



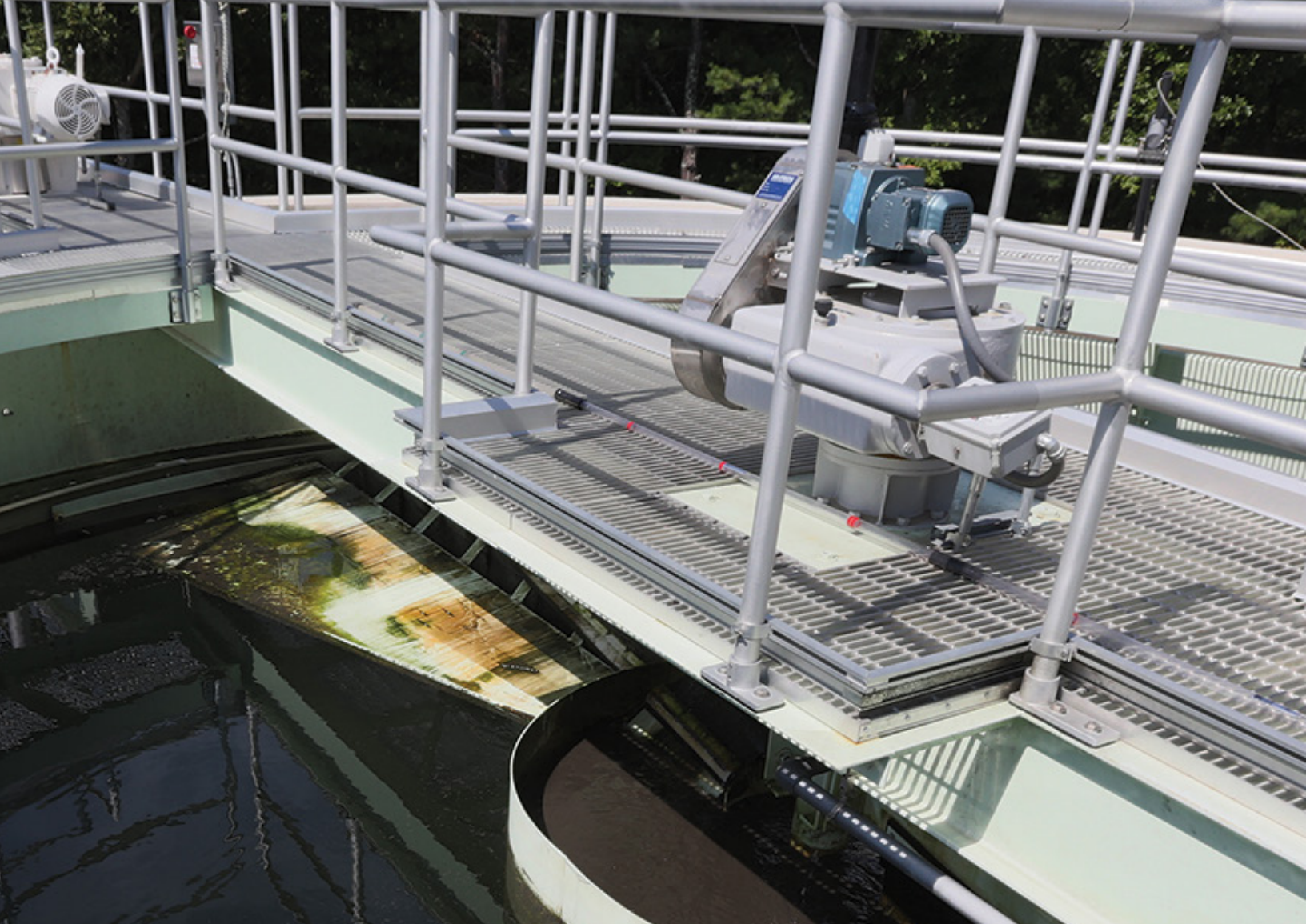
**eVOQUA**  
WATER TECHNOLOGIES



MAGNETITE-BALLASTED CLARIFICATION ENABLES THIS 18-FT DIAM. CLARIFIER TO HANDLE 2.3 MGD. DENSE FLOC SETTLES IMMEDIATELY BENEATH THE CENTER WELL, RATHER THAN DISSIPATING THROUGHOUT THE CLARIFIER.

