WASTEWATER TREATMENT FACILITY AERATION UPGRADE
CITY OF COLUMBUS, WI

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Columbus Lead Operator
Topics Covered

BACKGROUND
- City, Treatment Facility

PROBLEM
- Blowers, Diffusers, Air Piping

APPROACH

STUDY

DESIGN

CONSTRUCTION

ENERGY SAVINGS

GRANTS

SUMMARY
BACKGROUND
City of Columbus, WI

- Population: 4,900
- Historic Downtown
- Quality Schools
- Aquatic Center
BACKGROUND – WWTF

- Single Stage Activated Sludge
- Extended aeration
- Serves: City of Columbus, Town of Elba and Village of Fall River
- Population: 6,000
- 0.85 MGD/ADF
- BOD: 1,350 lbs./d
### Year 2030 Design Summary

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Population</td>
<td>7460</td>
</tr>
<tr>
<td>Average Annual Daily Flow</td>
<td>1.25 MGD</td>
</tr>
<tr>
<td>Peak Hourly Flow (w/ Blending)</td>
<td>7.50 MGD</td>
</tr>
</tbody>
</table>

### Annual Average Design Pollutant Loadings

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influent Biochemical Oxygen Demand (BOD)</td>
<td>1709 #/day</td>
</tr>
<tr>
<td>Influent Total Suspended Solids (TSS)</td>
<td>1877 #/day</td>
</tr>
<tr>
<td>Influent Total Kjeldahl Nitrogen (TKN)</td>
<td>288 #/day</td>
</tr>
<tr>
<td>Ammonia (NH4 as N)</td>
<td>178 #/day</td>
</tr>
<tr>
<td>Influent Phosphorus</td>
<td>77 #/day</td>
</tr>
</tbody>
</table>
BACKGROUND - WWTF

WWTF SITE PLAN

NO SCALE

FIGURE 1
PROBLEM

**Blowers:**
- Lack of redundancy
- Little turn-down
- Oversized
- Loud

**Diffusers:**
- Uneven air distribution, solids settling

**Air Piping:**
- Leaked underground

**Control:**
- No automated control
PROBLEM
PROBLEM
APPROACH

STUDY

DESIGN

CONSTRUCTION
STUDY

Evaluate “Do Nothing” versus replacement

Evaluate correct type of blower
  • Single stage turbo
  • Multi-stage centrifugal
  • Positive displacement
  • Screw compressor (hybrid)

Estimate savings
  • Use for Grants
DESIGN

Blowers
- PD
- VFD

Controls
- DO, target set points

Air Piping
- SS, Overhead
CONSTRUCTION

Flexibility of 2 extra basins

New/old air pipe connection
- Weld, 16-inch pipe
- No aeration, no flow through plant

Sequence
- New blower with new or old diffusers
- Old blower with old diffusers

Put online August 2013
CONSTRUCTION
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ENERGY SAVINGS

Columbus WWTF Power Usage

Month

kWh

Monthly Power Consumed
Columbus WWTF Power Usage and Influent Pumping

**ENERGY SAVINGS**

- **Ave. Power Usage Before**
- **Ave. Power Usage After**
- **Monthly Power Consumed**
- **Monthly Ave. Daily Flow**

**Month**

- Jul-09
- Nov-09
- Mar-10
- Jul-10
- Nov-10
- Mar-11
- Jul-11
- Nov-11
- Apr-12
- Aug-12
- Dec-12
- Apr-13
- Aug-13
- Dec-13
- Apr-14
- Aug-14
- Dec-14

**kWh**

- 0
- 40,000
- 80,000
- 120,000

**MGD**

- 0
- 0.5
- 1
- 1.5
- 2
- 2.5
- 3
- 3.5
- 4
ENERGY SAVINGS

Active Savings

Estimated Savings

14,000 kWh/month
$1,300/month
## GRANTS

<table>
<thead>
<tr>
<th>focus on energy</th>
<th>$17,000</th>
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</thead>
<tbody>
<tr>
<td>WPPI</td>
<td>$17,000</td>
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<tr>
<td>sold old blowers to hoffman</td>
<td>$8,000</td>
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</tbody>
</table>
SUMMARY

PROJECT OBJECTIVES MET

- Efficiency
  - Blowers
  - Diffusers
  - Aeration Piping
- Process Control
  - DO
  - Target Set Points
- SCADA