

# Orbal® Biological Nutrient Removal System Lake Geneva, WI WWTP

## ENHANCED BIOLOGICAL NUTRIENT REMOVAL EXCELLENCE

99% BOD removal  
93% TN removal  
80% TP removal

## DESIGN CRITERIA

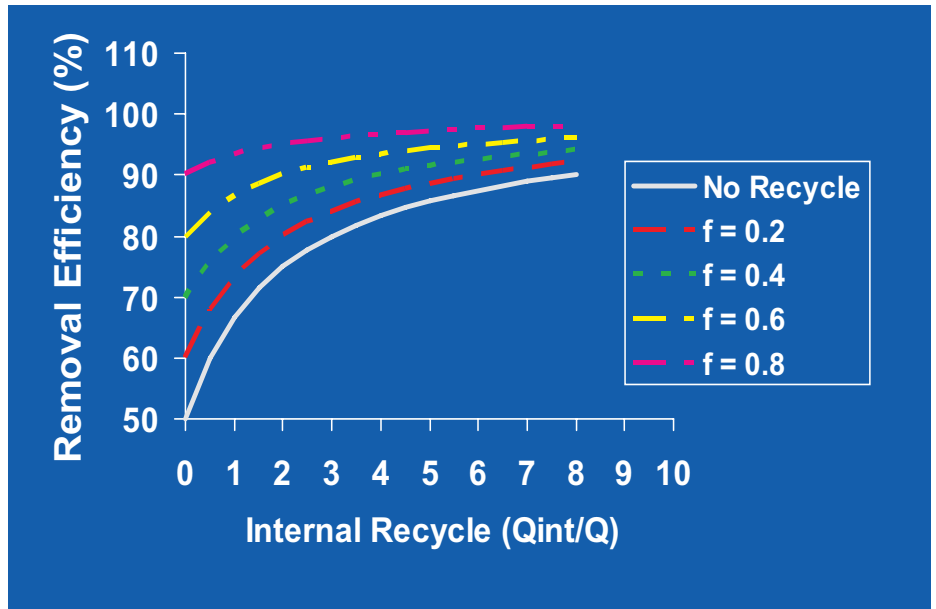
Average Daily Flow: 1.0 MGD  
BOD: 210 mg/l  
TSS: 180 mg/l  
NH<sub>3</sub>-N: 30 mg/l  
TP: 5 mg/l

The city of Lake Geneva, WI WWTP treats mostly municipal wastewater with relatively high peak month loads due to local vacation attractions and summer homes. The effluent from the plant is used for ground water re-charge. Therefore, total nitrogen removal is the most important biological function for this plant. The Orbal® BNR process was selected for this plant for its energy efficient biological nutrient removal capabilities. Orbal® operation started in 1984.

The Orbal® design for this plant consists of three concentric channels, with wastewater passing through the channels in series. Dissolved Oxygen (DO) concentrations in each channel are automatically controlled by varying aerator speed and/or disc immersion. The outer channel is maintained at low DO to provide simultaneous nitrification/denitrification conditions while the inner channel is maintained at aerobic conditions. The City of Lake Geneva, WI has a cold climate so it normally runs at higher sludge age in the winter to maintain nitrification. The Sim-Pre® recycle was also added to enhance denitrification by recycling nitrate from the inner to the outer channel where it converts to nitrogen gas under aerated anoxic conditions.



Oxygen recovered by denitrification in the outer channel results in power savings. This plant has a SmartBNR® electrical control system which continuously monitors Orbal® operational parameters such as ORP and DO levels in the channels, aerator speed, MLSS in the basin, and RAS / WAS flowrates. The SmartBNR® control system also provides the operator the ability to check system performance from offsite. The SmartBNR® control allows the plant to achieve its treatment goals with minimal operator attention. The Orbal® system is capable of operating in StormFlow® mode to prevent biosolids washout from the clarifiers during intense storm events. The StormFlow® mode operates by directing influent to the inner or middle channel while maintaining RAS flow in the outer channel, therefore, lowering the solids loading on the clarifiers.



Effect of Sim-Pre internal recycle on total nitrogen removal efficiency

Siemens  
 Water Technologies  
 1901 South Prairie Avenue  
 Waukesha, WI 53189  
 800.524.6324 toll-free  
 262.547.0141 phone  
 262.547.4120 fax  
[www.siemens.com/water](http://www.siemens.com/water)

Orbal, Sim-Pre, SmartBNR, and StormFlow are trademarks of Siemens, its subsidiaries or affiliates.

The information provided in this literature contains merely general descriptions or characteristics of performance which in actual case of use do not always apply as described or which may change as a result of further development of the products. An obligation to provide the respective characteristics shall only exist if expressly agreed in the terms of the contract.

©2007 Siemens WaterTechnologies Corp.  
 EN-LAKEGENEVA-DS-0807  
 Subject to change without prior notice. All rights reserved.