## **THE BIOMAG<sup>®</sup> SYSTEM FOR ENHANCED SECONDARY TREATMENT**

**THE WORLD'S FASTEST PROVEN CLARIFICATION TECHNOLOGY  
FOR BIOLOGICAL FLOC**



## ABOUT EVOQUA WATER TECHNOLOGIES

For more than a century, Evoqua Water Technologies has helped consulting engineers and municipalities clean and purify the world's most precious resource — our water. We excel in disinfection, membrane treatment, high-rate clarification, biological processes, low energy biosolids solutions, odor control and seamless controls across process equipment. Our Wallace & Tiernan®, MEMCOR®, Envirex®, Jet Tech and DAVCO™ brands are well established. And our experts, experience, technologies, integrated approach and services make us a reliable source for the municipal water and wastewater treatment needs of today and tomorrow.

# THE BIOMAG<sup>®</sup> SYSTEM — MAXIMUM PERFORMANCE AND UP TO TRIPLE THE CAPACITY

The BioMag<sup>®</sup> system uses magnetite — fully inert iron ore particles — to enhance the clarification process. The system uses the world's fastest proven settling clarification technology for biological floc — allowing capacity expansion and performance improvement with minimal plant modifications at the lowest cost possible. In fact, it consistently achieves a sludge volume index (SVI) of less than 50!

## Key benefits of the BioMag system:

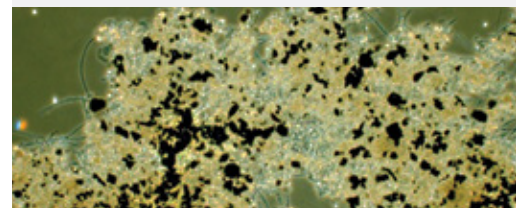
- **Simplicity and reliability**  
Ballasting biological floc with magnetite increases secondary settling rates while providing reliable control over the depth of secondary sludge blankets to minimize the risk of upsets.
- **Up to 300% increase in capacity**  
Rapid and reliable settling enables a 2 – 3x increase in mixed liquor suspended solids (MLSS) concentrations and an equivalent increase in treatment capacity all within existing bioreactors and clarifiers.
- **Enhanced nutrient removal (ENR) at lower costs**  
Increased capacity and superior solids removal enable existing activated sludge systems to free up reactor capacity for multi-stage treatment processes, thereby enabling the removal of nitrogen to  $\leq 3.0$  mg/L and phosphorus to  $\leq 0.2$  mg/L.
- **Stormflow management**  
Because the system enables secondary clarifiers to operate at higher hydraulic and solids loads than conventional alternatives, the system provides safeguards during stormwater events to keep biological solids within the treatment system.
- **Fast, cost-effective retrofits**  
Because the system is compatible with any type of activated sludge process and virtually all tankage and clarifiers, significant cost savings are achieved by reusing existing infrastructure.

## Magnetite: The little compound that pulls a lot of weight.

Magnetite is a readily available, fully inert form of iron ore ( $\text{Fe}_3\text{O}_4$ ), and the ballast that powers the BioMag system.

