

WWOA 48th Annual Conference

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

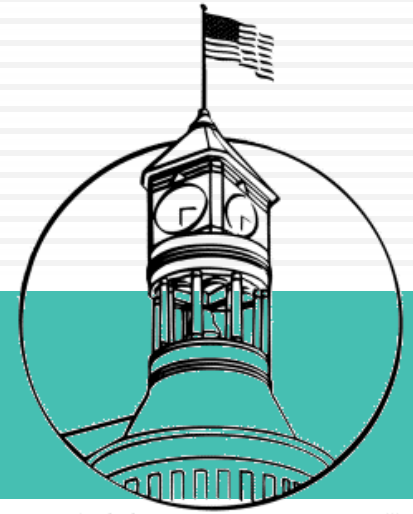
ENERGY SAVINGS

GRANTS

SUMMARY

BACKGROUND

City of Columbus, WI



Celebrate
COLUMBUS



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**

BACKGROUND - WWTF

Year 2030 Design Summary

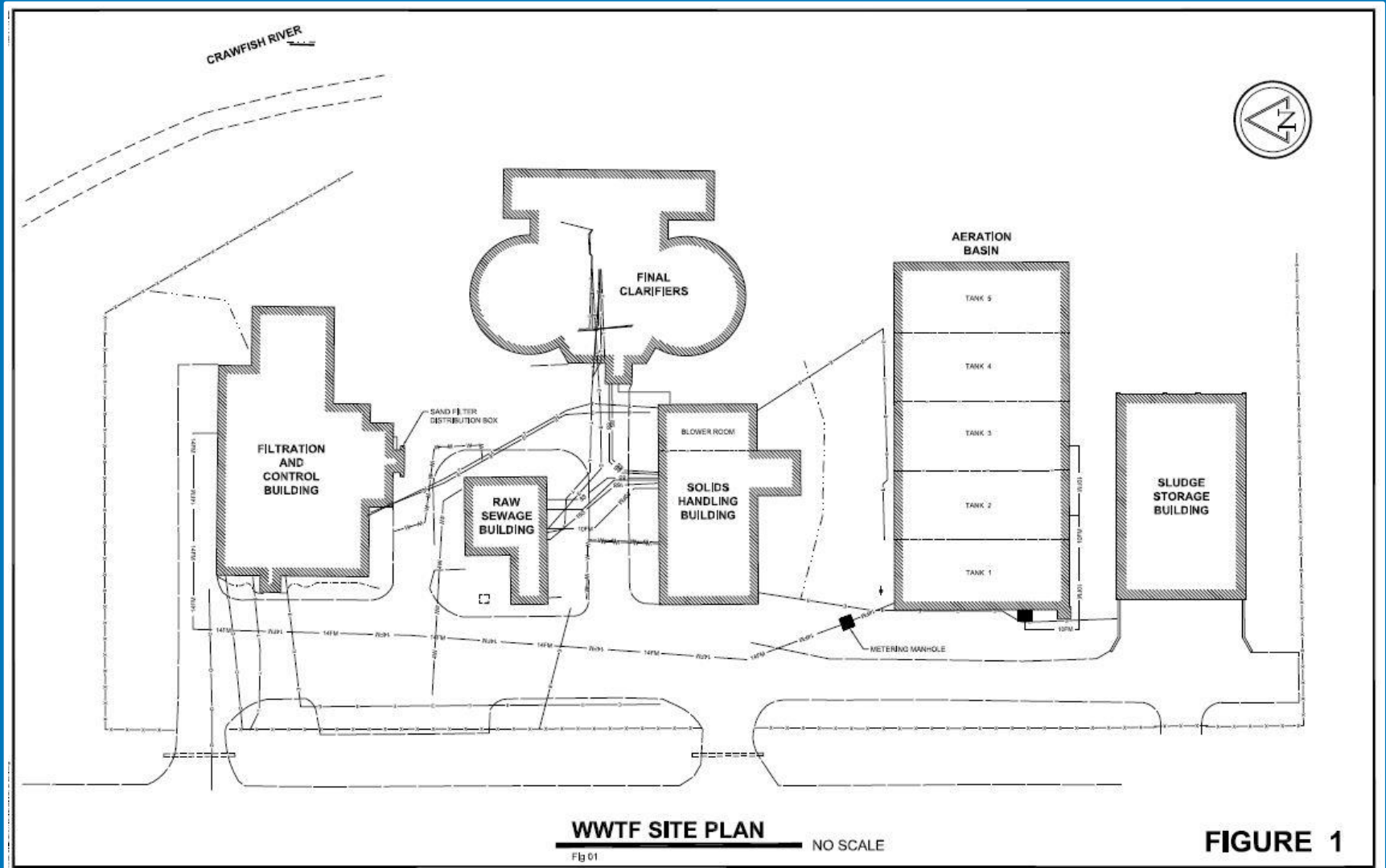
Design Population	7460
Average Annual Daily Flow	1.25 MGD
Peak Hourly Flow (w/ Blending)	7.50 MGD

