

New England's First Linear Motion Sludge Mixer – A Success Story

Northeast Residuals and Biosolids
Conference

Cromwell, CT

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Agenda

1 Background

2 Process Evaluation

3 Recommended Alternative

4 Construction

5 Operation/Results

Background

- **MWRA Clinton WWTP**
- **Clinton and Lancaster, MA**
- **Discharge to South Nashua River**
- **Average Daily Flow of 2.5 MGD**
- **Solids Train**
 - Anaerobic Digestion
 - Sludge Dewatering
 - Landfilling of Stabilized Biosolids



MXXXMA MWRA Clinton Wastewater

Anaerobic Digestion at the Clinton WWTP

- Facilities Prior to 2014-2015 Upgrade
 - Two primary digester tanks
 - One floating cover and one fixed cover
 - One digester in operation at a time
 - Digested sludge and gas storage tank
 - Pearth gas mixing system serves both digesters
 - Compressed gas injected through lances into tanks
 - Gas rising stirs tank contents, breaks up scum

Existing Anaerobic Digesters



Process Description

- **Anaerobic Digestion at the Clinton WWTP**
 - WAS, scum and gravity thickener overflow co-settled with primary sludge in primary clarifiers
 - Co-settled sludge pumped to 2 gravity thickeners; thickened to ~4% solids
 - Pumped to digesters for anaerobic digestion
 - Digested sludge pumped to sludge and gas storage tank
 - BFP dewatering
 - Disposal at MWRA/Clinton Sludge Landfill

Equipment Evaluation

- Replace aging equipment
- Improve solids reduction and biogas production
- Investigations included:
 - Digester covers
 - Mixers
 - Heaters
 - Recirculation and transfer pumps
 - Sludge piping and valves
 - Gas piping, valves and accessories

Evaluation of Mixing System

- Existing system installed in 1989
- Rotary valves and gas compressors in fairly good condition
- Pearth gas mixing system
 - Outdated technology
 - Poor mixing characteristics
 - Accumulation of solids deposition
 - Reduction of HRT and adverse impacts to process control and digestion efficiency

Digester Mixing Alternatives

- Mixing goal to produce uniform tank contents while minimizing costs
- Sludge concentration should not vary >10% (excluding heavier sludge settling to bottom)
- Alternatives for replacement system include:
 - Internal gas mixing
 - Internal or external mechanical mixing
 - Pumped sludge circulation

Internal Mechanical Mixing Systems – Ovivo Linear Motion Mixer

- Generate turbulent mixing currents through oscillating 72" disc
- Motion generated by scotch yoke mechanism mounted above cover for easy access and maintenance

