



Presented by:

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Town of Exeter, NH, WWTF Upgrade Including Cost-Effective Mixing for BNR & Sludge Holding Tanks

..... **Background for new WWTF**

- December 2012: Received new National Pollutant Discharge Elimination System (NPDES) permit
- June 2013: Received Administrative Order on Consent (AOC) from EPA
 - This AOC provided framework and schedule to be in compliance with the new permit
 - Permit required nitrogen discharge levels to be reduced
 - Old facility discharged about 30 mg/L of nitrogen



..... Project Scope

- Clean Water State Revolving Fund (CWSRF) provides about 2-3% debt forgiveness
- Project budget: \$53,580,000
- Project: New main pump station; 2 new force mains; new 4-Stage Bardenpho activated sludge facility
- Timeline:
 - 2014-2016: Design
 - June 2017: Construction began
 - June 2019: Started receiving wastewater through the new facility
 - December 2020: Completed

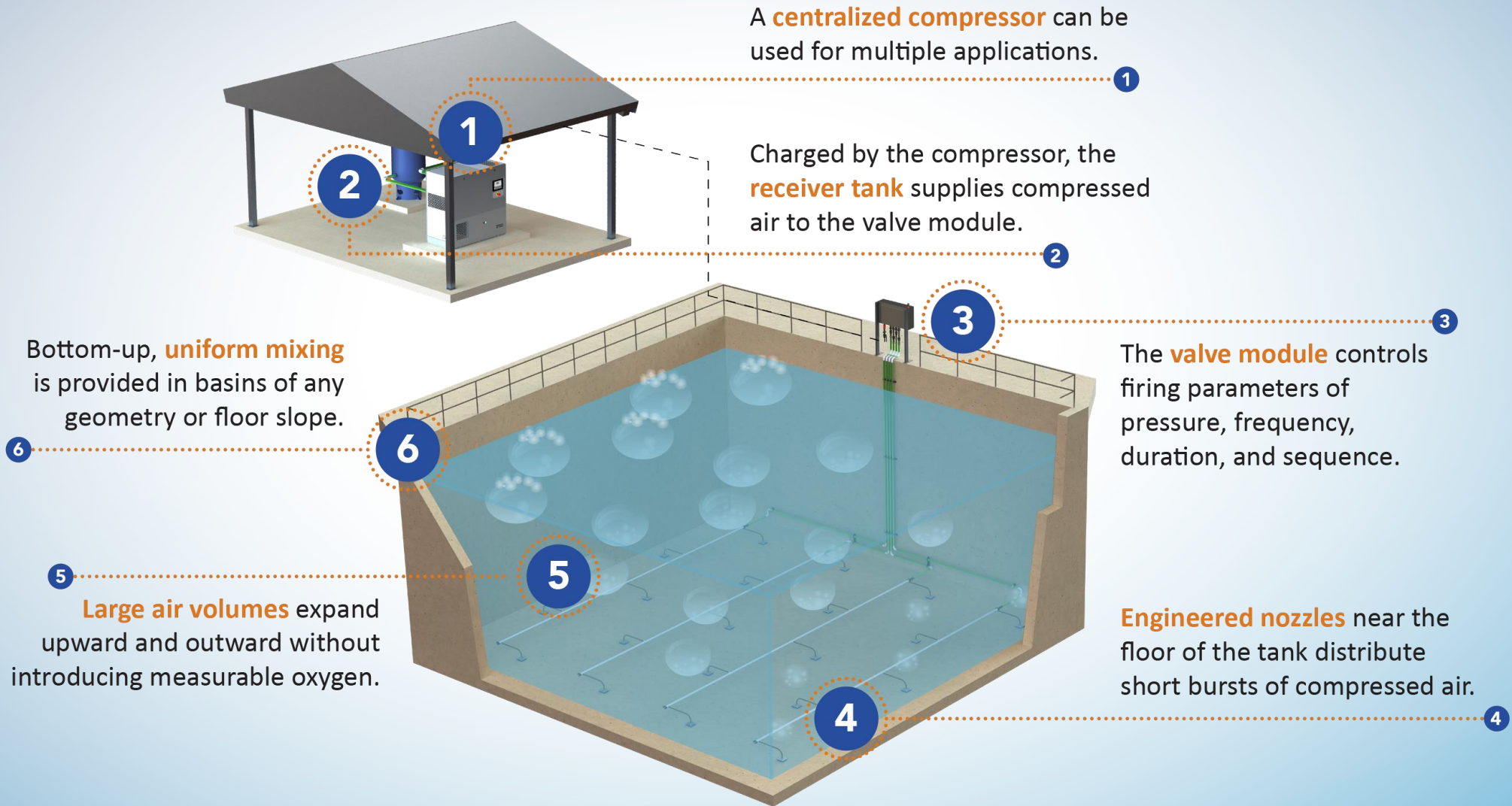


..... BioMix™ Compressed Gas Mixing

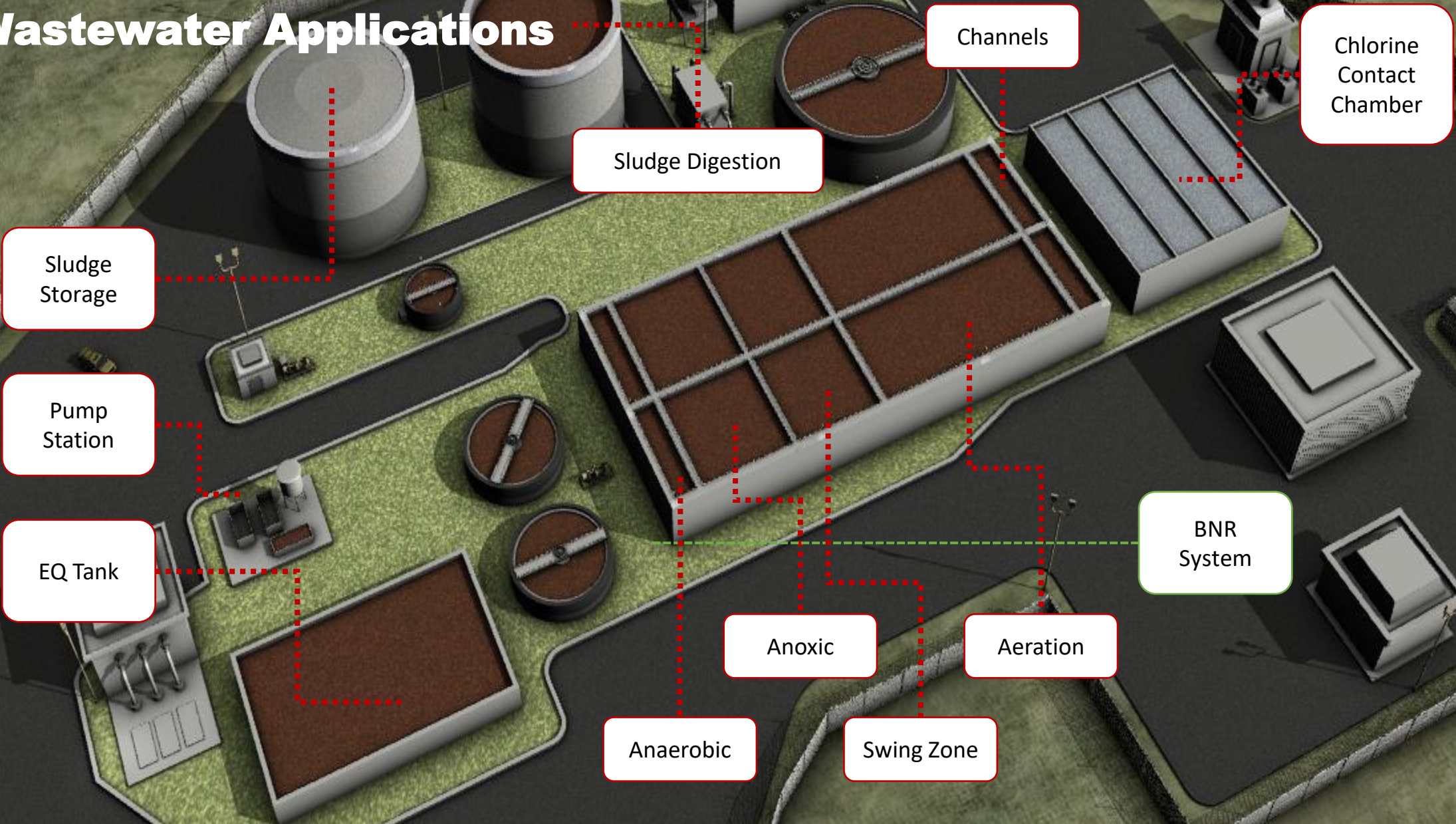
- During design, we were introduced to BioMix Compressed Gas Mixing manufactured by EnviroMix
- We were interested due to:
 - Limited moving parts and low maintenance costs
 - Mechanical mixers are maintenance headaches; fan blades getting bound up with waste products; high replacement and repair costs
 - No oxygen exchange in the anoxic zones of aeration basin
- Concern:
 - Would it work in the cold of the Northeast?
 - Toured facilities in Colorado to eliminate doubts.
- Added to the specification manual for bidding



