



2019 AAEEES E3S Award – Small Firms
Town of Moorefield/Hardy County
Regional WWTP Upgrade with the MOB™ Process

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NUVODA
Innovative Wastewater Solutions

About Nuvoda

- Environmental engineers dedicated to *innovative, sustainable and renewable* wastewater treatment technologies.
- Founded in 2006 and Headquartered in Raleigh, NC; R&D in Blacksburg, VA.
- Research, develop, manufacture, integrate and deliver industry leading, *cutting-edge biofilm and granular technologies.*

NUVODA

Innovative Wastewater Solutions

Town of Moorfield, WV and a local poultry factory collaborated to build a new WWTP in 2013.

- 6.2 MGD
- Discharges into Chesapeake Bay Watershed
- State-of-the-art 5-stage Bardenpho biological treatment process
- 90% industrial flow and 10% municipal flow



<https://www.dub-blandinc.com/products-elliptical.php>

Background

Challenges

Solutions

Results

Summary

The WWTP faced several challenges from the poultry waste soon after startup.

- High nutrients (N>30ppm, P>10ppm) but low BOD (<600ppm)
 - High dependency on expensive chemicals (sodium aluminum) to meet discharge limits
- Sanitation Chemicals
 - Multiple upsets throughout the year
 - High repair cost and slow recovery



<https://www.drovers.com/article/poultry-sectors-face-major-challenges>

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Nuvoda's solution: The MOB™ Process

- ORGANIC lignocellulosic media – Kenaf (*Hibiscus cannabinus*)
 - Industry's first plant-based biofilm carrier with strong mechanical properties
 - Offsets carbon footprint, highly renewable and sustainable



Background

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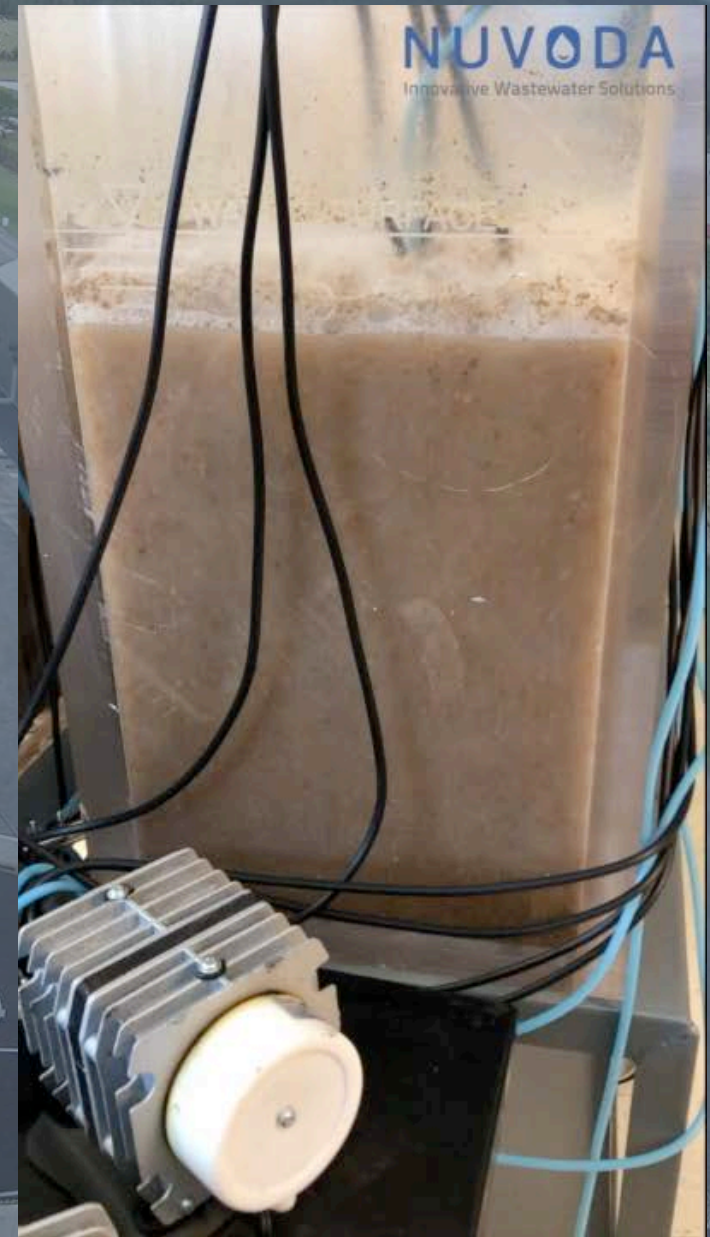
Solutions

