



NEWEA / NYWEA

Industrial Wastewater Pretreatment Systems

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Overview

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- **Industrial Wastewater Background**
- **Permit Compliance versus Sustainability**
- **Current Industrial Wastewater Market Trends**
- **Pre-Treatment Solutions**
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 - **Primary Treatment**
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- **Summary & Questions**

Industrial Wastewater Background

United States EPA National Pretreatment Program

- Standards to ensure goals of the Clean Water Act are attained.
 - General Prohibitions
 - Interference and Pass Through
 - Specific Prohibitions
 - Fire Hazard
 - Structural Damage (corrosive, etc.)
 - Heat
 - Petroleum
 - Categorical Pretreatment Standards
 - Technology Based National Standard
 - Technically Based Local Limits
 - Technology Based Local Standards



Permit Compliance vs. Sustainability

- **Minimum Treatment Requirements**
 - Industrial Discharge Permit Limits
 - Permitted Discharges and Surcharges
- **Environmental, Social, and Governance Criteria (ESG)**
 - Managing risks and opportunities around sustainability

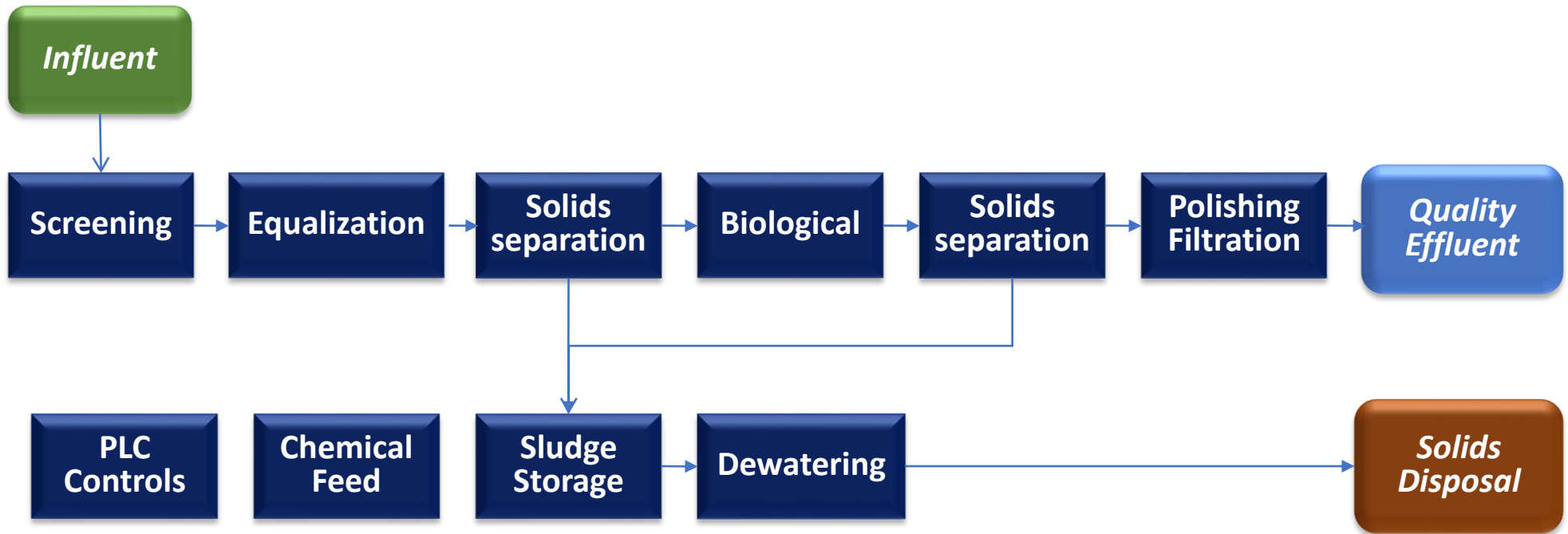


Current Industrial Market Trends

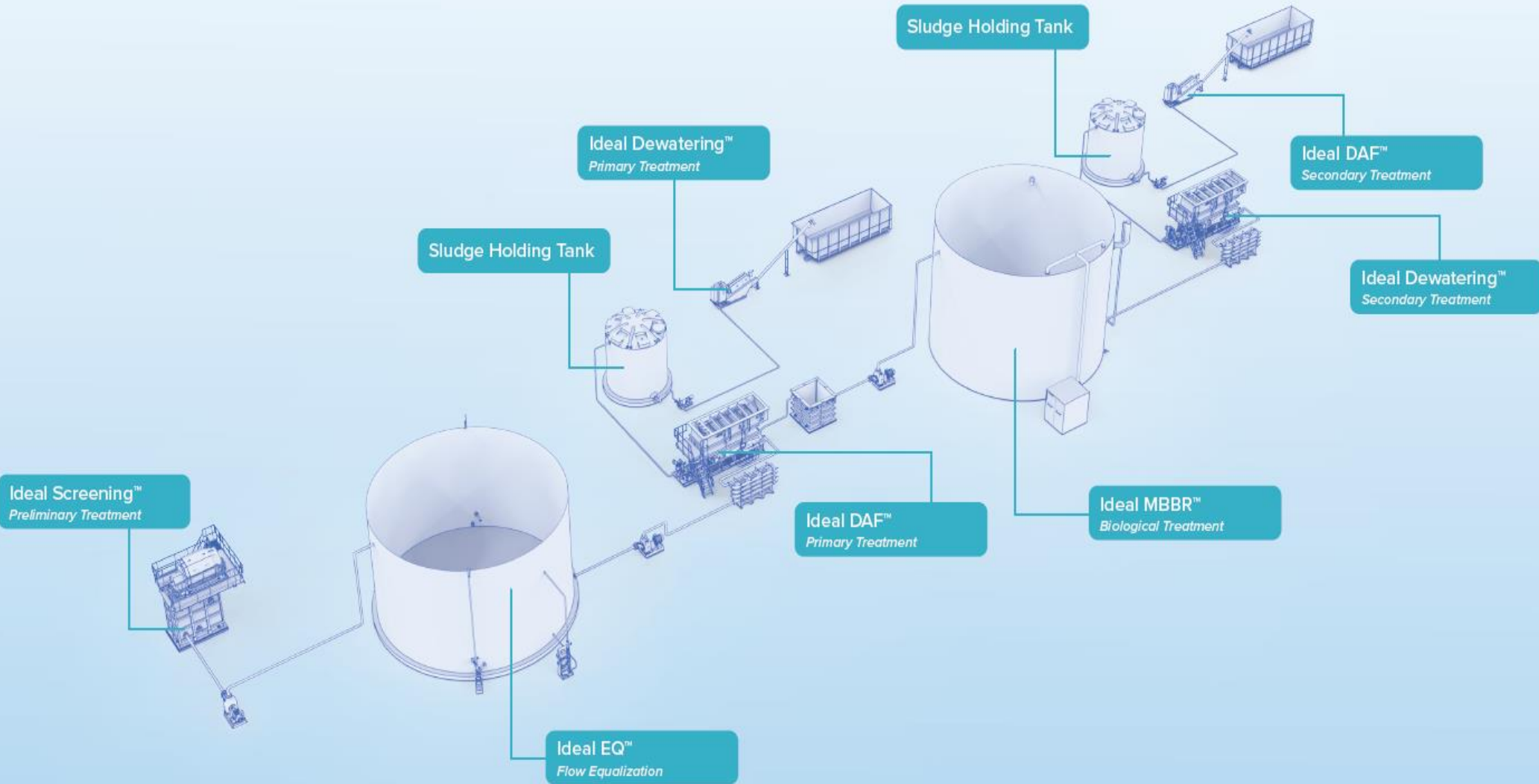
- **Water Reuse**
 - **US EPA Water Reuse Action Plan (WRAP)**
 - Educate Industrial and Municipal Organizations on water re-use and its benefits
 - **Sustainability**
 - ESG Ratings
 - **Wastewater to Beer**
 - Stone Brewing: Full Circle IPA
 - Village Brewery: Village Blond Ale
 - New Carnegie Brewery: PU:REST
- **Zero Liquid Discharge**
 - Social and Economic Impacts