## Benefits of Magnetite:

- **Extends equipment service life**  
Less abrasive and 75% smaller than sand particles
- **Hydrophobic**  
Shuns water and naturally bonds with chemical floc and biological solids
- **Dense**  
Specific gravity of 5.2 means increased floc density, faster settling and higher surface overflow rates (SOR) and solids loading rates (SLR)
- **Fully oxidized and insoluble**  
Will not rust, degrade or easily dissolve like some ballasting agents
- **Inexpensive**  
A readily available commodity that helps keep operational costs low
- **Reusable**  
Attracted to magnets, not components, allowing for easy recovery and reuse



MLSS BALLASTED WITH MAGNETITE



AN INNOVATIVE RECOVERY DRUM  
RECYCLES THE MAGNETITE



BIOREACTOR TANK

## INSIDE MAGNETITE BALLASTED TECHNOLOGY

### A. THE BIOREACTOR:

Ballasting the floc to increase capacity and reduce costs

The BioMag® system enhances the performance of nearly all activated sludge configurations and technologies. The first step is the addition of magnetite to the bioreactor. From various storage systems, magnetite is blended into a side stream of MLSS, fed directly into the bioreactor, gently mixed and fully infused in the biological floc.

With the resulting increase in the specific gravity of the floc:

- Biological solids settle faster and more reliably.
- MLSS concentration can be increased up to 3x without the risk of upset
- Clarifier SLR can be increased up to 4x
- Operators gain more control over sludge blankets (especially for stormflows)
- Tankage capacity is freed up for nutrient removal

The increased density can be employed to process greater loads, or flows or both — all within the existing bioreactor tanks, for substantially reduced costs.

### B. THE CLARIFIER:

Where the BioMag® system settles a conventional problem

Clarifiers are the bottleneck of every water and wastewater treatment plant. But magnetite ballasted floc from the BioMag® system eliminates bottlenecks, enabling:

- Rapid settling and short hydraulic retention times (HRT)
- 2 – 3x SOR and up to 4x SLR
- Low and stable sludge blankets with reduced risk of solids loss
- The ability to manage wide swings in loads and flows
- High contaminant removal

### C. RECOVERY AND REUSE

A sustainable process for lower OPEX

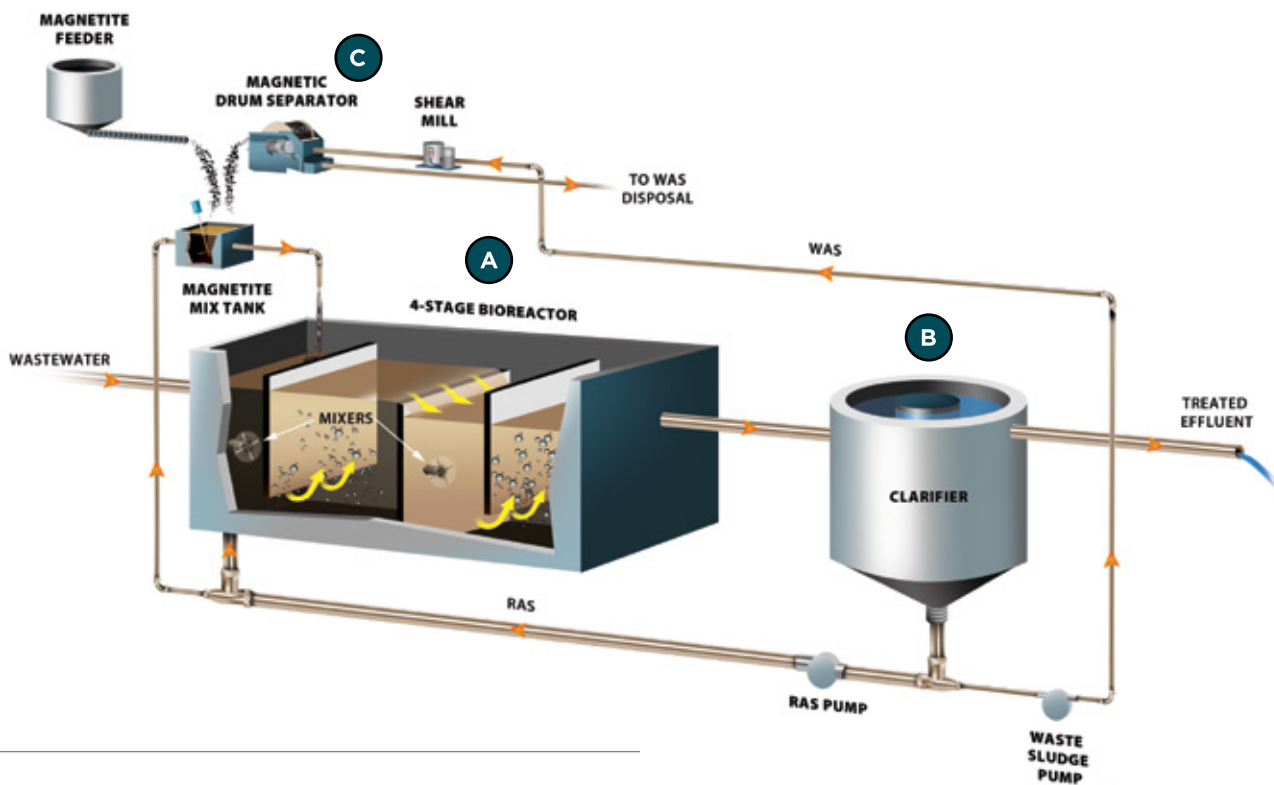
In addition to enabling rapid and reliable settling, the BioMag® system offers the cost-effective ability to continuously recycle and reuse magnetite. Here's how it works:

