By Jeff Adams

PLANT DESIGN *hits the jackpot*

Biological treatment/solids removal system allows a California resort room to grow

Over the last two decades, what began as a modest bingo hall on an American Indian reservation in California has evolved into one of the most successful American Indian gaming facilities in the state. Today, this world-class casino, hotel and spa destination is one of the largest tribal gaming facilities in the nation.

ARTICLE SUMMARY

Challenge: An easy-to-operate wastewater treatment plant is needed to handle waste-water from a casino resort.

Solution: An ISBR system that combines SBR technology with a solids reduction system produces a high-quality effluent at varying flows and loadings.

Conclusion: The system has helped the plant lower solids handling costs, reduce energy costs and meet tight effluent requirements.

The casino/resort staff realized that as the facility grew, so too would its wastewater treatment needs. They needed to build an efficient, easy-to-operate wastewater treatment plant (WWTP) that could handle high-strength wastewater from the hotel as well as large weekly variations in flows and loadings from the hotel and casino business. The plant design also had to be flexible enough to accommodate future expansions.

Flexible Design

The resulting 0.75-million-gal-per-day (mgd) facility was designed for a 900-mg/L biological oxygen demand (BOD) load using a design/build approach. An OMNIFLO interchange sequencing batch reactor (ISBR) system from Siemens Water Technologies is helping the plant lower solids handling costs, reduce energy costs and meet tight effluent requirements.

The system, which combines SBR technology with the Cannibal solids reduction system, has an inherent biological nutrient removal (BNR) capability through the use of automated controls that provide optimum environments for each BNR reaction. It also produces a high-quality effluent at varying flows and loadings. The small-footprint system produces a low sludge yield of 0.05 to 0.25 lb of biological solids per pound of BOD per day and compared to a typical SBR system, provides increased flexibility as well as significant power savings.

The plant's biological treatment process consists of a two-tank SBR with jet aeration that is operated by a flow-proportional control system. This system allows the process to automatically adapt to the widely varying flow conditions that occur at the plant. The easy-to-operate system consists of a fill-and-draw, non-steady state activated sludge process

in which one or more reactors are filled with wastewater during a discrete time period and then operated in a batch treatment mode. The SBR accomplishes equalization, aeration and clarification in a timed sequence in a single reactor basin. The operating strategy provides process control over a wide range of flows. Varying the operating strategy creates aerobic or anoxic conditions to optimize energy use to achieve a consistent effluent quality and encourage the growth of desirable microorganisms.

The tribe had initially thought of installing an aerobic digester and sludge drying beds for sludge handling, but the potentially high energy costs for aerating an aerobic digester made them seek a more energy-efficient sludge treatment solution. Pairing a Cannibal solids reduction system with the SBR technology has resulted in significant savings for the plant. Through a series of physical separation steps, the Cannibal solids separation module removes nonbiodegradable material such as trash and grit that are present in the mixed liquor of any conventional activated sludge plant. The sidestream interchange reactor requires minimal aeration, which reduces energy requirements. The process significantly reduces the biological solids production by reconfiguring the biology of the treatment process through the interchange process. The result is an effective system that decreases the costs associated with sludge wasting, stabilization and disposal.

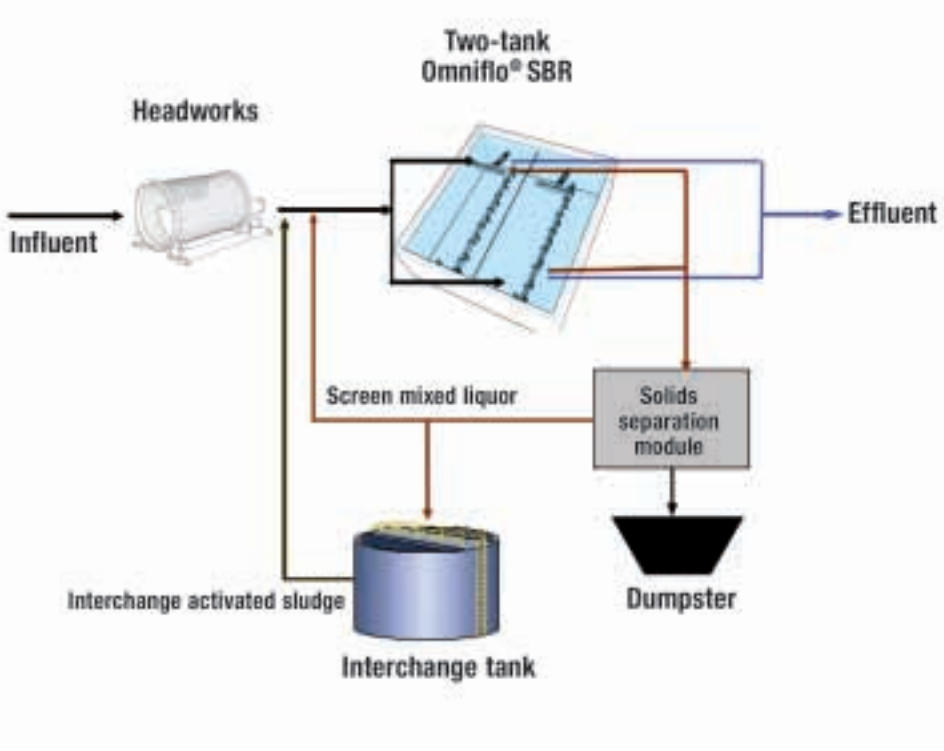
Cost Reductions

Since installing the ISBR system in July 2004, the California WWTP has used less than 10% of the power for solids treatment than was planned with the proposed aerobic digester. The system has also minimized solids wasting from the plant to less than 0.1 lb of biological solids per pound of BOD treated. The tribe's efforts to reduce power consumption and minimize solids wasting at the plant have helped support the nation's green energy initiative.

A single integrated control system has optimized overall plant performance and serves as a single point of contact for the process. It also balances ISBR system operating conditions over the widely varying loads to help maintain effluent quality and minimize solids production.

Siemens' ISBR system is ideally suited for plants that have high solids-handling costs, high energy costs and tight effluent requirements. Installing just an SBR system helps plants meet state nutrient removal limits. This California plant, however, exemplifies that adding a solids reduction system can also reduce high energy costs associated with aerobic digestion, reduce the size of the sludge handling equipment and generally provide a more energy-efficient solution. Significant reductions in the amount of solids generated for disposal are ultimately realized. WWD

Plant flow diagram of the OMNIFLO ISBR system installed at the California WWTP.



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