Benefits of Using Iron Coagulants in Wastewater Treatment

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Odor & Corrosion Control

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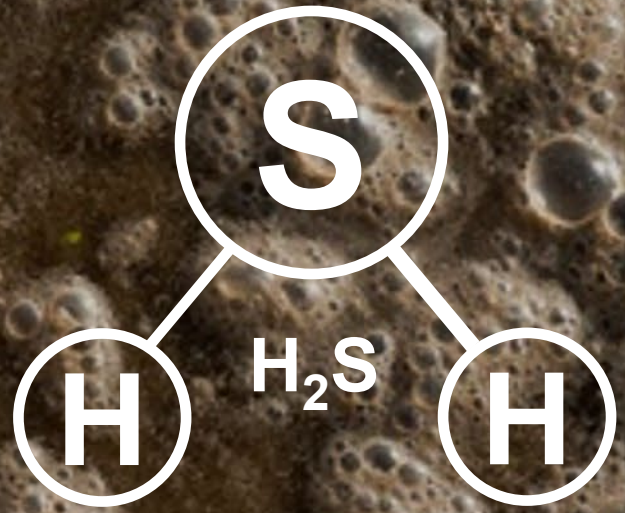
Hydrogen Sulfide



HEAVIER THAN AIR

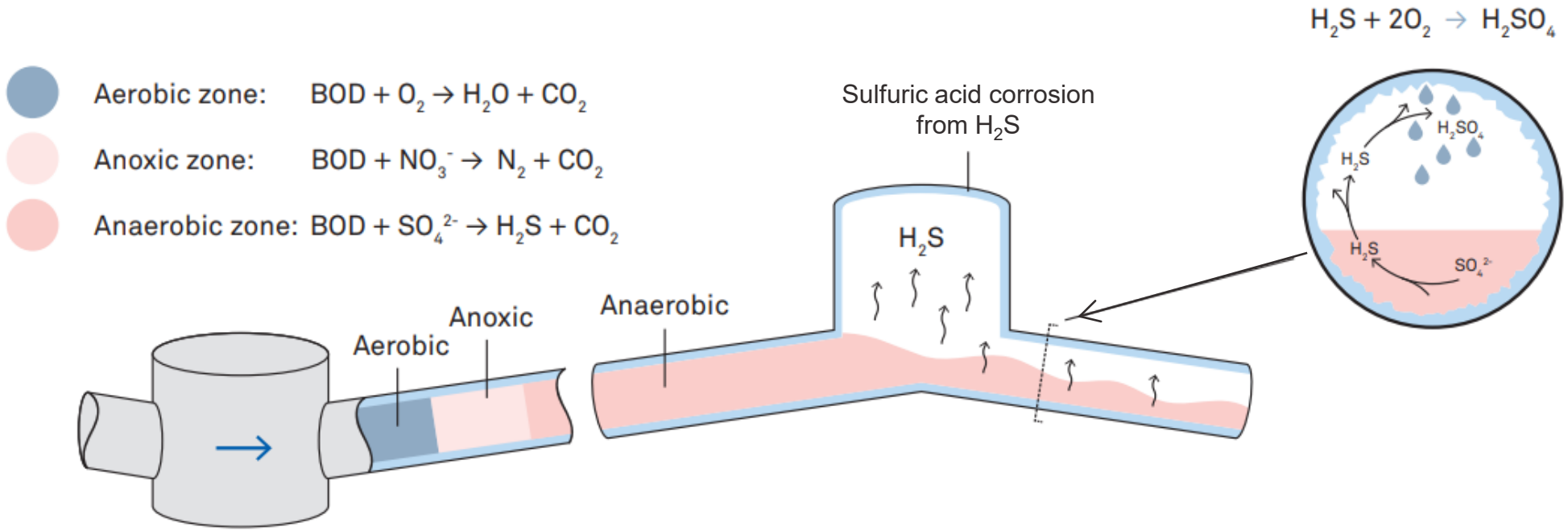
POISONOUS

CORROSIVE

FLAMMABLE

AQUATIC TOXIN

What Causes H_2S to Form?