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Nuvoda's solution: The MOB™ Process

- The Mobile Organic Biofilm (MOB™)
- Fully MOBILE within the process
- Increase settleability in clarifiers
- Easy retrofit with minimal modifications



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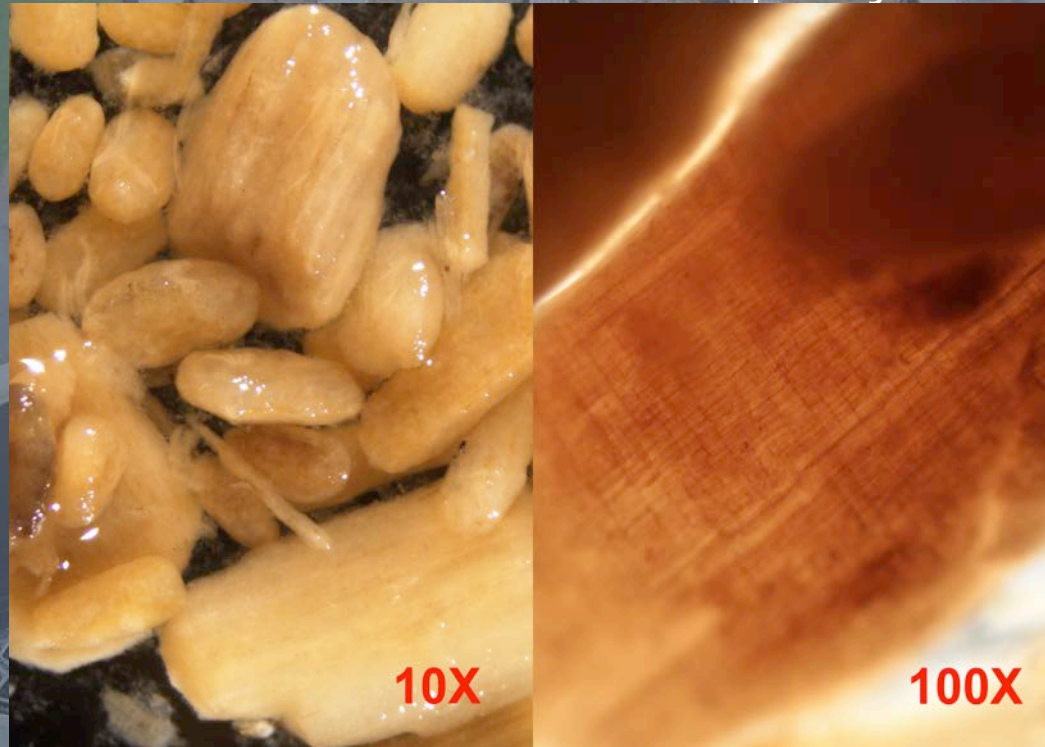
Solutions

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Nuvoda's solution: The MOB™ Process

- Support dense BIOFILM growth
 - Stratified biofilm promotes simultaneous nutrient removal (similar to granular sludge)
 - High surface area increases treatment capacity