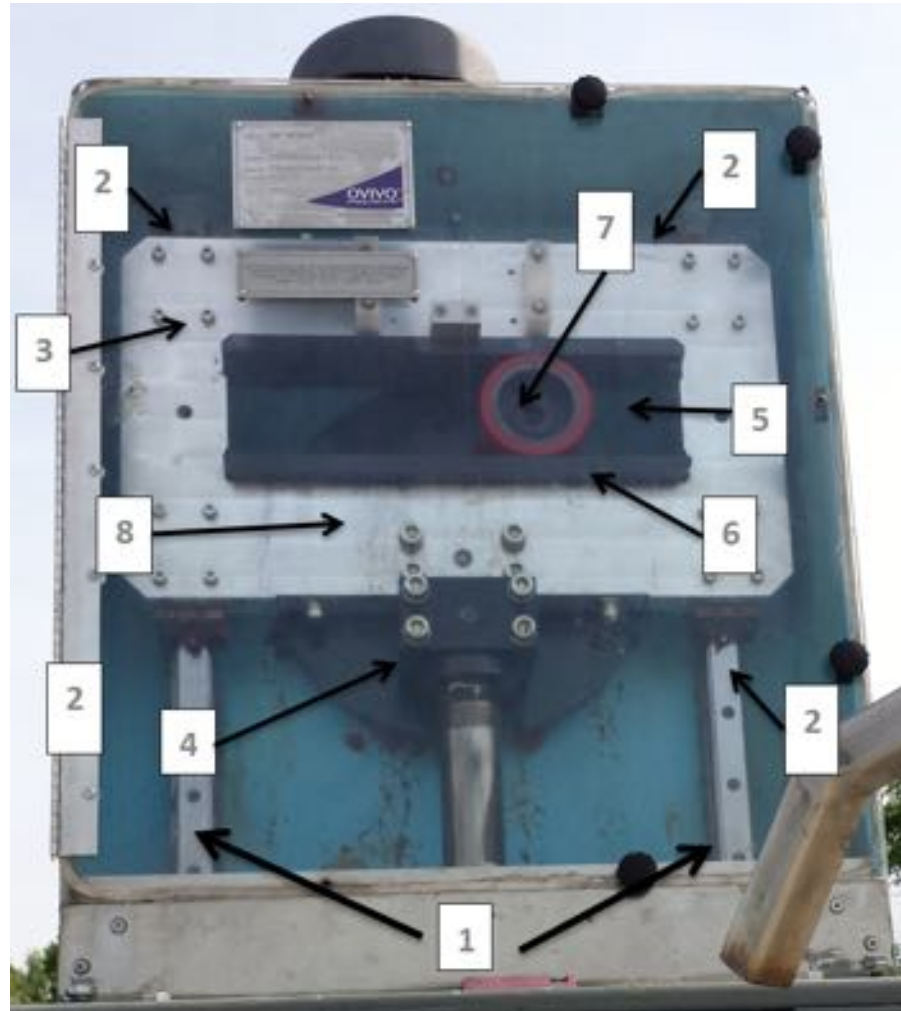


Favored Mixing Alternative – Linear Motion Mixers

- Demonstrated to provide homogeneous mixing by independent tracer tests and CFD analysis
 - Custom design to meet specific needs
 - Reports from existing installations indicated improved performance

Ovivo LM Mixer Drive Head

- 1 Rail (2ea)
- 2 Sliding Block, (4ea)
- 3 Scotch Yoke
- 4 Crank Assembly
- 5 Top Guide Plate/Bar
- 6 Bottom Guide Plate/Bar
- 7 Roller



Scotch Yoke – Cam Drive System



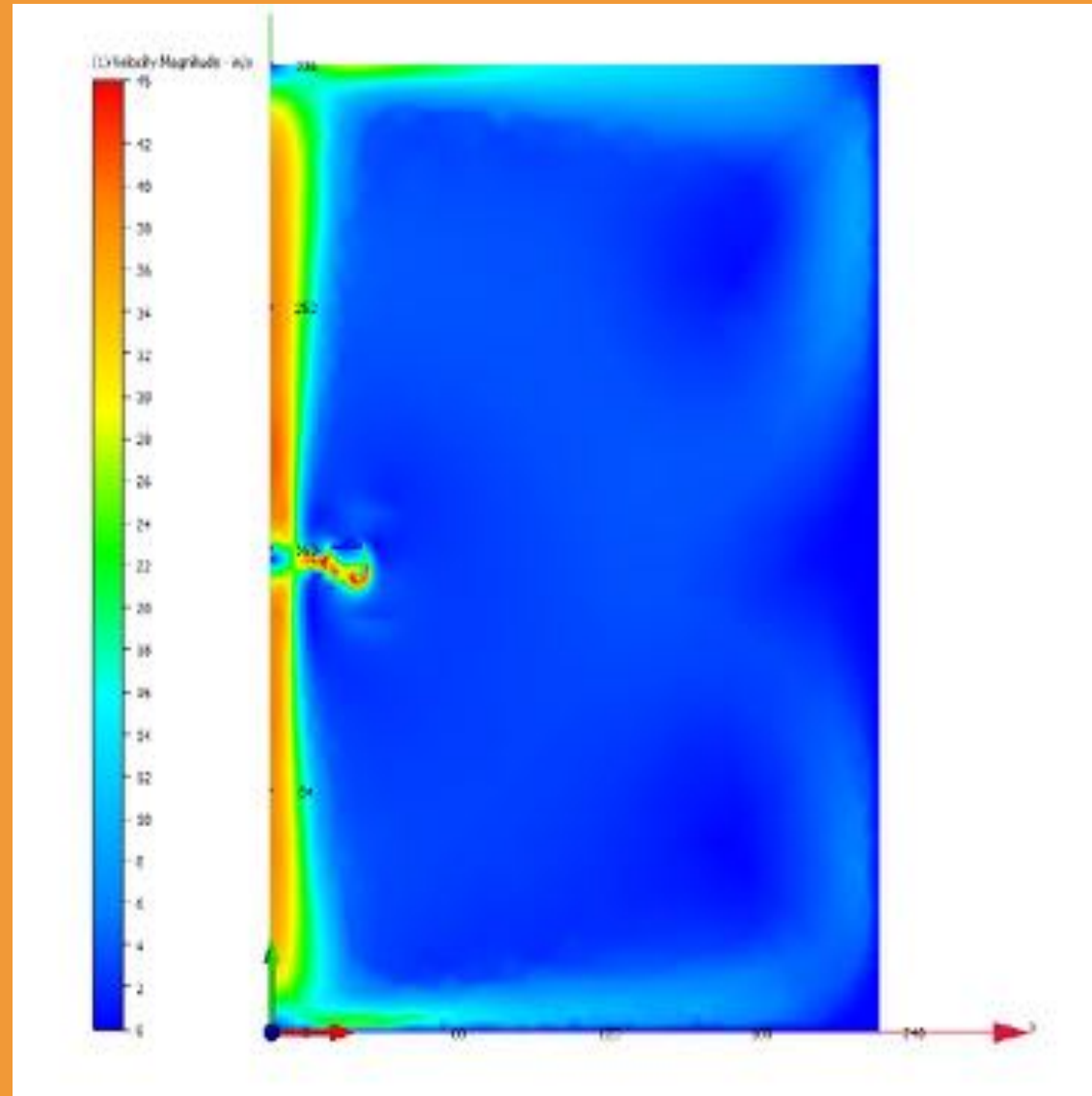
Mixing Action



CFD Results for Clinton WWTP

Chart represents 2D y-axisymmetric cross-section fluid velocity flow pattern

Determined 90% of tank has velocity greater than 1 in/s



Construction Timeline

- **NTP: April 25, 2014**
- **Contractor: RH White**
- **Startup of floating cover digester:
August 2015**











