Webinar

Combatting Microthrix Parvicella in Wastewater

LEADERS IN CLEAN WATER SOLUTIONS

Agenda

1. USALCO Company Profile
2. Microthrix parvicella – Intro, Identification
3. Treatment Challenges & Proliferation
4. Coagulant Success Story
5. USALCO Coagulant Guide & Calculations
6. How-to Feed Coagulants
7. Bench Testing

VISION

Develop, make, and deliver great water treatment solutions for a cleaner more sustainable future

MISSION

Be a force for good – enrich the lives of our stakeholders and communities by helping to address America's need for clean water

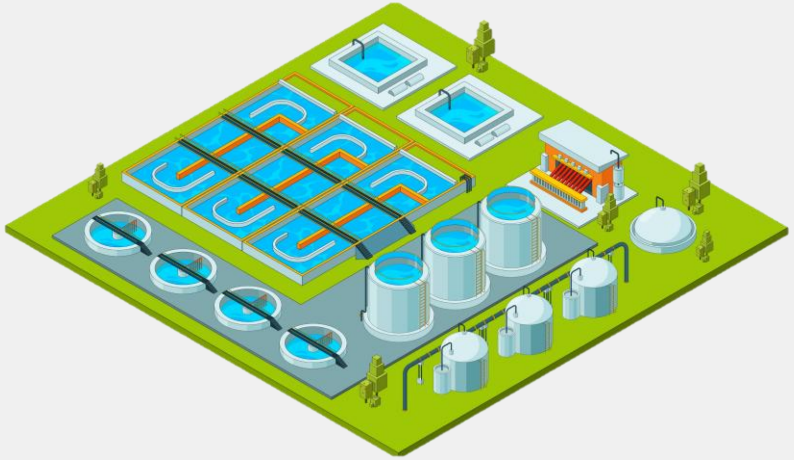
VALUES

Safety, Integrity, Customer-Focus, Teamwork, Innovation, Results, Respect for People

26+7	500+	130M+	70,000+
Locations	Total associates	Lives impacted	Annual deliveries

Leading Wastewater Facilities Trust USALCO to Deliver Solutions in Coagulation, Filtration, Process Control and Expertise

Wastewater Facility



Key Aspects

- Coagulation
- Filtration
- Biological Nutrient Removal
- Disinfection
- Chemical Process Control
- Operating Personnel

USALCO's Offering

- Industry-leading Coagulant Portfolio
- Filter Media Cleaning

- CoPilot™ Automated Coagulant Dosing
- Tank Telemetry
- Expert Support and Training

Resulting In

- Maximize facility production
- Lower Maintenance
- Lower Energy Consumption
- Lower Sludge Disposal Costs
- Reduce pH control cost
- 24/7 Optimal dosing
- Reduced CO_2 from Freight
- Fewer deliveries
- Process Resiliency