Background

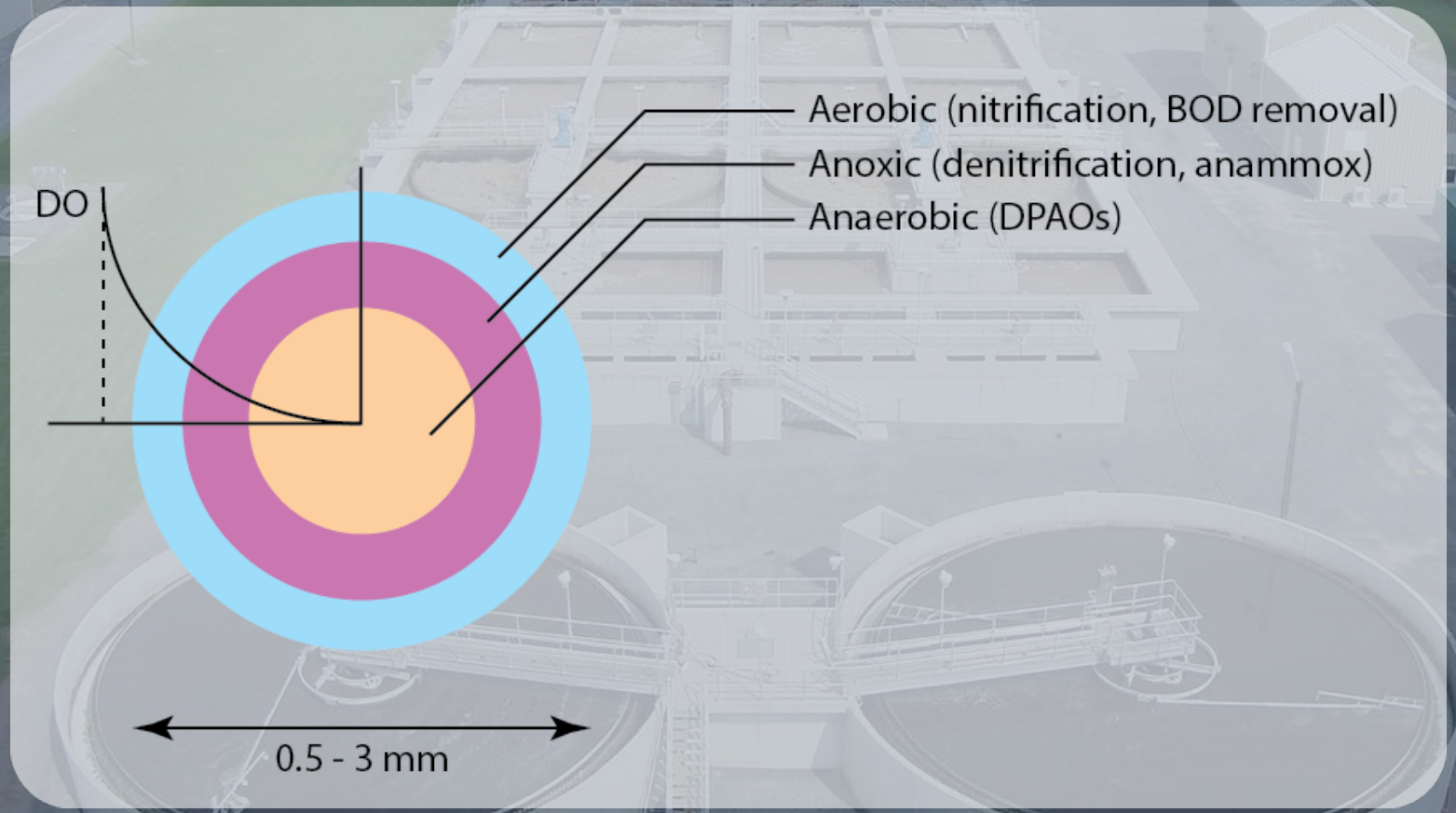
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Granular-sludge-like Kenaf media has all the benefits of granular sludge and more.



Granular-sludge-like Kenaf media has all the benefits of granular sludge and more.