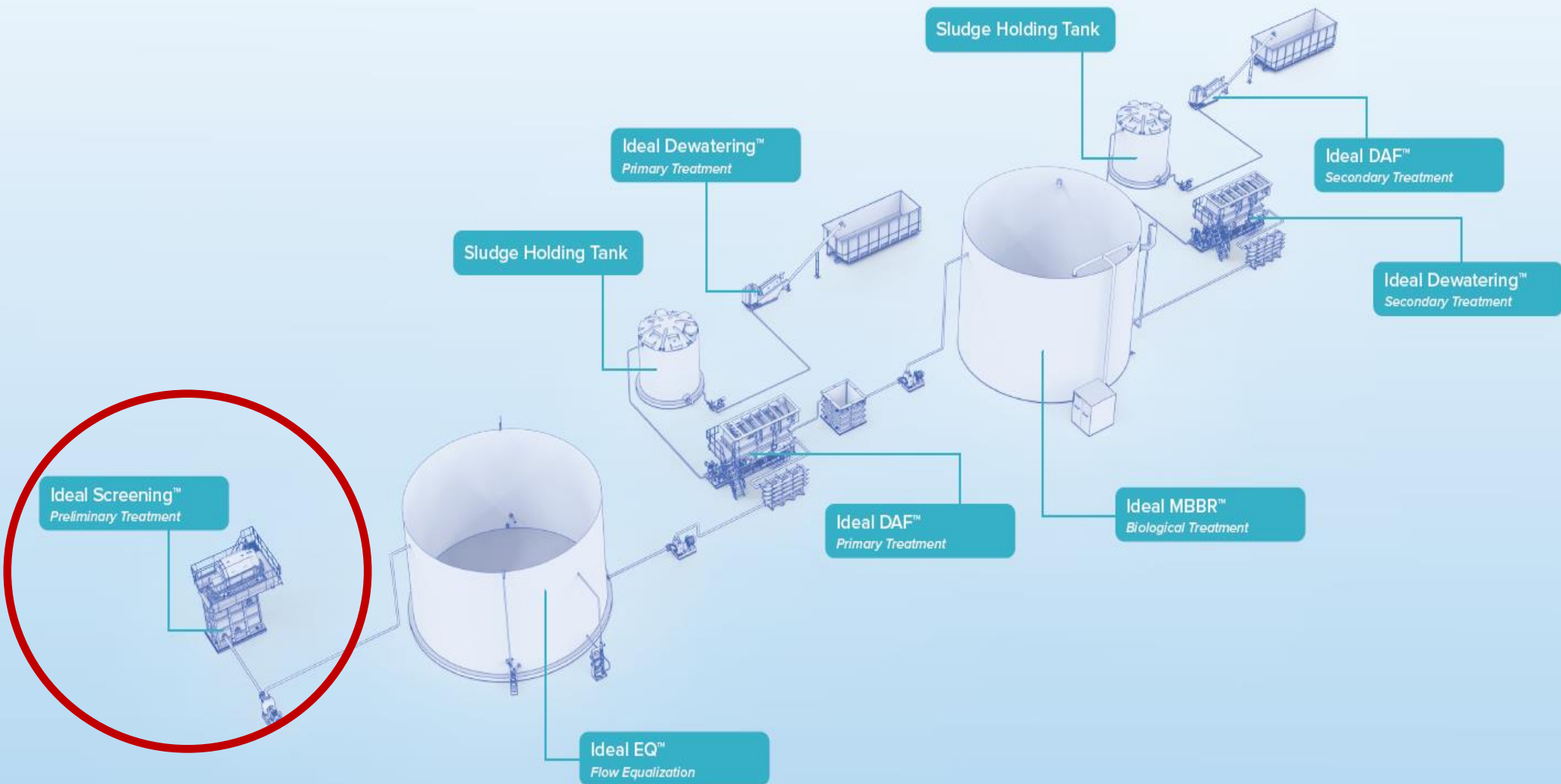
Industrial WWTP Integrated Solution



Industrial Wastewater Treatment System



Pre-Screening



Pre-Screening - Purpose

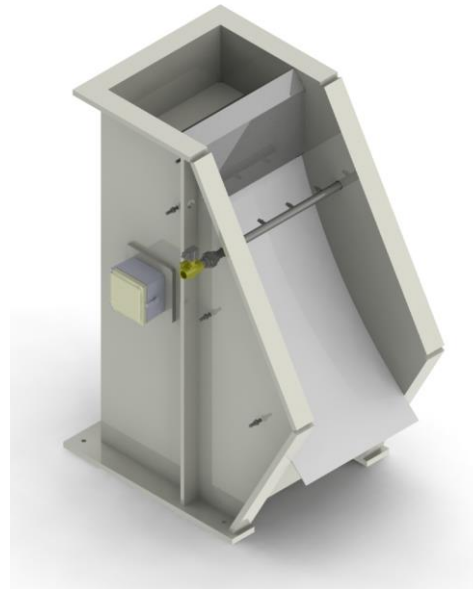
- Debris and large solids removal
- Protects downstream equipment – pumps, pipes, tanks, etc.
- Reduced maintenance and downtime
- Reduces chemical use
- Prolongs life of pumps and valves
- Most efficient removal of large solids early in process



