Innovative Delivery Yields Innovative Technical Solutions
2018 One Water Ohio

30-August-2018

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Outline

• The Problem
• The Approach
• The Solution
In 2015, After 35 years of Zimpo Operations we analysed the viability of our operations for the future
Areas of concern

- Increasing COD Loading in the Raw Sewage
- Increasing problems due to internal waste stream recirculation
- Maintenance issues with high pressure equipment
- The high cost of energy required for the current sludge process
- Future capabilities of the current aeration system
- Maintaining and improving our BNR systems
The Cod loadings to the plant have steadily increased while the flows have remained stable. This was a strong indication that our efforts would need to be in the area of solids handling.
Thermal Hydrolysis

• Lysis – breaking stuff apart
• Thermal – with heat
• Hydro – with water (solubilization)

Our Zimpro Process is a Thermal Hydrolysis Unit
In 2015 we conducted an intensive two week sampling campaign at multiple locations throughout our plant and sewer system. One of the most interesting findings was the significant percentage of recycle loading from our Zimpro process.
Our Zimpro operations currently consumes 17 percent of our electrical power use.

By shutting down Zimpro our average Electrical power use would drop to 1.01 MW. This power could be provided by one of our existing gas generators.

Zimpro consumes 85 percent of our natural gas.

This natural gas could be diverted to run one generator for 13 hours per day. While supplying hot water and Steam to a new process.
Maintenance of high pressure equipment has been a constant issue.

Some of our equipment is no longer functional.
With the loadings increasing we considered adding more aeration tanks.

Our projections however, showed that even adding three more aeration tanks would not provide enough capacity by 2038.
Liverpool WWTP – Existing Plant

**Legend**

- **Existing Liquid Stream**
- **Existing Solids Stream**

**45961 # per day of RAW COD**

**BioP**

**ENERGY!**

High energy requirements for Zimpro and aeration
However..........VFA is available for BioP

Our concern would be what would happen to our Bio P process if the VFA supply was reduced if the Zimpro process was shut down
ENERGY SAVINGS PERFORMANCE CONTRACTS (ESPC)
DELIVERY MODEL

1. REQUEST FOR QUALIFICATIONS
   - Qualifications-based selection
   - Select team for entire project

2. INVESTMENT GRADE AUDIT
   - Project Goals
   - Scope/Project Definition
   - Preliminary Design

3. PROPOSED ESPC AGREEMENT
   - Guaranteed Lump Sum Price
   - Guaranteed Savings

4. PROJECT EXECUTION
   - Final Design
   - Procurement
   - Construction

5. MEASUREMENT & VERIFICATION
   - Verify Performance
   - ESCO Corrects or Reimburses Underperformance
PROJECTS CAN BE IMPLEMENTED WITH NO RATE INCREASE

Typical operating budget

- Debt Service
- Energy
- Chemicals
- Maintenance
- Labor

Efficiency project creates savings

- Debt Service
- Energy
- Chemicals
- Maintenance
- Labor

Savings applied to capital payments to fund project

- Annual Payment
- Debt Service
- Energy
- Chemicals
- Maintenance
- Labor

EXCESS SAVINGS
Design-Bid-Build

Performance Contract

Energy Savings Performance Contracting
DELIVERING THE LIVERPOOL PROJECT THROUGH ESPC
<table>
<thead>
<tr>
<th>Event</th>
<th>2015</th>
<th>2016</th>
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<td>Initial Framework</td>
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<tr>
<td>Process Development</td>
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<td>Initial Development of ECMs</td>
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<td>ECM Screening</td>
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<td>Project Definition</td>
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<td>Basis of Design/GMP Development</td>
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**Timeline:***

1. Project Kick-Off
2. ECM Walkthrough
3. ECM Screening / Digester Alternatives
4. Configuration Confirmation
5. Project Definition
6. GMP/ESPC
7. Process Finalization Work Session
8. Framework Memo
9. Initial ECM List
10. Proposed ECM List
11. Final ECM List
12. Proposed Configuration
13. Project Definition Memo
14. Basis of Design
15. ESPC/GMP Proposal
A COLLABORATIVE PROCESS

• ECM Walkthrough
• ECM Screening
• Project Definition
• Process/Configuration Finalization
Managing Risk

- B&V at risk for aggregated savings

- Looked closely at our risk using Monte-carlo type analysis (using @Risk software)

- Polymer was by far the biggest risk

- In the end the client removed savings guarantee to reduce project cost
INNOVATIVE RESULTS
COD / energy is redirected to anaerobic digestion.
Engine generators converted to CHP to run on biogas and produce steam
RAS fermenter to maintain stable bioP operation with less influent VFA
Struvite removal to prevent PO4-P recycle
INNOVATIVE PROCESS

THP and Digesters

- 1,100 gph throughput (THP feed)
- 2 x 0.87MG digesters (1 primary, 1 secondary)

RAS Fermenter

- 0.7 MG
- 2 day SRT

Struvite Precipitation (Airprex)

- 41,000 gpd
- > 85% PO4-P removal
CODIGESTION/COGENERATION

DAF Plant (Marks Rd PS)
- Drum screen
- Single DAF unit
- 240 gpm

HRSG & Steam Accumulator
- 1,800 lb/hr steam at 175PSIg
- Existing steam generator as auxiliary boiler

HSW Tank
- 67,000 gallon high strength waste tank
Liverpool WWTP

- Lipp Digesters
- Rolled stainless steel construction
CURRENT STATUS
As of August 30, 2018

- Aeration Control ✓
- RAS Fermenter ✓
- Bioaugmentation Reactor (BAR) ✓
- BNR ✓
- Cogen Engine Controls ✓
- Construction Complete and Mechanical Systems Commissioned – November 2018
- Digester Seeding – November 2018
- THP Start-up – December 2018
- Gas Cleaning and CHP – January 2019
- Airprex, Dewatering, Polymer – February 2019
QUESTIONS?

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