usalco®

DelPAC® UltraPAC® G-PAC™

Delta-Floc® UltraFLOC®

Aluminum Coagulants

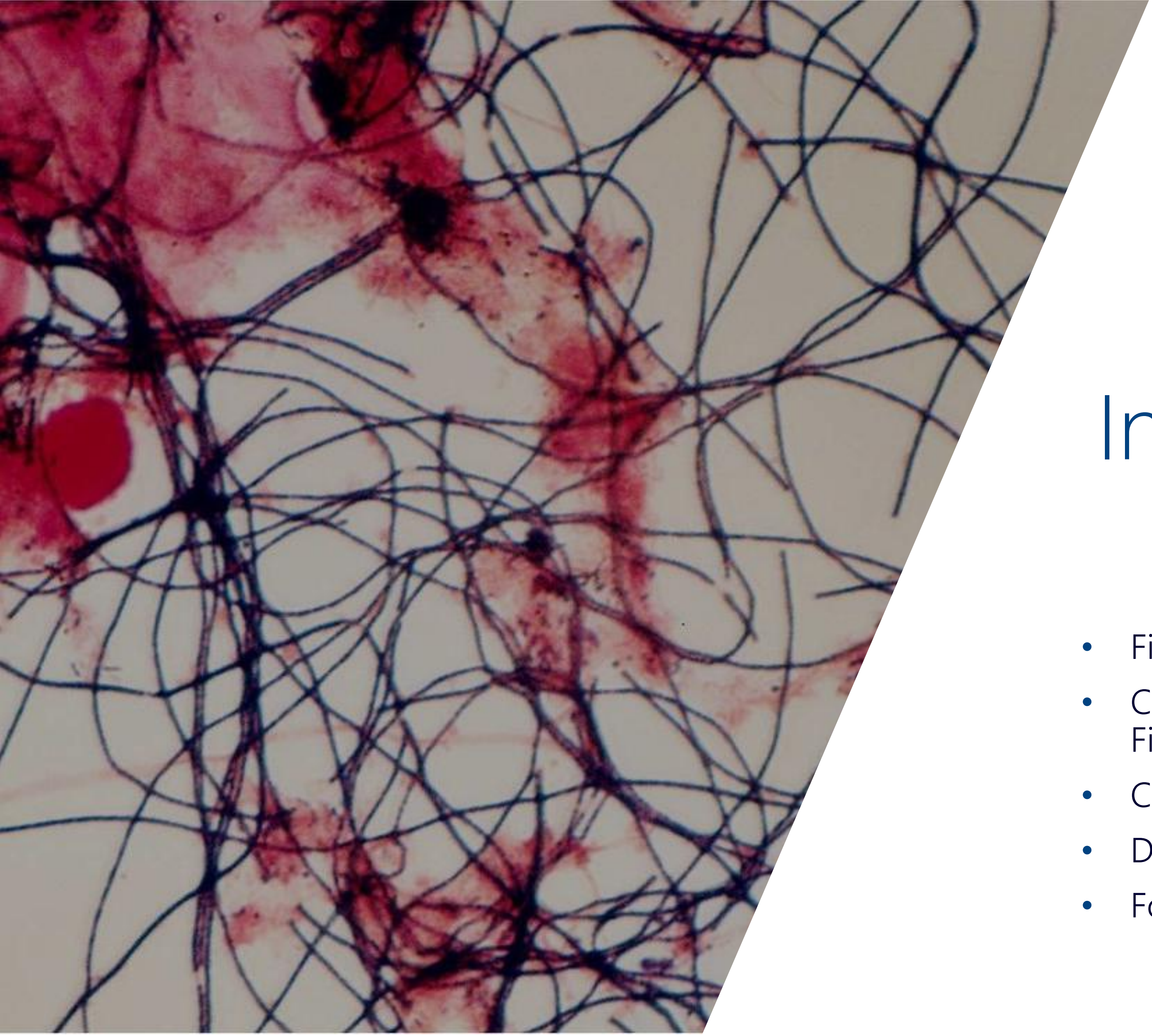
- Sulfated Polyaluminum Chloride
- Polyaluminum Chloride
- Aluminum Chlorohydrate
- Aluminum Chloride
- Aluminum Sulfate
- Dry Aluminum Sulfate
- Sodium Aluminate

Iron Coagulants

- Ferric Sulfate 10%
- Ferric Sulfate 12%
- Ferric Sulfate 13%
- Ferric Chloride 40%
- Ferrous Sulfate 5%
- Ferrous Sulfate 7%
- Ferrous Chloride

Polymers

- Melamine Resins
- Polyamine (epiamines)
- PolyDADMAC

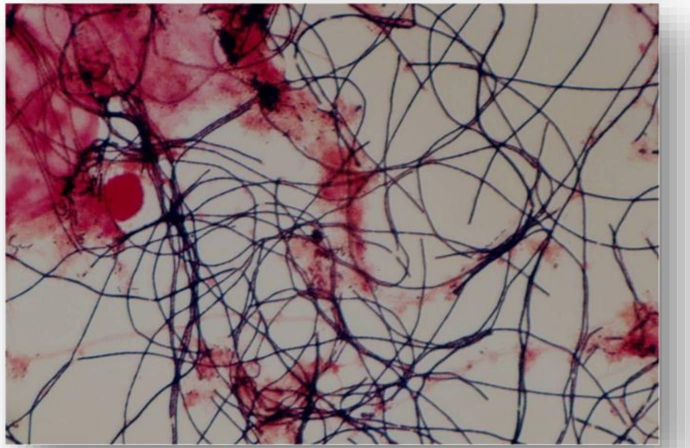


Introduction

- Filamentous Bacteria
- Can appear independently or along with other Filaments
- Cause Bulking & Foaming in Activated Sludge Plant
- Difficult to eradicate
- Found Globally in Wastewater treatment systems