Pre-Screening – Basket Strainers, Bag Filters & Sidehills

Screens to be selected based on application and location

- Point source
- Manual cleaning
- Loading
- Solids, fog's

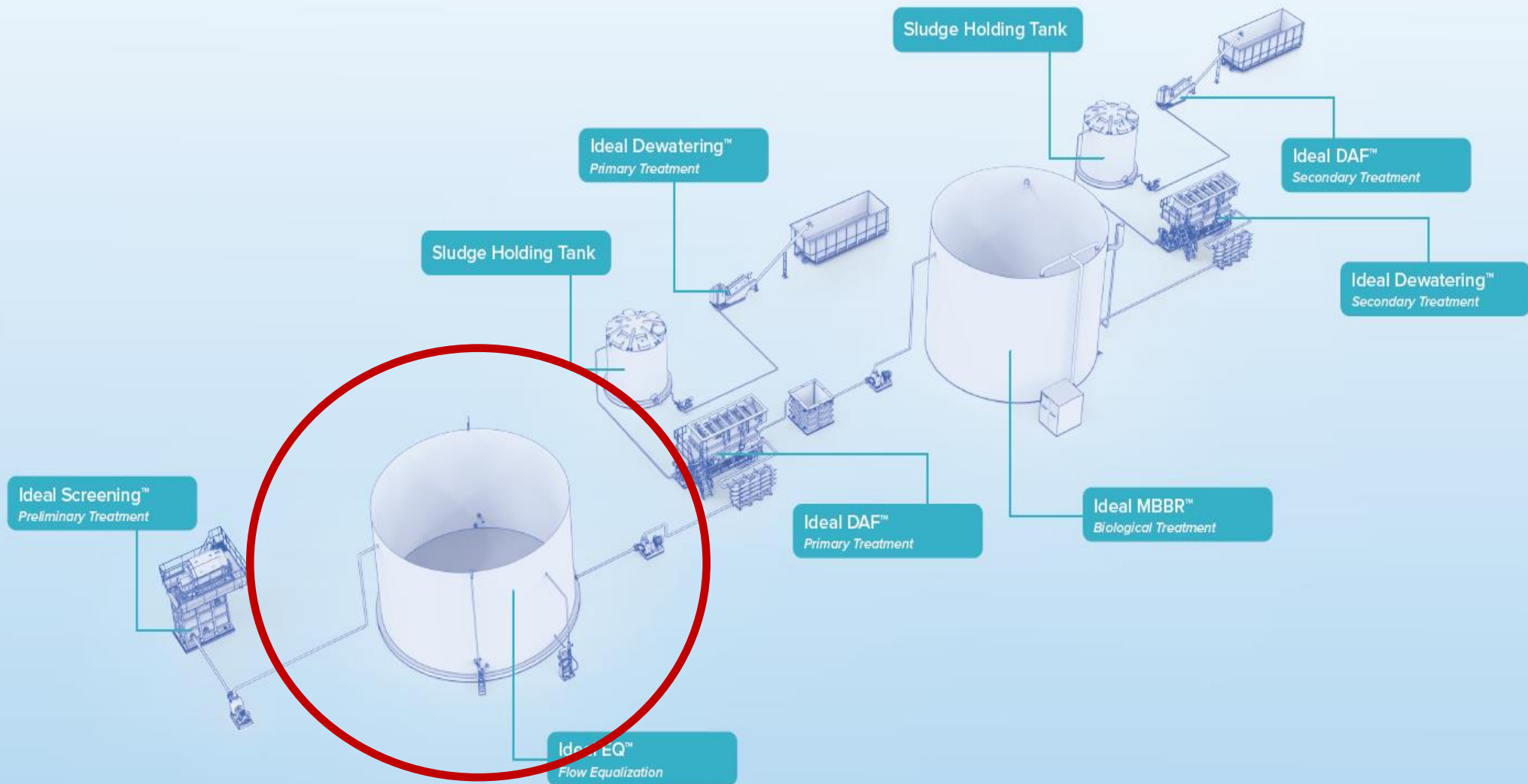


Pre-Screening – Rotary Screens

- Full flow
- Moderate to high FOG and TSS
- Simple operation, flexible
- Moderate maintenance
- Automatic cleaning
- Requires hot water
- Difficult to blind



