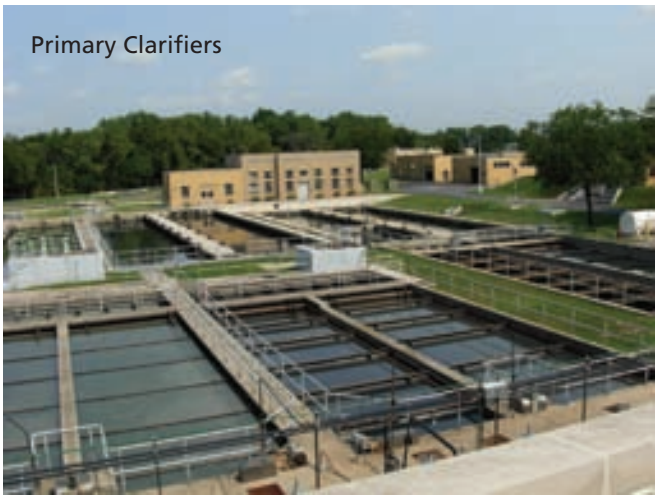
Thorn Creek Basin Sanitary District

By Jim Daugherty


Primary Clarifiers


Final Clarifiers

Established in 1928 to serve Chicago Heights, Illinois, the Thorn Creek Basin Sanitary District (TCB) has expanded to provide wastewater treatment services for six communities in the southern suburbs of Chicago. TCB has focused on constructing and operating wastewater treatment facilities and a regional trunk sewer system. Each of the six communities owns and operates the local collection system.

TCB's wastewater treatment plant is located in Chicago Heights. The receiving stream, Thorn Creek, extends 19.5 stream miles before discharging into the Little Calumet River. Historically flowing into Lake Michigan, the Little Calumet River is now diverted via the Cal-Sag Canal into the Illinois River waterway. Upstream of the district's outfall, the 7Q10 of Thorn Creek is 0.19 MGD. The stream volume available for mixing is less than 1:1.

The district's first wastewater treatment plant was constructed in 1933. It was an activated sludge plant, one of the first in Illinois. That plant has been expanded seven times and now has a dry weather flow capacity of 15.94 MGD. It provides treatment services for the district's entire service area containing 100,000 people.

The plant was expanded to achieve nitrification in 1978 by adding two-stage activated sludge. The plant is currently operating at 75% of rated capacity. To reduce the power demand and save operating labor, the first stage activated sludge units were removed from service in 1982. The facility is able to achieve complete nitrification using only the second stage. The design detention time of the second stage is 4.6 hours. At current average annual flow, detention time is just over five hours. Aeration basins are loaded at 25 lbs CBOD5/CCF.

The clarifiers used for the activated sludge system are peripheral feed clarifiers and produce an effluent low in SS. That effluent is further polished by shallow bed traveling bridge sand filters. Disinfection is practiced May through October using sodium hypochlorite. Sodium bisulfite is used for dechlorination. The system is automated using ORP monitors.

Discharge limits and plant performance are:

	NPDES LIMIT *	ANNUAL AVERAGE DISCHARGE
CBOD	10 mg/l	3.4 mg/l
SUSPENDED SOLIDS	12 mg/l	3.8 mg/l
AMMONIA - SUMMER	1.8 mg/l	0.25 mg/l
- WINTER	4.0 mg/l	0.35mg/l
FECAL COLIFORM -SUMMER	400 count /100 ml	60 count / 100 ml
CHLORINE	0.05 mg/l	0.02 mg/l

** Monthly average except chlorine, which is a daily limit.*

Solids processing consists of two-stage mesophilic digestion. The first stage is completely mixed and provides 15 days of detention time. The second stage is partially mixed. Digested biosolids are pumped to lagoons for thickening. After several years of thickening, the biosolids are removed with a dredge at 8-10% TS. Tank trucks are used to haul the biosolids to farm fields where application is via knife injection.

TCB was one of the first facilities to use computers to monitor plant operations. A SCADA system was placed in opera-

tion in 1978. A third generation SCADA system is now in use. The SCADA system improves plant control and performance and has led to a reduction in the work force.

In 1992, the district decided to replace its turbine aeration system with a more efficient fine bubble system. After pilot testing, the district decided to use fine bubble membrane disc aerators. Off-gas testing of the entire aeration system was conducted to determine the actual oxygen demand, the alpha factor, the spatial distribution of the oxygen demand. Alpha was found to increase in each of the three aeration passes. Following installation, the off-gas testing was repeated to verify the system design. The follow-up testing showed that the installed system closely matched oxygen demand in each pass and has proven useful in fine tuning operation of the system for optimum efficiency. The work was described in a paper presented at a CSWEA conference.

In 1995, TCB began receiving an industrial wastewater high in sodium sulfate. Since sodium sulfate is not removed in the treatment plant, the industrial discharge caused elevated levels of sulfate and total dissolved solids (TDS) in the plant effluent. TCB was able to show that elevated levels of TDS and sulfate would not have a negative impact on Thorn Creek. The Illinois Pollution Control Board granted an adjusted standard for Thorn Creek to cover the proposed discharge. Based in part on the Thorn Creek experience, the Illinois EPA is proposing to raise the sulfate limits statewide. This work was the basis of a paper presented at WEFTEC.

Elevated sulfate concentrations in the wastewater have increased concentrations of hydrogen sulfide in the district's anaerobic digesters to as high as 1% (by volume). Increased scaling in boilers/heat-exchangers and gas mixing equipment results in increased maintenance costs.

In spite of having a separate sewer system TCB experiences increased flow rates during storm events as a result of inflow and infiltration (I/I). Excess flow facilities at the main plant boost the peak capacity to 64 MGD or four times dry weather flow. The district also has an off-site excess flow facility with a capacity of 26 MGD. These facilities are not adequate to handle peak flows from intense storms. TCB has responded by establishing peak flow limits on I/I for the six communities that own the local sewers. TCB is requiring the communities to spend a minimum of $30 per capita per year on sanitary sewer rehab. TCB is also constructing a 26 MG retention basin for short-term shortage of peak flows.


Aeration Basins


Aeration Basins

The district's workforce consists of 33 full-time and two to six part-time employees. The plant is staffed 24 hours per day. CS