City of Faribault
Water Reclamation Facility

By Travis W. Block

The City of Faribault Water Reclamation Facility was originally constructed in 1954. The facility has been upgraded several times since then. The facility treats a combination of residential, industrial and lake service district flow for a population of 23,382 with an average flow of 4.0 MGD. A large percentage of the flow (50-55%) is from industrial sources. The liquid train for the facility includes screening, grit removal, primary settling, roughing filters, activated sludge, secondary settling, disinfection, and post aeration. The solid train consists of mechanical thickening, anaerobic digestion and liquid biosolids storage.

The facility's most recent upgrade occurred in 2008 partially as the result of an effluent phosphorus limit that had to be met by December 31, 2011. This limit also brought to light several large components of the treatment facility that were aging and in need of replacement. Prior to the upgrade, the facility faced operational challenges with the headworks, aeration, secondary settling and digester gas handling. Although the facility was able to discharge effluent that met permit requirements, there was a need to update these systems to achieve more reliable and efficient permit compliance.

Donohue & Associates was chosen to complete a facility plan and design for the City of Faribault. The plan took a look at the plant's current treatment processes and identified where upgrades would be the most beneficial. The process was extensive involving examining and exploring many different options that ultimately resulted in a $28M replacement in kind upgrade project. This option allowed for the continued use or reuse of existing treatment processes

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that were recently upgraded in 1998. This approached allowed for a very economical option that was able to address both the outdated equipment and phosphorus removal requirements. The upgrade had the intention of being a 20-year solution.

HEADWORKS BUILDING

There were many different processes at the facility that saw an upgrade during the project. One of the largest was the creation of a new headworks building for influent pumping. Previously this function was carried out in the control building. The new headworks building created an enclosed wet well with submersible pumps that pump the influent to rotary drum screens. From there the influent enters a vortex grit chamber where grit is removed. The headworks building not only provides improved screening of the influent but also addresses odor issues at the facility. Previously, odor from the wet well was vented off into the atmosphere. The new building provides an enclosed environment where the odorous air is exchanged and piped to carbon bed filters that are also used by the roughing filters.

AERATION

Prior to the upgrade the facility struggled to keep adequate dissolved oxygen levels in the aeration basin. The old blowers fed air to multiple fine and course bubble processes locations throughout the facility. The installation of three high-speed turbo compressors allow the operators to regulate the amount of air that the basin receives. The high-speed blowers are extremely low maintenance and are very reliable. Additional improvements were made to the aeration basin. The old two-cell basin was divided into four cells to allow for homogenous mixing and uniform air distribution.

PRIMARY CLARIFIERS

New scum beaches were added to the clarifiers to improve the removal of floating scum. New air diaphragm primary sludge pumps were added to allow for consistent 24/7 pumping. The addition of these pumps allows for more consistant sludge blanket depths which results in a steady feed to the digesters.

ROUGHING FILTERS

The roughing filters are true workhorses at the facility removing upwards of 70% of the influent CBOD. These filters are a key part of the treatment process allowing the treatment of the fluctuating loads that the facility receives. The filters received new media and motorized distribution arms. The distribution system allows for the waste stream to be evenly distributed over the media bed regardless of flow. This corrected the previous condition where the distributor arms would often stop in one place during periods of low flow.

DIGESTER BUILDING

The digester building saw many improvements to the three digesters during the project. Most of the solids piping was replaced. The new piping allowed for more flexibility in operations by allowing staff different combinations to operate. The gas piping was replaced in addition to new pressure regulators which allow gas to be captured and used more efficiently. The heat exchangers were replaced allowing for better sludge temperature control. Lastly, a new membrane cover was added to the third digester for gas storage, replacing the old floating cover.

SOLIDS THICKENER

A new solids thickening building was built housing a new gravity belt thickener. Solids from the secondary clarifiers are thickened before they are sent to the digesters. A new polymer feed system was added to optimize the polymer dosage.

SECONDARY CLARIFIERS/UV

The secondary clarifiers received all new recirculation pumps. The new pumps are larger with a higher gallon per minute pumping rate allowing for higher return rates resulting in improved performance. Baffles were also installed to improve settling. The plant previously used chlorine gas and sulfur dioxide for disinfection. This was replaced with an ultraviolet disinfection system yielding consistent permit compliance without having chemicals stored at the facility.

SCADA

The facility now utilizes a true SCADA system which allows for both increased operational efficiency and convenience. The SCADA system allows operating staff to dial in certain pieces of process equipment to match the existing conditions. Operators also can operate pieces of process equipment from multiple buildings on the grounds. Previously if an operator wanted to make a change they had to return to the control building.

One element that posed a significant challenge to the project was the flooding events that occurred in September 2010. Excessive rainfall fell across the area causing the Straight River to rise to historic levels. These river waters caused the failure of a siphon box structure severing the facility from the collection system. This condition allowed an overwhelming amount of river water to enter the facility and flooding it from the inside out. This event occurred at the time the construction was well under way. This caused some delays from a scheduling standpoint but an excellent job was done by the contractor Rice Lake Construction Group, Donohue & Associates and city staff to keep the project moving forward towards completion.

The facility is staffed by a superintendent, foreperson and four operators. Henry Morgan is the wastewater superintendent. Henry has 42 years of experience that aids in the operation and leadership at the facility. His knowledge of the facility and the community is a useful tool that help the facility achieve consistent permit compliance. Steve McDowell is the foreperson responsible for overseeing daily operations. The plant operators are John Frame, Matt Mensing, Chas Schroht and Andrew Fischer. The skilled team ensures that the facility is well maintained and that permit compliance is achieved. CS

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