Equalization



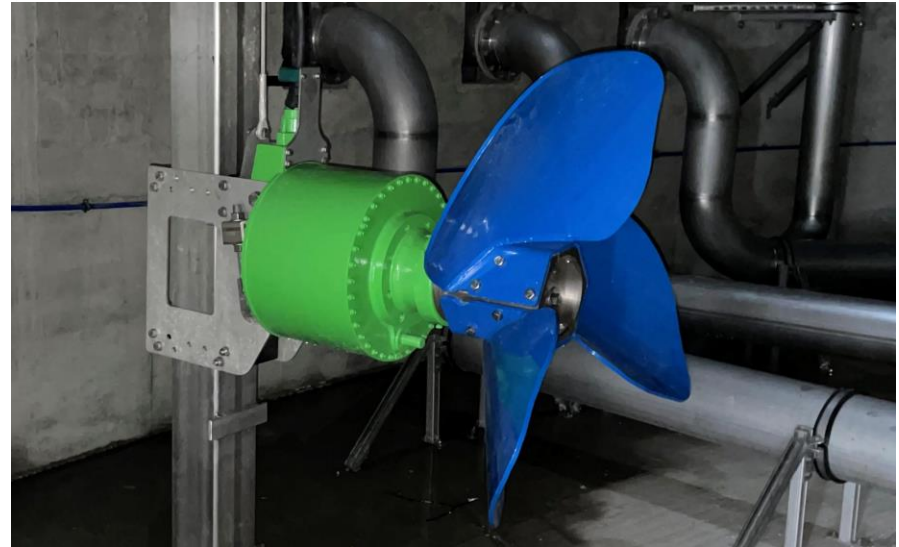
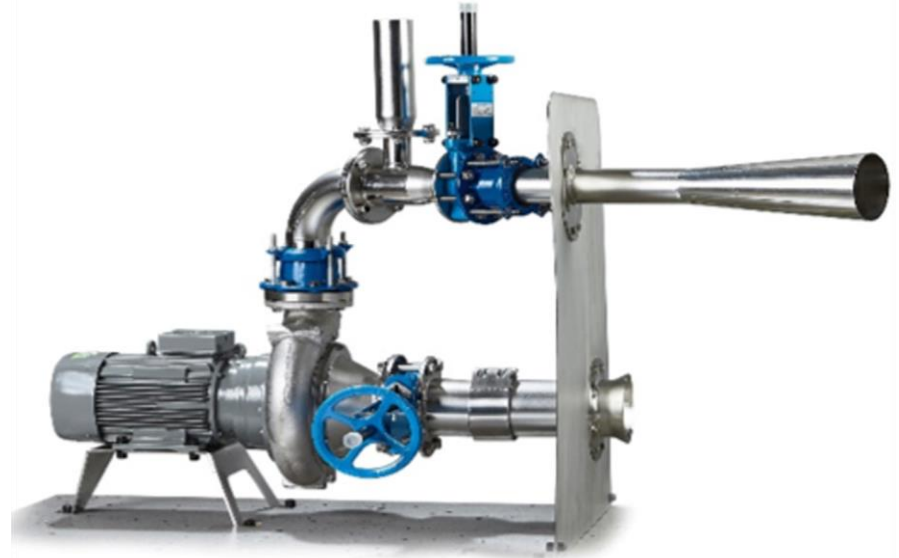
Equalization - Purpose

- Homogenization of streams
- Consistent and predictable flow and load
- Absorbs slugs and surges
- Reduces size and cost of downstream processes
- Self-buffering of pH
- Reduce chemical costs
- Insurance policy
- Provides preventative maintenance without downtime