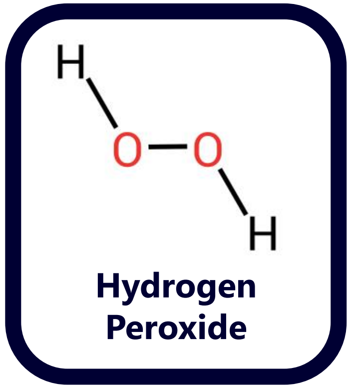
Characteristics

- Filamentous bacterium thriving in low Food to Microorganism (F:M) conditions
- Often appears in Long Sludge Age Plants and Systems with Anoxic-aerobic Alternation
- High storage capacity for Long Chain Fatty Acids
- Typically occurs during low temperature events, below 22°C (72 °F)
- More likely to occur when Fats, Oil, and Grease are present



Challenges in Treatment

- Resilient to Oxidizers such as Peroxide, and Chlorine
- Contributes to Poor Sludge Settling and Turbid Effluent
- Design Flaws like Poor Mixing, Dead Zones, and Low Dissolved Oxygen Exacerbate Outbreaks



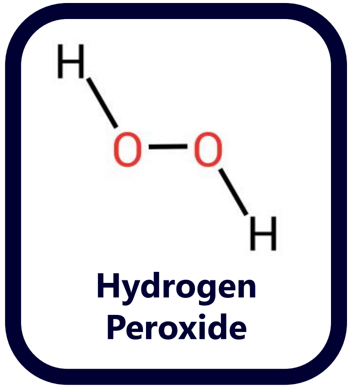
Why Microthrix Proliferates

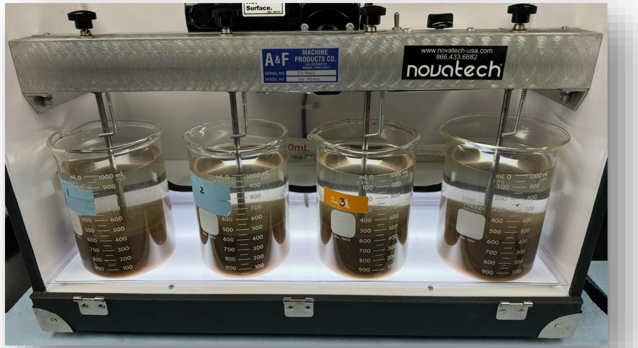
- Ability to consume Long chain fatty acids under Anaerobic, anoxic, and aerobic conditions
- Competes well in systems with alternating anaerobic-aerobic zones
- Found in Wastewater with significant COD from Lipids

Condition	Oxygen Availability	Electron Acceptors	Main Processes	Byproducts
Anaerobic	None	Organic compounds, SO_4^{2-}	Fermentation, Methanogenesis	Methane (CH_4), CO_2, H_2S
Anoxic	No oxygen, but NO_3^-/NO_2^-	Nitrate, Nitrite	Denitrification	Nitrogen gas (N_2), CO_2
Aerobic	Present	Molecular oxygen (O_2)	Respiration, Nitrification	CO_2, NO_3^-, H_2O

Typical Treatment Methods

- Oxidizers such as Chlorine and Peroxide
- Operational Adjustments, Lowering the Sludge Age
- Mechanical Methods
- Polyaluminum Chloride





INDUSTRY

MUNICIPAL WASTEWATER

Challenge

- This 7.5 MGD wastewater treatment plant goal was to avoid Microthrix parvicella growth in the treatment process
- Chlorine and other treatment methods have worked but were not preferrable
- Primarily a seasonal issue occurring in winter months

