Biosolids Dewatering Equipment Comparisons

WWOA Annual Operators’ Meeting

October 5, 2015
Common Dewatering Equipment
Belt Filter Press

• Advantages
  • Low power consumption
  • Low polymer consumption
  • Low speed equipment
    • Fewer specialized maintenance requirements
  • High wash water requirements

• Disadvantages
  • Humid and odorous atmosphere
    • Operator Exposure
    • Corrosion Potential
  • Lower cake solids
  • Higher operator attention required
Common Dewatering Equipment
Centrifuge

- Advantages
  - Contained equipment, improved atmosphere
  - High cake solids
  - Low wash water requirements
  - Reduced operator attention required
  - Small footprint

- Disadvantages
  - High power consumption
  - High polymer consumption
  - High speed equipment
    - Potential specialized maintenance requirements
  - Potential for higher centrate solids
Common Dewatering Equipment
Screw Press

• Advantages
  • Low power consumption
  • Low speed equipment

• Disadvantages
  • Humid and odorous atmosphere
    • Operator Exposure
    • Corrosion
  • Lower Cake Solids
  • High polymer consumption
Common Dewatering Equipment
Rotary Fan Press

• Advantages
  • Low power consumption
  • Low speed equipment
  • Low capital cost
  • Low operator attention required
  • High cake solids
  • Low wash water requirement

• Disadvantages
  • High polymer consumption
  • Limited throughput
    • Suitable for smaller installations
Alternative Dewatering Approach
Sludge Drying Beds

• Advantages
  • No power consumption
  • Very low maintenance requirements (facility dependent)
  • Very high cake solids achievable (40%)

• Disadvantages
  • Sometimes labor intensive
  • Weather-dependent operation
  • Space requirement
  • Odor potential
  • Appearance
Illinois WWTP Dewatering Evaluation

- 3.5 mgd design average flow
- Extensive Renovations
  - Remove Primary Clarifiers
  - Expand Aeration Tanks
    - Use Adjacent Aerobic Digester Tanks
  - Convert Anaerobic Digesters to Aerobic Digesters
  - Demolish Sludge Drying Beds
  - Implement Mechanical Dewatering
  - Screw Press Pilot
Screw Press Pilot

- Trailer Mounted Unit
- 12 gpm sludge flow rate
- Aerobically digested sludge
- 3.0% TS feed sludge
- Achieved 22.4% dry solids (average)
- 28 lbs active polymer per dry ton
## Centrifuge vs. Screw Press Comparison

<table>
<thead>
<tr>
<th></th>
<th>Screw Press</th>
<th>Centrifuge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Units</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Flow Rate (gpm)</td>
<td>50</td>
<td>157</td>
</tr>
<tr>
<td>Operating hours/wk</td>
<td>56</td>
<td>18</td>
</tr>
<tr>
<td>Polymer (lb active/ton)</td>
<td>28</td>
<td>15</td>
</tr>
<tr>
<td>Power (each)</td>
<td>2.5</td>
<td>75</td>
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<tr>
<td>Annual O&amp;M</td>
<td>$112,000</td>
<td>$81,000</td>
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<tr>
<td>Capital Cost (including equipment, building, storage)</td>
<td>$2,934,000</td>
<td>$3,142,000</td>
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<tr>
<td>Total Present Worth</td>
<td>$4,079,000</td>
<td>$3,845,000</td>
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Wisconsin WWTP Dewatering Evaluation

• 2.3 mgd design average flow
• Heavy Industrial Loads
  • 4,400 lb/day BOD
  • 3,500 lb/day TSS
• Anaerobic Digestion
• Currently Use Belt Filter Press
  • In need of replacement or reconditioning
• Limited Cake Storage Capacity
• Evaluate Replacement Options
  • Recondition Belt Filter Press
  • Centrifuge
  • Rotary Fan Press
## Alternatives Comparison

<table>
<thead>
<tr>
<th></th>
<th>Recond. Belt Press</th>
<th>Fan Press</th>
<th>Centrifuge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polymer (lb active/ton)</td>
<td>22</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>Power (each)</td>
<td>5</td>
<td>2.5</td>
<td>75</td>
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<tr>
<td>Cake Solids</td>
<td>17.5%</td>
<td>20%</td>
<td>24%</td>
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<tr>
<td>Additional Storage</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
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<tr>
<td>Required?</td>
<td></td>
<td></td>
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<tr>
<td>Annual O&amp;M</td>
<td>$173,000</td>
<td>$121,000</td>
<td>$121,000</td>
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<tr>
<td>Capital Cost</td>
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<td>$1,099,000</td>
<td>$1,057,000</td>
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<tr>
<td>Total Present Worth</td>
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<td>$2,940,000</td>
<td>$2,900,000</td>
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</table>

Owner Selected Centrifuge
Illinois WWTP Dewatering Evaluation

• 25 mgd design average flow
• Anaerobic Digestion
• 98,000 gpd digested sludge
• Currently Use Belt Filter Presses (3)
  • In need of replacement or reconditioning
• Limited Cake Storage Capacity
• Evaluate Replacement Options
  • Replace Belt Filter Press
  • Centrifuge
  • Screw Press
## Alternatives Comparison

<table>
<thead>
<tr>
<th></th>
<th>Belt Press</th>
<th>Centrifuge</th>
<th>Screw Press</th>
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<tbody>
<tr>
<td>Number of Units</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Flow Rate (gpm)</td>
<td>130</td>
<td>300</td>
<td>225</td>
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<tr>
<td>Operating hours/wk</td>
<td>88</td>
<td>38</td>
<td>51</td>
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<tr>
<td>Polymer (lb active/ton)</td>
<td>24</td>
<td>30</td>
<td>35</td>
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<tr>
<td>Connected Power (hp)</td>
<td>29</td>
<td>182</td>
<td>43</td>
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<tr>
<td>Cake Solids</td>
<td>16%</td>
<td>23%</td>
<td>21%</td>
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<tr>
<td>Annual O&amp;M</td>
<td>$1,277,000</td>
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<tr>
<td>Capital Cost</td>
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<td>$5,347,000</td>
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<tr>
<td>Total Present Worth</td>
<td>$18,191,000</td>
<td>$15,575,000</td>
<td>$17,033,000</td>
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