4 REASONS WHY THIS MAY BE THE SOLUTION FOR YOU

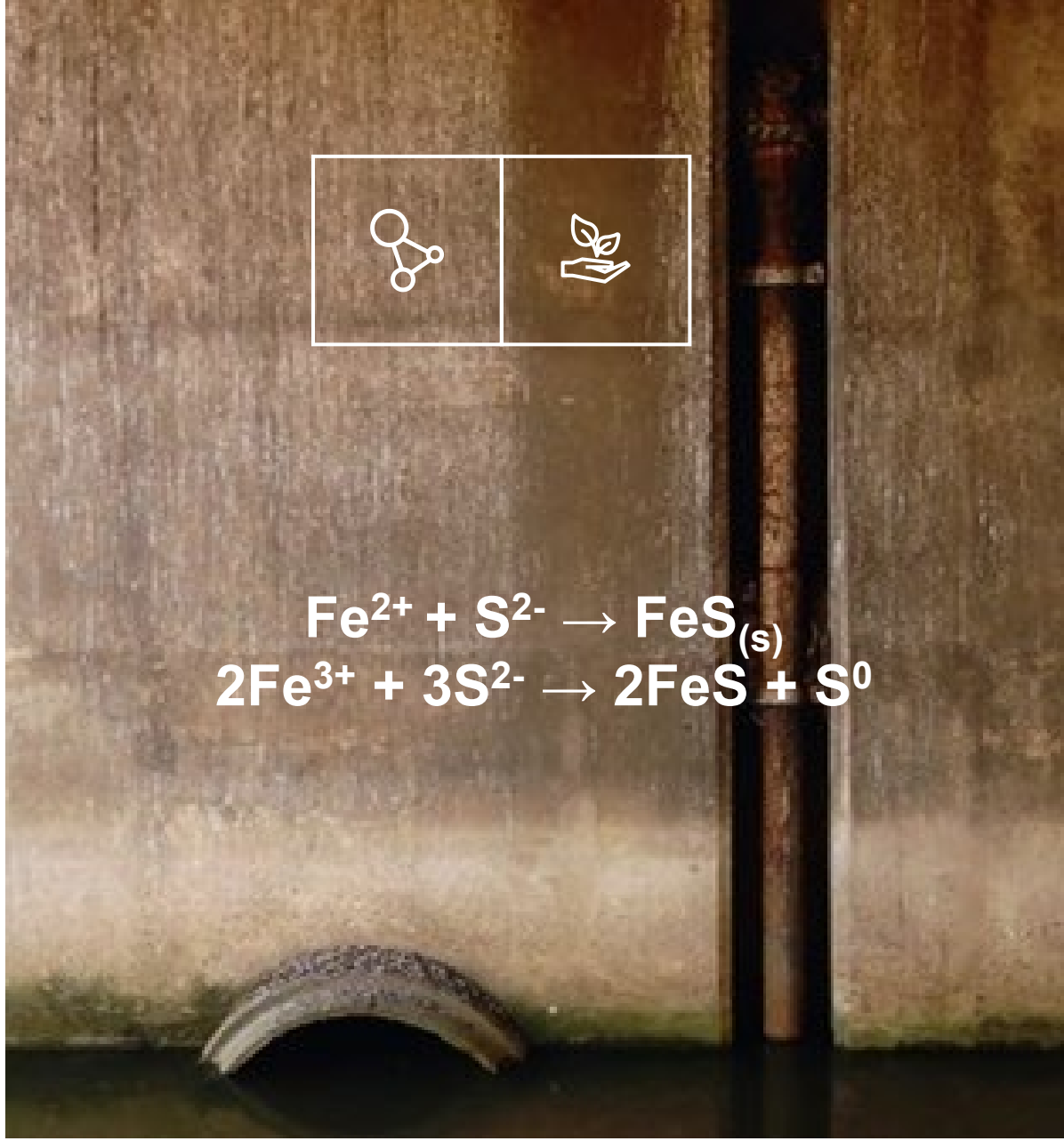
Benefits of Iron Addition for Sulfide Control

