Spinning Into Control:

City of Sacramento’s
New 360 mgd
Solids Handling Facilities

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City of Sacramento WTPs

Sacramento River WTP (160 MGD)

EA Fairbairn WTP (200 MGD)

You are here

Sacramento River

American River
HISTORICAL SOLIDS HANDLING
Historical Solids Handling

Filter Waste Washwater
- fill-decant to load FWW basins
- pile-spread for solar drying to >50% solids
- Landfill Disposal

Sedimentation Basin Blowdown
- fill-decant to load Sludge Lagoons
### Historical 2005-2009 Solids Production

<table>
<thead>
<tr>
<th></th>
<th>SR</th>
<th>EAF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Flows (mgd)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacity</td>
<td>160</td>
<td>200</td>
</tr>
<tr>
<td>Max</td>
<td>122</td>
<td>112</td>
</tr>
<tr>
<td>Ave</td>
<td>63</td>
<td>57</td>
</tr>
<tr>
<td><strong>Raw Turbidity (NTU)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max</td>
<td>225</td>
<td>178</td>
</tr>
<tr>
<td>Ave</td>
<td>13</td>
<td>3.0</td>
</tr>
</tbody>
</table>
Historical Solids Production

<table>
<thead>
<tr>
<th>[dry ton/day]</th>
<th>SR</th>
<th>EAF</th>
</tr>
</thead>
<tbody>
<tr>
<td>95th Percentile</td>
<td>80.7</td>
<td>23</td>
</tr>
<tr>
<td>50th Percentile</td>
<td>6.2</td>
<td>1.7</td>
</tr>
</tbody>
</table>
Historical Landfill Disposal

<table>
<thead>
<tr>
<th>[ave ton/yr]</th>
<th>Dry</th>
<th>Wet</th>
<th>% Solids</th>
</tr>
</thead>
<tbody>
<tr>
<td>SR</td>
<td>1,994</td>
<td>3,527</td>
<td>56%</td>
</tr>
<tr>
<td>EAF</td>
<td>483</td>
<td>1,250</td>
<td>39%</td>
</tr>
</tbody>
</table>

- <50% pay to haul water to more expensive LF
- % solids anticipated to decrease as WTPs production increases
- Losing 1 lagoon/WTP drove $1M/yr in contract dewatering
DEWATERING SYSTEM DESIGN
When is mechanical dewatering better than solar drying?

• When there is a preference for mechanical dewatering over solar drying, and staff are OK with associated mechanical maintenance

• When site footprint available for PROPERLY SIZED solar drying bed is not available (i.e. 6 – 10 lbs/ft²/year solids loading)

• Raw water turbidity and chemical dosing is relatively high (i.e. >100 lbs/MG solids)

• When “GUARANTEED” solids dewatering capacity, throughout the year and during all seasons, is required.

• When COST of equivalent solar drying beds is greater than mechanical dewatering equipment
Residuals Handling Alternatives

- **No change**
  - Already overloaded, existing operational challenges, anticipated to get worse with time, unable to address future flows

- **Contract dewatering**
  - $52.8M\_{20-yr \text{ present worth}}$

- **All mechanical**
  - $143M\_ {20-yr \text{ present worth}}$ process peak events

- **Hybrid (mechanical + existing infrastructure)**
  - $68M\_ {20-yr \text{ present worth}}$ $\sim 1/4^{th}$ capacity of “all mechanical” through peak storage
Hybrid Peaking at SR

- To Lagoon for Peaking
- No Peaking

Peak Storage

Mechanical Dewatering
Overview of Residuals Handling Process

- Sed. Basins
  - Thickeners (1.5%)
  - Homogenizing Tanks (3-6%)
  - Centrifuges (>20%)

- Centrifuges (3-6%)
Overview of Residuals Handling Process

Filters

Sed. Basins

Thickeners

1.5%

1.5-7%

1.5-7%

FWW Basins

Recycle to head of WTP

Homogenizing Tanks

Centrifuges

Drying

Sewer

Truck/Landfill

Truck

50-60%

>20%

0.1-1.5%

>20%
Design Basis

<table>
<thead>
<tr>
<th>Process</th>
<th>Units</th>
<th>SR</th>
<th>EAF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FWW Sludge Collectors</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>No.</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Total Area</td>
<td>ft²</td>
<td>48,000</td>
<td>46,600</td>
</tr>
<tr>
<td><strong>Gravity Thickeners</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>No.</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Diameter</td>
<td>ft</td>
<td>80</td>
<td>65</td>
</tr>
<tr>
<td><strong>Homogenizers</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>No.</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Total Volume</td>
<td>gal</td>
<td>220,000</td>
<td>135,000</td>
</tr>
<tr>
<td><strong>Centrifuges</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>No.</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Total Capacity</td>
<td>lbs/hr</td>
<td>3,600 (+1,800)</td>
<td>1,800 (+1,800)</td>
</tr>
<tr>
<td>Total Capacity</td>
<td>gpm</td>
<td>320 (+160)</td>
<td>160 (+160)</td>
</tr>
</tbody>
</table>
NEW THICKENING & DEWATERING FACILITIES
FWW Hoseless Sludge Collectors
Gravity Thickeners

SR WTP

EAF WTP
Polymer System
Homogenizers
Five 43,200 lb/day Centrifuges
Conveyors and Off-Haul
Conveyors and Off-Haul
STARTUP AND OPTIMIZATION
Effect of Solids Loading on Cake Solids

![Graph showing the relationship between solids loading and cake solids percentage. The x-axis represents solids loading (dry lbs/hr), and the y-axis represents cake solids percentage. The data points are scattered across the graph, indicating variability in the relationship.]
Solids Loading Effect on Recovery
Effect of Feed Solids on Cake Solids
Cake Solids Across Feed Flow Range
Acrylamide Management

• US EPA limits acrylamide by Treatment Technique (potable dose ≤1 mg/L)

• Polymer to Centrifuge
  – Control Strategy 1 – Centrate to Sewer
    • No additional action
  – Control Strategy 2 – Centrate to Gravity Thickener
    • For max dose (20 lb polymer/ton) at max SR solids processing (3,600 lb solids/hr), WTP flow must be ≥51.8-mgd
    • 14-17 ug/L acrylamide in grab centrate samples (6 to 8 lbs/ton Clarifloc A-333P; 98% recovery)
    • 0 ug/L acrylamide in control (settled water)
Acknowledgements

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Questions?

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