- Multiple redox condition
 - simultaneous nutrient removal
- High mechanical strength and stability
 - Resistant to shear and toxicity and shock loadings
- High settleability
 - low SVI, reduced footprint
- High biomass retention
 - higher treatment capacity
- ✓ Kenaf's high surface area readily supports dense biofilm growth without the intricate granular cultivation process.
- ✓ Reduced overall operation and energy cost

Background

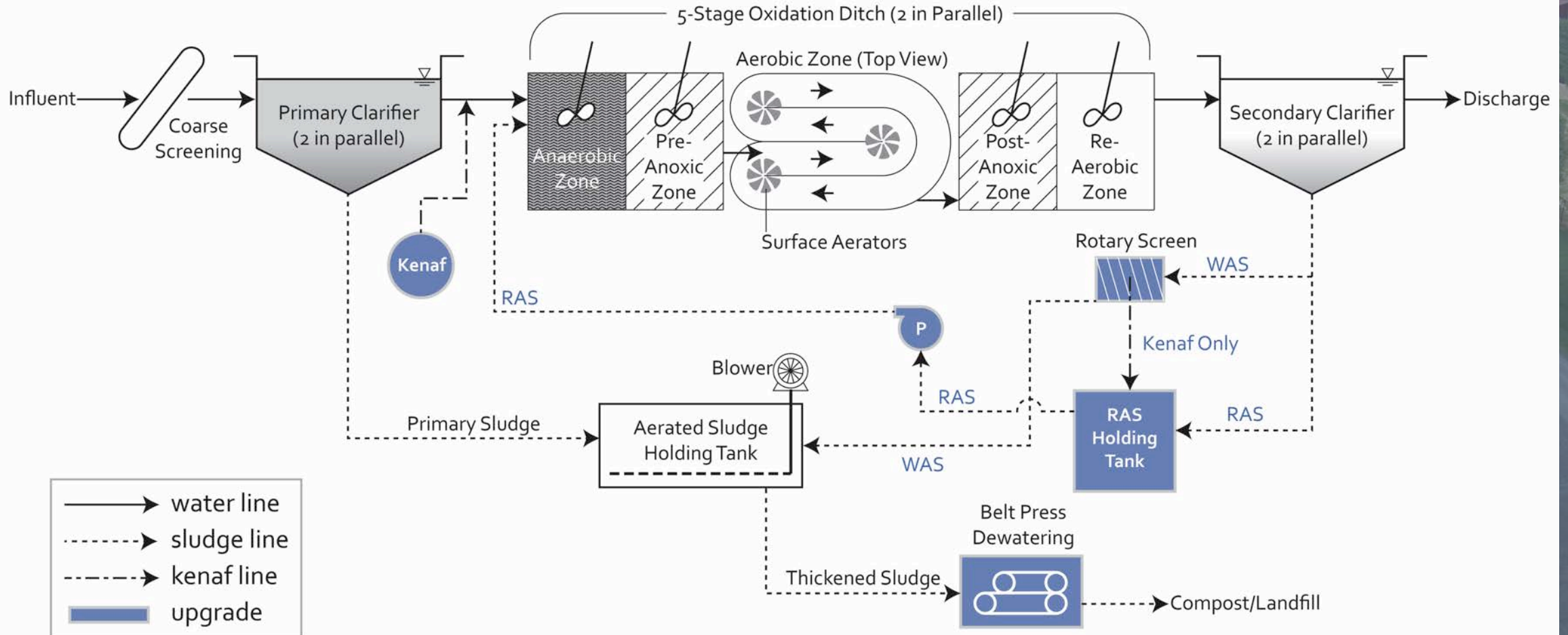
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MOOREFIELD WASTEWATER TREATMENT PLANT PROCESS OVERVIEW



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Upgrade Goals

- Improve biological nutrient removal and treatment capacity
 - High surface area kenaf supports dense biofilm growth
 - Reduce SRT
- Reduce chemical usage
 - Increase bio-P removal and reduce sodium aluminum usage
- Eliminate system upsets
 - Robust kenaf granules resist toxicity shocks
- Reduce energy costs
 - Reduce MLSS and reduce blower capacity
- Improve sludge dewatering and reduce polymer feed
 - Extracellular polymeric substance (EPS) improves flocculation and sludge thickening and reduce polymer usage

