EMERGING TRENDS IN WATER TREATMENT

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WEFTEC
21st Century Water Systems

- Smart Technology
- Lower energy use
- More efficient water use
- Smaller footprint: weight/size
- Chemical optimization
- Reduced wastewater
- Less labor and maintenance
History of Detection

ppm = parts per million
ppb = parts per billion
ppt = parts per trillion
pp? = parts per ????
Are we headed here?

Quadrillion

1,000,000,000,000,000
Invasive Species
“Israel is the only nation that appears to have done what the world needs to do over the next 30-40 years - double water productivity in agriculture.”
Developing Countries
Multi-Stage Treatment
Vee-Wire Technology
Energy Market
Natural Gas Storage Facility
Industrial Cooling Applications
Mobile Services
Desalination

Typical Costs for RO Desal Plant

- Electrical Energy: 44%
- Fixed Cost: 37%
- Labor: 4%
- Membrane Replacement: 5%
- Maintenance & Parts: 7%
- Consumable: 3%
Rainwater Harvesting Systems

Ozone-UV Rainwater Treatment System
Stormwater Treatment & Reuse

- Site Runoff
- Settling Chamber
- Vertical Turbine Pumps
- Cyclone Separators (3)
- (3) Amiad EBS Filters – 130 micron
- 1,000,000gal settling tank
- Water truck for dust control
- Process Water for Shredder Cooling
- 0-35% Surface Water Discharge depending on rainfall
Case Studies
Waste Discharges from Water Treatment

<table>
<thead>
<tr>
<th>Process Type</th>
<th>Wastestream make-up</th>
<th>Disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clarification</td>
<td>Water / Solids mixture</td>
<td>Dewatering required before landfill</td>
</tr>
<tr>
<td>Filtration</td>
<td>Water / Solids mixture Filter bags</td>
<td>Dewatering required before landfill Bags disposed directly</td>
</tr>
<tr>
<td>Selective Ion Removal</td>
<td>Water / Solids mixture Concentrated Brine</td>
<td>Dewatering required before landfill Disposal Wells or Crystallization</td>
</tr>
<tr>
<td>Total Dissolved Solids Removal</td>
<td>Concentrated Brine</td>
<td>Disposal Wells or Crystallization</td>
</tr>
<tr>
<td>Evaporation / Crystallization</td>
<td>Steam Plumes Crystallized Salts</td>
<td>Specialty landfill to prevent resolubilizing</td>
</tr>
</tbody>
</table>
Case Study – Power Plant

• Cooling tower flow rate = 1.5 million gallons per minute (340,000 m³/hr).
• Intake structure located three miles out into the lake source.
• Contract for initial modeling effort.
• CFD model was built around dual flow modifier pipe design, minimizing thru slot velocities at the screen surface.
• CFD Model was used to present to regulators to meet 316(b) fish protection regulations.
• Order was for 24 T-96’s - Z-Alloy material.
Case Study – Fly Ash Lagoon Elimination Project

• Lagoons acted as the primary clarifier, prior to discharge to river
• Lagoons filled up faster due to recent process changes
• Created non-compliant discharge to the river

• Lab and pilot testing
• Mobilized temporary treatment systems

• Designed two permanent treatment systems
• Start up in early 2012
• Next project starting up in April 2013
• Lagoons eliminated, quality to river improved and process controlled
## Growth Potential

### McIlvaine Report

<table>
<thead>
<tr>
<th>Industry</th>
<th>2013 Revenues in € Millions</th>
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</thead>
<tbody>
<tr>
<td>Chemical</td>
<td>320</td>
</tr>
<tr>
<td>Food</td>
<td>690</td>
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<tr>
<td>Metals</td>
<td>195</td>
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<td>Mining</td>
<td>722</td>
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<tr>
<td>Other Industries</td>
<td>648</td>
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<td>Pharmaceutical</td>
<td>272</td>
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<td>Power</td>
<td>1260</td>
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<td>Pulp &amp; Paper</td>
<td>137</td>
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<tr>
<td>Wastewater</td>
<td>845</td>
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<tr>
<td>Water</td>
<td>410</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5499</strong></td>
</tr>
</tbody>
</table>

- **Growing Energy Thirst**
  - **2010**
    - Coal Power: 56.7%
    - Gas Power: 14.9%
    - Biomass: 17.9%
    - Nuclear Power: 10.4%

- **2035**
  - Coal Power: 30.4%
  - Nuclear Power: 30.4%
  - Biofuel: 30.4%

*Source: International Energy Agency, current policies scenario*