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Your Total
Water Solutions Provider

Considerations Before Moving Into Intensification Phase

Yaldah Azimi, Ph. D., P. Eng. (they/them)
Senior Program Manager (Wastewater)
Process Optimization and Technical Services
Ontario Clean Water Agency

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5 million+ Ontarians Place Their Trust In Us

- Largest water & wastewater operator in Canada.
- Manage around $20 billion in municipal infrastructure.
- Each of the 11 Hubs in Ontario have their own regions and clusters of operators, managers, and process and compliance staff.
- 225 clients all over Ontario for Operation and Maintenance

Innovation Process Optimization and Technical Services (IPOTS)

- Experts in Process Innovation and Leading Edge Technologies
- Process Assessments and Value Engineering
- Piloting and Commissioning Support
- Conceptual-level Process Design
- Technical Design Review
- Process Expertise to Support Energy Program
- Troubleshooting, Process Risk Mitigation and Day-to-Day Operator Support
- Development of Standard Operating Procedures
- Support Compliance with Process
- Support Operations on MECP Inspection Reports
- Emergency Response
- Consultation with Regulatory Bodies

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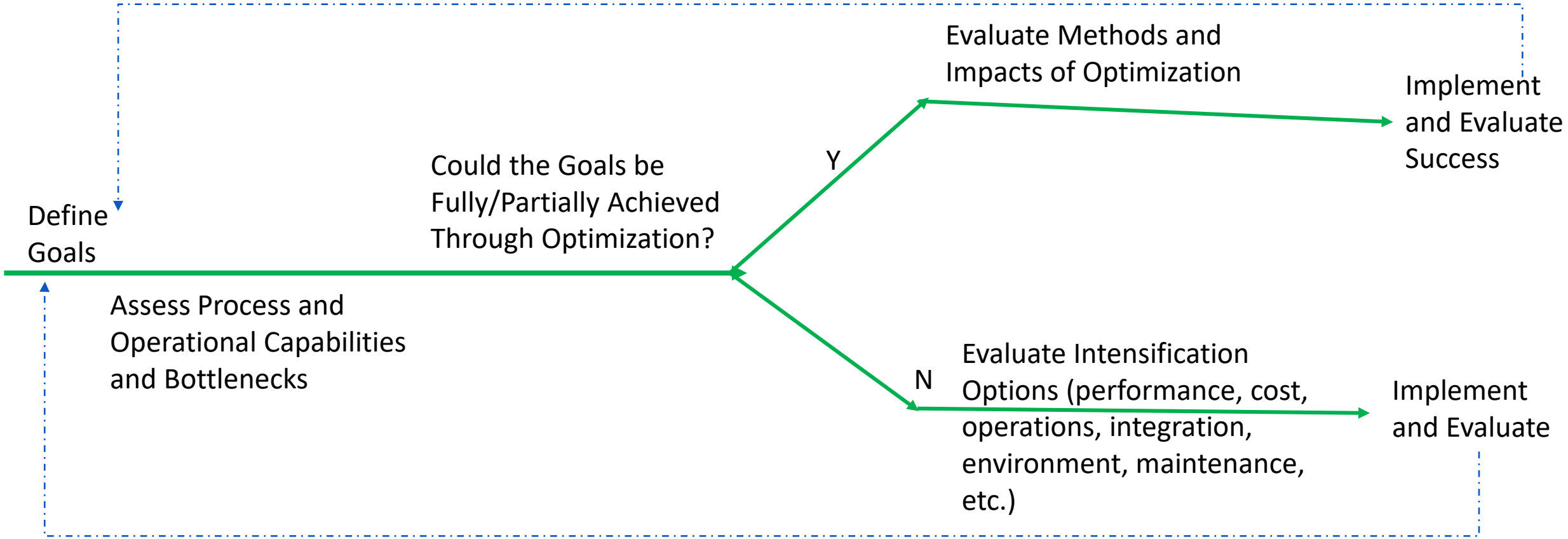
The Path to Intensification



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Why Look at Optimization?

