ENVIROMIX

Straightforward, Energy-Efficient Mixing Solutions

The power of innovation …

BioMix™ Compressed Gas Mixing

Mixing Alternatives

Objectives and considerations of mixing technology

- Maintain optimum conditions for nutrient removal

- Effectively suspend solids and maintain homogeneity

- Operate with high efficiency

- Have minimal maintenance requirements and cost

- Offer lowest life cycle cost

- Facilitate variable mixing intensity
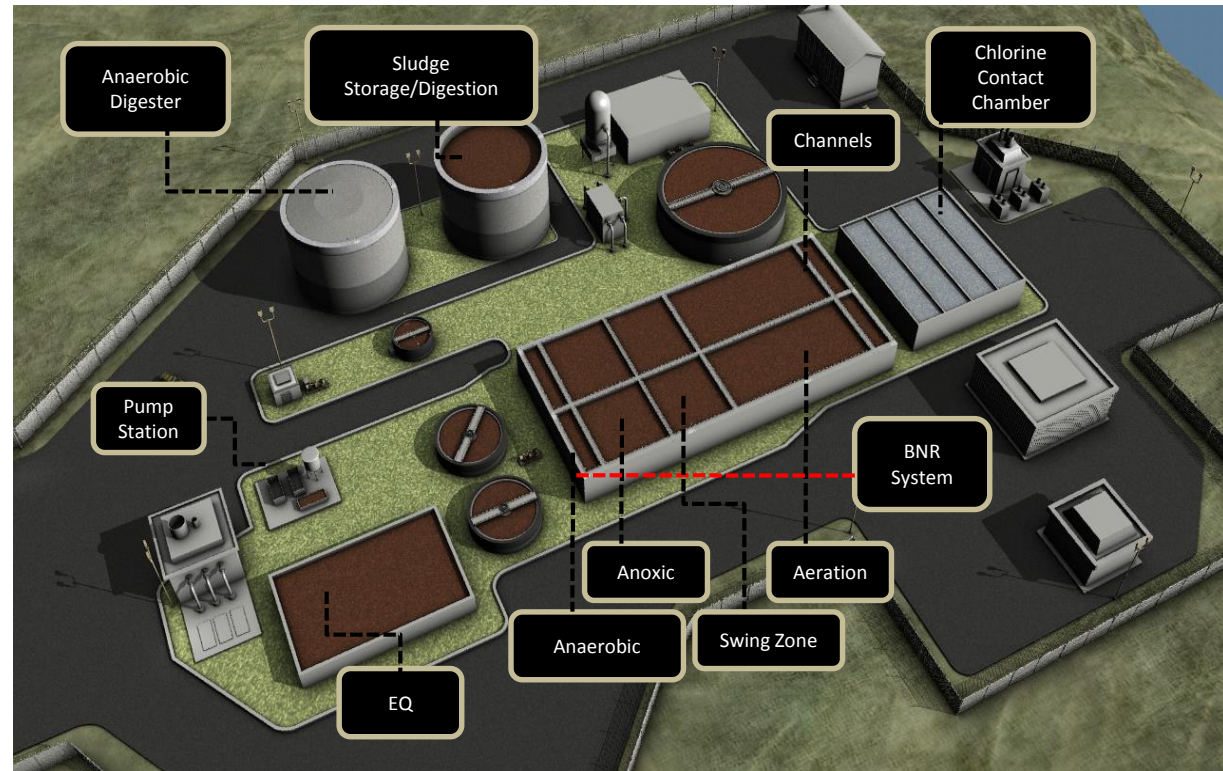
Point-Source Mixers

- Energy input is isolated
- Up to 2x the energy cost of distributed energy model
- Submerged mechanical equipment
- Multiple mixers (maintenance points) in large plants