Background

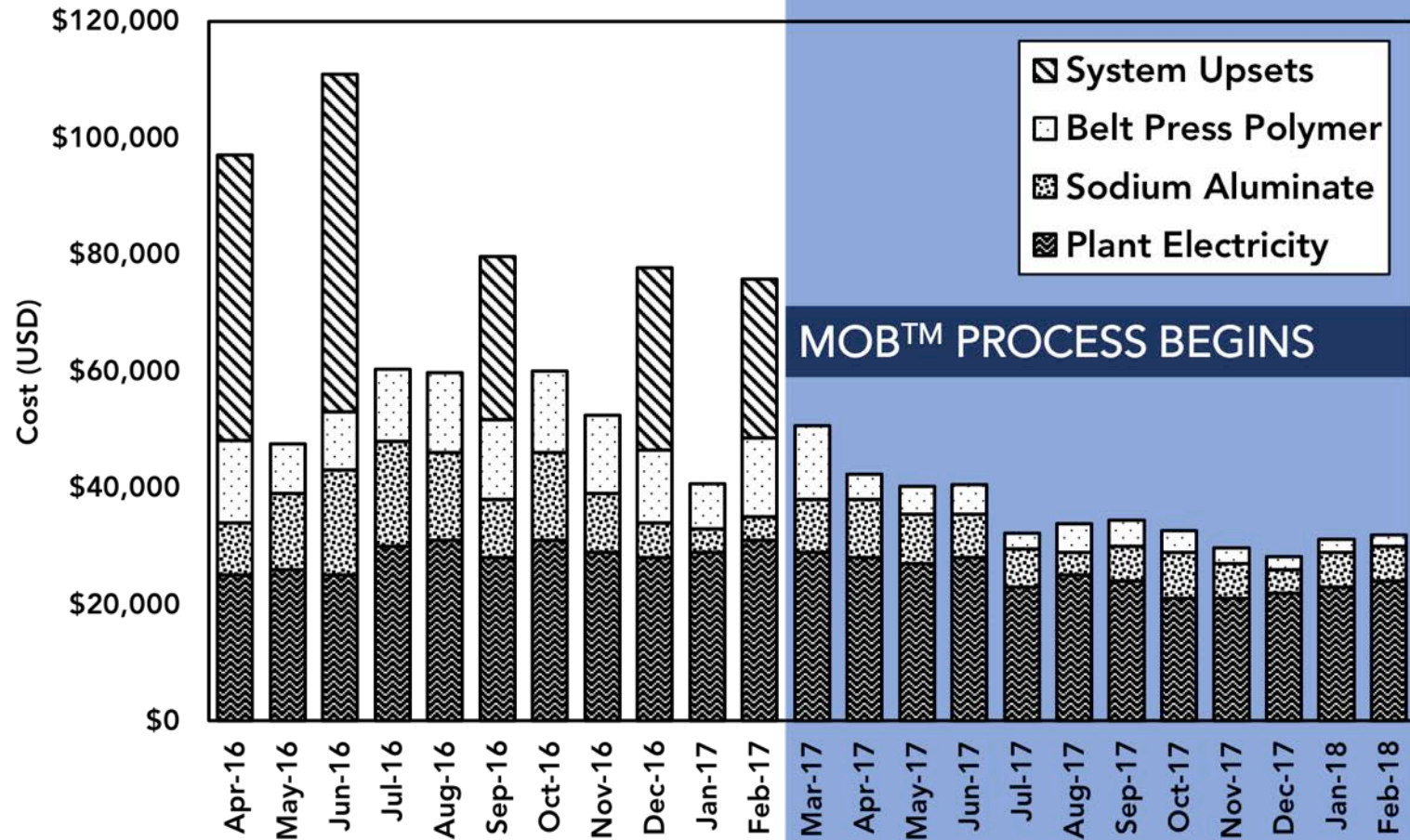
Challenges

Solutions

Results

Summary

MOB™ Process Upgrade Results – Cost



Background