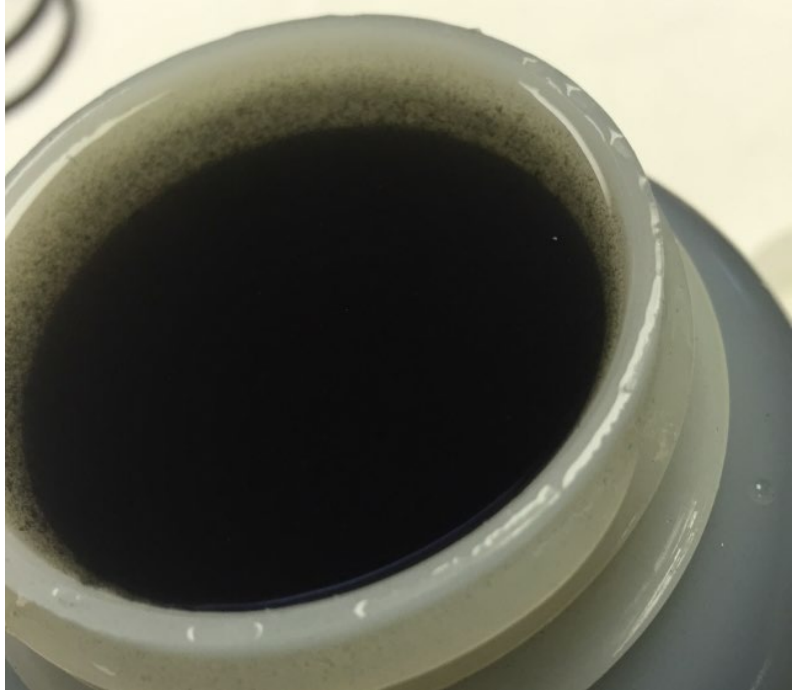
			
Binds sulfides rapidly	Eliminates sulfides to non-detectible levels	Prevents corrosion & noxious odor	Cost effective

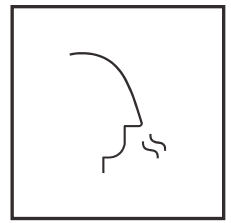
The Chemistry of Iron-Based Sulfide Control

Iron (Fe) reacts with sulfide species resulting in:

- Direct precipitation of dissolved sulfides (HS^-, S^{2-}) as water-insoluble solids $FeS_{(s)}$ & $S_{(s)}$
- Irreversible binding of iron with dissolved sulfides leads to elimination of free S^{2-}