Distributed Energy Model

- Distributed energy input
- Effective and efficient:
    - 60%+ energy savings
- No moving parts in the basin
- Multiple mixers replaced with a single compressor
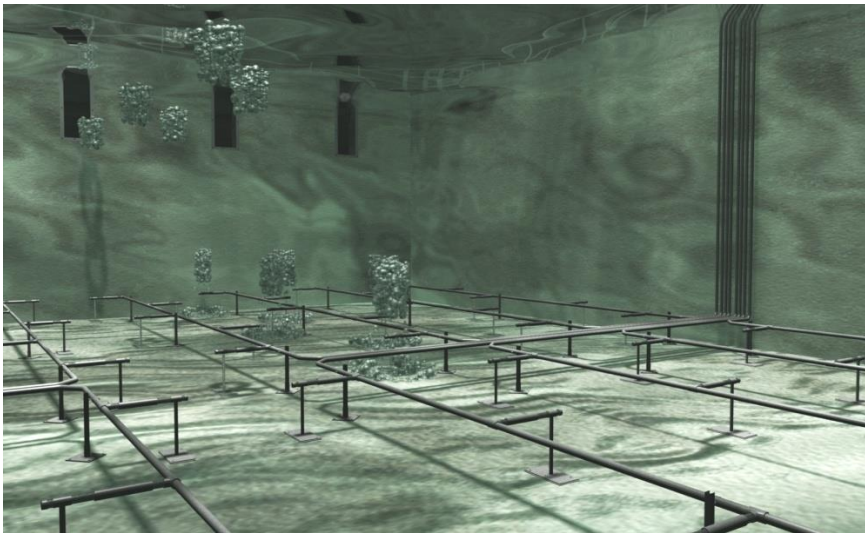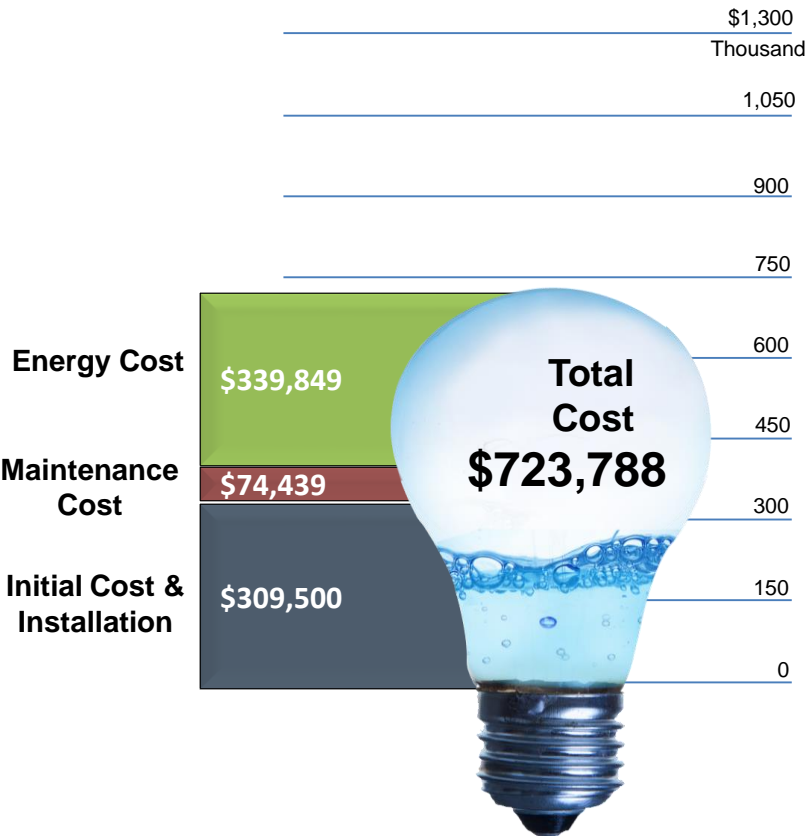
Mixing Power Comparison

- Rules-of-Thumb mixing power comparison have been derived through empirical field data in activated sludge applications