..... BioMix: How It Works



Wastewater Applications



..... BioMix: How It Works

- Short 0.5 – 1.0 second bursts of compressed air
- Fired through a nozzle header system
- Creates circulatory or rolling mixing action
- Groups of nozzles fired 2 – 3 times per minute
- Provides uniformly mixed basin contents
- Ideal for anoxic and anaerobic mixing environments



..... Comprehensive Scope of Supply (Unit Responsibility)

Receiver Tank(s)

Compressor(s)



Valve Module

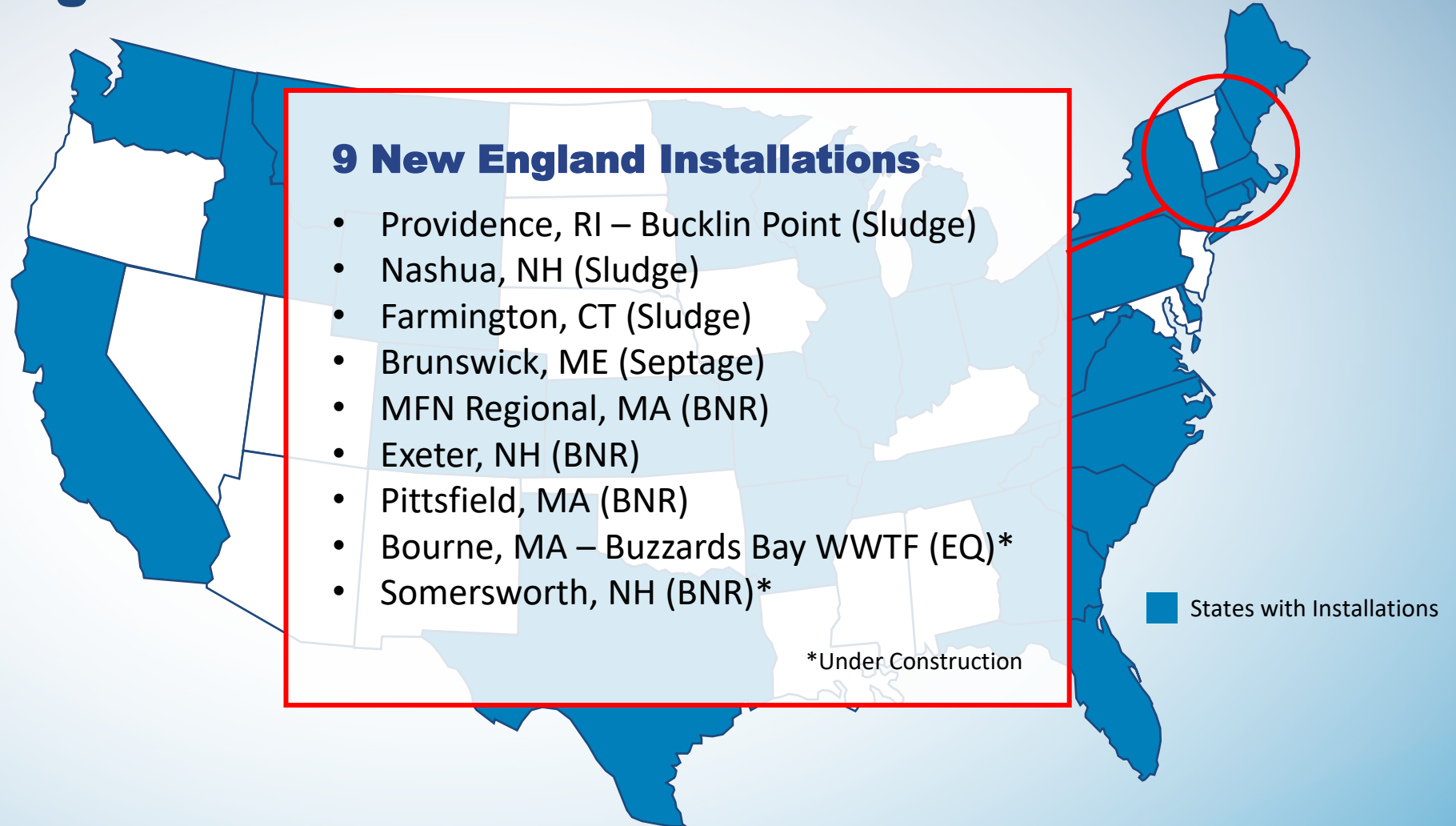
Comprehensive application/ design support and performance guarantee

