Background Information

- Ladysmith WI – Rusk County
- Population – 3,367
- Preliminary Engineering Report in 2011 estimated substantial energy savings from Upgrade
- Energy savings will be realized from replacing coarse bubble diffusers with fine bubble diffusers
- City started construction on the upgrade project in 2014
Existing Conditions

- WWTP constructed in 1990
- Design Flow – 0.778 mgd
- Existing Flows
  - Average Daily – 0.49 mgd
  - Maximum Daily – 1.74 mgd
  - Average BOD 220 mg/l
- Discharge to the Flambeau River
Background Information

- Existing WWTP consisted of 3 Lagoons
- Lagoon 1 approximately 9.6 million gallons
- Lagoon 2 approximately 9.6 million gallons
- Lagoon 3 approximately 18.2 million gallons, non rectangular.
- Total Volume approximately 37.4 million gallons
Existing Site
Effluent Requirements

- BOD – 30 mg/l
- TSS – 30 mg/l
- Ammonia – varies based on pH of effluent
- Phosphorus - 2 mg/l (at time of design)
  - Current is 1.8 mg/l
  - May eventually need to meet < 1 mg/l
Preplanning

- A preliminary review was performed to determine energy savings if aeration was upgraded from coarse bubble to fine bubble
- Focus on Energy reviewed and offered a construction grant ($35,000)
- Preliminary estimates determined that $37,933 per year could be saved by reduced energy usage at WWTP
Additional Work for Upgrade

- Sludge Removal
- Replace four 75 HP blowers with one 60 HP blower
- Fine Screen
- Chemical room for Phosphorus removal and pH adjustment
- UV replacement
- Electrical Upgrade
- Water pressure booster
Upgrade

- Aeration costs approximately $341,000
- Preliminary Report estimated $297,000
- Total project cost - $2,243,400
- Aeration was approximately 15% of project
- Funding by DNR CWF
Upgrade

• Keeping the same design flow, less lagoon volume is needed with fine bubble aeration
• With coarse bubble, total lagoon volume was 37.4 million gallons
• New fine bubble aeration, total volume of lagoon for same design flow is 19.2 million gallons
Sludge Removal
New Lagoon 2
Precast building construction
Precast building
Fine Screen, Chemical, Water, Electrical Building
Fine Screen construction
Fine Screen
Blowers

Old Layout

New Layout
UV Disinfection
Pre Energy and Post Energy
Yearly Energy Costs

Year       | Costs
-----      |-----
1/1/2011   | $60,000.00
1/1/2012   | $70,000.00
1/1/2013   | $70,000.00
1/1/2014   | $70,000.00
1/1/2015   | $30,000.00
1/1/2016   | $10,000.00

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Conclusion

• Last full year of Coarse Bubble was 2014 and yearly energy cost was $63,776
• First full year of Fine Bubble was 2016 and yearly energy cost was $23,696
• Saving is $40,080 actual (with a new fine screen too) compared to an estimated savings calculated in 2011 of $37,933
• New energy use is approximately 37% of old
• **FINE BUBBLE AREATION IN LAGOONS PROVIDE SUBSTANTIAL ENERGY SAVINGS**