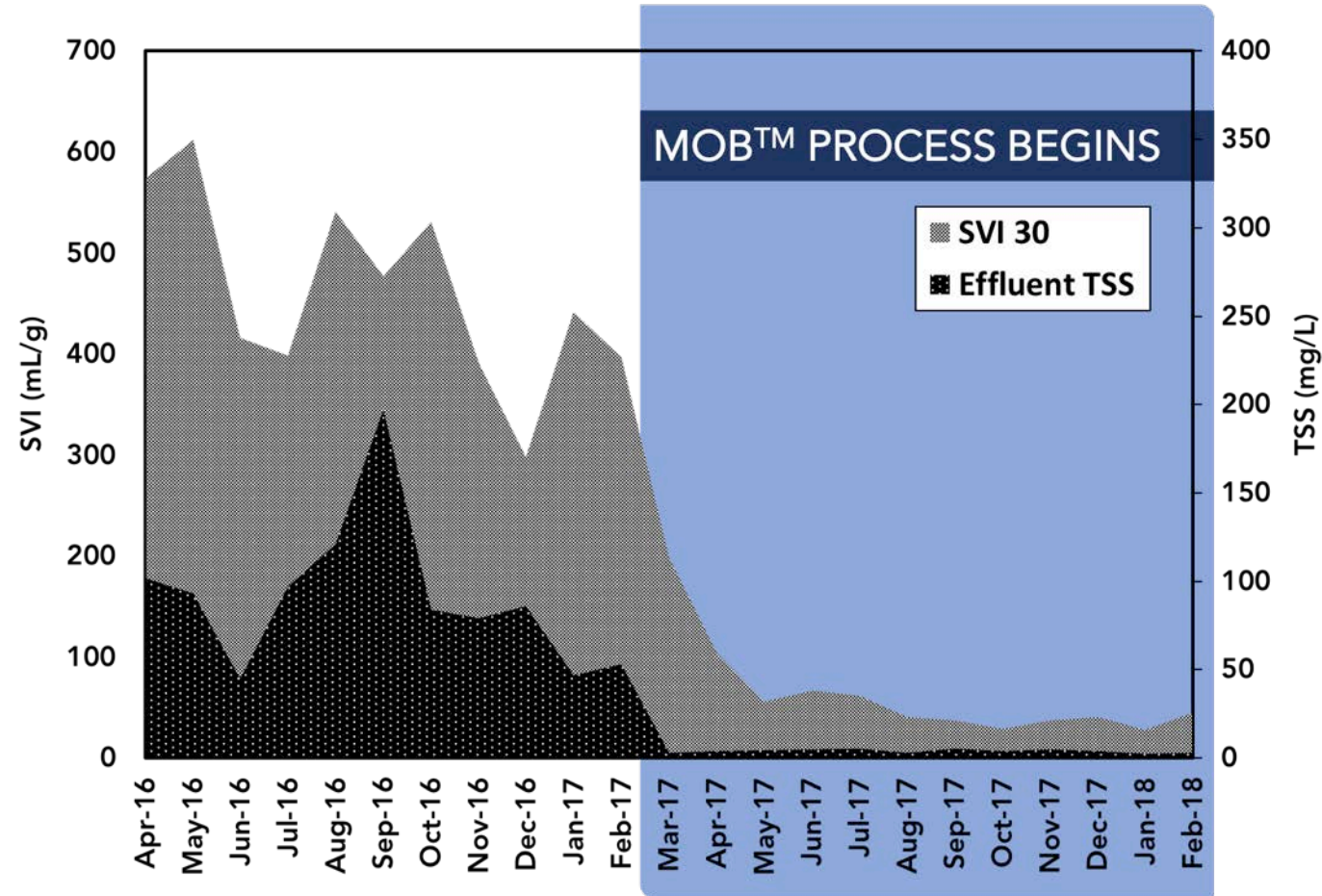
Challenges

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Summary

MOB™ Process Upgrade Results – SVI30 (87% Reduction)