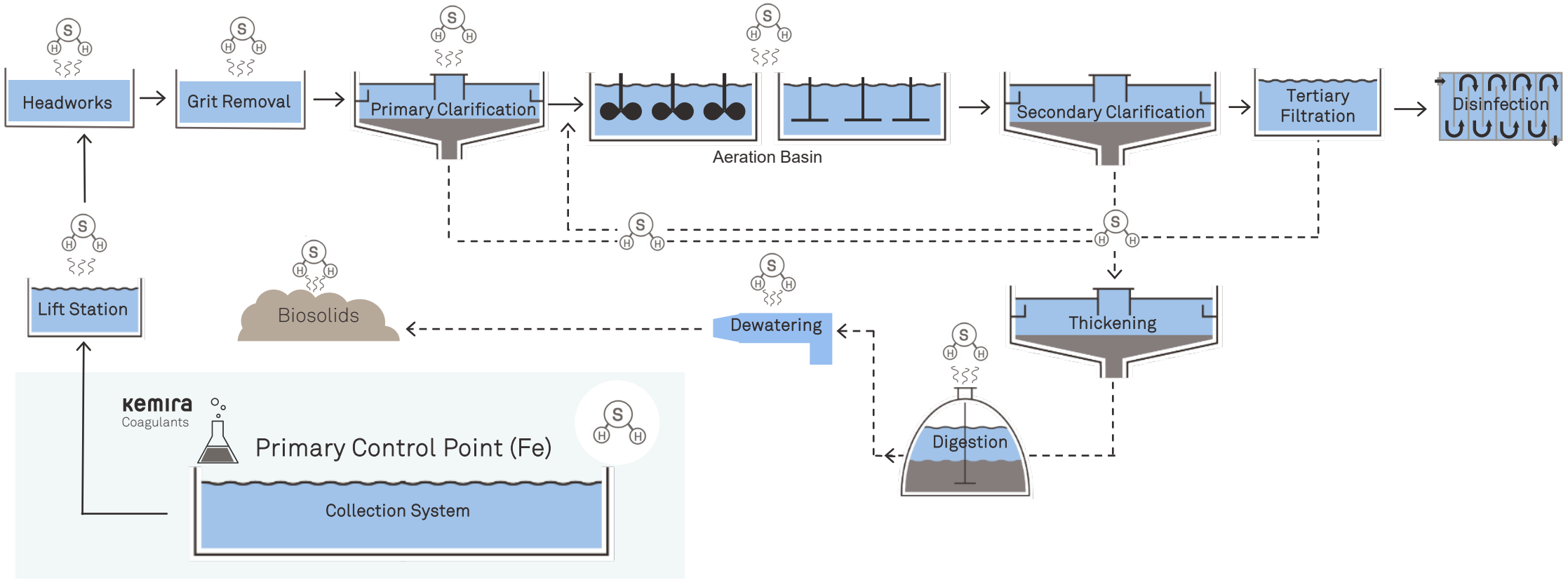




The Chemistry of Iron-Based Sulfide Control

Iron (Fe) binds strongly to sulfides, inhibiting the production of $H_2S_{(g)}$, thereby preventing corrosion & noxious odor

