Case Study: Pima County Implementations

Presented by: Jeff Prevatt
January 29, 2019
Digestion
Mixing
## Annual Mixing Energy Costs & Savings

Tested: (Anaerobic Digester 90’ dia x 28’ SW x 1.5 Mgal)

<table>
<thead>
<tr>
<th>Mixer Type</th>
<th>H.P.</th>
<th>Cost/kWhr</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$0.08</td>
</tr>
<tr>
<td>Impeller Draft Tube</td>
<td>90</td>
<td>$47,052</td>
</tr>
<tr>
<td>Enersave VLM Mixer</td>
<td>10</td>
<td>$5,228</td>
</tr>
</tbody>
</table>

|               |      | Savings/Year | $41,824 | $52,280 | $62,736 | $78,420 |
|               |      | Savings/ 5 Tear | $209,118 | $261,398 | $313,678 | $392,100 |
Disinfection Byproduct Reduction
Distributed Chlorine Injection To Minimize NDMA Formation during Chloramination of Wastewater

Kirin E. Furst, Brian M. Pecson, Brie D. Webber, and William A. Mitch

† Department of Civil and Environmental Engineering, Stanford University, 473 Via Ortega, Stanford, California 94305, United States
‡ Trussell Technologies, Inc., 1939 Harrison Street, Suite 600, Oakland, California 94612, United States

DOI: 10.1021/acs.estlett.8b00227
Publication Date (Web): June 5, 2018
Copyright © 2018 American Chemical Society

Water Research
Volume 149, 15 October 2018, Pages 579–588

Tradeoffs between pathogen inactivation and disinfection byproduct formation during sequential chlorine and chloramine disinfection for wastewater reuse

Kirin E. Furst, Brian M. Pecson, Brie D. Webber, William A. Mitch

† Department of Civil and Environmental Engineering, Stanford University, 473 Via Ortega, Stanford, CA 94305, United States
‡ Trussell Technologies, Inc., 1939 Harrison St., Suite 600, Oakland, CA 94612, United States

Received 30 March 2018, Revised 26 May 2018, Accepted 28 May 2018, Available online 31 May 2018
Minimization of NDMA Formation during Chlorine Disinfection of Municipal Wastewater by Application of Pre-Formed Chloramines

Chloramination

\[ \text{NH}_3 + \text{NH}_3 + \text{NHCl}_2 + \text{NH}_2\text{Cl} \xrightarrow{[\text{NaOCl}]} [\text{NDMA}] \]

Chlorination

\[ \text{NH}_3 + \text{NH}_3 + \text{NHCl}_2 + \text{NH}_2\text{Cl} \xrightarrow{\frac{1}{2} [\text{NaOCl}]} [\text{NDMA}] \]
Ammonia Residual Results

<table>
<thead>
<tr>
<th>Elapsed Time</th>
<th>Beaker 1, mg/L</th>
<th>Beaker 2, mg/L</th>
<th>Beaker 3, mg/L</th>
<th>Beaker 4, mg/L</th>
<th>Average, mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 hr</td>
<td>0.782</td>
<td>0.629</td>
<td>0.591</td>
<td>0.521</td>
<td>0.631</td>
</tr>
<tr>
<td>3 hr</td>
<td>0.821</td>
<td>0.682</td>
<td>0.630</td>
<td>0.566</td>
<td>0.675</td>
</tr>
<tr>
<td>4 hr</td>
<td>0.870</td>
<td>0.738</td>
<td>0.690</td>
<td>0.620</td>
<td>0.730</td>
</tr>
<tr>
<td>5 hr</td>
<td>0.923</td>
<td>0.794</td>
<td>0.746</td>
<td>0.676</td>
<td>0.785</td>
</tr>
</tbody>
</table>
Struvite Abatement
Struvite: \( \text{MgNH}_4\text{PO}_4 \cdot 6\text{H}_2\text{O} \) (MAP)

Before & After Descaling
Tres Rios WRF Yard Piping
Resource Recovery

Through selective precipitation

From this....

....to this!
Demonstration Results

Pilot results:
5-week test period

- 89% reduction in orthophosphate
- 13% decrease in ammonia
- 3.9% increase in cake dryness
- 30% reduction in polymer
- $370,000 reduction in ferric usage
Struvite Abatement Alternatives
Side Stream Deammonification
Side Stream Treatment

Diagram showing the process of Side Stream Treatment, including Raw Influent, PS, Anaerobic digestion, Dewatering, and Biosolids disposal.
Centrate
Side Stream Flow

- 300,000 - 500,000 gpd
- 1,000 – 1,200 mg/L ammonia
- 30% of the daily ammonia load
- Aeration is 60% electrical usage
Anammox Configurations

Carrier

Granular Sludge

5 mm
Anammox Bioagumentation
For Mainstream Wastewater Treatment

National Science Foundation

$350,000 grant 1705674 award, 2017

PIMA COUNTY
WASTEWATER RECLAMATION

ARIZONA
Biogas Utilization
Project NTRY9T15: Sustainable Struvite Control Using carbon Dioxide from Digester Gas

1. Evaluate feasibility of using CO₂ to prevent struvite formation
2. Analyze alternatives for CO₂ injection in a pilot study
3. Develop a design protocol for full scale implementation
Application of Gaseous CO$_2$

Liquid Inlet

Gas Inlet

CO$_2$ Tank

P = 1 atm, Liquid Flow Rate = 19 L/min

In-line pH probe

Outlet

0 50 100 150

pH

Distance (ft)

4 L/min - 10 L/min
Application of Aqueous CO$_2$
This slide should show the treatment process and maybe a chart of cost and ROI
Class A Biosolids ALternatives
Pilot Demonstration, February 2019
Class A Thermal Dryer
Thank You!

Jeff Prevatt
jeff.prevatt@pima.gov
520-724-6060