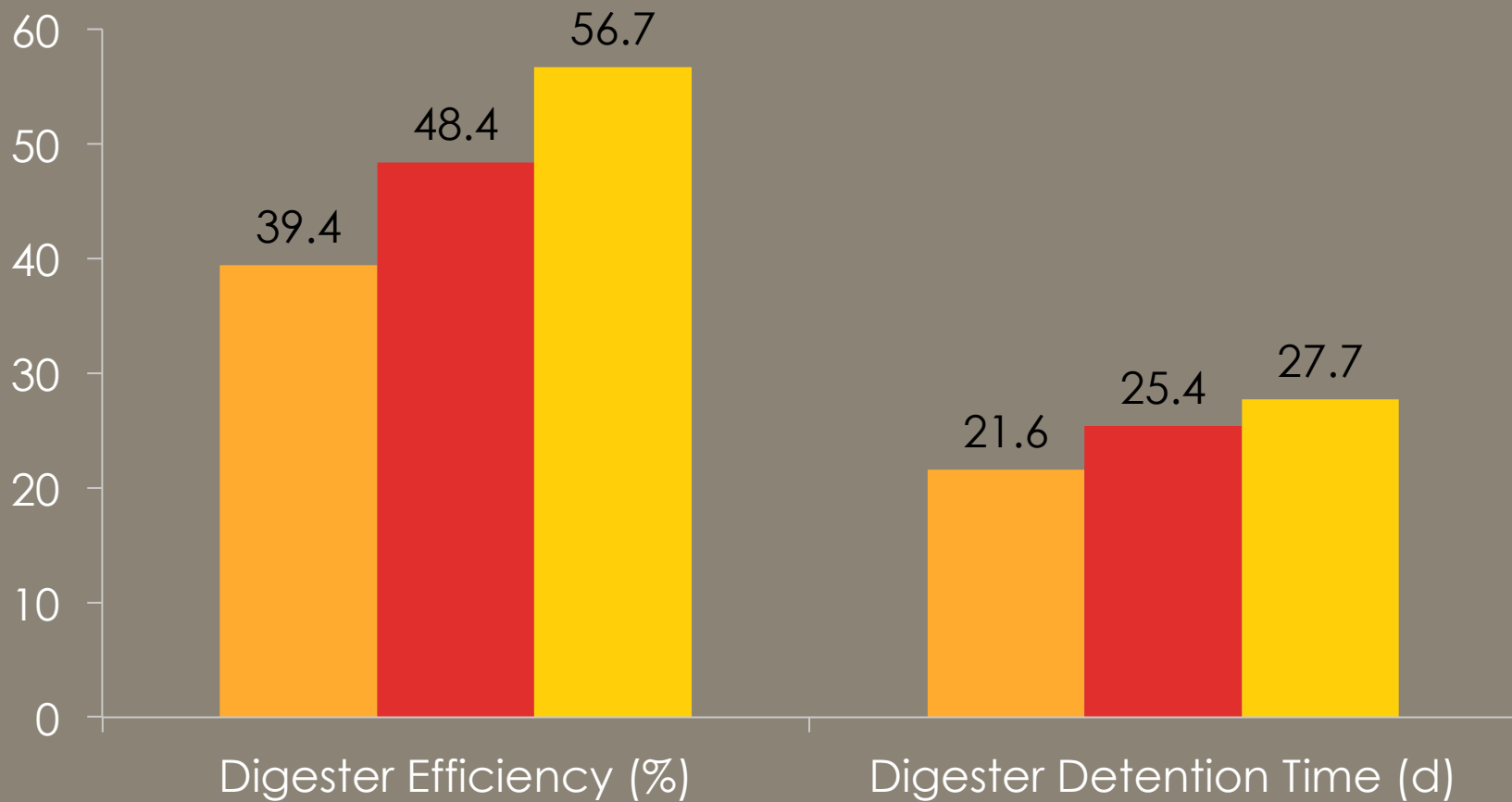




Operating Data

44% Increase

28% Increase



Operating Data

- Sludge heats faster to desired operating temperature
- Digester maintains operating temperature more uniformly
- Gas production has improved
- Uniform solids concentration
 - 2.13% from bottom of digester
 - 2.09% from 19 ft

Other Benefits

- Low maintenance
- Energy and cost savings
 - 5 hp motor vs 10 hp compressor
 - Estimated electrical savings \$6,000/year
 - Increased gas production leads to less fuel consumption

Conclusions

- Increased digester efficiency
- Increased gas production
- Decreased energy consumption

New England's 1st Linear Motion Mixer is a Success!

Questions?

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