Background

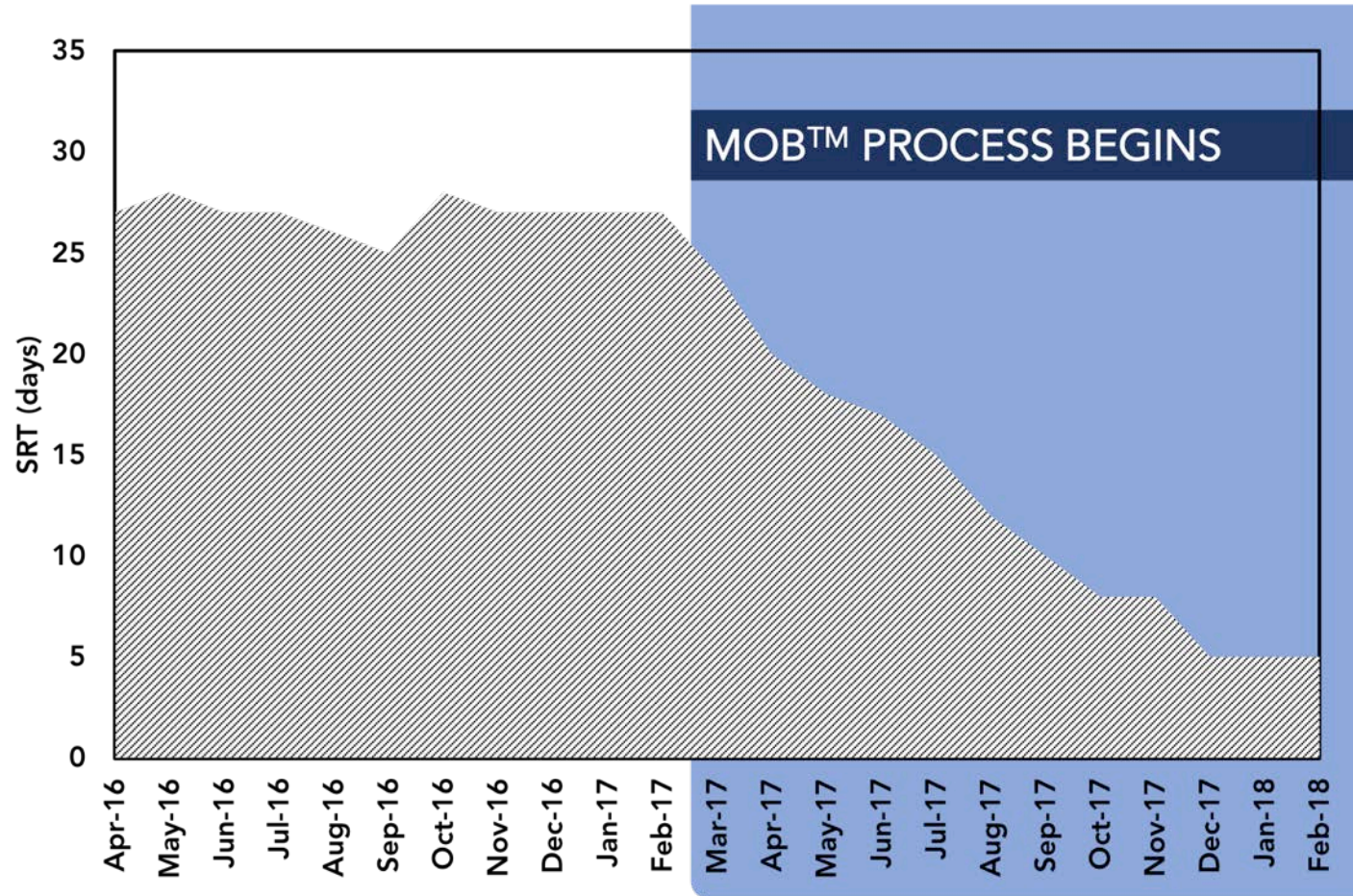
Challenges

Solutions

Results

Summary

MOB™ Process Upgrade Results – SRT (80% reduction)