- Optimization-shopping is a better value
- Defer capital cost
- Provides a detailed look at how operational decisions are made
- An optimization study gives you a process roadmap
- Provides ideas on improving process control and instrumentation
- Your process issues may not be originating from where you think they are

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Optimization Goals

- Process Optimization:
  - Increase Operating Capacity
  - Improve Compliance Metrics
  - Improve Energy Efficiency
  - Reduce GHG Emissions
  - Increase redundancy and operational flexibility
  - Improve Climate Resilience
  - Reduce Chemical Usage
  - Reduce Cost
- Operation and Maintenance Optimization:
  - Improving Staff Working Knowledge of the Treatment Process
  - Reinforcing Data-driven Decision Making
  - Increasing Efficiency in Completing Tasks
  - Effective Asset Tracking (Maintenance and Capital Planning)

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Optimization Approach

Assess Process Capabilities Based on Equipment and Tankage

- Plant Data
- Design Guidelines
- Check with Operations
- Process Modelling

Determine which Ones are Capable or Not Capable

- Capable: Optimization
- Not Capable : Needs Capital

Decide on Altering Process Control, Operation and Monitoring Strategies that Could Lead to Improvements

- With Operations

- Implement Optimization Strategy and Evaluate Performance
- Remain Open to Altering the Strategy as you Learn More

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Small and Medium Size Facilities have More Varied Challenges Compared to Larger Ones

- Compliance is often stricter
  - TN or NO_3-N requirements in the effluent
  - Lower TP requirements based on receiving waters (e.g., Lake Simcoe)
- Processes could be more varied – Increased complexity
- Higher fluctuations in loads and flows
- Poor controls
- Higher fraction of industrial wastewater
- Varied access to resources (capital, labour, etc.)
- $$$ - Design not well thought through. They are often more challenging to troubleshoot and optimize.

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Common Process Challenges at Wastewater Facilities

- Effluent compliance
- Poor biomass quality
- Under-designed or over-designed unit processes
- No cross connections between unit processes
- Process capacity mismatches – liquids vs. solids
- Biosolids storage
- Changes in influent characteristics

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Key Process Interdependencies

- Poor grit removal –> quantity and quality of solids
- Primary treatment –> solids processing, secondary treatment loads
- Chemical TP removal –> Influence on TAN
- Secondary biomass quality –> Solids treatment, tertiary treatment
- WAS co-settling –> more operational unpredictability (solids)
- Digester supernatant –> secondary treatment

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Potential Process Optimization Solutions

- Aeration optimization – DO set points, control strategies (e.g., ABAC, MOV), diffusers, blowers, MABR.
- Step feed
- Improved process control (WAS, SRT control, total mass control, chemical set points) and monitoring
- Flow/load equalization
- Optimizing chemical usage - theoretical values, mixing, injection points, monitoring program, equipment maintenance
- Sidestream management
- Biomass selection strategies – cyclone, granulation
- Biofilm technologies – Modular fixed film systems, IFAS, MBBR, MABR, Biocord, Ecofixe, etc.
- Baffles, variable height inlet systems (secondary clarifiers)

