



**evoqua**  
WATER TECHNOLOGIES



2.2 MGD TERTIARY  
CLARIFIER USING THE  
COMAG SYSTEM

## **THE COMAG<sup>®</sup> SYSTEM FOR ENHANCED PRIMARY AND TERTIARY TREATMENT**

**SETTLES FLOC UP TO 30 TIMES FASTER THAN CONVENTIONAL  
TREATMENTS WHILE EXTENDING EQUIPMENT SERVICE LIFE**



## 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 COMAG® SYSTEM — ENHANCED CLARIFICATION THAT EXTENDS EQUIPMENT SERVICE LIFE

The CoMag® system uses magnetite — fully inert iron ore particles — to settle chemical floc up to 30 times faster than conventional treatments. Primarily used to improve primary and/or tertiary treatment, the CoMag system easily integrates with planned or existing facilities, making it easier than ever to solve today's operational and environmental challenges.

### Key benefits of the CoMag system:

- **Extends equipment service life**  
Recovers and continuously reuses magnetite ballast (up to 99%), which is less abrasive and 75% smaller than sand particles.
- **Superior contaminant removal**  
Total suspended solids (TSS), total phosphorus (TP), turbidity, color, pathogens and metals can be reduced to levels far below conventional treatment.
- **Low costs**  
High-rate, ballasted clarification allows for smaller reaction and solids separation tanks, minimal power consumption and moderate chemical use.
- **Improved productivity**  
The system minimizes the risk of upsets and handles a wide range of flows and loads — including peak flow events — with no backwashing, plugging or fouling, no media filters required and almost no effect on contaminant removal performance or operational stability.
- **Ultraviolet enabling**  
The high transmissivity of the system effluent reduces energy and operating costs of final purification.
- **Stormflow management**  
During storms, the system can go online in less than 15 minutes to handle hydraulic surges. Once the rain event subsides, the system can go offline or serve as a tertiary treatment unit during dry weather.
- **Fast, cost-effective retrofits**  
Because the system is compatible with virtually all types of 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 CoMag 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



THE COMAG SYSTEM'S MAGNETITE BALLAST EXTENDS EQUIPMENT SERVICE LIFE. THIS IMPELLER PUMP HAS BEEN OPERATING CONTINUOUSLY WITH THE COMAG SYSTEM FOR MORE THAN A DECADE WITHOUT ANY SIGNS OF ABRASION.



MAGNETITE  
RECOVERY DRUM

## INSIDE MAGNETITE BALLASTED TECHNOLOGY

### A. THE REACTION TANK:

#### Familiar process with one simple change

With the CoMag® system, the traditional process of flocculation, coagulation and clarification remain the same. The benefits result from the simple infusion of magnetite.

Inside the reaction tank:

- Alum, ferric or poly-aluminum chloride (PAC) is added to the influent
- The resultant chemical floc is infused with magnetite, quickly increasing solids density through simple mixing
- The magnetite ballasted floc then travels to a conventional clarifier

### B. THE CLARIFIER:

#### Where the proof is clear

The high-density, magnetite ballasted floc that flows into a conventional clarifier settles rapidly and reliably, resulting in remarkably clear effluent. It also allows for a much smaller clarifier, substantially reducing capital costs in new facilities or expansions and providing a particularly effective solution for sites with a tight footprint.

The enhanced settling capabilities of the CoMag system can help plant operators:

- Increase SOR up to 10x
- Increase SLR up to 20x
- Achieve turbidity < 1 NTU
- Expand or build new with 1/10<sup>th</sup> of the traditional clarifier footprint
- TP < 0.05 mg/L

In addition to high-rate clarification, the CoMag system employs a sludge recycle function to increase system performance and the clarity of its effluent. Approximately 85% of clarifier underflow is recirculated into the system's reaction tanks. The resulting high-density slurry allows the application to easily manage upsets and variations in the influent flow stream and sweep up any fine particulate remaining in the system.

### C. RECOVERY AND REUSE:

#### A sustainable process for lower OPEX

In addition to the low capital expense associated with installation, the CoMag system offers the cost-effective ability to continuously recover and reuse 99+% of the injected magnetite.