In-tank nozzles, piping, and anchors

..... Rapidly Expanding Installation List

**>100
Installations**

EnviroMix is not just a mixing company. We are a supplier of process solutions with over 50 years combined activated sludge, BNR, aeration, and mixing experience in the sales department alone!



..... **Benefits of BioMix Compressed Gas Mixing**

Requires less energy

- 70-80% less than diffused air mixing
- 40-60% less than mechanical mixing

Provides effective mixing and efficient operation

- Uniform distribution of mixing energy
- Bottom-up mixing regime
- Guarantee < 10% (CV)

Highly scalable

- Once compressor replaces multiple mixers and much larger aeration blowers

Flexible design

- Any basin footprint, depth, or tank slope

No Maintenance on In-Basin Equipment

- Preventative maintenance limited to compressors, which are completely accessible

Compressed gas enables mixing solutions that save time and money.



**BioMix™ BNR Selector
..... Mixing System:
Exeter, NH**

..... BioMix BNR Selector Project: Exeter, NH

Evaluation

- BioMix selected with lowest NPV offering 20-Year savings of over \$530k
- BioMix installed cost was ~15% lower than hyperbolic mixers
- BioMix energy consumption was almost 30% less than hyperbolic mixers
- Mixers required removal of diffusers beneath the mixer diminishing aeration capacity
- Mixers put additional stress on aeration system



BioMix had the lowest operating energy consumption.

..... BioMix BNR Selector Project: Exeter, NH

System features

- 40 Hp rotary screw compressors
- BioMix nozzle headers integrated into diffused aeration grids in Anoxic Zones, Swings Zones, Mixing Limited Aeration and Sludge Holding Tanks
- Change mode of operation from anoxic to aerobic as process conditions dictate

Performance results

- Mixing performance testing showed < 5% coefficient of variation in TSS concentration



..... WWTF Performance with EnviroMix

- The system has worked great for us
- Mixing has been good with no oxygen exchanged in the anoxic zones
- Compressors have been alternating use to keep hours equal
- Used in
 - Aeration tank of 4-Stage Bardenpho activated sludge process
 - Sludge storage tanks to keep sludge mixed, thickened, and suspended for dewatering
- Had minor nuisance issue with pop-it valve seals — EnviroMix came out and replaced them all; minor preventative maintenance



..... Experience with Compressed Gas Mixing

- Before the WWTF project I had no experience with compressed gas mixing — I didn't know what it was
- EnviroMix taught me what I know; Tyler came out and did a presentation for us
- Competitors do not provide a complete system or guarantee performance like EnviroMix
- Now I can explain how large bubbles vs small bubbles work in the aeration basin; mixing technology





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Summary + Questions