Sludge Thickening/Storage Alternatives Analysis for a 225 MGD Wastewater Treatment Facility
PRESENTATION AGENDA:

≡ Introduction
≡ Background
≡ Key Issues / Initial Scope
≡ Alternatives
≡ To and Fro
≡ Final System
≡ Lessons Learned
INTRODUCTION / BACKGROUND

≡Downriver WTF (DWTF)


≡Wyandotte

≡Serves 13 Communities

≡Allen Park, Belleville, Brownstown Twps., Dearborn Heights, Ecorse, Lincoln Park, River Rouge, Riverview, Romulus, Southgate, Taylor, Van Buren Twps., Wyandotte
DWTF

≡ 40 MGD ADF
≡ 225 MGD Peak Flow (250+ MGD)
≡ Chemical Phosphorus Removal (Ferric)
≡ High Purity Oxygen Activated Sludge
≡ Unique Blending Process:
  ≡ 225 MGD Headworks and Disinfection
  ≡ 150 MGD Primary
  ≡ 125 MGD Secondary
SOLID PROCESS PRIMARY SLUDGE

- 7 Primaries (1962, 1969, 1999)
- Each Tank Has Dedicated Chopper Pump
- Timer Control Based on Sludge Blanket Levels
- Pump to 150,000 Gallon (ea.) Primary Sludge Storage Tanks (then to Incineration 1962)
- Pump to 4 Gravity Thickeners w/ Two Chopper Type Pumps (1975)
WAS SLUDGE

6 Secondary’s (1972, 1986),
- Each with RAS Pump
Consistent WAS Pumping Based On MCRT, MLSS
Pump Directly to Gravity Thickeners
Co-Thicken But Maintain Separate Feed
SOLID COMPLEX

- Thicken,
- Dewater,
- Convey to Roll-offs,
- Truck to Landfills
SOLID COMPLEX EQUIPMENT

≡4 Gravity Thickeners, with 6 Plunger Pumps (1975)
≡2 Sludge Storage / Blend Tanks, with 3 Rotary Lobe Pumps and Chopper Pumps
≡2 4,000 lbs./day Centrifuges, Individual Feed (2008)
≡4 BFPs with Loops Feed (1995)
≡Screw Conveyor (2008) Cake to Truck, Landfill
KEY ISSUES / INITIAL SCOPE

≡ Antiquated, Total Facility Upgrade
≡ Update to State of the Art
≡ Simplify but Maintain Needed Redundancy
≡ Get rid of extra pumps, storage tanks
≡ Pump Sludge to Splitter Box, Gravity Feed to Gravity Thickeners
≡ Pump to Storage / Blend Tank
≡ Attempt to Remove Grit
INITIAL PROCESS FLOW SCHEMATIC

≡ Pump Primary Sludge Directly to Thickeners
≡ Splitter Box Gravity Feed
THICKENING PROCESS FLOW SCHEMATIC – SIMPLIFY!
SPLITTER BOX CONCEPT
EVALUATIONS / WORKSHOPS

- Considered Batch vs. Continuous Processing
- Evaluated Splitter Box vs. Flow Meter – Control Valves Sets
  - 12 Meter – Control Valve Sets
  - Four, Five and Six Sided Splitter Box
  - Fixed vs. Controlled Gates
- Mechanical vs. Turbulence Mixing
- Means of Grit Removal
EVALUATIONS / WORKSHOPS CONT.

≡ Evaluated Sludge Pumps
  ≡ 7 Possibly Types
  ≡ Site Visit PVP and Other Due Diligence

≡ Evaluated Blend Tank Mixers
  ≡ 6 Possibly Types
  ≡ Linear Motion Due Diligence

≡ Grit Removal
  ≡ Consider Repurpose Skimmings Building
  ≡ Explore Equipment at WEFTEC
INITIAL PROCESS SELECTIONS

≡ Mag Meter – Control Valve Sets (12) to New Gravity Thickeners
≡ Pump to Blend Tanks
≡ Mix to provide consistent feed
≡ Linear Motion Mixers
≡ Dedicated PVPs to Centrifuges, Rotary Lobes to BFPs

7/10/2017
But…

Why Are We “Thickening?”

…and...