Finding & Results

- Switched to DelPAC® 1842 and achieved treatment objective following the initial outbreak
- Fed approximately 212 gallons per day for 5 weeks
- Lowered dose to 35 gallons per day to assist with phosphorus removal and outbreak prevention
- DelPAC® neutralized Microthrix parvicella filamentous bacteria outbreaks

REDUCED TOTAL TREATMENT COSTS BY NOT OVERFEEDING CHLORINE

RESOLVED M. PARVICELLA OUTBREAK

IMPROVED PERFORMANCE

IMPROVED PHOSPHORUS REMOVAL TREATMENT

2601 Cannery Avenue
Baltimore, MD 21226
410-354-0100

Overview

Microthrix parvicella presents significant challenges in municipal wastewater treatment, primarily due to its characteristic behaviors and environmental preferences that lead to operational complications. *M. parvicella* is a gram-positive, un-branched filamentous bacterium prevalent in bulking sludges and foams across wastewater treatment facilities. It thrives in environments with long Solids Retention Times (SRTs), particularly in Biological Nutrient Removal (BNR) plants, alternating aerated and non-aerated zones, foam trapping conditions, low temperatures (notably in winter and spring), and when Long Chain Fatty Acids (LCFAs) originating from fats, oils, and grease (FOG) are present. These conditions are common in municipal wastewater settings, making *M. parvicella* a persistent issue that impacts the aesthetics and functional capacity of the wastewater facilities and creates breeding grounds for additional filamentous organisms.

Addressing the *M. parvicella* challenge requires a multifaceted approach, as various preventative measures have their own drawbacks and benefits. Strategies include reducing SRTs, adding chlorine or other chemicals, eliminating food sources like FOG, and implementing physical interventions such as surface spraying of foam or digester modifications. Each method has its complications; for example, reducing SRTs or adding chlorine can inhibit nitrification, a crucial process in wastewater treatment. Other measures, like FOG elimination, tackle the cause of *M. parvicella* growth but are difficult to achieve effectively. Advanced techniques, such as adding a high-metal-content Polyaluminium product, such as DelPAC 1842, DelPAC 1525, AlcoPAS™ 1000, or UltraFloc® 1209, aim to target *M. parvicella's* food source directly and have proven to be the most cost-effective solution for outbreak prevention.

DelPAC and AlcoPAS products are used to avoid *M. parvicella's* ability to propagate using lipids; lipids are prevalent in wastewater as fats and oils which coagulants can help remove from the process. On the next page, you will find 2 steps to follow when implementing USALCO products to defeat the propagation of *Microthrix parvicella.*

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Implementation Guide

1 Step 1
Calculate Remedial Dose

a. [Calculate Al Required and Factor]
60 / SRT = Al required per kg MLSS
b. MLSS / 1000 = Factor A
(Mixed Liquor Suspended Solids)
c. Al Required x Factor A = g/m³ MLSS
d. %Al^{3+} / 100 = Concentration of Al Required
e. g/m³ / Al Required = ppm for Remedial Dose
(Parts per Million)

2 Step 2
Treatment Conditions

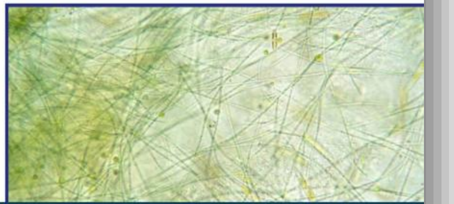
PAC should be administered concurrently with a high oxygen concentration in the aeration basins (above 2.5mg/L) and with the MLSS concentration kept low (below 2.5 g/L) since *M. parvicella* thrives in conditions of low oxygen.