Annual Average Design Pollutant Loadings

Influent Biochemical Oxygen Demand (BOD)	1709 #/day
Influent Total Suspended Solids (TSS)	1877 #/day
Influent Total Kjeldahl Nitrogen (TKN)	288 #/day
Ammonia (NH ₄ as N)	178 #/day
Influent Phosphorus	77 #/day



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

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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



DESIGN



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



CONSTRUCTION



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CONSTRUCTION



CONSTRUCTION

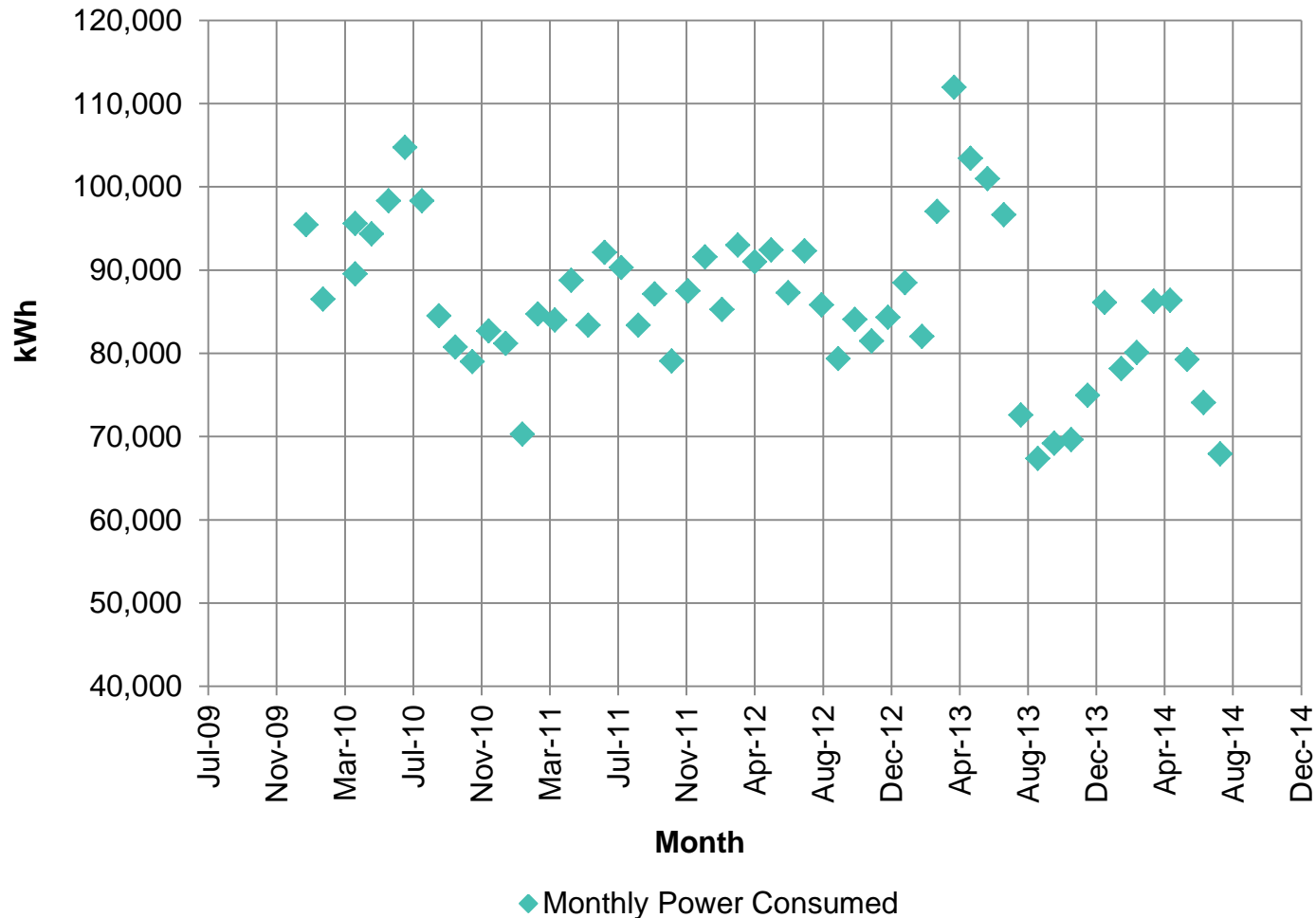


CONSTRUCTION



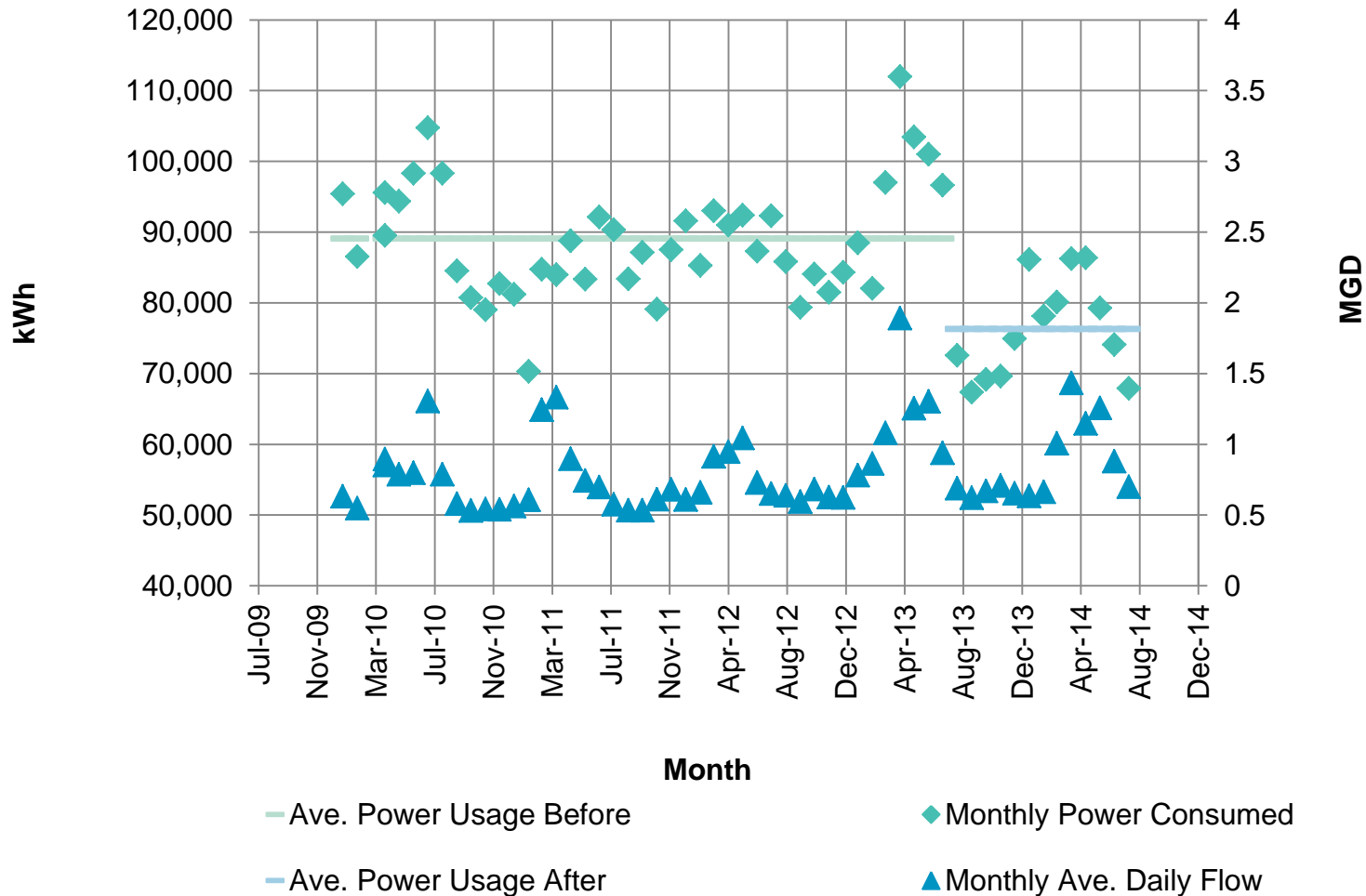
ENERGY SAVINGS

Columbus WWTF Power Usage



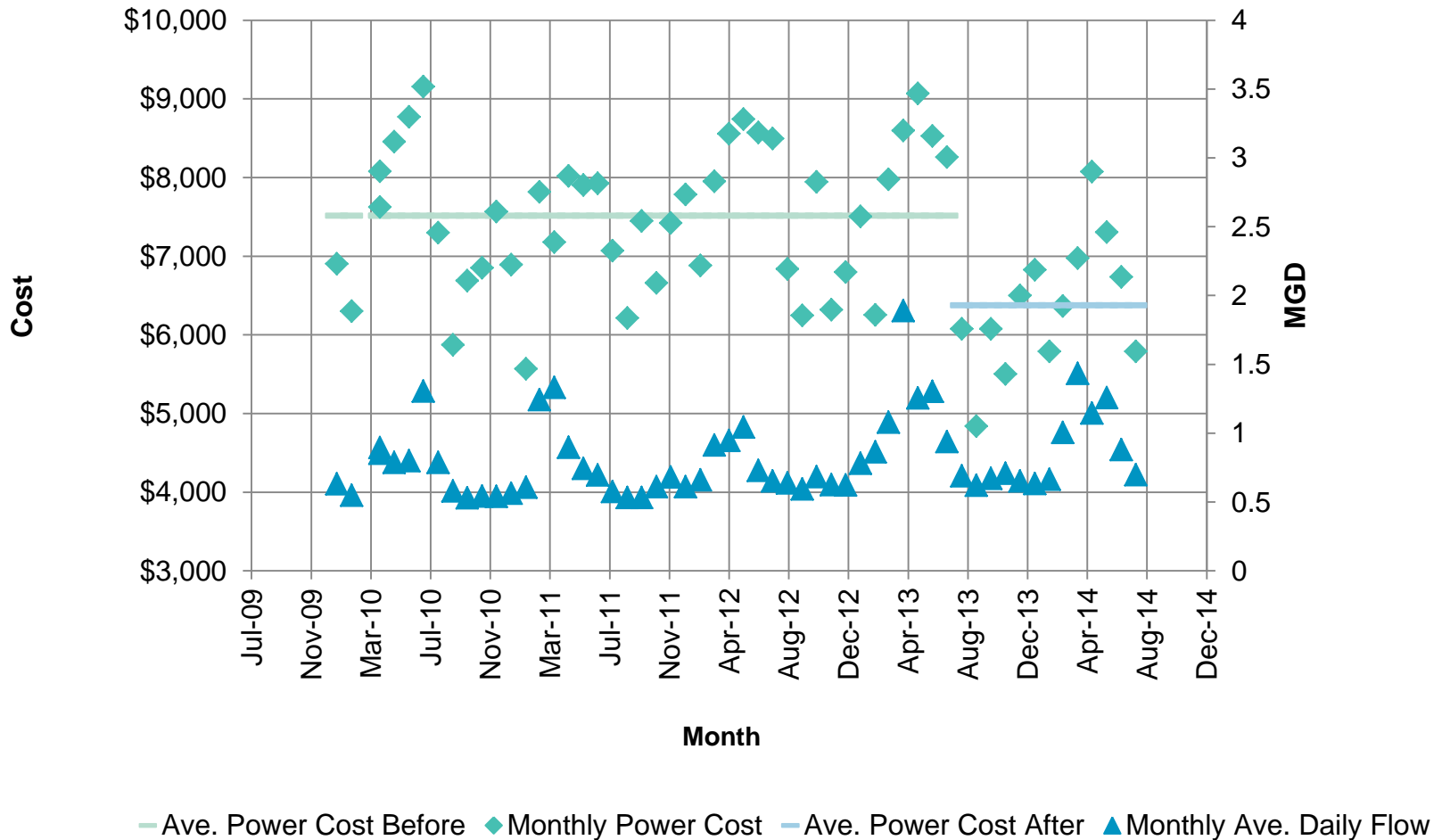
ENERGY SAVINGS

Columbus WWTF Power Usage and Influent Pumping



ENERGY SAVINGS

Columbus WWTF Power Cost and Influent Pumping



