Wastewater Treatment System Evaluation
Pulp and Paper Mill
Northern United States

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Purpose of Visit

- Review wastewater treatment operation in the context of anticipated changes when the one of the two mills discharging to the treatment system ceases operation this summer.
- Assist mill in developing a strategy for transitioning from current operating conditions to future ones.

Growth Pressures or “Limiters”

- BOD_5,COD or TOC (Type and amount of food)
- pH
- Toxicity and Inhibition
- Dissolved Oxygen
- Hydraulic retention time and flow patterns
- Nutrients (N&P)
- Temperature
- Amount and health of biomass

Type and amount of food BOD_5 and COD

- Current BOD Loading to Lagoons
  - Mill #1 – 32,000 lb/day
  - Mill #2 – 54,500 lb/day
- Average loading to UNOX – 60,300 lb/day
- BOD removed across both lagoons – 26,200 lb/day
- Amount removed in each lagoon is unknown – testing recommended
- Change in type of food – relative biodegradability

pH

- Concern is that pH will be significantly higher under new operation
- Three issues:
  - pH for optimum UNOX performance
  - pH for effluent compliance
  - pH for odor minimization
- Between pH 5.0 – 9.5, lagoons will “self buffer”
- Influent of 6.0 – 8.5 is fine for UNOX
- A pH control (trim) system is needed for those times when lagoon outlet pH is unstable
- Final effluent pH will be higher, but more stable (less dissolved CO_2)

Dissolved Oxygen

- Current oxygen usage average is ~90,000 lb/day
- At future anticipated BOD loading of 22,000 – 30,000 lb/day, oxygen requirement will be 35,000 – 50,000 lb/day
- Projected need is well below output of one compressor

Nutrients

- Nutrient demand is stoichiometeric with BOD loading
- Mill currently runs at target for P, but frequently above target for N
- P method is very accurate and precise. Ammonia method is less so.
- Future nutrient demand will drop proportionally to BOD loading decrease
- Lower loading makes switch from anhydrous ammonia to aqueous ammonia or urea-ammonium nitrate more attractive
- A potential scenario for improved nutrient control is to tie nutrient feed to oxygen flow to UNOX reactors

Temperature

- Nekoosa mill effluent is 5 – 15 degrees hotter than Port Edwards
- UNOX influent temperature must stay below 104 F
- Cooling is critical in summer
- Two scenarios
  - Run both lagoons at ~7 MGD each (4 days). Same heat transfer potential via coolers/aerators. Twice as much potential cooling due to ambient cooling
  - Put all cooling /aeration equipment in one lagoon
    - Pros
      - Better mixing
      - More thorough aeration
    - Con
      - Less time for cooling
      - Cost for redesign
  - Both options being evaluated by equipment consultant

Amount and Health of Biomass

- Target MLSS
- Sludge age
- Future primary/secondary ratio
- Future polymer chemistry
- Improve solids capture on gravity tables
- Mass balance spreadsheet
- State point analysis – Solids load to clarifiers – (1, 2, or 3 clarifiers)

Secondary Clarifier Capacity

- Depends upon SVI, Flow, MLSS conc.
- 3 clarifiers recommended initially
- Assess sludge quality and MLSS…
  - 2-clarifier operation may be possible
    - SVI ≤ 125 mL/g
    - Q ≤ 18 MGD
    - MLSS ≤ 3,200 mg/L
- Hypochlorite (filament control) is essential

Summary

- What will happen following mill shutdown?
- Compliance - expect success
  - Honor past practices but be prepared to change strategy and tactics.
  - Re-allocate and or modify assets.
    - Temp (lagoon modifications), pH trim, nutrient optimization, UNOX 1-train &cryo modifications, dewatering optimization, secondary clarifier optimization.
- Capable facility, competent people, pride of ownership
  - Best in Class Performance (people and process)

Q&A