Remedial Formula: 60/SRT = grams of Al^{3+} per kg MLSS
Prevention Dose = ~1/6 of Remedial Dose
g/m³ = mg/L = ppm

Example

MLSS = 3000 SRT = 25	
DelPAC 1842 = 9.01% Al^{3+} or 0.0901	
Step 1 - Calculate Remedial Dose	
a.	60 / SRT = 2.4 g of Al^{3+} / kg MLSS
b.	MLSS / 1000 = 3
c.	2.4 x 3 = 7.2 g/m³ of Mixed Liquor
d.	Determine Al^{3+} Based Product %Al^{3+} / 100 = 0.0901 Al^{3+}
e.	Determine ppm of Product 7.2 / 0.0901 = 79.9 ppm of DelPAC 1842

USALCO Product Name	% Al^{3+}
DelPAC 1525	7.23
DelPAC 1842	9.01
UltraFloc 1209	6.94
AlcoPAS 1000	4.37



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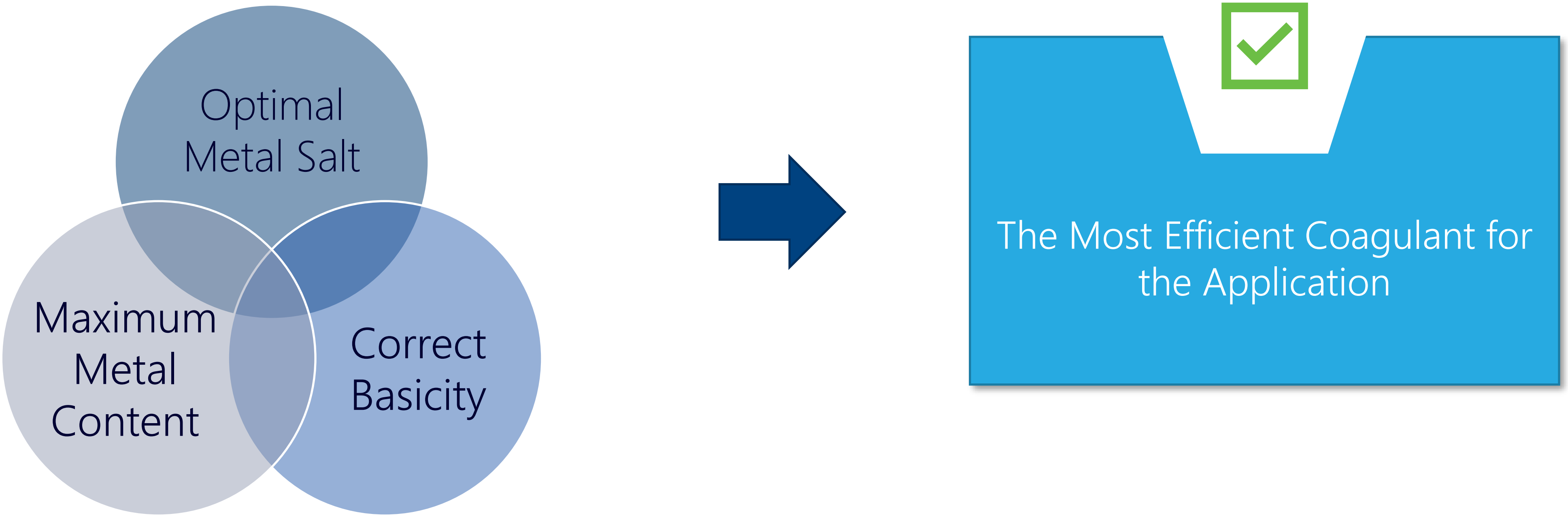
Download the guide at www.usalco.com , in the "Resources" section, under Tech Resources

Questions? Email: webinar@usalco.com

Treating Water Effectively Requires the right Coagulant
One size fits all approach is Inefficient

Three Key Components of Effective Coagulants



Microthrix Parvicella Coagulant Guide

- Coagulant, USALCO Recommendations
- Basicity and molecule Structure are the Differentiators

USALCO Product Name	% Al^{3+}
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Microthrix Parvicella Coagulant Guide

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Implementation Guide

1

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Microthrix Parvicella Coagulant Guide

