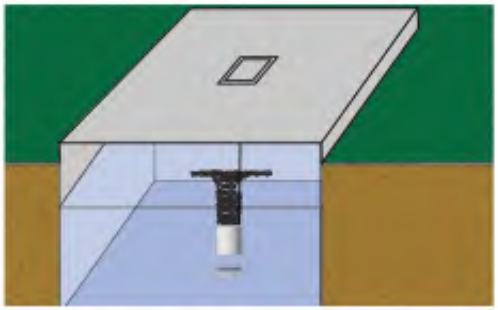
AP500 Mixer

The AP500 air-powered mixer, the smallest mixer in the AP Series features a non-clog design with no moving parts and no electricity in the water, it is portable, compact, and lightweight, and easy to install.

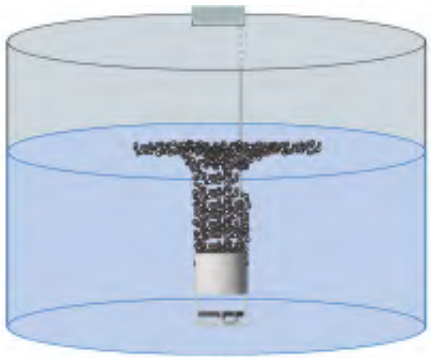
Chain

Air Hose

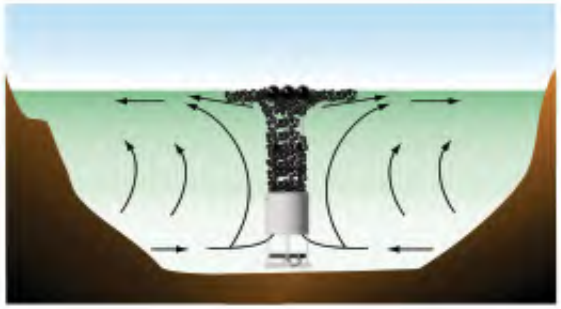
Air Unit



Wet Wells and Lift Stations



Industrial Tanks



Basins and Ponds

AP500 Air-Powered Mixer

Applications:

- Wet wells / lift stations - reduce grease buildup, H2S odor /corrosion and, prevent wipe clogging
- Tanks – municipal and industrial tanks; mix most types of liquids
- Standby mixer - can be used as backup wherever you need it

AP500 Mixer

Features:

- Can be suspended from a chain or set on the bottom of a tank
- Constructed of 316SS and polymer materials

Before startup of AP500 in Wet Well **After startup of AP500 in Wet Well**

"This is our first AP500 installation. In 6 hours it has almost completely removed a foot thick scum layer. When we attempted to lower the unit through the scum, it wouldn't go through. It rested on top. The only way to get it down was to turn it on and let it work itself down. We are impressed."

AP500 Air-Powered Mixer

Installation Before & After Photos

Before Startup of AP500 Mixer

24Hrs after Startup of AP500 Mixer

LDC Application Benefits

Lagoon Systems

- Provide energy savings with a 1 to 5 year payback
- Reduce short circuiting
- Maintain or improve wastewater treatment
- Provide odor control
- Reduce algae BOD / TSS issues in the back end

Waste sludge storage ponds

- Energy savings vs brush aerator
- Less struvite problems
- Less sludge mounding

EQ Basins - Anoxic Basins

- Energy Savings / improve mixing

Main Reactor Basins

- Energy savings, allows less intense aeration while keeping solids suspended

Incentives and Purchase Options

Long-Distance Circulation technology qualifies for possible incentives in three categories:

- energy efficiency
- energy conservation
- renewable energy

Ask about the following programs:

- ARRA – Green, American Made
- Energy rebates, PG&E, SCE, Xcel, TVA, Bonneville Power
- Federal tax incentives
- Rent-to-own
- Lease-purchase
- Grant opportunities
- Sole Source Justification / Sole Source Letter

GridBee®

Air-Powered Mixers

Full Specifications, Videos, Case Studies,
White Papers, Questionnaires, etc. available at:

https://www.medoraco.com/resources