Common Points for Presence of H_2S Gas



Chemically Enhanced Primary Treatment

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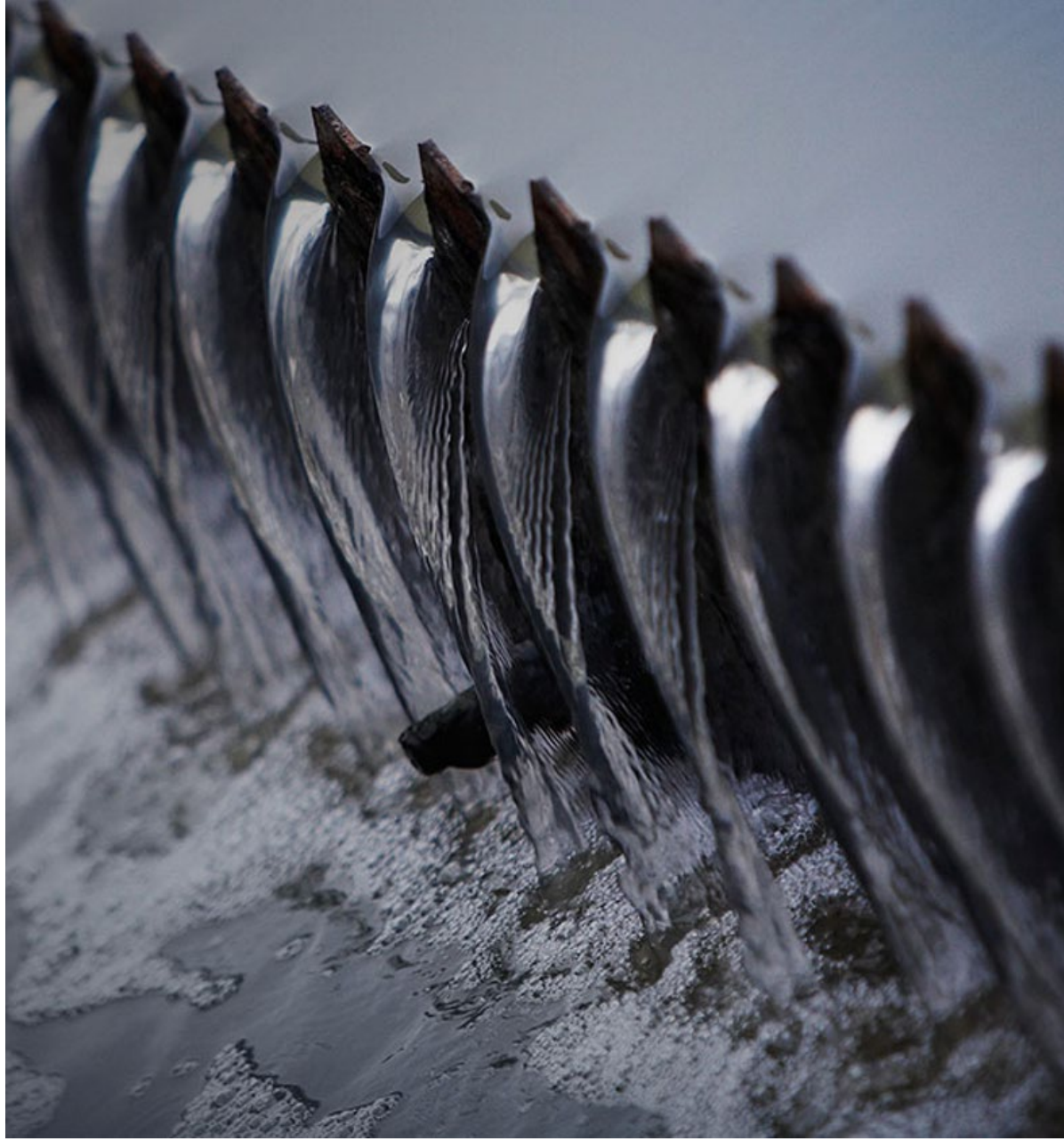
Chemically Enhanced Primary Treatment (CEPT)

