Flood Recovery By the Book, While Writing the Book
Recovery and Startup of the Nashville Central WWTP Biosolids Facility

Presented by Bob Wimmer, PE
Co-Authors

- Ron Taylor, Metro Water Services
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- Roy Denney, Metro Water Services
- Neil Massart, Black & Veatch
- Shannon Lambert, BWSC
- Tazio Qubeck Brown and Caldwell
- Patrick Moore, BWSC
The Distraction
Just when things are running smoothly... Other challenges present themselves.
May 2010 Flood

- 2 day rain of > 19 inches

- Cumberland River Crested at 51.86 feet in Nashville
  - Highest level since 1937
  - Record crests at numerous points along the river

- $2.3 Billion in damages
May 2010 Flood

LP Field
Central Biosolids Facility

- 137 DT per day facility
- 4 circular DAFTs
- 4 primary 2.5 MG mesophilic digesters
  - 3 fixed cover
  - 1 Dystor cover
- 1 secondary 2.5 MG digester
  - Dystor cover
- High solids centrifuges
- Rotary Drum Dryer
Damaged Equipment

- 4 circular DAFTs  Out of service
- 4 primary 2.5 MG mesophilic digesters  Out of Service
- 1 secondary 2.5 MG digester  Out of Service
  – Dystor cover
- High solids centrifuges  Functional but no power
- Rotary Drum Dryer  Out of Service
- Liquid Plant  Minor Damage
Metro SOP
Section 13 - Flood Recovery
In the case of a 500 year flood – figure it out as you go (Ha, Ha, Ha)
Immediate Actions

- Complete inventory of equipment
  - Develop documentation system
  - Photos, testing reports, repairs
- Emergency Maintenance Contracts
- Pull Motors and bake
- Make a Plan
  - Value of Electronic O&M
  - Off site staff
  - Vendors
Move Solids

- Installed a temporary belt filter press and hauling contract (unstabilized solids) between 20 to 25 dt/day
- Stop wasting primary
- WAS into out of service aeration basin
- Make a Plan
Stabilize Solids

- Created 2 stage aerobic digester
  - Utilized out of service aeration basins (approx 2MG per basin)
- Temporary pumping between basins
- Use out of service primary clarifier as digested sludge storage
- Restart DAFT
- Restart Centrifuges – relieve some pressure
Sludge Pumping Challenges

- WAS
- PS
- WC
- Aerobic Digester
- BFP
- DAFT
Digester Start Up

DIGESTER 2 & DIGESTER 3 - AVERAGE VOLATILE SOLIDS LOADING

VS Loading, lb/kcf/d

0 20 40 60 80 100 120 140 160 180 200

1-Jul-10 3-Jul-10 5-Jul-10 7-Jul-10 9-Jul-10 11-Jul-10 13-Jul-10 15-Jul-10 17-Jul-10 19-Jul-10 21-Jul-10 23-Jul-10 25-Jul-10 27-Jul-10 29-Jul-10 31-Jul-10

Graph showing the average volatile solids loading for Digester 2 & Digester 3 from 1st July to 31st July 2010.
Targets and Action Items for July 26.

- Digester loading for July 25: Target 70 lb VS/kcf/d – Actual: 62 lb VS/kcf/d
- Temporary BFP dewatering restarted on July 25 – operating at a hydraulic throughput of approximately 230 gpm/24 hours.
- Digester loading increased to 77 lb VS/kcf/d.
- Sludge pumping rates adjusted for the target digester loading of 77 lb VS/kcf/d
  
  Approx 46:54 PS: WAS on dry weight basis
  North Primary for 12 hours @ 150 gpm
  South Primary for 12 hours @ 150 gpm
  North Waste Sludge for 12 hours @ 700 gpm
  Whites Creek sludge for 12 hours at 300 gpm

Next meeting - **8A on Tuesday July 27 @ B&V trailer.**

Attachments:

1. Pumping Rate Spreadsheet for July 26, 2010
### ANAEROBIC DIGESTION

<table>
<thead>
<tr>
<th>Digester Operating Level</th>
<th>ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Primary Digesters</td>
<td>2</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Organic Loading Rate to Digesters</th>
<th>TARGET</th>
<th>ACTUAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>lb VS/kcf/d</td>
<td>75</td>
<td>77.3</td>
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</table>

<table>
<thead>
<tr>
<th>Total Feed to Digesters</th>
<th>Volatile Solids</th>
<th>Total Solids</th>
<th>Feed Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>lb/d</td>
<td>lb/d</td>
<td>gpd</td>
<td></td>
</tr>
<tr>
<td>48,100</td>
<td>73,050</td>
<td>175,180</td>
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</table>

<table>
<thead>
<tr>
<th>Approximate PS:WAS Split (TS Basis)</th>
<th>PS</th>
<th>WAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>46%</td>
<td>54%</td>
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</table>

### DISSOLVED AIR FLOTATION THICKENING

<table>
<thead>
<tr>
<th>Solids Capture Efficiency</th>
<th>85.0%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digester Feed Solids Concentration</td>
<td>5.0%</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Total Feed to DAF</th>
<th>Volatile Solids</th>
<th>Total Solids</th>
<th>Feed Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>%VS</td>
<td>lb/d</td>
<td>%TS</td>
<td>lb/d</td>
</tr>
<tr>
<td>65.8%</td>
<td>56,590</td>
<td>1.7%</td>
<td>85,940</td>
</tr>
</tbody>
</table>

### TEMPORARY BELT FILTER PRESS DEWATERING

<table>
<thead>
<tr>
<th>Hours of Operation</th>
<th>24</th>
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<tbody>
<tr>
<td>Hydraulic Loading Rate</td>
<td>230 gpm</td>
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</table>

<table>
<thead>
<tr>
<th>Total Feed to BFP Dewatering</th>
<th>Volatile Solids</th>
<th>Total Solids</th>
<th>Feed Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>lb/d</td>
<td>lb/d</td>
<td>gpd</td>
<td></td>
</tr>
<tr>
<td>30,990</td>
<td>47,060</td>
<td>331,200</td>
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</table>

### SLUDGE PUMPING FROM CENTRAL WWTP

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Digester Start Up

DIGESTER 2 & DIGESTER 3 - AVERAGE VOLATILE SOLIDS LOADING

VS Loading, lb/kcf/d

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Digester Start Up

DIGESTER 2 & 3 - AVERAGE VOLATILE SOLIDS LOADING

VS Loading, lb/kcf/d

1-Aug-10  3-Aug-10  5-Aug-10  7-Aug-10  9-Aug-10  11-Aug-10  13-Aug-10  15-Aug-10  17-Aug-10  19-Aug-10  21-Aug-10  23-Aug-10  25-Aug-10  27-Aug-10  29-Aug-10  31-Aug-10
Dystor Collapse
Cover Repairs
Lessons Learned

- Communication
- Valve Options
- Slow and Steady
- Critical Failure Analysis
Thank you

- All the Metro Staff
- Numerous Contractors
- Numerous Vendors
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