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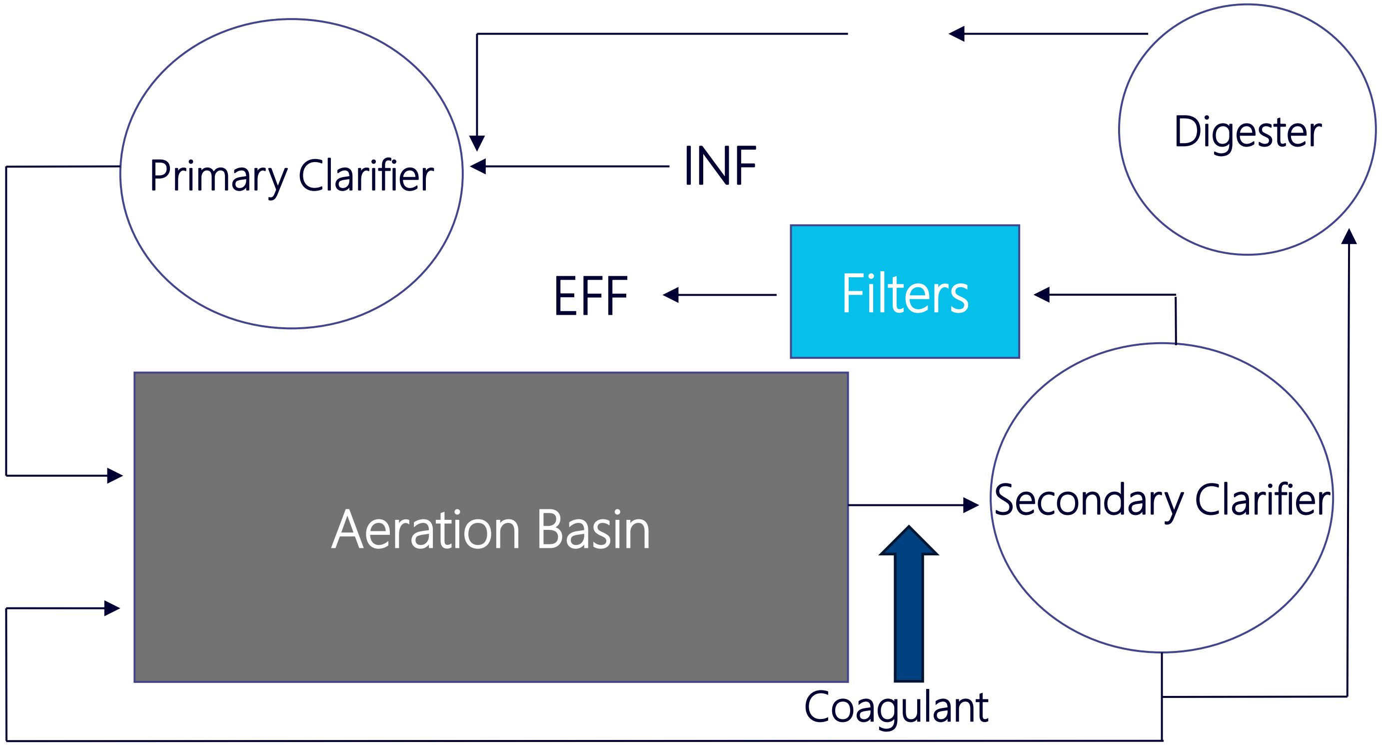
Calculate Prevention Dose