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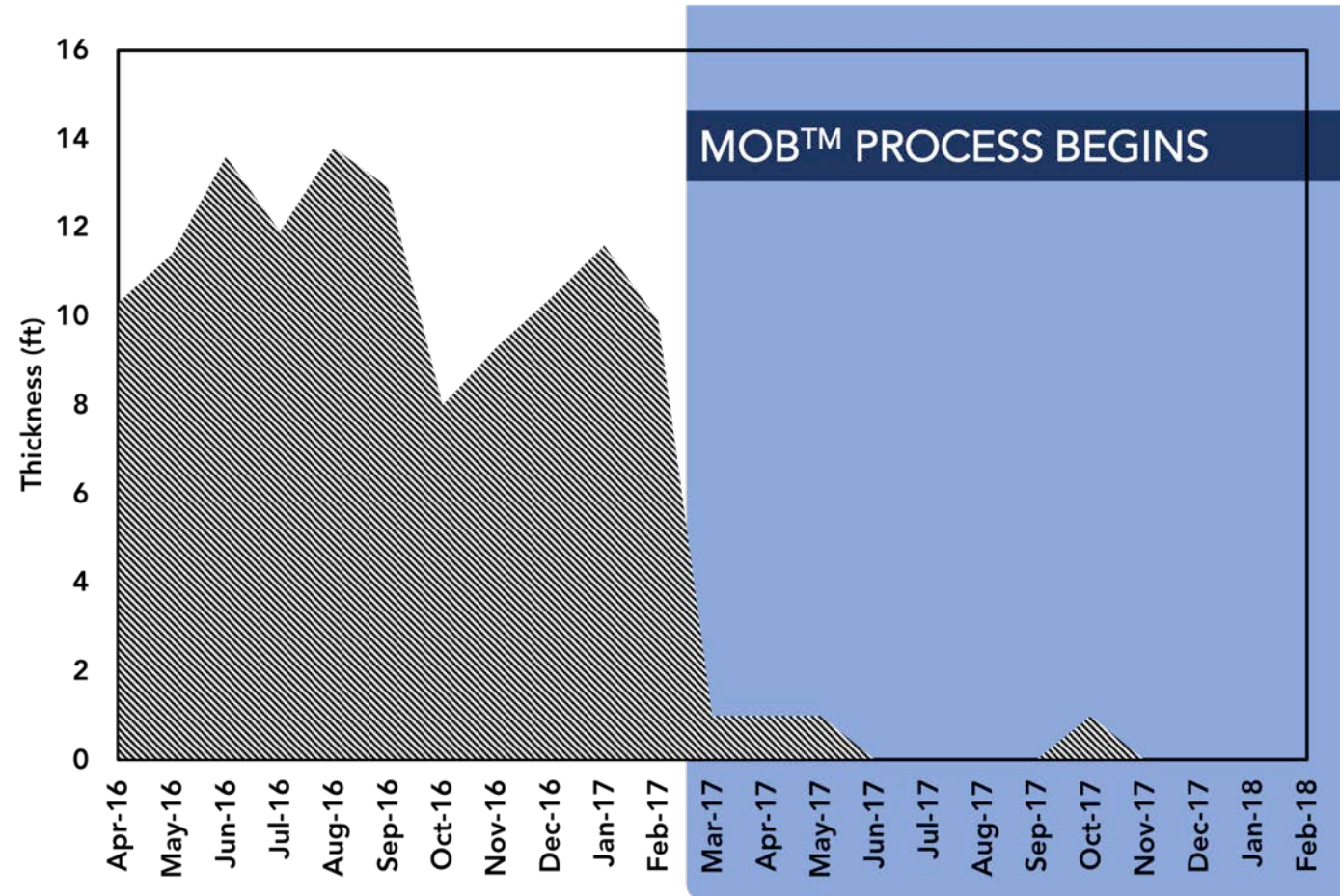
Challenges

Solutions

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Summary

MOB™ Process Upgrade Results – Sludge Blanket



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Challenges

Solutions

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Summary

Total Phosphorous Removal Cost Since 2014

Moorefield WWTP TP Removal Cost



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Challenges

Solutions

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Summary: All the upgrade goals for the Moorefield WWTTP were accomplished.

- Improve biological nutrient removal and treatment capacity
- Reduce chemical usage
- Eliminate system upsets
- Reduce energy costs
- Improve sludge dewatering and reduce polymer feed

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Solutions

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Summary