Success Stories

Aqua-Aerobic Systems, Inc.

Plant Name/Location: Clear Lake Sanitary District/Clear Lake, IA

Type of Plant: Municipal/Industrial Reuse

Design Daily Flow: 5.7 MGD (21,577 m^3/day) **Peak Flow:** 8.2 MGD (31,041 m^3/day)

Aqua-Aerobic Products: Four-basin AquaSBR® System, (3) 6-disk AquaDisk® Filters

Clear Lake is First in Iowa to Provide Reuse Water for Power Plant!

Clear Lake Sanitary District (CLSD) was originally built in the early 1950s and utilized a trickling filter system. By 1988, it became evident that the treatment needs of the growing population and increasing storm flow discharges would require the plant to be upgraded. In order to meet the more stringent environmental requirements defined by the NPDES permitting authority, the plant chose to undergo a major renovation. This $23 million renovation 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 their secondary treatment process needs. The remaining renovations were completed by 2001.

Aerial view of Clear Lake showing four AquaSBR® basins.

Aware of the treatment plant's major upgrade, Alliant Energy contacted CLSD in 2002 to propose a partnership. Alliant asked 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 would be the first water reuse application of its kind in the state of Iowa. In order to meet the new reuse guidelines that accompanied the agreement, CLSD added tertiary treatment processes filtration and disinfection of the effluent before it could be discharged 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 (photo to the right) and an ultraviolet disinfection system. The cloth media filters have an average design capacity of 3.0 MGD with one filter out of service, but can easily handle a maximum hydraulic flow of over 9.0 MGD with all three filters during storm flow conditions.

Once the power plant receives the treated effluent from CLSD, it further disinfects it using chlorination and blends the effluent with groundwater to a ratio of 60% groundwater and 40% effluent before it is used 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 sodium bisulfite addition is needed for dechlorination. CLSD's effluent is then blended with the return cooling water prior to discharge due to the high concentration of dissolved solids in the evaporate. The blended effluent is discharged to Beaver Dam Creek and eventually to Cedar River.

CLSD has been providing 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".

From Pretreatment...To Reuse

PRODUCTS

Aeration

Mixing

Biological Processes

Cloth Media Filtration

Sand Media Filtration

Membranes

Controls

Aftermarket Sales & Service

CAPABILITIES

Research & Development and Engineering

Quality Manufacturing

Technical Training

Financing

International Expertise

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AquaSBR® System Process

The AquaSBR system operates on a simple concept of introducing a quantity of waste to a reactor, treating the waste in a pre-determined time period, and subsequently discharging a volume of clear effluent. This "Fill and Draw" principle of operation involves the basic steps of Fill, React, Settle, Decant, and Sludge Waste. Each system is designed to include these five primary phases of operation, with the duration of each individual phase based upon specific waste characteristics and effluent objectives.

Where nutrient removal is required, a simple adjustment to the SBR's operating strategy permits nitrification, denitrification, and biological phosphorus removal without the need for separate anaerobic or anoxic reactors.

AquaDisk® Filter Process

Clarified effluent from an activated sludge 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.

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 utilitzed 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 the 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^{o} to 10^{o} C (celcius).

2005 Average Operating Data

	Design Influent	Avg Influent	Design Effluent	Reclaimed Effluent
Avg Flow (mgd)	5.7	1.9	-----	-----
Max 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

* Reuse requirements for Alliant Energy cooling water.

AquaSBR® System Advantages:

- Accomodates variable hydraulic and organic loads
- Controls filamentous growth
- Provides quiescent settling
- Conserves energy via separation of aeration and mixing
- Capable of advanced nitrogen and phosphorus removal
- Low installation costs
- Eliminates return activated sludge pumping and secondary clarifiers
- Small footprint
- Simple to expand or upgrade
- One company accountability

Cloth Media Filter Advantages:

- Reuse quality effluent
- Low backwash rates
- Accomodates extreme variations in loads
- Continuous filtration during backwash
- Minimal operator attention
- Minimal maintenance
- Small footprint
- Eliminates sand media and underdrains