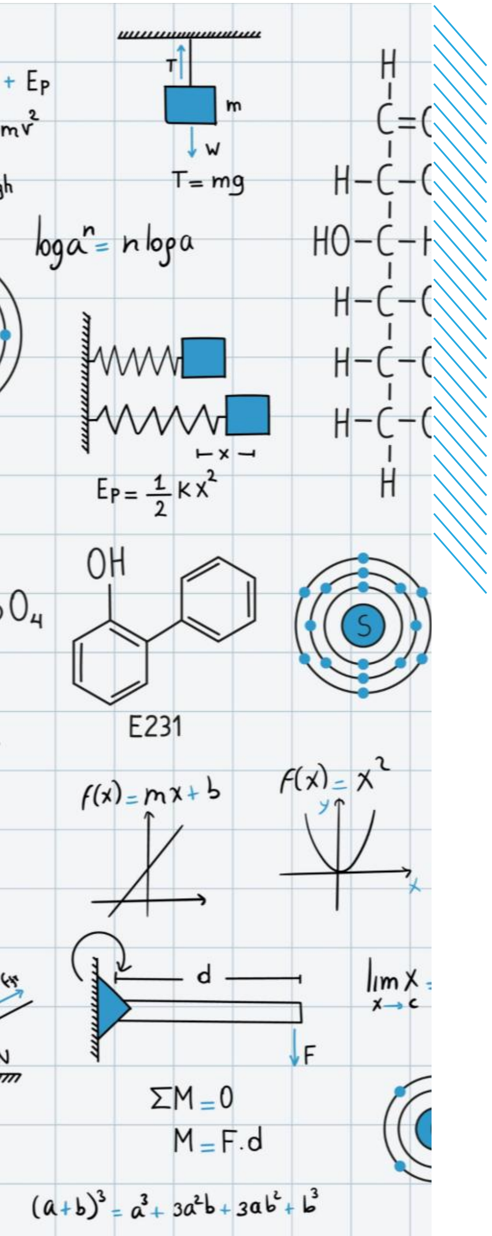
Remedial Formula: 60/SRT = grams of Al^{3+} per kg MLSS
Prevention Dose = ~1/6 of Remedial Dose
g/m^3 = mg/L = ppm

Example: Prevention Dose
Remedial Dose / 6 = Prevention Dose
79.9 / 6 = 13.3 ppm of DelPAC 1842
13.3 ppm = Prevention Dose

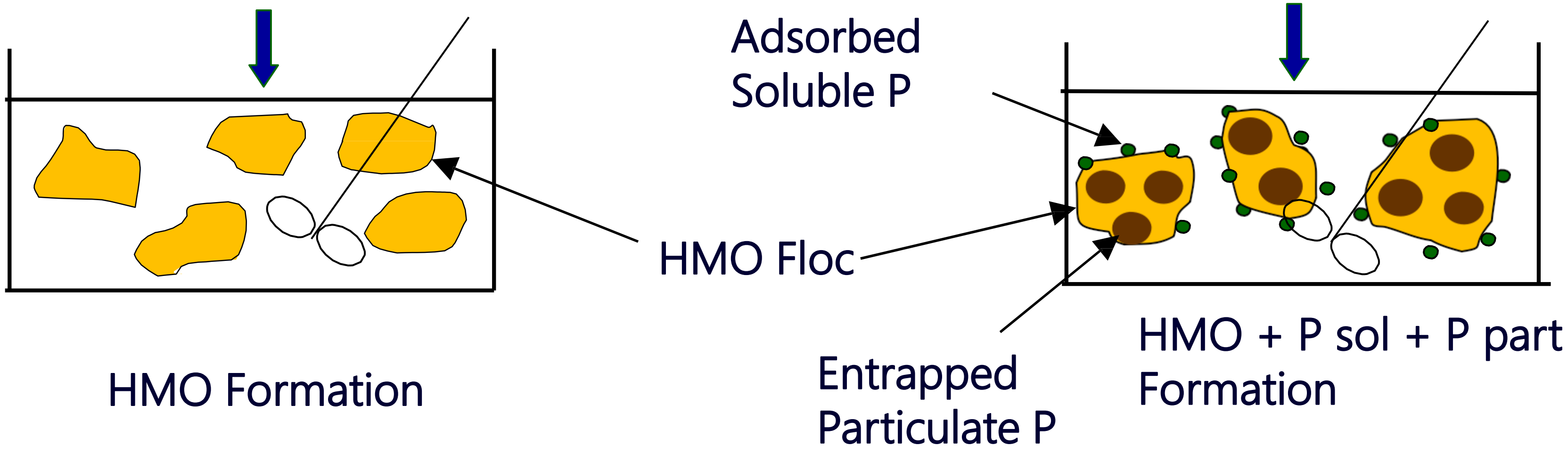
Municipal Wastewater Process

Typical coagulant application is phosphorus removal





Mechanism of Reaction



Therefore, good mixing is required for HMO(Floc) formation and chemical dose optimization