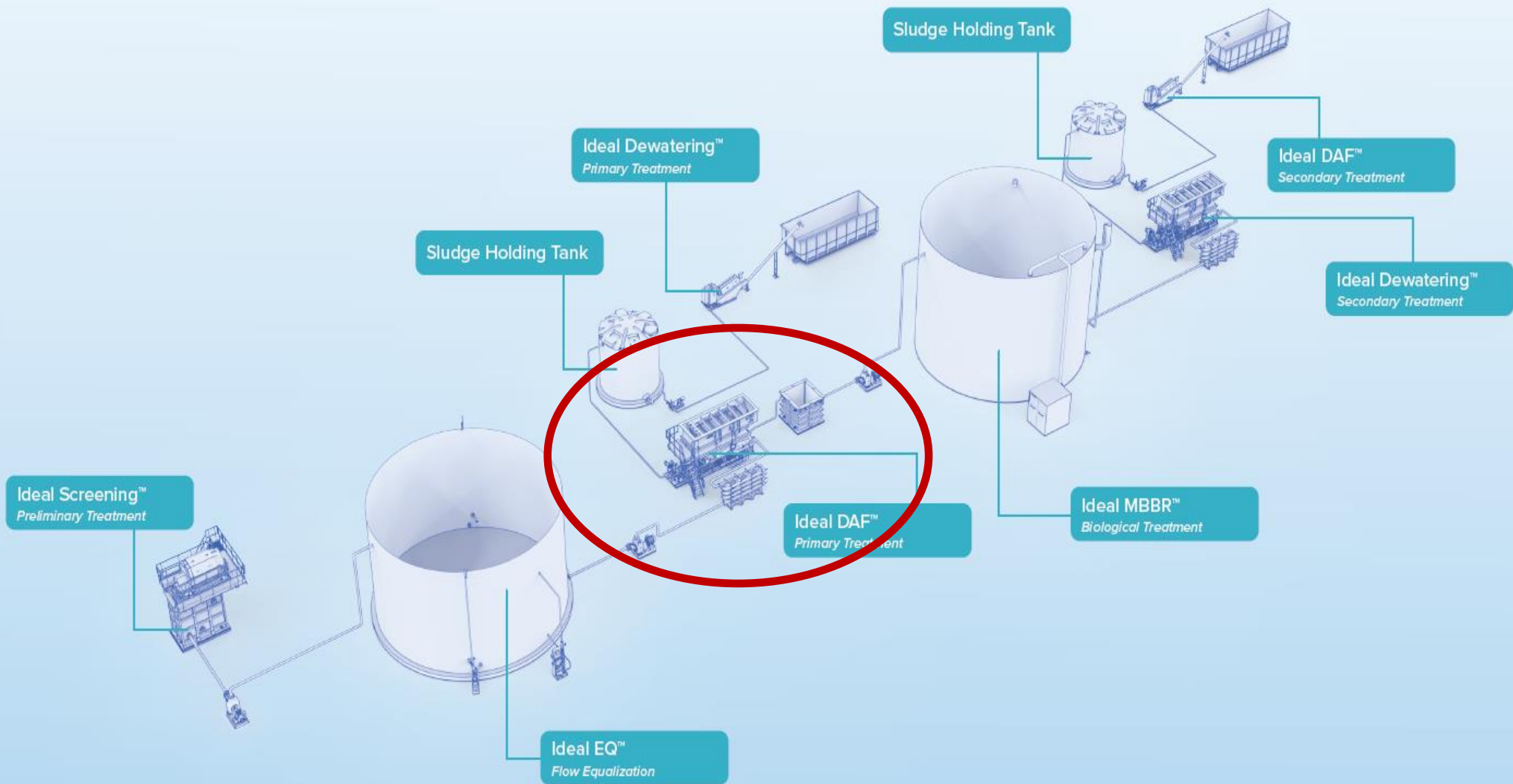


Equalization - Components

- **Tank**
 - 8-24 hours HRT
 - Various MOC
- **Mixing**
 - Mechanical
 - Course bubble aeration
 - Jet mixing – with or without air
- **pH Control**
 - Recirculation on tank
 - In-pipe

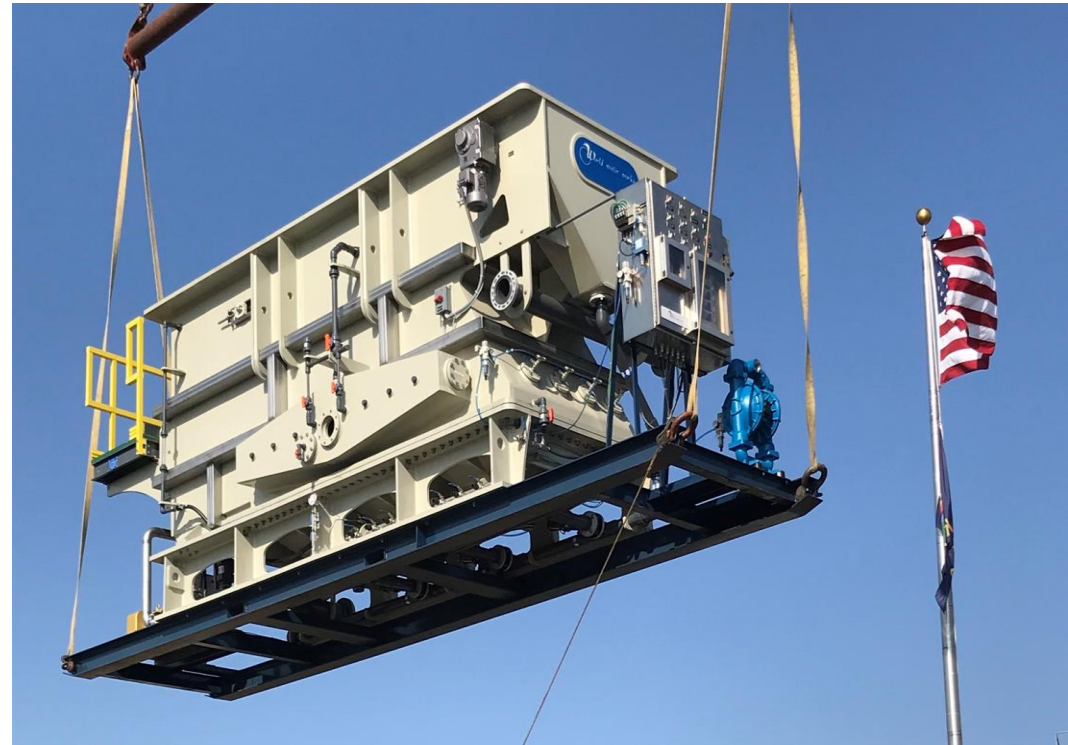


Primary Treatment



Primary Treatment

- TSS, FOG, insoluble BOD/COD, organic N, TP, metals
- Reduces downstream secondary treatment sizing and cost (if needed)
- DAF or clarifier
- With or without chemical



Primary Treatment - DAF

Dissolved Air Flotation

- Dissolves microbubbles in stream to float containments
- Most common industrially
- Wide application range
- Simple to operate
- Most TSS applications
- Fog
- 3-7% solids content
- Small footprint
- Energy requirement
- More moving parts



