

## Strantrol 890 Fine-Tunes Biological Nutrient Removal

### Challenge

The 12.5 MGD Fox River Water Pollution Control Center, built in 1974, is a regional treatment plant for the Upper Illinois Fox River Watershed, serving a portion of Brookfield, Wis., and six other member communities. Expanded in 2000, the facility utilizes the activated sludge process that serves as secondary treatment by breaking down complex organic matter and converting it into a biological mass, which can then be separated from the wastewater and removed. In this process, the plant's aeration tanks are separated into four stages designed to help achieve biological nutrient removal (BNR) and provide semi-plug flow conditions to reduce short circuiting.

Stage 1 is intended to be anoxic. The objective of Stage 1 is to provide BOD removal (as the result of denitrification) in addition to consuming nitrates that are formed during nitrification. Mixed liquor that flows through this state is held in suspension by submersible mixers. Stages 2 through 4 in each aeration tank are equipped with fine bubble diffusers — Stage 2 has the most diffusers followed by Stage 3, with Stage 4 having the least. From Stage 4, the mixed liquor that does not get returned to Stage 1 proceeds via aerated effluent channels to one of the plant's final clarifiers.

Because nitrate recycle pumps return mixed liquor from Stage 4 to Stage 1 at a rate that is proportional to the influent flow rate, the plant's engineers wanted to incorporate a reliable means to monitor the process and automatically maintain conditions so that the Stage 1 portion of each aeration tank remains anoxic.

### Solution

In June 2000, the plant installed a Strantrol® 890 High Resolution Redox® Control System that continuously monitors return flow from the plant's Stage 4 to Stage 1 aeration basins according to oxidation reduction potential (ORP) setpoints and automatically modulates the recycle rates based on ORP readings.

- The Strantrol 890 provides accurate monitoring, reliable control and complete data management.

### Results

Oxidation reduction potential (ORP) is the measure of a solution's oxidizing or reducing strength. This can be used in the activated sludge process because ORP measurements in an aerobic environment are higher than in an anoxic environment, which in turn are higher than in an anaerobic environment.

- Because the ORP value will change as biological conditions change, it can be used to help monitor and control the process to maintain desired conditions in the anoxic zone.
- "High ORP values indicate too much oxygen is being returned to Stage 1 of the process, likely the result of high nitrate recycle rates," says Operation Supervisor Stanley Kucharski. "Under these conditions, the Strantrol automatically lowers the pump speed until ORP conditions return to the desired range."
- Low ORP values indicate anaerobic conditions, and here the controller automatically increases the nitrate recycle pump rate to maintain desired conditions. "This system works great," says Kucharsk "and it has really helped us to finetune BNR at our plant."