ENERGY SAVINGS



14,000 kWh/month
\$1,300/month

GRANTS

GRANTS

FOCUS ON ENERGY

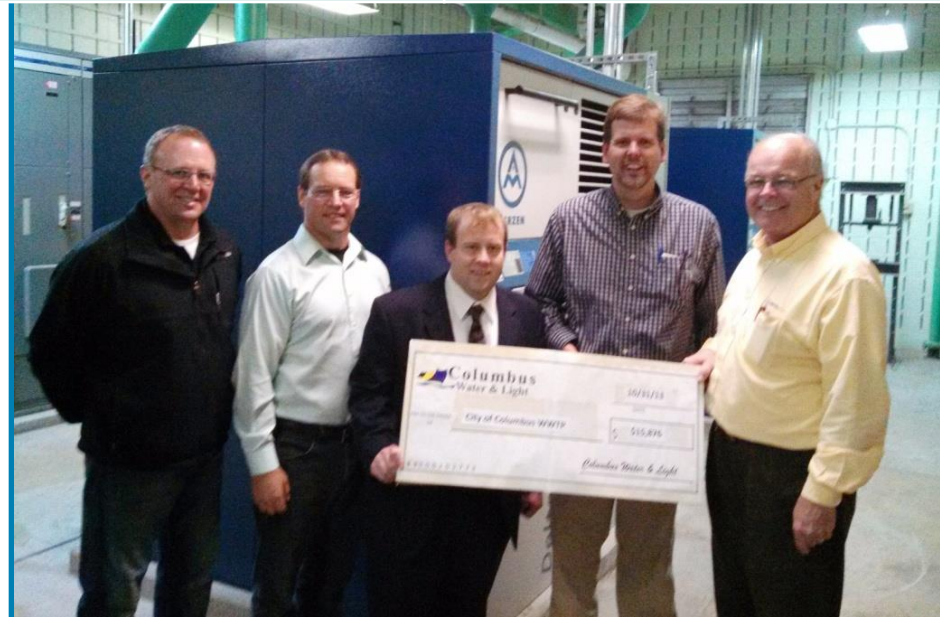
\$17,000

WPPI

\$17,000

**SOLD Old BLOWERS TO
HOFFMAN**

\$8,000



SUMMARY

PROJECT OBJECTIVES MET

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