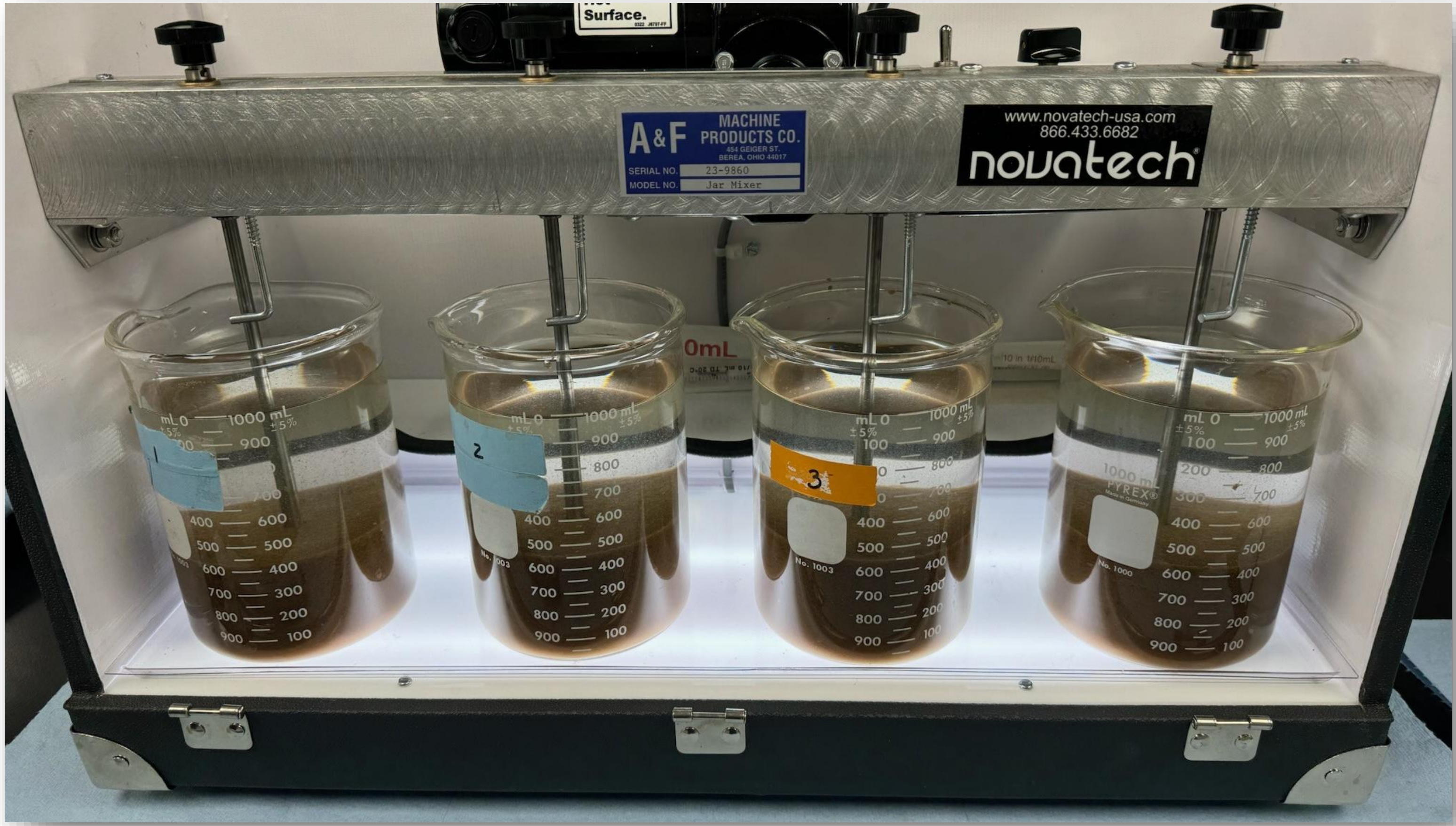
Water Quality Goals

Wastewater Plant

- Phosphorus Removal – Mitigate Microthrix Parvicella
- Improved Settling Rate*
- Less Alkalinity Impact with DelPAC*
- Sludge Reduction
- Overall Clarification – BOD, COD, FOG Removal (Industrial Applications)

Jar Testing – Critical for Wastewater

Let us Help!



Questions? Email: webinar@usalco.com

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