Wastewater treatment plants (WWTP) dealing with increased flows, treatment bottlenecks and/or plant expansion restrictions

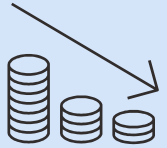
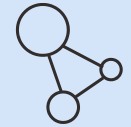
Addition of iron coagulants at headworks

Increased removal of organic / particulate matter in primary clarifiers

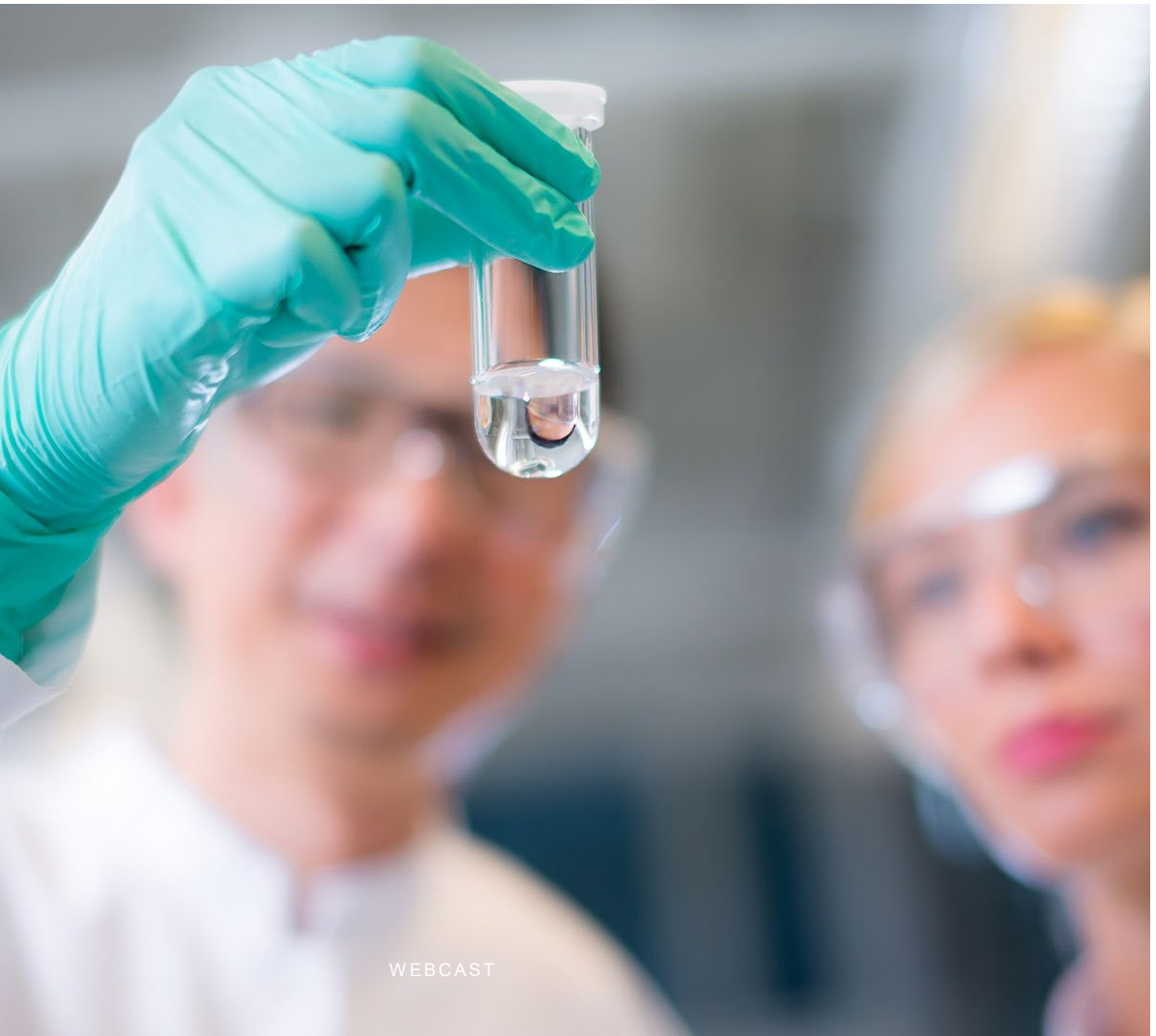


4 REASONS WHY THIS MAY BE THE SOLUTION FOR YOU

Benefits of Iron Coagulants for CEPT

			
Reduces TSS/BOD/P load	Increases plant throughput rates	Reduces energy and dewatering costs	Increases biogas production

Properties of Ferric Coagulants



- Removes TSS, BOD, P & heavy metals
- Creates a dense, fast-settling floc
- Wide pH range
- Controls formation of H_2S gas
- Low freezing points

CEPT Addresses These Process Issues

Influent water quality fluctuations

Increased capacity needs / removal of process bottlenecks:

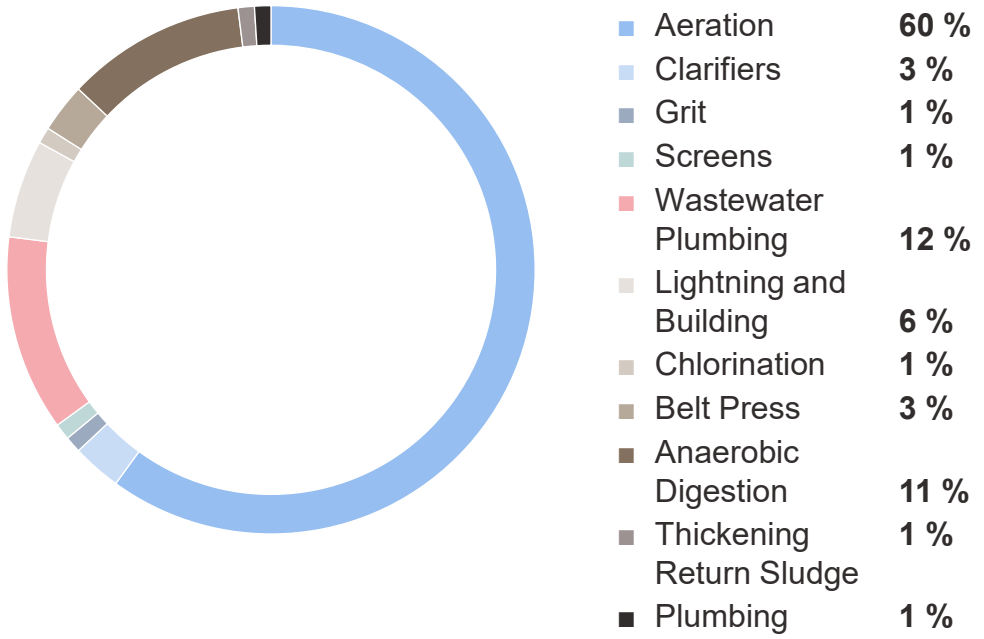
- Primary clarifiers
- Activated sludge

Variable biological treatment load

Energy costs associated with aeration basins

Need to boost biogas production

Energy cost represents between 20 to 40%of total operating costs of a municipal WWTP