Why Are We Pumping Again?
Competing Dewatering Interests

Centrifuge Loading:

- 2% - 4% Feed Concentration
- 4,000 lbs./hr.
- New and Shiny

BFP:

- 4% - 10% Feed Concentration
- One-third the Centrifuge Production
- Old and saggy

Ultimately Going With Additional Centrifuges
EVALUATION / SOLUTIONS:

- Convert Thickeners to Storage Tanks
- Eliminate Blend Tanks
- Mix to provide consistency
- Pump Directly to Dewatering Units
ULTIMATE SOLUTION

≡ Eliminate Primary Sludge Storage Tanks and Sludge Pumps
≡ Convert Gravity Thickeners to Sludge Storage
≡ Pump Primary and WAS Directly to Sludge Storage Tanks
≡ Eliminate Sludge Storage / Blend Tanks
≡ Continue Flow Control Valve Meter Sets
  ≡ (Eliminate elutriation water control sets)
≡ Mix with Linear Motion Mixers
≡ Relocate Ex Rotary Lobe to Feed BFP (problematic)
≡ New PVP to Feed Centrifuges
Rotary Lobe – Lobes Swelled, Rubbed Casing (Left Doors Open)

Vendor - “They shouldn’t swell”

Switched Out Lobes with Little Results

Vendor Witnessed Maintenance Procedures

Wrong Procedures

Staff Retrained

No More “Swollen Lobes”
LESONS LEARNED (CONT.)

≡ Centrifuge Internals Headloss
≡ 6” lines, to 4’ dia. Centrifuge Feed Pipe
≡ Internally, Pipe Necks Down to 2” dia.
≡ Discovered When Pumps Were Dismantled For Repairs (Oh-Shmit Moment)
LESSONS LEARNED (CONT.)

≡ Oh-Biosolids Moment
≡ (Discovered When Pumps Were Dismantled For Repairs)
Centrifuge Internal Headloss

- 6” lines, to 4’ dia. Centrifuge Feed Pipe
  - 4” = 10 fps

- Internally, Pipe Necks Down to 2” dia.
  - 2” dia = 40 fps

- Additional 25 ft. headloss (clean water)
LESSONS LEARNED

≡ Dual Disk Pump - ‘Enamored’ with PVPs (Nice Shiny Technology)
≡ Due Diligence Calls / Site Visit
≡ Lease-to-Purchase for 6 Months
≡ Worked Flawless at 120 gpm, Low Head
≡ Once applied, severe vibrations, disk ruptures, inability to meet design conditions (400 gpm), loss of air in pulsation dampener chambers,
Penn Valley Pump Company, Inc.
The World Leader in Free-Diaphragm® Pumping Technology

Model 8DDSX125 Double Disc Pump™

Features and Benefits:
- Patented "Maintain-in-Place" design allows servicing without disturbing piping
- Only 6 wetted components
- Self-priming with high suction lifts
- Seal-less design, no stuffing box or mechanical seals, no seal water required
- Runs dry without damage
- No check valves, no fouling problems
- Passes up to 2" solids and fine size semi-solids
- No routine maintenance required
- Compact design
- Two (2) year warranty

Technical Specifications:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Twice Flow Range</td>
<td>Up to 650 GPM</td>
</tr>
<tr>
<td>Displacement</td>
<td>1.25 gpm per revolution</td>
</tr>
<tr>
<td>Operating Speed</td>
<td>40 to 42 RPM</td>
</tr>
<tr>
<td>Discharge Pressure</td>
<td>Up to 120 psi operating</td>
</tr>
<tr>
<td>Suction Pressure</td>
<td>Up to 100 psi suction</td>
</tr>
<tr>
<td>Combustion</td>
<td>1.1 HP Rated</td>
</tr>
</tbody>
</table>

Materials of Construction:

- Housing: Cast iron
- Optional: Lined with Hypalon, Neoprene, PVC, Teflon, Orings, etc.
- Elastomers: Neoprene, Buna-N, Hypalon, PTFE, Viton, etc.
- Connecting Rods: High density Aluminum
- Drive Shaft: High density 400 Series SS
- Eccentric Gears: High density Bronze
- Bearing Pedestals: Aluminum
- Frame and Covers: 316SS, Stainless steel

Drives:
- Engine: Electric motor and pulley
- Optional: Air and Hydraulic motor
- Motor: Electric, gas and diesel engine

950 Easton Road • Warrington, PA 18976 • Phone: 215-343-8750 • Fax: 215-343-8753 • www.pennvalleypump.com
WRAP-UP:

$10M Construction
Sorenson Gross (Prime)
J.F. Cavanaugh
Shaw Electric
Commerce Controls Inc.
Final Completion May 2016
Q&A???

THANK YOU!

Tim Sullivan, P.E.

If you have questions about the presentation, please contact me:

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