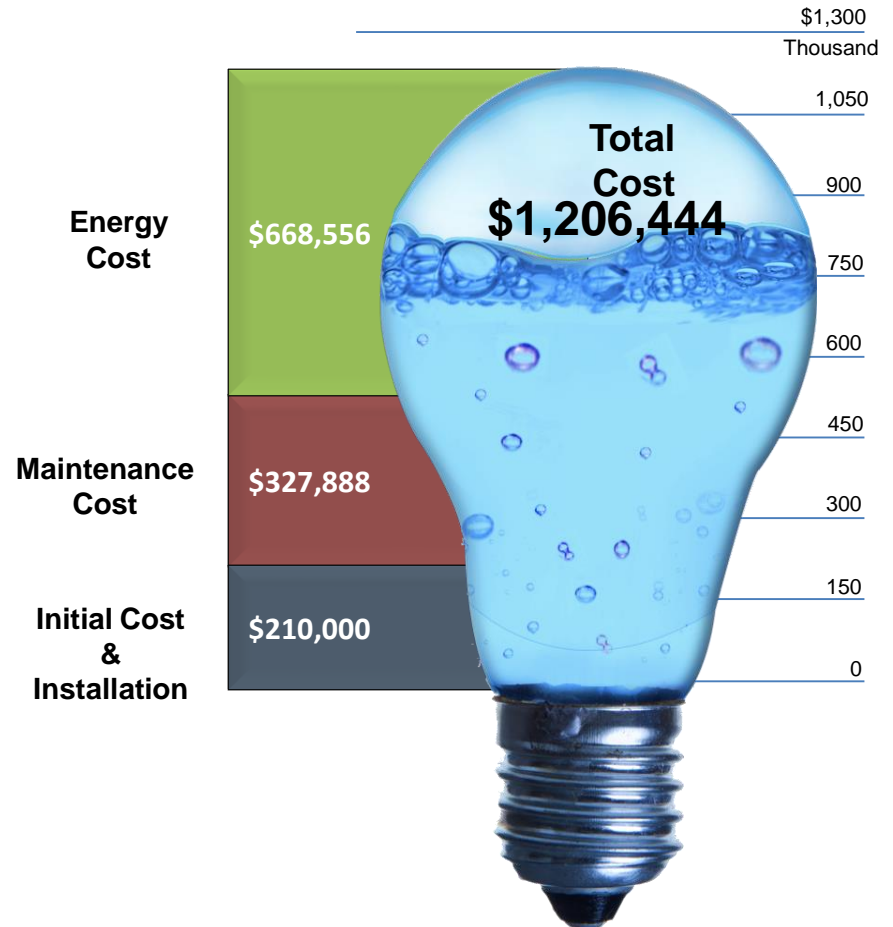| Technology	Power (HP/1,000 ft^3)
Floating and Submersible (direct-drive) Mixers	0.25 – 0.3
Long-Blade (gear reduced) Mixers	0.18
Vertical Turbine and Hyperbolic	0.12 – 0.15
Compressed Gas (improves with increasing depth)	0.065 – 0.1

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Mixing by the Numbers

- 20-Year Cost to own BioMix vs. Submersible Mixers for Anaerobic/Anoxic mixing at a 6 MGD Facility.

Compressed Gas Mixing

$1,300
Thousand

1,050

900

750

Energy Cost — $339,849

600

Total
Cost
$723,788

450

Maintenance
Cost — $74,439

300

Initial Cost &
Installation — $309,500

150

0

Conventional Mixing

$1,300
Thousand

1,050

Energy
Cost — $668,556

Total
Cost
$1,206,444

900

750

600

Maintenance
Cost — $327,888

450

300

Initial Cost
&
Installation — $210,000

150

0

BioMix™ Compressed Gas Mixing

Compressed Gas Mixing

- Intermittently firing short bursts of compressed air through engineered nozzles and controlled by valve panel

- Compressed gas mixing creates solutions that:
    - Save energy
    - Reduce maintenance
    - Address nutrient removal