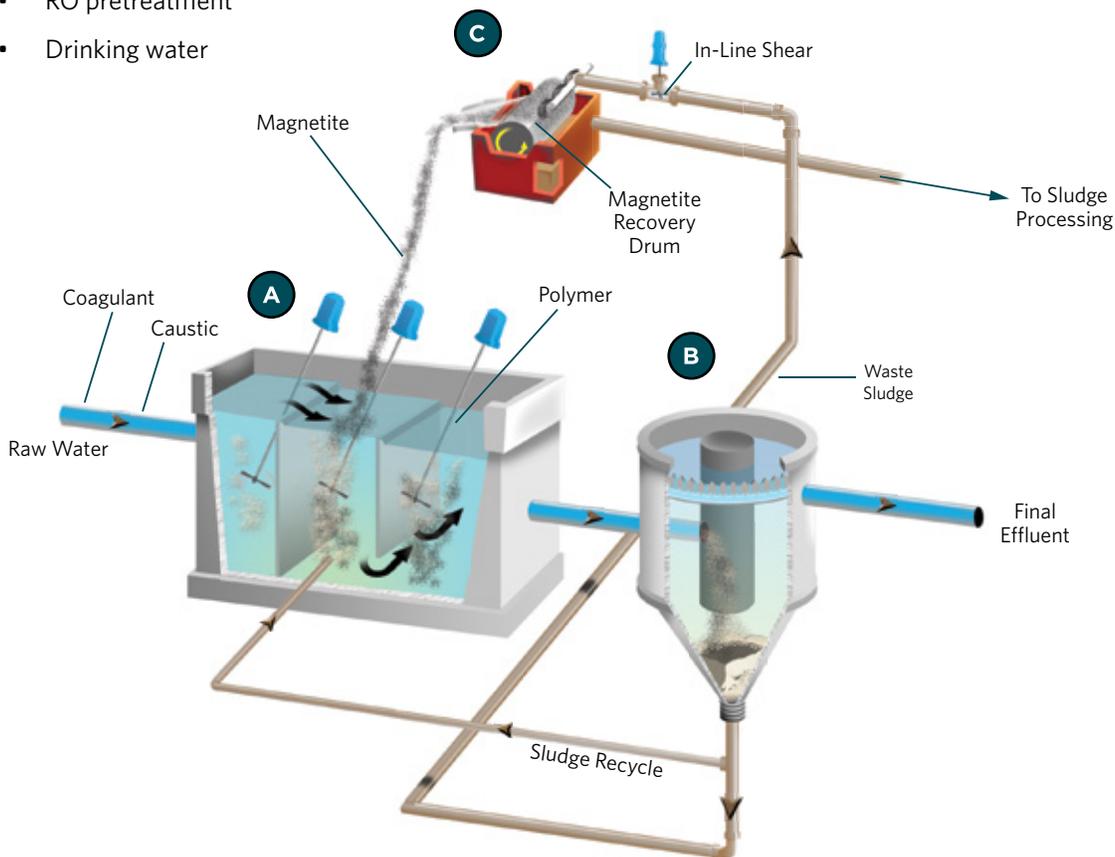
Here's how it works:

- Sludge moves from the clarifier via a waste sludge line to an inline high-speed shear mixer where magnetite is liberated from floc
- The resulting two-part slurry is then passed under a magnetic recovery drum
- Permanent and stationary magnets inside the drum help to capture 99+% of the magnetite and deposit it back in the system
- Sheared sludge, minus the magnetite, then flows to sludge disposal

## PRACTICAL USES FOR THE COMAG® SYSTEM

The CoMag® system competes effectively with all forms of media and membrane filtration and conventional clarification for multiple applications, including:

- Primary treatment (chemically enhanced)
- Stormwater/CSO (combined sewer overflow)/wet weather control
- Tertiary treatment for polishing secondary effluent
- Ultra-low nutrient removal
- Recycle-reuse
- RO pretreatment
- Drinking water



## THE HARD NUMBERS. EFFLUENT PERFORMANCE OF THE COMAG® SYSTEM.



MAGNETITE REACTION TANKS IN FOREGROUND AND  
RECOVERY DRUMS IN BACKGROUND

The CoMag® system can produce effluent quality far superior to conventional alternatives, at lower life-cycle costs, and has been proven at multiple municipal and industrial facilities to deliver the following results:

- TP < 0.05 mg/L
- TSS < 2.0 mg/L
- Color 2 Pt-Co Units
- Turbidity < 1 NTU
- Fecal Coliform < 200 Col/100 mL
- Copper  $\leq$  8  $\mu$ g/L
- Aluminum  $\leq$  80  $\mu$ g/L
- Arsenic < 5  $\mu$ g/L
- UV Transmittance > 75%
- Oil and Grease Removal



**EMBRACE GRAVITY. DEFY CONVENTION.**

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

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

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.



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