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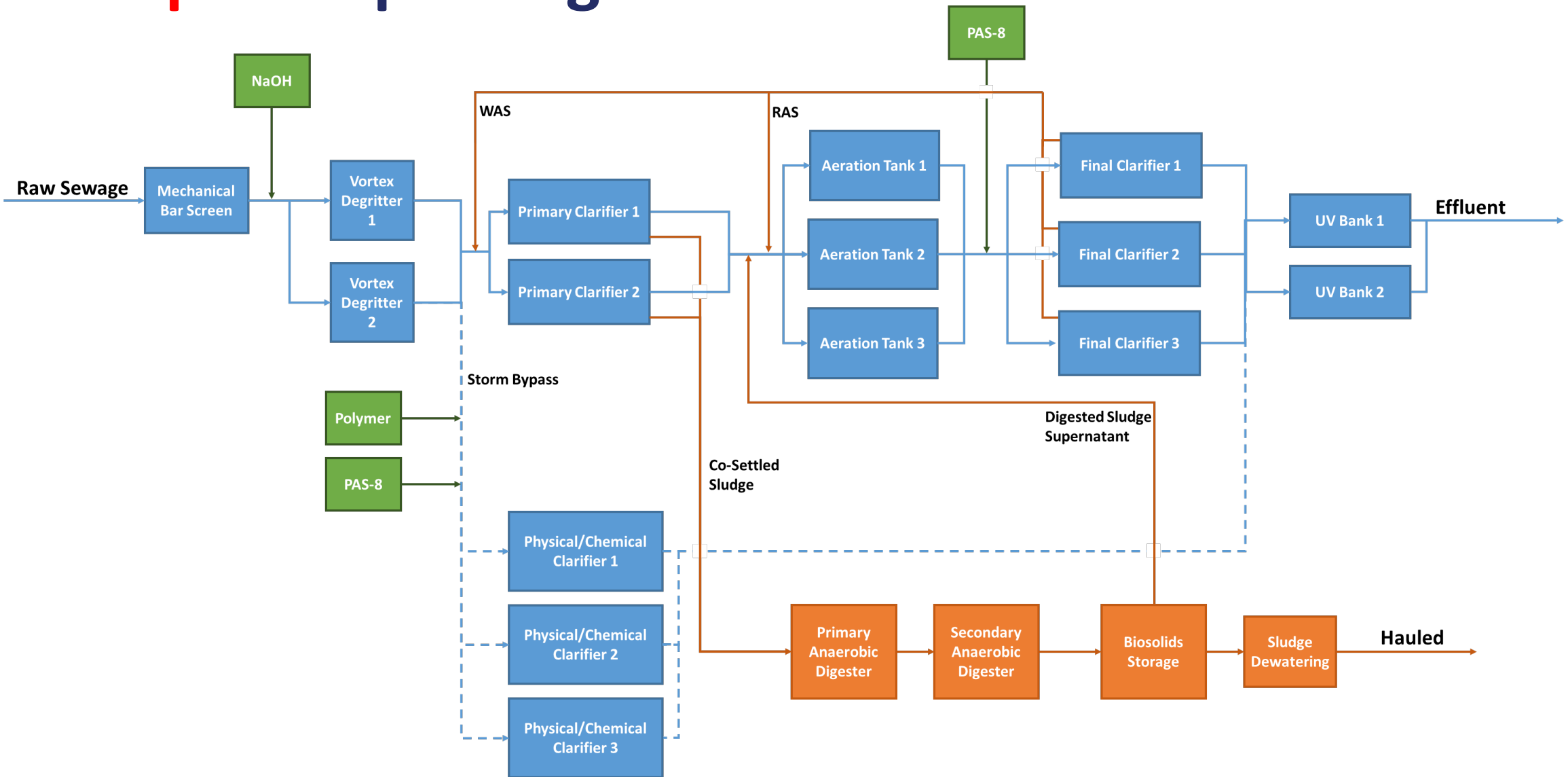
Example: Improving TAN Treatment