- Effective mixing and efficient operation

    - Uniform distribution of mixing energy
    - Guarantee < 10% coefficient of variation (CV)
    - 60% or more energy savings

- Highly scalable

    - Once compressor replaces over 20+ mixers

- Flexible design

    - Any basin footprint, depth or slope

- Field optimized operational parameters
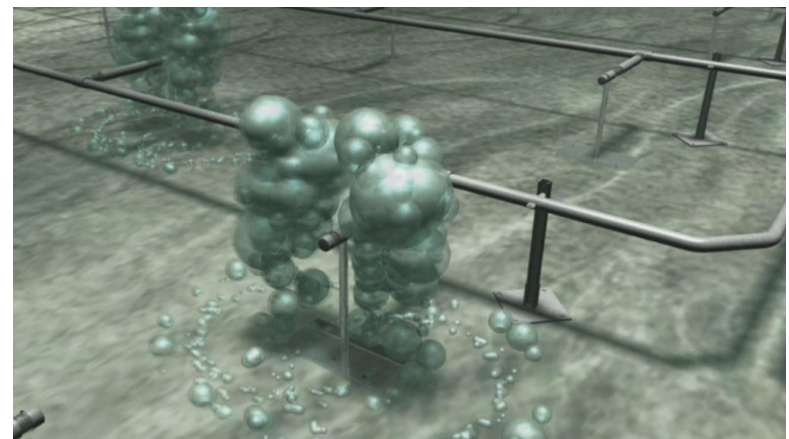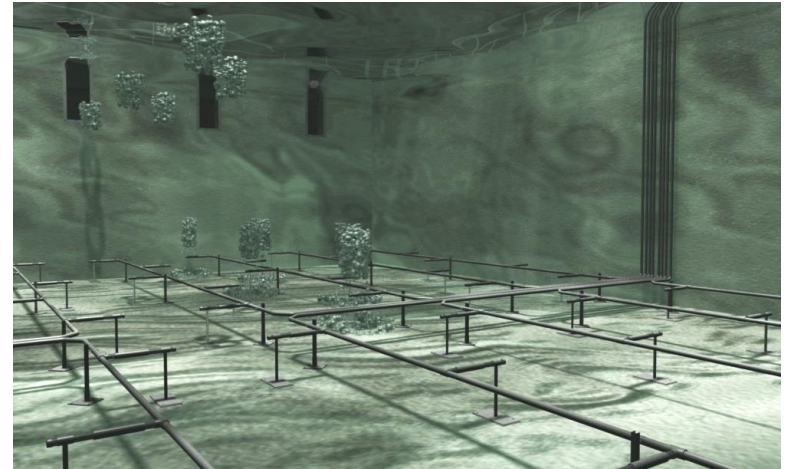
Compressed Gas Mixing

- Intermittent and sequential short bursts of compressed gas introduced into the fluid

- Large compressed gas volumes expand upward and outward

- Expanding bubbles provide controlled turbulence, fluid currents and provide mixing

- Does so with negligible amount of oxygen transfer due to low surface area to volume ratio

- Ideal for Anoxic and Anaerobic mixing environments

Comprehensive Scope of Supply (Unit Responsibility)

