October 10, 2019

Annual Meeting
WWOA

WWTP Effluent Phosphorus Filtration for Point-O-Seven-Five

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Presentation Outline

• Background
• Technology Selection
• Performance Guarantee Criteria
• Design Concepts
• Operational Concepts
• Conclusions
Background: WWTP Details

- Existing WWTP
  - 0.6 mgd average and 3.66 mgd firm capacity
- Activated sludge WWTP
  - Influent fine screening
  - Grit removal
  - A/O Activated sludge with final clarifier(s)
  - Deep bed sand filtration
  - UV disinfection
  - DAF/Aerobic digestion/BFP
- Permit limit = 0.075 mg/L TP (2024)
  - Studied options for compliance → selected filtration
Background: Existing Sand Filtration Issues
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• Needed a solution:
  ▪ End of Useful Life (valves, blowers, sand, controls)
  ▪ High Energy (air scour, backwash, effluent pumping)
  ▪ High Backwash Recycle
  ▪ Limited Control
  ▪ Filter Flies

• Saw newly converted filters in Oconomowoc, WI in 2014
  ▪ Facility plan recommended disc filters
Technology Selection

Aqua vs. Kruger/Westech

- Experience with low TP
  - References / Tour / Pilot / Etc.
  - Single source responsibility
  - Guarantee

- Hydraulics
- Cost
- References
- Proprietary vs. Open

Selected Veolia (Kruger)
Performance Guarantee Criteria

• The basics:
  ▪ How long
  ▪ In-House vs. Commercial Lab
  ▪ mg/L and Flow goals

• The fine print:
  ▪ Who does what: (runs the system, collects samples, pays for analysis)
  ▪ Applied TP
  ▪ sNRP limit
  ▪ Dose limitations

A happy wife lab director, is a happy life.
Design Concepts – Operator Perspective

• Check TP upstream of old sand filters

Sand filters offline for construction 11/1/18
Design Concepts – Operator Perspective

- Flow Control / Flexibility for Maintenance
- Access
- Coagulant Feed Systems
- Polymer Feed Systems
- W3 non-potable supply
- Expandability
- Redundancy in key equipment
Design Concepts – Operator Perspective

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• Polymer Feed Systems (dry vs. emulsion)
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Design Concepts – Engineer Perspective

• Right Size
• Hydraulic Validation
• Rapid Mix G-Factor
• Coag/Floc Zone Dimensions
• Dose Control / Monitoring
• Enclosed vs Open Units
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Takacs, et. al
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Startup and Optimization

- Chemical Dosing (quantity)
- Floc Control (quality)
- Monitoring (automatic vs. manual)
- Clarifier Upsets (high TSS)
- Bio-P Upsets (high TP)
- Noise

Basic Recipe for 0.075 mg/L TP

- Initial dose 20 mg/L Ferric, start high then back off checking residual orthoP
- Stable polymer dose (0.5 mg/L)
- Monitor floc development in Floc Tank / Filter Inf Well
- Polymer and Ferric need to be balanced or it will blind/backwash
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Operational Concepts – Effluent Data

- **Medford Startup Data**
  - 2017 Effluent Data from N. Attleboro, MA Disc Filter
  - 0.1 mg/L limit
  - 11-15 mg/L FeCl₃ dose
  - 0.15 mg/L Polymer dose

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Operational Concepts – Effluent Data

• Medford Startup Data

Operational Statistics
• 0.075 mg/L TP limit
• 19 mg/L FeCl₃ dose (23:1 molar ratio)
• 0.5 mg/L Polymer dose
• 0.041 mg/L TP actual 7/7/19-9/8/19
Conclusions

• Still proving itself
• Extensive startup/lab effort
• Not so simple after all
  ▪ Great steady state
  ▪ Attention during Peak Flows/Upsets
• Looking forward to more good effluent
• BFP cake improved
Conclusions (continued)

• Backwash Flow Surges
• Flow vs. Loading Rate
• Analyzer LOD
• Ramifications of Ferric Overdose

Words to live by:

“I will reserve all comments until startup is complete.”
- John Fales
Before
Questions and Comments

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