



## THE BIOMAG® SYSTEM AND THE COMAG® SYSTEM

# STURBRIDGE, MASSACHUSETTS POTW

Greater capacity for high flow events, with enhanced clarification for new regulations

### THE BIOMAG® SYSTEM AND COMAG® SYSTEM WERE SELECTED AS A COST-EFFECTIVE ALTERNATIVE TO AN MBR.

#### A Plant Approaching Critical Capacity

Sturbridge, Massachusetts historically suffered from periodic blooms of filamentous bacteria that caused bulking in the secondary clarifiers of their three activated sludge package plants. The elevated clarifier solids loading rates (SLR) during high flow events often caused excessive sand filter backwash cycle times and occasional diversion of excess flow to a neighboring publicly owned treatment works (POTW). Sturbridge's need for additional treatment capacity in a highly constricted footprint, coupled with tighter permit limits for BOD, TSS, total nitrogen (TN) and phosphorus (TP), created the need to upgrade the wastewater treatment plant.

#### Innovative Technology Creates a More Cost-Effective Solution

Initially, Sturbridge considered installing a membrane bioreactor (MBR) system to achieve the required limits on contaminant removal and deliver the additional capacity needed without expanding the footprint of the plant.

After examining the capital and operating costs of the MBR solution, Sturbridge investigated and ultimately chose to run a pilot of the innovative BioMag® System from Evoqua that uses magnetite ballasted technology to enhance settling rates and increase performance. The trial, on one of its three activated sludge trains, was designed to measure results based on three main objectives. First, was to demonstrate that the BioMag System was a cost effective alternative to MBR. Second, was to identify whether converting the activated sludge system to the BioMag System could increase overall plant capacity from 0.75 MGD to 1.6 MGD without adding additional bioreactor or clarifier tanks. Finally, the pilot would determine whether the increased efficiency of the BioMag System would enable the plant to meet all permit limits, achieving < 10 mg/L TN and < 0.2 mg/L TP. The BioMag System exceeded all expectations.

#### Industry

##### Municipal Wastewater

#### Business Challenges

- Increase operational capacity
- Control periodic filamentous bacterial blooms
- Comply with new environmental regulations

#### Keys to Success

- Identify the most cost-effective biological treatment technology
- Integrate a tertiary treatment process to meet tighter permit limits
- Maintain existing plant footprint

#### Results

- Expanded existing capacity from 0.75 MGD (2.84 MLD) to 1.6 MGD (6.06 MLD)
- Substantially reduced effluent concentrations
- Total solution implemented within existing space at less cost than an MBR

#### KEY ADVANTAGES

##### BioMag® System

- Eliminates clarifier bottlenecks and improves secondary effluent quality.
- Increases activated sludge capacity 3 times without new tanks
- TN < 3.0 mg/L and TP < 0.2 mg/L

##### CoMag® System

- Superior solids removal in much less space
- TP < 0.05 mg/L
- Turbidity below 1 NTU

Both systems increase process reliability and redundancy

## The BioMag® System Overview

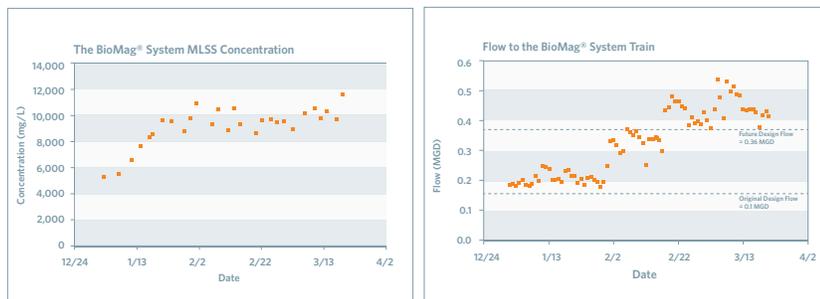
Simple, reliable and proven, the BioMag® System is an optimal solution for activated sludge plants requiring increased treatment capacity or enhanced nutrient removal capability. The BioMag System infuses magnetite as a weighting agent into biological floc, resulting in rapid and reliable settling. With a specific gravity of 5.2 and a strong affinity for biological solids, magnetite substantially increases the settling rate of biological floc and increases mixed liquor suspended solids (MLSS) concentration. Higher MLSS concentration enables the treatment of increased hydraulic flows or surges and loadings, all within the same tankage.

This means the BioMag System can be cost effectively applied to both new or existing treatment plants to achieve much more concentrated suspended solids, a more dense and stable sludge blanket, reduced vulnerability to load and flow variations, and superior nutrient and solids removal.

## Improving Tertiary Treatment with the CoMag® System

Concerned by the expected tightening of phosphorus limits coupled with a desire to have a reliable tertiary treatment process to follow the BioMag System, Sturbridge initially focused on expanding its conventional media filtration system. But a demonstration by Evoqua engineers proved that the CoMag System can produce effluent quality far superior to conventional alternatives and at lower life-cycle costs. Further, after comparing costs to an expanded sand filter, the advantages of the CoMag System with its smaller footprint, no loss of productivity to clogging, plugging or backwashing, and a process guarantee of < 0.05 mg/L of effluent phosphorus made the long-term choice for Sturbridge self-evident.

The full trial period for the BioMag System and the CoMag System in Sturbridge ran from November 2007 through May 2008. The high performance process was since commissioned and has been fully operational since Fall 2011.



BioMag® system start-up data shows a rapid increase in MLSS concentration enables a substantial increase in biological system capacity.

## SOLUTIONS/SERVICES

### The CoMag® System

### The BioMag® System

[www.evoqua.com/comag](http://www.evoqua.com/comag)

### Customer's Primary Business

The town of Sturbridge POTW serves more than 9,000 residents and local businesses.

[www.town.sturbridge.ma.us](http://www.town.sturbridge.ma.us)

### Customer Location

Sturbridge, Massachusetts

## FULL SCALE PERFORMANCE RESULTS

MLSS	> 10,000 mg/L
Clarifier Solids Loading	> 90 lbs/day-ft <sup>2</sup>
SVL	< 40 mL/g
BOD <sub>5</sub>	< 2 mg/L
TSS	< 5 mg/L
NH <sub>3</sub> -N	ND
Total Nitrogen	< 5 mg/L
Total Phosphorus	< 0.1 mg/L
Ortho Phosphate	< 0.05 mg/L
Turbidity	< 0.5 NTU



BioMag® system increased plant capacity from 0.75 to 1.6 MGD without adding additional bioreactor or clarifier tanks.



210 Sixth Avenue, Suite 3300, Pittsburgh, PA 15222

+1 (866) 926-8420 (toll-free) +1 (978) 614-7233 (toll)

[www.evoqua.com](http://www.evoqua.com)

BioMag and CoMag are trademarks of Evoqua, its subsidiaries or affiliates, in some countries.

All information presented herein is believed reliable and in accordance with accepted engineering practices. Evoqua makes no warranties as to the completeness of this information. Users are responsible for evaluating individual product suitability for specific applications. Evoqua assumes no liability whatsoever for any special, indirect or consequential damages arising from the sale, resale or misuse of its products.

© 2017 Evoqua Water Technologies LLC Subject to change without notice BC-STURBRIDGE-CS-0717