*Walther, E. "Energy efficiency and GHG reduction in wastewater facilities." Northern California Chapter Meeting (2009).

Enhanced Biogas Production

- Use of iron addition to reduce or eliminate digester H_2S
  - > Not only eliminates corrosion concerns, also results in significant increases in methane production
  - > Iron addition can be adjusted to meet target digester H_2S levels.

Process Benefits of CEPT Using Iron

- ✓ Increased primary clarifier removal rates
- ✓ Reduced aeration process energy use
- ✓ Lower F/M ratio & increased aeration process capacity
- ✓ Improved biological process
- ✓ Increased primary sludge, increased biogas & reduced CO_2 footprint

Case Studies

ORANGE COUNTY, CA PLANT #1 WWTP	SAN DIEGO- POINT LOMA, CA WWTP	CITY OF SAN JOSE, CA	MIAMI-DADE NORTH DISTRICT, FL- TRIAL
Primary TSS removal 50% → 85%	Primary TSS removal 90%	Primary TSS removal 47% → 68%	Primary TSS removal 41% → 80+%
Primary BOD removal 50% → 85%	Primary BOD removal 60%	Primary BOD removal 30% → 52%	Reduced P load to bio process
80% primary: 20% secondary		52:48% before, with CEPT 72:28% P:S	
Increased methane production		+4 primary clarifiers capacity with CEPT	
Increased cake solids		Methane +14%	
		Reduced P load to bio process	
		Aeration demand -14%	

FEATURES AND BENEFITS

Enhanced Dewatering

- Eliminates struvite buildup
- Improves cake solids
- Reduces dewatering polymer dosage
- Increases machine throughput
- Optimizes & automates the dewatering process

4 REASONS WHY THIS MAY BE THE SOLUTION FOR YOU

Enhanced Dewatering

			
STRUVITE ELIMINATION	**DRYER CAKE SOLIDS**	**REDUCED PHOSPHATE**	**HIGER QUALITY REJECT WATER**

Enhanced Dewatering Sustainable Benefits

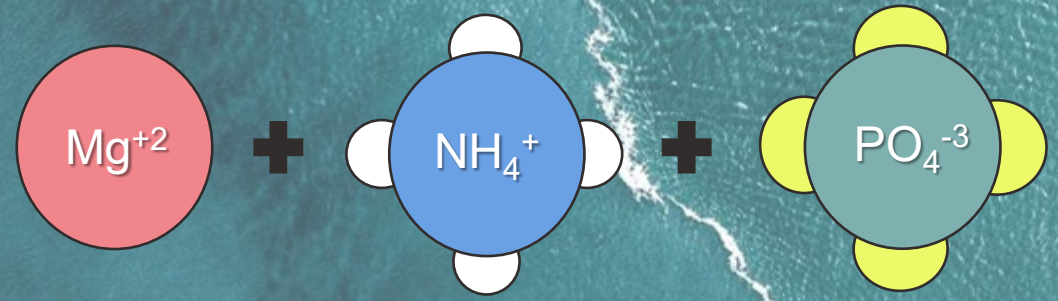
- CO_2 reduction
- Capacity increase
- Energy savings
- Freight savings
- Sludge final disposal savings