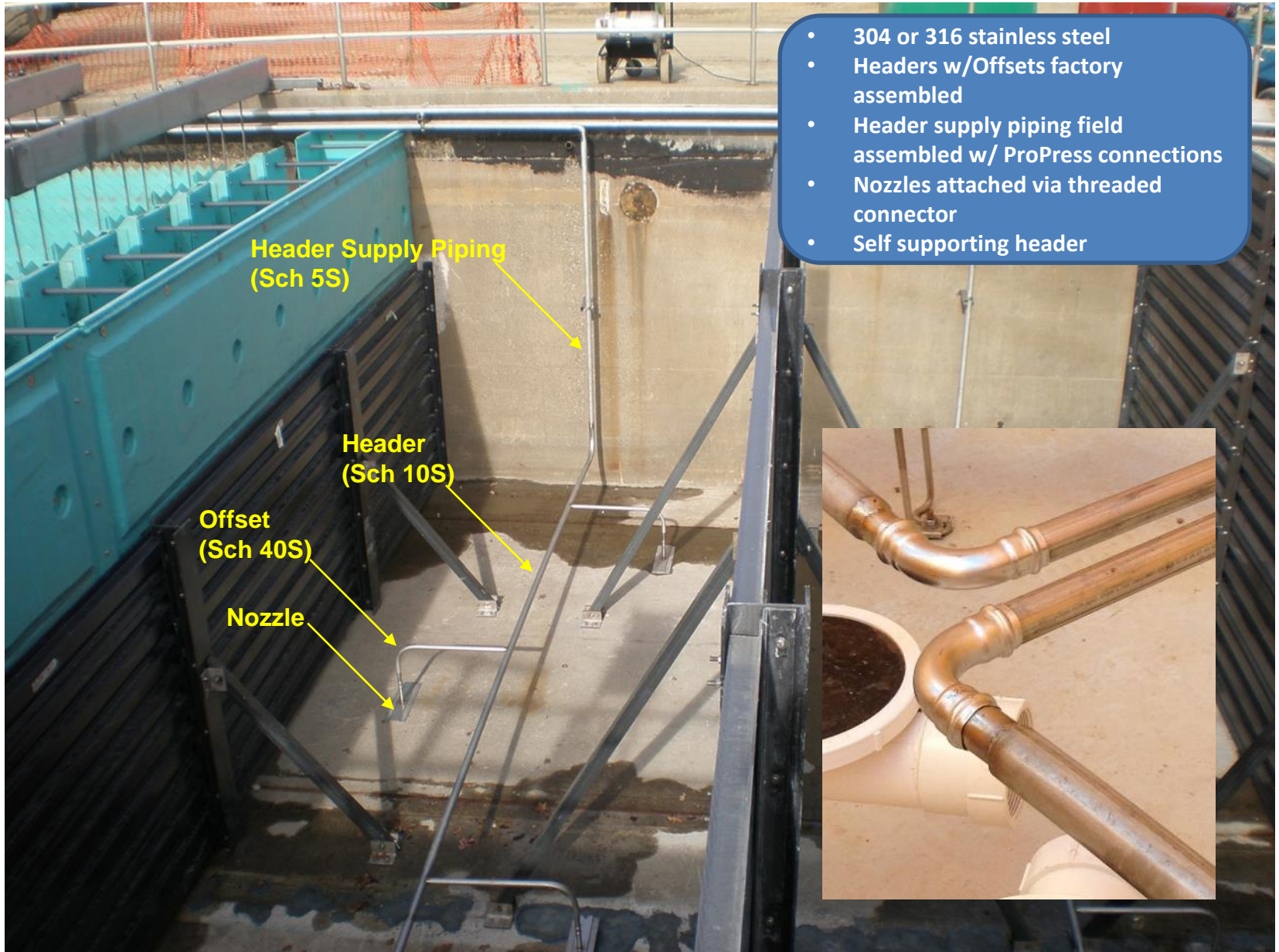Compressor w/ Receiver Tank(s)

Valve Panel w/ HMI Controller & Optional Remote Monitoring

www.enviro-mix.com

In-Tank Nozzles, Piping and Anchors

Comprehensive Application/Design Support & Performance Guarantee

BioMix System Components

ENVIROMIX

- 304 or 316 stainless steel
- Headers w/Offsets factory assembled
- Header supply piping field assembled w/ ProPress connections
- Nozzles attached via threaded connector
- Self supporting header

Header Supply Piping (Sch 5S)

Header (Sch 10S)

Offset (Sch 40S)