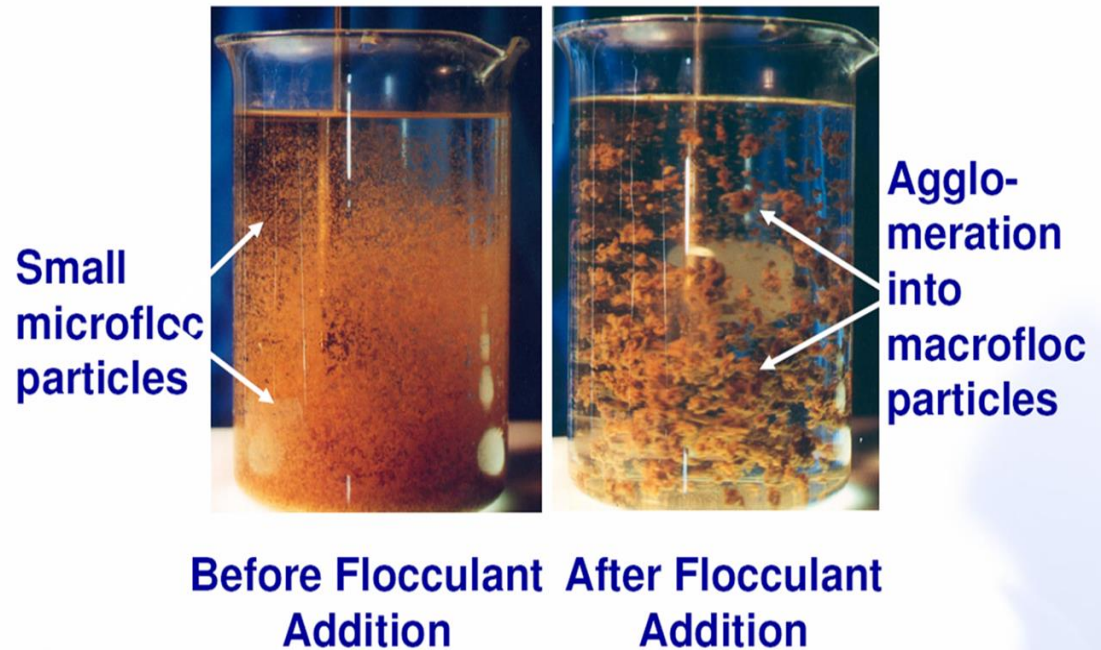
Primary Treatment - Clarifier

- Provides HRT to allow solids to settle
- Traditional or lamella
- May skim floating FOG and scum
- Most common municipal
- Wide application range
- Simple to operate
- Heavy TSS applications
- Not good for FOG
- 0.5-2% solids content
- Large footprint
- Low energy
- Minimal moving parts

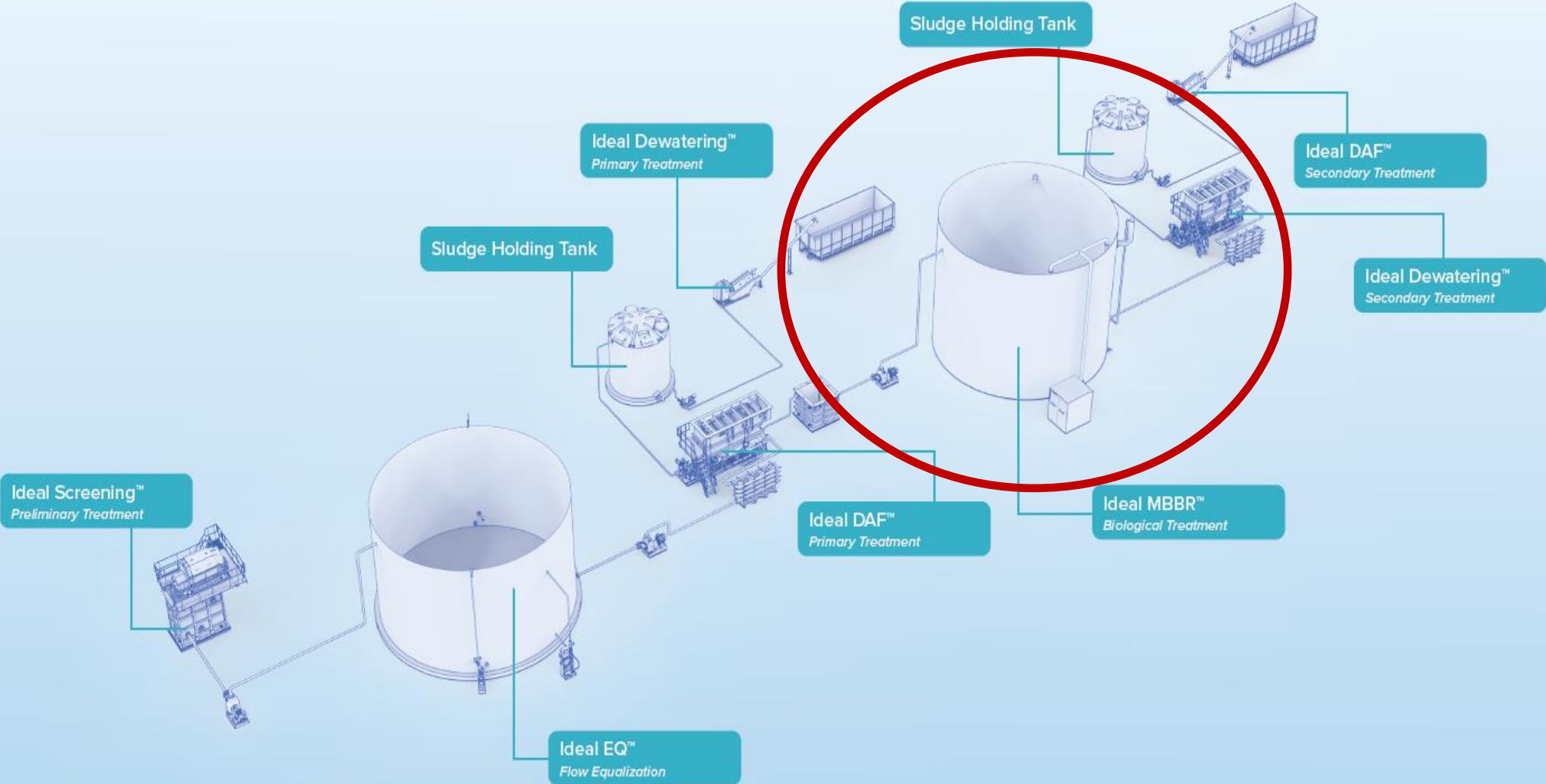


Primary Treatment – Chemical Conditioning

- Improve efficiency
- Crack emulsified O&G
- Metals precipitation
- Colloidal and small particles
- Coagulants used to form pin flocs and precipitate
- Flocculants are used to bind pin floc
- Coagulants and flocculants have pH target ranges



