



AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

SUCCESS STORIES

PLANT NAME AND LOCATION

CLEAR LAKE SANITARY DISTRICT - CLEAR LAKE, IA

DESIGN DAILY FLOW / PEAK FLOW

5.7 MGD (21,577 M³/DAY) / 8.2 MGD (31,041 M³/DAY)

AQUA-AEROBIC SOLUTION

FOUR-BASIN AquaSBR[®] SYSTEM, 3 AquaDisk[®] FILTERS (6-DISK)

CLEAR LAKE IS THE FIRST IN IOWA TO PROVIDE REUSE WATER FOR A POWER PLANT!

Clear Lake Sanitary District (CLSD) was originally built in the early 1950s and utilized a trickling filter system. By 1988, the treatment needs of the growing population and increasing storm flow discharges required the plant to be upgraded. In order to meet more stringent requirements defined by the NPDES permitting authority, the plant underwent a major renovation. The \$23 million project began in 1995 and was implemented in several phases over the course of six years. Renovation included construction of new pumping systems, a new secondary treatment system, and a new 5 million-gallon storm flow equalization basin along with renovations of eight lift stations. The trickling filter system was retrofitted with a 4-basin AquaSBR[®] system in 1997 to meet secondary treatment process needs. The remaining renovations were completed by 2001.

Aware of the treatment plant's upgrade, Alliant Energy contacted CLSD in 2002 to propose a partnership, asking CLSD to supply treated wastewater to a nearby, newly constructed power generation plant for reuse purposes to meet its cooling water demand. Alliant and CLSD signed a 25-year agreement. This was the first water reuse application of its kind in Iowa. In order to meet the new reuse guidelines that accompanied the agreement, CLSD added tertiary treatment processes for filtration and disinfection of the effluent before discharging to the power plant. Alliant paid for this supplemental upgrade, which included a 150,000 gallon post secondary equalization basin, a new Tertiary Treatment Building that houses (3) 6-disk AquaDisk[®] cloth media filters and an ultraviolet disinfection system. The cloth media filters have an average design capacity of 3.0 MGD and can easily handle a maximum hydraulic flow of over 9.0 MGD with all three filters during storm flow conditions.



Aerial view of Clear Lake showing four AquaSBR[®] basins.

Once the power plant receives the treated effluent, it further disinfects it using chlorination and blends the effluent with groundwater to a ratio of 60% groundwater and 40% effluent before using it as cooling water. The "evaporate", or 20% of water that remains after the cooling water process, is returned to CLSD for discharge. An inline probe monitors the chlorine concentration of the returned cooling water to determine if dechlorination is needed. CLSD's effluent is blended with the return cooling water prior to discharge due to a high concentration of dissolved solids in the evaporate. The blended effluent is discharged to Beaver Dam Creek and eventually to Cedar River.

CLSD has provided reuse water to the power plant since December of 2003. Alliant's power plant has access to up to 19.2% of CLSD's dry weather hydraulic treatment capacity, which is 5.7 MGD/day.

Kevin Moler, Plant Superintendent, says "I'm proud of the plant's accomplishments and am happy to provide onsite tours to visitors".

AquaSBR® SYSTEM PROCESS

The AquaSBR system operates on a simple concept of introducing a quantity of waste to a reactor, treating the waste in an adequate time period, and subsequently discharging a volume of effluent plus waste sludge that is equal to the original volume of waste introduced to the reactor. This “Fill and Draw” principle of operation involves the basic steps of Fill, React, Settle, Decant, and Sludge Waste. The system may be designed to include seven individual phases of operation but the inclusion or duration of any individual phase is based upon specific waste characteristics and effluent objectives.

Where nutrient removal is required, a simple adjustment to the SBR’s operating strategies permits nitrification, denitrification, and biological phosphorus removal.

AquaDisk® FILTER PROCESS

Clarified effluent from the AquaSBR system enters the filter and flows by gravity through the cloth media of the stationary hollow disks. The filtrate exits through the hollow shaft which supports the individual disks and flows to the effluent channel. As solids accumulate on the surface of the media, the water level surrounding the disks rises. Once a predetermined level is reached, the disks rotate and the media surface is automatically vacuum backwashed clean. Heavier solids settle to the bottom of the tank and are then pumped to a digester or to the plant headworks.



AquaDisk® filters reside inside Tertiary Treatment Building.

DESIGN CHARACTERISTICS

The 4-basin AquaSBR system was retrofitted into the plant’s existing trickling filter system with a design average daily flow of 5.7 MGD. While the current average flow is approximately 2 MGD, the AquaSBR system is designed to handle a daily peak hydraulic flow of 8.2 MGD without the need for treatment cycle modifications, which is essential during the area’s busy tourist season. Two of the AquaDisk filters are utilized on a daily basis for an average daily flow capacity of 3.0 MGD and all three filters can easily handle a daily peak hydraulic flow of 9.0 MGD. The AquaSBR system and AquaDisk filters allow CLSD to meet stringent TSS and BOD requirements for reuse, and address future requirements such as total nitrogen removal, without further expansion.

Although the plant is not required to meet a nitrate or total nitrogen limit, these values are still recorded in preparation for expected future permit additions. The current effluent values for nitrate are impressive, especially considering that winter basin temperatures often drop to 8° to 10° C (celcius).

AVERAGE OPERATING DATA (2005)

LOADING	DESIGN INFLUENT	AVG INFLUENT	DESIGN EFFLUENT	RECLAIMED EFFLUENT
AVG Flow mgd	5.7	1.9	----	----
Peak Flow mgd	8.2	5.8	----	----
CBOD ₅ mg/l	114	140	5*	2
TSS mg/l	128	186	5*	3
NH ₃ -N mg/l	14*	13.0	1.5 summer 2.0 winter	< 0.1
NO ₃ -N mg/l	----	----	----	< 1.0

AquaSBR® SYSTEM ADVANTAGES

- Tolerates variable hydraulic loads
- Tolerates variable organic loads
- Controls filamentous growth
- Provides quiescent settling
- Separation of aeration and mixing
- Lower installation costs
- Return activated sludge pumping eliminated
- Small footprint
- Simple to expand or upgrade
- One company accountability

AquaDisk® FILTER ADVANTAGES

- Consistent, high quality effluent
- Lower backwash rates
- Tolerates extreme variations in loads
- Reuse quality effluent
- Continuous filtration during backwash
- Minimal operator attention
- Minimal maintenance
- Small footprint
- Eliminates sand media and underdrains