Nozzle
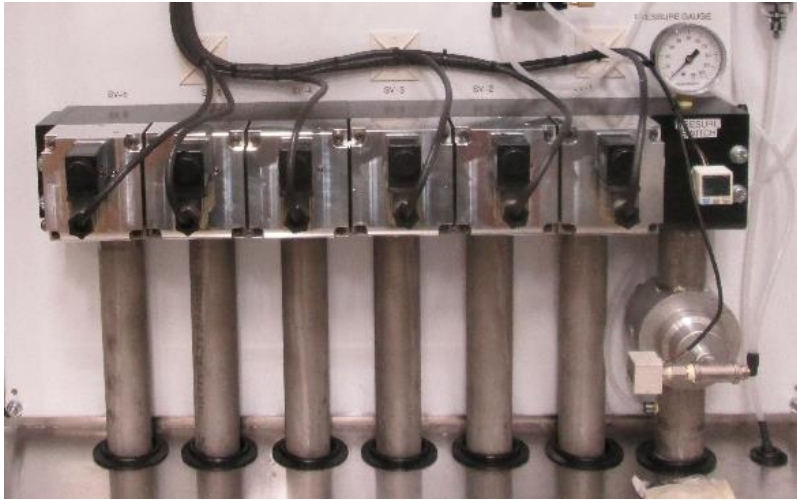
Valve Control Panel

- NEMA 4X, 304 SS Panels

- Long life poppet/solenoid valves

- Human Machine Interface with

  4 parameters of control

    - Pressure

    - Frequency

    - Duration

    - Sequence

![EnviroMix]

Poppet/Solenoid Valve

- Designed for high frequency operation

- Long life, 20-25 million cycles

- Fire 2-3 times per minute

- 15+ year life

- Maintenance free

Valve Closed

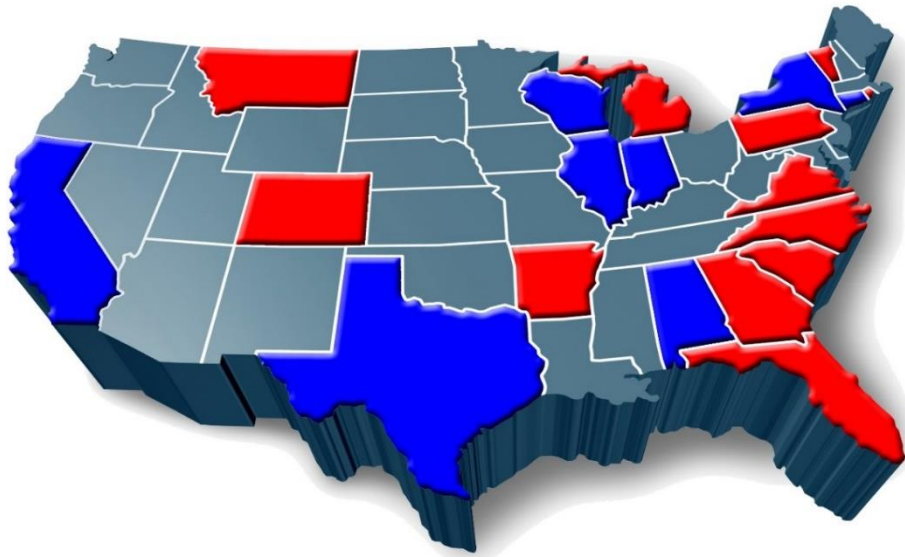Valve Open

Compressor Technology

- Rotary Screw Compressor

- After-cooler and moisture separator for cool, dry air

- Fire at 25-30 psig plus static head ≈ 7-10 psig

- Minimal maintenance
    < 4 hours/year
    < $2,000/year in materials (parts/fluids)

- Quiet < 80 dBA w/enclosure

Installations

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20 Projects Through 2014
18 New Orders forecast for 2015