Secondary Treatment - Biological



Secondary Treatment - Biological

- “Bugs” / bacteria
- Controlled environment
- Aerobic or anaerobic
- Several technologies to consider
- Soluble BOD/COD
- Ammonia
- Total nitrogen
- Ortho-phosphorus



Secondary Treatment - Biological

Aerobic

- <10,000 mg/L BOD
- Utilizes aerobic biology to reduce BOD, TKN, TN, TP, etc.
- Several technology options
- Typically requires primary treatment
- Pretreatment or full treatment
- Various levels of operational complexity and maintenance
- Generates sludge
- Requires high energy

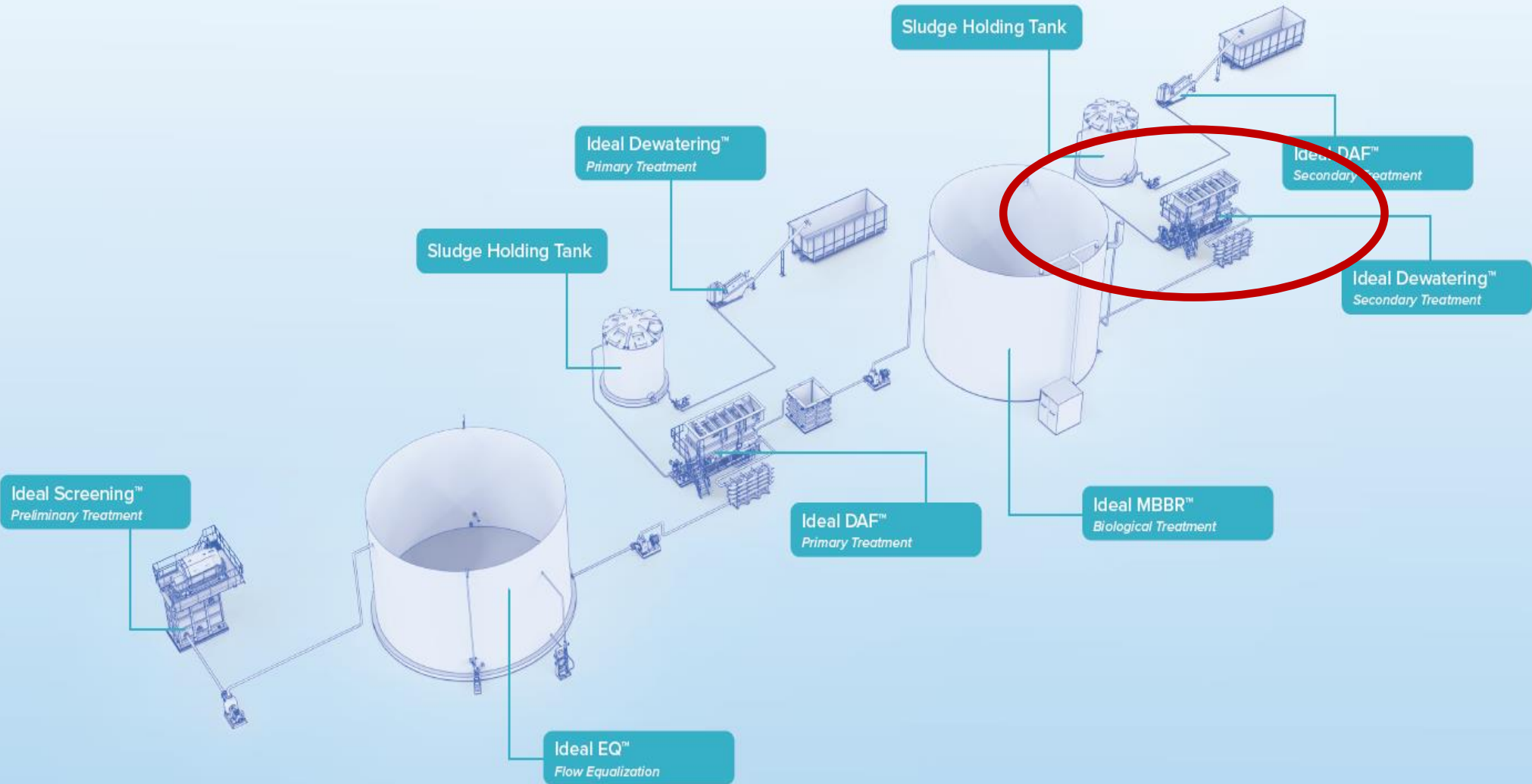
Anaerobic

- >7,000 mg/L BOD
- Utilizes anaerobic biology to reduce BOD, TKN, TN, TP, etc.
- Several technology options
- May or may not need primary treatment
- Up to 90% BOD reduction
- May require aerobic polishing
- More challenging operation
- Generates less sludge
- Minimal energy requirement
- May generate energy
- High CAPEX (Xproof and flare)

Secondary Treatment – Aerobic Technology

	Moving Bed Biofilm Reactor (MBBR)	Traditional Activated Sludge	Membrane Bioreactor (MBR)	Trickling Filter	Sequence Batch Reactor (SBR)
<u>PERFORMANCE</u>					
Handling Overload Situations	★★★★★	★★	★★	★★★★★	★★★★
Temporary Load Limitation	★★★★★	★★	★	★★★★★	★★
Rate of Recovery from Upset	★★★★★	★★	★★★	★★★★★	★★
Effluent Consistency	★★★★★	★★★★	★★★★★★	★	★★
Sludge Hauling	★★★	★★★★	★★★	★★★	★★★★
Odor Potential	Low	Med	Med	Very High	High
<u>FINANCIAL</u>					
Footprint	Small	Large	Small	Med	Large
Capital Cost	\$\$\$	\$\$	\$\$\$\$\$	\$	\$\$
Operational Cost	\$\$\$	\$\$	\$\$\$\$\$	\$	\$\$
Expandability	★★★★★	★★	★★★	★	★★
Ease of Operation	★★★★★	★★	★	★★★★★	★★
Chemical Consumption	Med	Med	High	Low	Med