- Sludge moves from the clarifier via a waste activated sludge (WAS) line to an in-line high-speed shear mill where magnetite is liberated from biological floc.
- The resulting two-part slurry is then passed under a magnetic recovery drum.
- Permanent and stationary magnets inside the drum help capture 95+% of the magnetite, then release it back into the system.
- Sheared sludge, minus magnetite, then flows to a gravity thickener where it thickens to 3 – 6% solids.

## PRACTICAL USES FOR THE BIOMAG® SYSTEM

Municipal and industrial wastewater treatment facilities rely on the proven technology of the BioMag® system to:

- Enable capacity increases up to 300% without new tankage
- Manage wet weather flows without bypassing the biological process
- Free up existing tankage to meet tougher ENR standards
- Manage high organic industrial waste
- Enable the conversion of single-stage bioreactors to higher performing multi-stage systems
- Find a cost effective alternative to MBR, MBBR, IFAS technologies and conventional clarifier expansion solutions



THE BIOMAG® SYSTEM AS PART OF A TRADITIONAL SECONDARY TREATMENT CONFIGURATION

## SOLID PROOF. THE DEMONSTRATED PERFORMANCE OF THE BIOMAG® SYSTEM.



EFFLUENT TURBIDITY READING FOR SECONDARY CLARIFIER USING THE BIOMAG SYSTEM AT STURBRIDGE, MA

The BioMag® system can double if not triple a plant's existing biological treatment capacity and achieve enhanced nutrient removal limits — all within existing tankage — and has been proven at multiple industrial and municipal facilities to deliver the following results:

- $BOD_5 \leq 5.0$  mg/L
- $TSS \leq 5.0$  mg/L
- $NH_3-N \leq 0.2$  mg/L
- $TP \leq 0.2$  mg/L
- $TN \leq 3.0$  mg/L
- $SVI \leq 50$  mL/gram
- Clarifier SLR up to 100 lb/day-ft<sup>2</sup> (20 kg/m<sup>2</sup>-hr)
- Clarifier SOR up to 2,500 gpd/ft<sup>2</sup> (254.5 m/hr)
- MLSS up to 10,000 mg/L
- MLVSS up to 8,000 mg/L



**EMBRACE GRAVITY. DEFY CONVENTION.**

Learn more about how the BioMag® system harnesses the force of gravity to eliminate clarifier bottlenecks and enhance the performance of primary and tertiary treatment.

Visit [www.evoqua.com/biomag](http://www.evoqua.com/biomag) to access settling videos, case studies, recorded webinars and FAQ's.



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