Energy Savings by Combining Mixers and Aeration

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Rock River WRD
Wastewater Treatment Plant
Rockford, IL
Rock River WRD - General

Service Area of ~ 100 square miles serving:
- Rockford
- Loves Park
- Machesney Park
- Roscoe
- Cherry Valley
- New Milford
- part of Rockton
- unincorporated areas of Winnebago County

Design Flow 40 MGD (average day)
Brief Plant History

1928 Primary Plant Completed
1958 Secondary Treatment Plant added (Trickling Filters)
1966 Aeration Basins 1 – 4 built
1975 Aeration Basins 5 and 6 built
1995 Aeration Basins 7 and 8 built
Plant Schematic

Rock River Water Reclamation District
Treatment Plant
Schematic Diagram

1. Bar filter
2. Grit removal
3. Parshall Flume
4. Primary Settling Tanks
5. Aeration tanks
6. Final Settling Tanks
7. Chlorine Contact Tanks
8. Sludge Thickening Tanks
9. Sludge Dewatering
10. Maintenance Building
11. Blower Building

Raw Wastewater Enters

Admin Bldg

Purified Water

Rock River

Sludge trucked to disposal
Aeration History

1966 Four Aeration Basins
   Sparged Turbine Aeration

1975 Two Aeration Basins added
   Sparged Turbine Aeration

1995 Two Aeration Basins added
   Upgrade all basins to ceramic disc diffusers

2006 Aeration Upgrade
   Membrane disc diffusers replace ceramic disc diffusers
Air Delivery System
Air Delivery System

700 HP motor
Air Delivery Energy Use

Two 700 HP centrifugal blowers operating (with one standby)

Energy draw 860 kW (430 kW per blower)
Recent Operational History

Energy efficient aeration results in little to no oxygen demand toward effluent of Aeration Basins

Aeration system operated at minimum air flow to maintain solids in suspension

Excessive dissolved oxygen in Aeration Basin effluent
Aeration Grid
District Action

Identified an opportunity to reduce energy use and improve plant performance
District Action

Evaluate use of mixers in last grid and turn off air to that grid.

Existing membrane disc aeration system to remain in place - if aeration demand increases.

Mixers must be able to be installed / removed without basin draining.

Mixers must be low maintenance and not foul with rags or stringy material.
District Action

Evaluate mixing systems available that meet the project requirements
Significant energy savings predicted
Research funding sources
Grant application process
Plant staff to do the installation to save cost

Pursue the project
Mixing Zones

One zone in each of eight basins

59 feet by 59 feet with 15 ft SWD
Mixer Selection

INVENT Hyper Classic ™ Mixers
Mixer Features

Hyperboloid Shape
Close to floor placement
Slow rotational speed
Light weight
Energy efficient
Gentle uniform mixing
Polished FRP body
Non ragging / fouling
Minimal maintenance

– Oil change annually (dry mounted drive)
Project Challenges

Desire to install / remove mixers without basin draining

Six existing platforms need to be modified

Two newer basins have no bridges / platforms
Project Challenges

Basins 1 – 6

Aeration drop pipe in center of platform
(same opening as preferred for Mixer)
Project Challenges

Basins 7 and 8

No bridges across basins
Problem Solving

Brainstorming
Plant Staff
Design Engineer
Equipment Supplier
Manufacturer’s Representative
Solution

Basins 1 – 6

New platforms mounted off side of existing platform
Solution

Basins 1 – 6

New platforms - off set mixer placement

Handrail and grating not yet installed
Solution

Basins 1 – 6

New platforms with “slot” to allow mixer placement / removal without basin draining
Solution

Basins 7 and 8

Install “finger piers” - cantilever for mixer placement
Solution

Basins 7 and 8
Solution
Basins 7 and 8
Mixer Installation
Mixer Installation
Mixer Installation
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Mixer Installation
Mixer Installation
Mixer Installation
Mixer in Operation
Mixer in Operation
Results

December 2014 – 6 mixers installed

Turned off one 700 HP blower

Inlet valve of operational blower throttled to 80% capacity

Dissolved Oxygen ranges from 2 – 4 mg/l

April 2015 – final 2 mixers installed
Results

Blower Energy Draw
Prior to project - 860 kW
After 6 mixers installed - 521 kW

Total Mixer Power Draw
(with all eight in service)
39 kW
Results – *other than energy*

Plant reports

Better settling in clarifiers

Reduced floc shear
Successful Upgrade

Reduced energy use

Improved plant performance

Increased operational versatility
Is your plant next?
Thank you for your attention.

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