Secondary Clarification

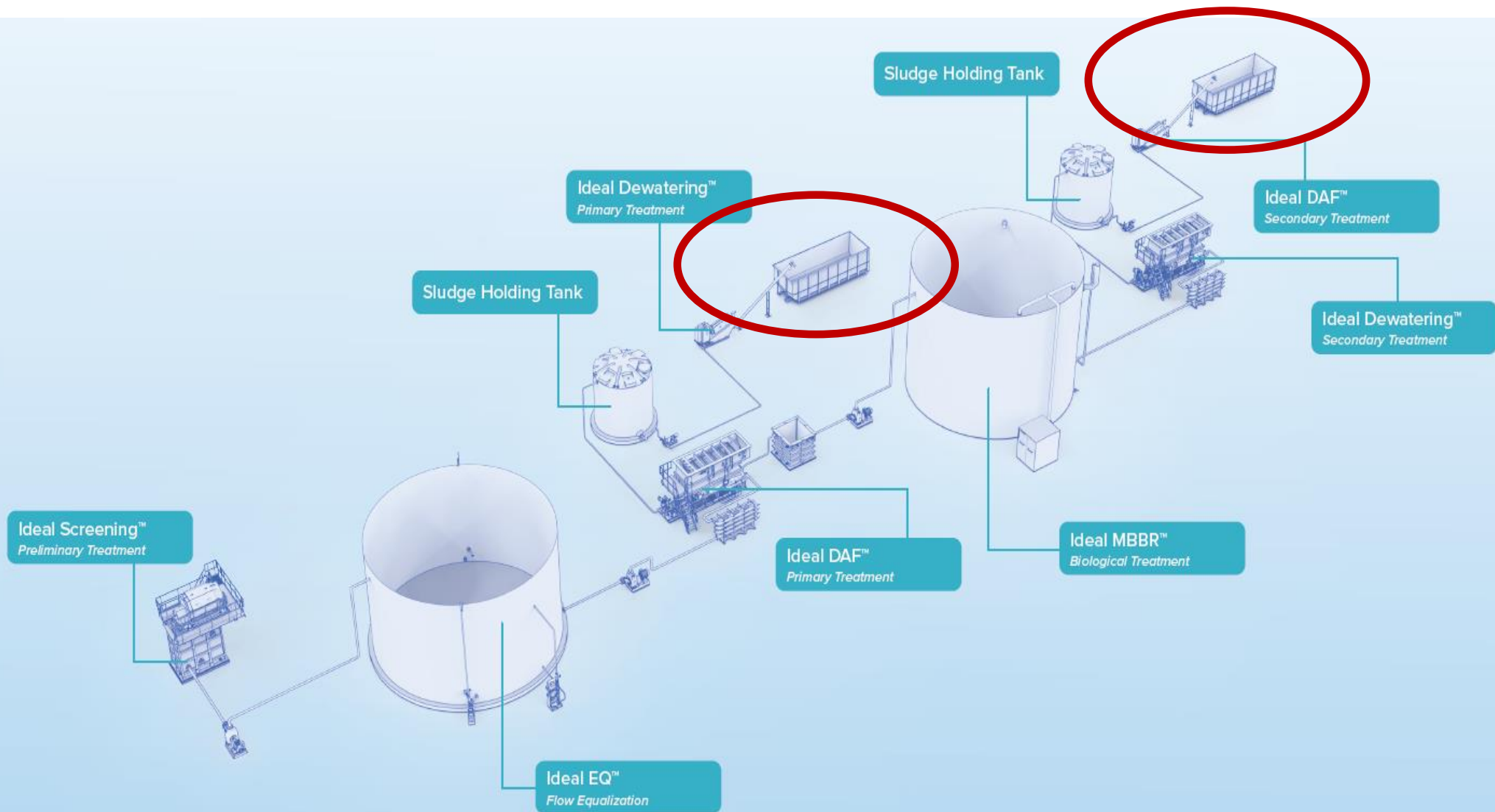


Secondary Clarification

- DAF, clarifier, UF, filters
- Depends on biological technology



Dewatering

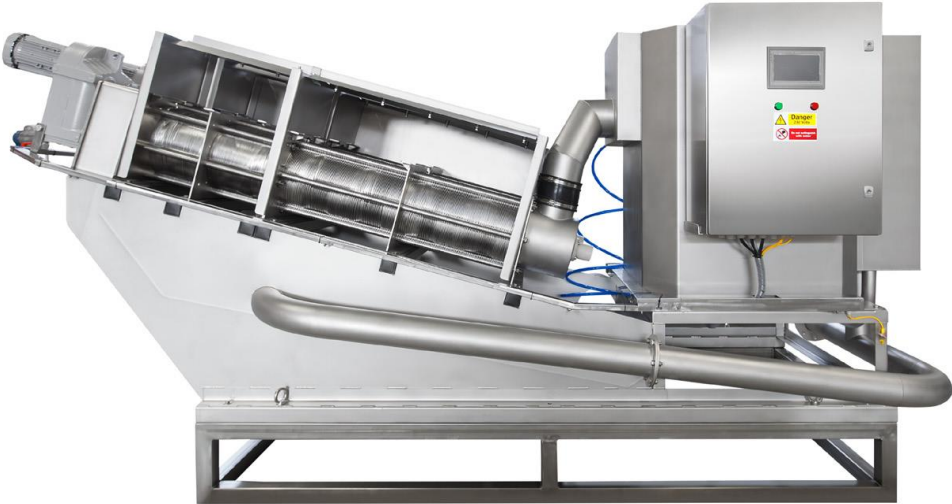


Dewatering - Purpose

- Reduce sludge disposal volume
- Reduce hauling costs
- Reduce disposal costs
- More disposal options available
- ROI



Dewatering — Screw Press, Belt Press, Centrifuge and Plate and Frame Press





THANK YOU

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