Microfiltration and Conventional Treatment – Teaching an old dog new Tricks!
Lessons Learned from an Integrated Water Supply in Brown County, Texas
Overview

- The Need for Membranes
- Integrated System Operation
- Benefits
- Lessons Learned
BCWID

• District established in 1925
• Located in North/Central Texas
• Water Source: 29,000 AFY in Lake Brownwood
• Good water quality
East WTP

• Capacity of 4 MGD constructed in 1938
• Expanded to 8 MGD in 1942
West WTP

- Capacity of 10 MGD constructed in 1985
- Down-rated to 7.5 MGD
Infrastructure Study

- In 2002, District recommended to uprate the West Plant
- East Plant would be retired
  - Valves
  - Switchgear
- Membranes could be competitive with conventional expansion
Pilot Study

• Pilot Test – November 2003 to March 2004
• Approved flux rate of 80 gfd – highest in Texas
MF Plant

- Rated capacity of 9.0 MGD at 20 °C
- Began selling water in 2009
- Additional membrane rack helps the plant achieve a higher net production rate:

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>Gross Flux Rate (gfd)</th>
<th>Net Production (MGD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>61.6</td>
<td>8.06</td>
</tr>
<tr>
<td>10</td>
<td>67.7</td>
<td>8.88</td>
</tr>
<tr>
<td>15</td>
<td>74.1</td>
<td>9.74</td>
</tr>
<tr>
<td>20</td>
<td>80.6</td>
<td>10.60</td>
</tr>
<tr>
<td>25</td>
<td>86.9</td>
<td>11.45</td>
</tr>
<tr>
<td>30</td>
<td>92.6</td>
<td>12.22</td>
</tr>
</tbody>
</table>
Overview

- Brown County Water Improvement District No. 1 (BCWID)
- Integrated System Operation
- Benefits
- Lessons Learned
BCWID WTP Modes of Operation

• In Parallel
• Conventional
• Membrane
• In Series
Parallel

**West Conventional Plant**
- Chlorine Ammonia
- Rapid Mix/ Flocc’n
- Sedimentation/ Tube Settling
- Settled Water Transfer Line
- Filters

**Microfiltration Plant**
- Chemical Mix Basin
- MF Pumps
- MF Filtration Membranes
- CIP Waste, Sedimentation/ BW Sludge Storage Lagoon
- Filter BW PS
- Dist’n PS
- Dist’n

**Used During Conventional Treatment Mode**
- Terminal Storage Reservoir
- Chlorine

**Used During Pre-Treatment Mode**
- Chemical Mix Basin
- Chlorine
- Ammonia

**Micromembranes**
- Chlorine
- Ammonia
West Conventional Plant

Microfiltration Plant

Chemical Mix Basin

MF Filtration Membranes

CIP Waste, Sedimentation/BW Sludge Storage Lagoon

Clearwells

Dist’n PS

To Dist’n
Overview

• Brown County Water Improvement District No. 1 (BCWID)
• Integrated System Operation
• Benefits
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Advantages

• Capital Cost Savings
• Operational Cost Savings
• Future Expansion Cost Savings
Advantages

• Flexibility of Operation
• Common component sharing
• Tastier water!
Overview

• Brown County Water Improvement District No. 1 (BCWID)
• Integrated System Operation
• Benefits
• Lessons Learned
Lessons Learned

• Cross-training plant staff
• Integration of Regulatory Reporting
Lessons Learned

• Electronic Recording and Reporting

Photos courtesy of homelandsecureit.com and icorestudio.com
### Lessons Learned

- **Chemical Requirements – CT credits**

<table>
<thead>
<tr>
<th>WTP Facility Description</th>
<th>Cryptosporidium Removal Credits (log removal)</th>
<th>Giardia Removal Credits (log removal)</th>
<th>Virus Removal Credits (log removal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MF, UF, NF &amp; RO without Pretreatment</td>
<td>2.0</td>
<td>3.0</td>
<td>No credit given</td>
</tr>
<tr>
<td>MF, UF, NF &amp; RO with coagulation and flocculation</td>
<td>2.0</td>
<td>3.0</td>
<td>1.0</td>
</tr>
<tr>
<td>MF, UF, NF &amp; RO with coagulation, flocculation and clarification</td>
<td>2.0</td>
<td>3.0</td>
<td>2.0</td>
</tr>
</tbody>
</table>
Acknowledgements

• BCWID Staff

• AMTA and AWWA

• Mike Morrison, P.E., BCEE
Takeaways

- Integrated systems can be cost-effective
- Relationships are your best resource
- Be willing to adapt

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