Installed

Pending Orders

Philadelphia, PA
Southwest WPCP: 200 MGD

Russellville, AR
City Corporation PCWTP: 6.5 MGD

Mt. Pleasant, SC
Center Street WWTP: 4.0 MGD

Warren, MI
Warren WWTP: 36 MGD

Butner, NC
SGWASA WWTP: 6.0 MGD

Little Rock, AR
Fourche Creek, WWTP: 16 MGD

Providence, RI
Bucklin Point WWTP: 116 MGD

Chambersburg, PA
FCGA WWTP: 4.0 MGD

Gwinnett County, GA
F. Wayne Hill WRC: 60 MGD

Norfolk, VA
HRSD - VIP: 54 MGD

Target Applications and Summary of Benefits

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BioMix™

Anoxic/Anaerobic Mixing

Low O$_2$ Demand/Mixing Limited
Aeration Zones
(De-couple Aeration and Mixing)

Channel Mixing

Sludge Storage

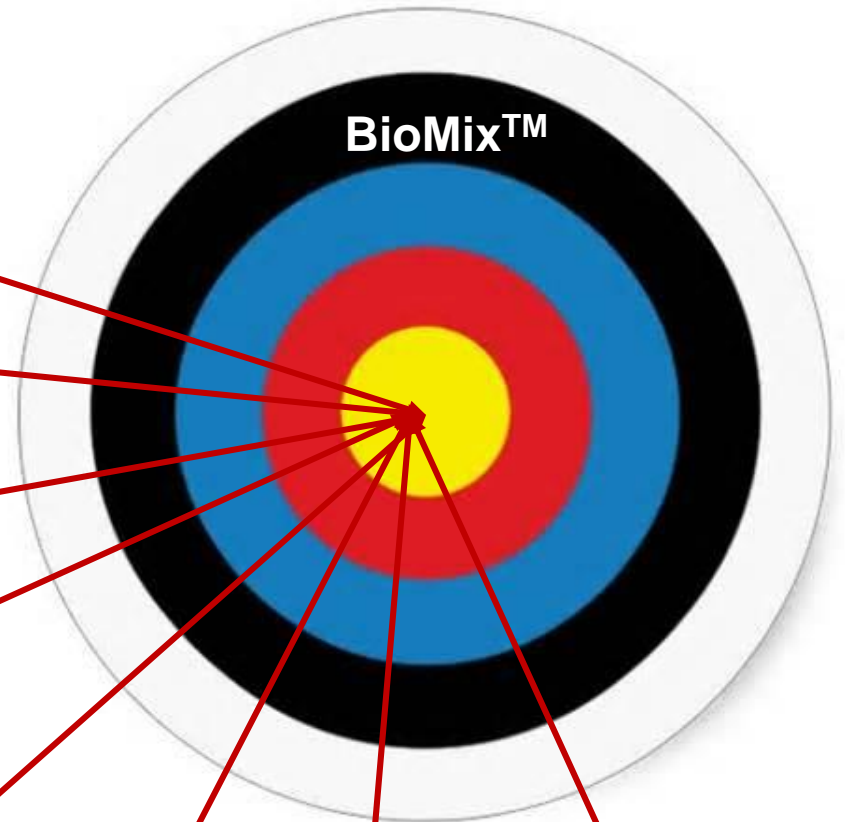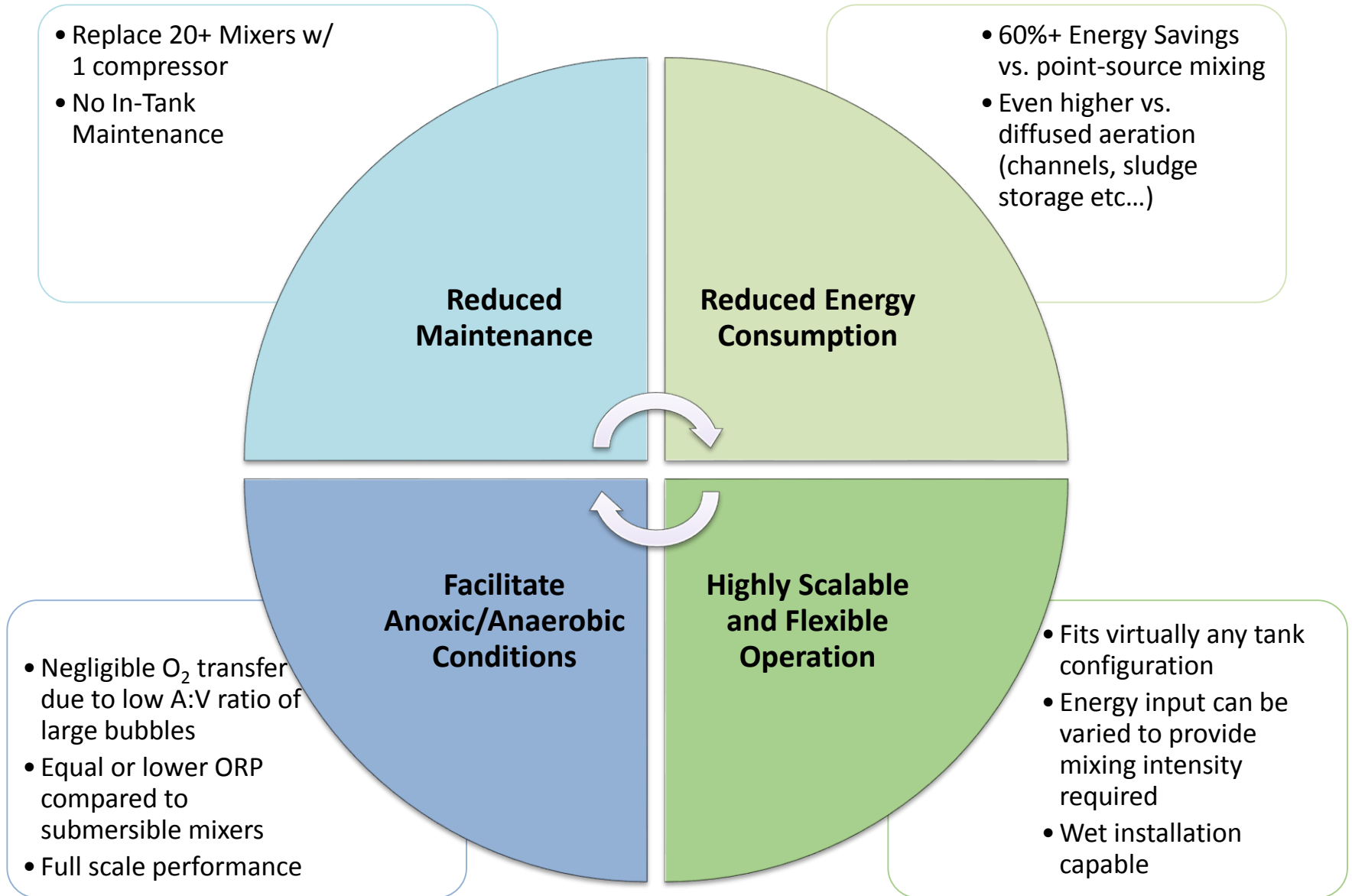Equalization/Storm Water Holding

Septage Receiving

Aerobic SHT and Digesters
(De-couple Aeration and Mixing)

Anaerobic Digesters

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- Replace 20+ Mixers w/ 1 compressor
- No In-Tank Maintenance

- 60%+ Energy Savings vs. point-source mixing
- Even higher vs. diffused aeration (channels, sludge storage etc...)

Reduced Maintenance

Reduced Energy Consumption

Facilitate Anoxic/Anaerobic Conditions

Highly Scalable and Flexible Operation

- Negligible O_2 transfer due to low A:V ratio of large bubbles
- Equal or lower ORP compared to submersible mixers
- Full scale performance

- Fits virtually any tank configuration
- Energy input can be varied to provide mixing intensity required
- Wet installation capable

20

Questions?