



AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

SUCCESS STORIES

PLANT NAME AND LOCATION

CAMBRIDGE/OAKLAND WASTEWATER COMMISSION WWTF – CAMBRIDGE, WI

DESIGN DAILY FLOW / PEAK FLOW

0.644 MGD (2434.3 M³/DAY) / 0.805 MGD (3,043 M³/DAY)

AQUA-AEROBIC SOLUTION

AQUA TRUDENSE™ TRUE DENSIFIED SEQUENCING BATCH REACTOR



Aqua TruDense™ Provides Additional Capacity, Improves Settling and Achieves Enhanced Nutrient Removal

Cambridge, Wisconsin, is a small village located in south-central Wisconsin, approximately 50 miles west of Milwaukee and 20 miles east of Madison. The Cambridge Wastewater Treatment Facility (WWTF) is situated on the north side of the village and discharges treated effluent to Koshkonong Creek.



Aqua TruDense™ Reactor at Cambridge, WI

Constructed in 2005, the facility is designed to provide advanced biological treatment and includes a rotary fine screen and grit removal, followed by two (2) AquaSBR® sequencing batch reactors, effluent equalization, and ultraviolet (UV) disinfection.

The wastewater treatment plant primarily receives flow from residential sources, with a smaller proportion originating from industry and commercial businesses. This commercial input introduces variability in the influent characteristics, contributing to fluctuations in organic and nutrient loading. Overall, the influent is classified as medium-strength when benchmarked against typical residential wastewater standards.

In 2024, Aqua-Aerobic Systems proposed to the commission the possibility of supporting a densified sludge full scale study, to evaluate process intensification by achieving densification of the activated sludge. With agreement from the board, one of the two SBR reactors was retrofitted into an Aqua TruDense Densified SBR reactor. The retrofit allowed for effective selective feeding, efficient selective surface wasting of the lighter sludge, and a modified cycle structure.

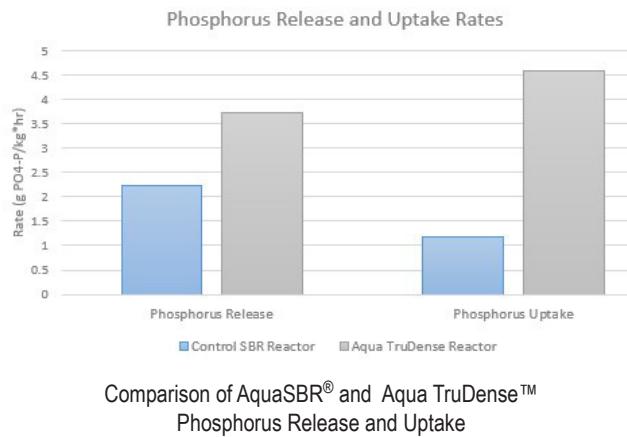
Aqua TruDense™ SYSTEM PROCESS

Densified sludge is an advanced treatment intensification process that promotes the formation of a broader spectrum of sludge particle sizes. This diversity in particle size distribution enhances biomass stability and settling characteristics, offering improved performance over conventional activated sludge systems. The Aqua TruDense system exemplifies this approach by integrating the advantages of a true batch Sequencing Batch Reactor (SBR) with the benefits of densified sludge technology. It enables faster settling rates and supports elevated Mixed Liquor Suspended Solids (MLSS) concentrations, thereby delivering high-efficiency treatment within a significantly reduced footprint compared to traditional activated flocculent sludge systems.

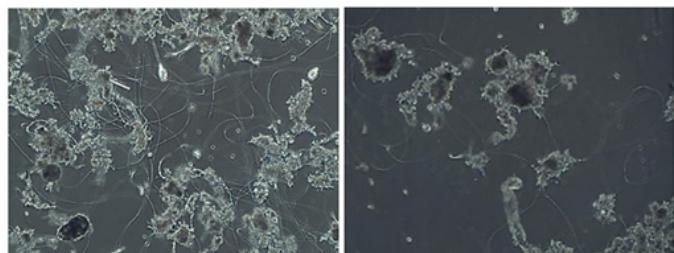
DESIGN & OPERATION

A comprehensive series of tests was conducted to validate both the formation and operational performance of densified sludge. Key parameters evaluated included sludge settling velocity, particle size distribution, and nutrient removal kinetics. To evaluate the potential for increased treatment capacity, influent flow was strategically divided with 45% directed to the conventional SBR and 55% to the Aqua TruDense basin, effectively representing a 20% increase in system throughput compared to the SBR reactor.

The current plant operation shows improved settling over time, even under influent loading fluctuation. It also demonstrates process intensification with enhanced nutrient removal, showing lower levels of effluent total nitrogen and total phosphorus compared to the SBR system. Furthermore, a significant increase of phosphorus release and uptake was observed.



In addition, the Aqua TruDense reactor's mixed liquor suspended solids comprised larger and denser flocs compared to the more dispersed flocculant sludge found in the control reactor.



Dispersed floc in AquaSBR® (left) compared to larger, denser floc in Aqua TruDense™ (right)

Aqua TruDense™ ADVANTAGES AT CAMBRIDGE

The following advantages were observed with the Aqua TruDense reactor at Cambridge:

- Improve settling even during great influent loading variation
- Higher content of particles larger than 200 micron
- Significant increase of phosphorus release and uptake
- Improvement of total nitrogen and phosphorus removal
- Increased capacity compared to the SBR system

AVERAGE OPERATING DATA, JULY 2025

Loading	Current Influent	Design Influent	Combined Effluent	Aqua TruDense™	AquaSBR®
Avg. Flow (MGD)	0.38	0.644	--	0.21*	0.17
BOD ₅ (mg/L)	195	186	3.0	--	--
TSS (mg/L)	213	186	2.7	--	--
TN (mg/L)	41	27	3.45	3.1	3.8
TP (mg/L)	4.5	6.1	0.5	0.2**	0.86**

*20% higher flow entering the Aqua TruDense™ reactor

**Significantly lower Total Phosphorus (TP) out of the Aqua TruDense™ Reactor without chemical addition