MAJORITY OF PROJECTS BEGIN WITH PREVENTING STRUVITE FORMATION

STRUVITE CONTROL

ENHANCED DEWATERING

PHOSPHATE REMOVAL



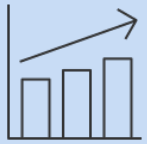
1 Magnesium Ion

1 Ammonium Ion

1 Phosphate Ion

Phosphorous Removal

Benefits of Iron Coagulants for Phosphorous Removal



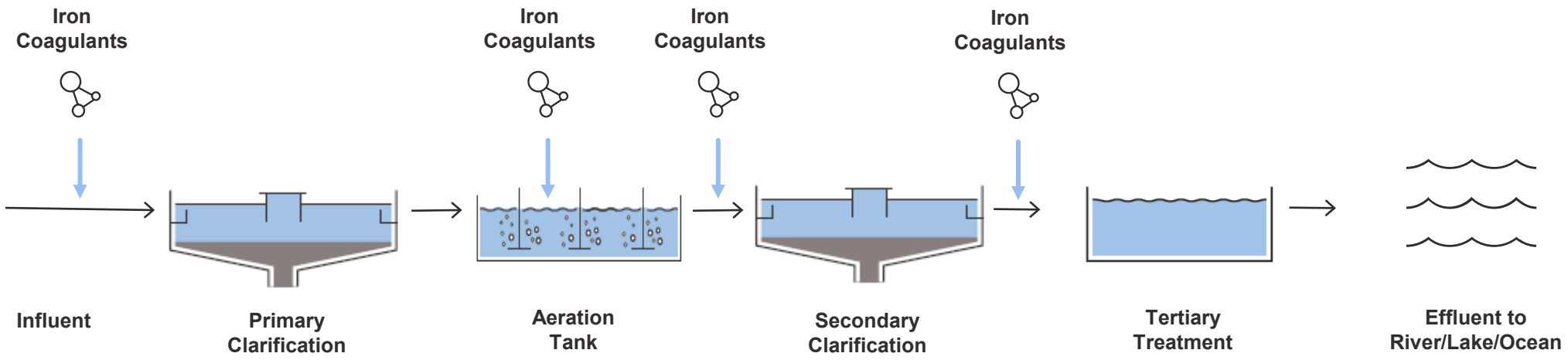
Improved water quality

Phosphorous discharge limit compliance

Cost savings

Multiple down-stream benefits

Iron-based Phosphorous Removal



WATER RECLAMATION FACILITY
NORTH LAS VEGAS, NV

Case Study

Issue:

- Increased phosphorous due to hot weather

Solution:

- Add ferric chloride above 82ºF

Result:

- 20-25% reduction in phosphorous discharges
- ~ 7% increase in cake dryness
- ~ $100,000 annual savings in biosolid process cost

Recapping Using Iron Coagulants in Wastewater Treatment

Water treatment expertise to help municipalities and water intensive industries optimize every stage of the water cycle.

- ✓ Eliminates sulfides to non-detectible levels and prevents corrosion & noxious odor
- ✓ De-bottlenecking key aspects of the treatment process
- ✓ Increasing plant throughput rates/process capacities
- ✓ Increasing the production and quality of biogas
- ✓ Reducing treatment costs
- ✓ Optimizing treatment plant performance on a 24/7 basis
- ✓ Phosphorous discharge limit compliance
- ✓ Downstream benefits
- ✓ Reducing the WWT plant's carbon footprint
- ✓ Digitally enhanced process optimization
- ✓ Sustainability- reuse of raw material

High%

recycled material

THE GLOBAL SHARED AMBITION TO BUILD A SUSTAINABLE WORLD IS ARTICULATED IN **THE UN SUSTAINABLE DEVELOPMENT GOALS (SDGS)**.

Q&A

Thank you so much for listening

Brett Offerman
Sr Account Manager, Kemira
Brett has 45 years of drinking and wastewater industry experience and 25 of those years with Kemira in managing major water and wastewater accounts. In addition to this, Brett has 18 years of experience in the operation of various wastewater plants, and he holds a California SWRCB Grade 5 Operators Certificate.

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Richard Waterous
Sr Account Manager, Advanced Water Treatment, Kemira
Richard has 34 years of industry experience, and 17 of those years are with Kemira. He has extensive experience with potable water and a wide range of wastewater treatment applications.

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