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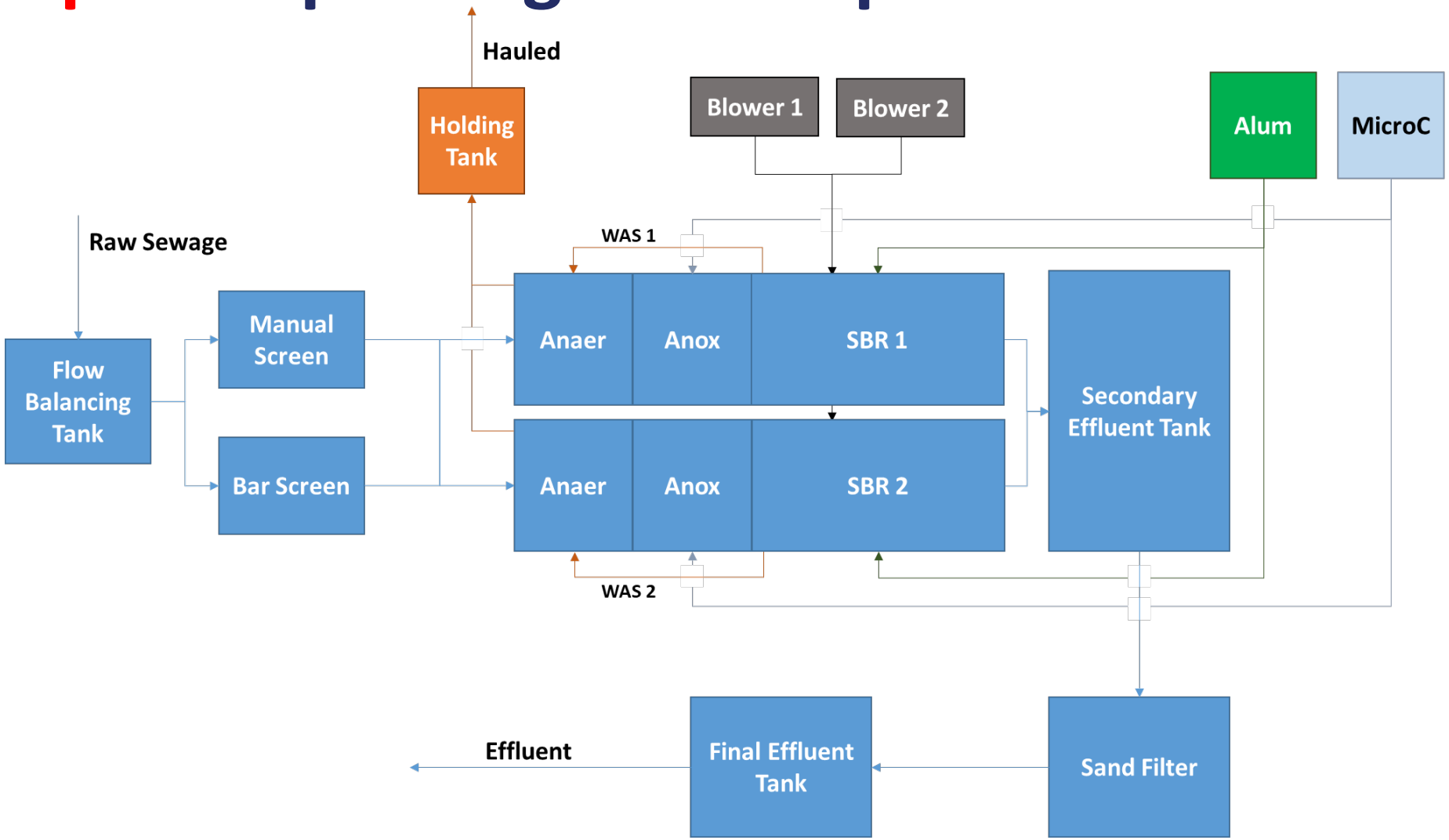
Example: Improving TN Compliance



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Be Careful with Optimizing Yourself Out of Compliance!

- Chemical optimization (compliance limits and averaging periods)
- Impact/s of design and operational changes to effluent acute lethality often ignored (chemical reduction, aeration optimization, impacts on pH and effluent toxicity)
- Step feed ratios need close monitoring

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Process Monitoring (Online or Not)

- How is the existing data used?
  - Collected for compliance (required)
  - Collected for process adjustment and optimization (additional cost, often needs buy-in)
- Online sensors
  - Integrated with SCADA for automated process control
  - Information for operations to make process adjustments and logged on SCADA (future design)
- The importance of operator engagement
- Are we getting better performance?

Other Factors for Consideration

- Operational burden vs. capital cost
- Lessons learned from design and operations mistakes
- The human factor (who am I designing for and how it will be used)
- Small footprint solution for a plant with lots of space
- Vendor warranties vs. designer liability

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Main Takeaways

- Always start with optimization
- Be aware of all interdependencies (various processes, but also design, operation, administration, maintenance)
- Every plant is different
- Change is slow
- Increase monitoring as you optimize to a new condition
- Engage operations more on process control, optimization and monitoring
- Discuss a range of normal and not-normal operation modes (events) and evaluate OPMAN risks

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Thank You!

Dr. Yaldah Azimi, MA Sc. Ph.D., P. Eng.

Senior Program Manager - Process Optimization and Technical Services

Ontario Clean Water Agency

Yazimi@ocwa.com

905.301.9449 ♦ www.ocwa.com