Early-Stage Floating Treatment Wetland Technology To Achieve Nutrient Removal in Aerated Facultative Wastewater Treatment Lagoons

Project Location: Wiconisco Township, Pennsylvania, USA

The following case study underscores the capabilities of Floating Island International's (FII) patented floating treatment wetland (FTW) technology and its ability to purify water by significantly reducing nutrient levels. Constructed of post-consumer polymer fibers and vegetated with native plants, FTWs mimic the ability of natural wetlands to improve water quality by bringing a "concentrated wetland effect" to any water body – in this case, an aerated facultative wastewater lagoon.

Results of this case study illustrate the early stages of the FTW technology as passive installations with no integrated circulation or aeration. They represent the first steps in the progression of the FTW technology in wastewater treatment applications. As with any technology, early versions serve as the critical basis for refining and developing more advanced latest generation manifestations (see Rehberg Case Study).

Overview:

In an effort to comply with The State of Pennsylvania's nutrient reduction goals for the Chesapeake Bay Tributary Strategy, Wiconisco Township's Supervisors approved a unique solution beyond the limitations of conventional treatment technology.

In 2005, the Pennsylvania Department of Environmental Protection's "Growing Greener: New or Innovative Water and Wastewater Treatment Technology" grants program awarded funding to the Wiconisco Wastewater Treatment Plant to utilize early-stage FII FTW technology to remove nutrients from municipal wastewater. In 2006, three FTWs were installed into one of two existing lagoons. Encouraged by initial successes, the Township has added a fourth FTW to the system.

In March 2009, solar-powered circulation pumps were also installed to efficiently raise water onto the top surface of the FTW, providing more active treatment via percolation through the polymer matrix and biofilm.

Results:

Four years after installation, nutrient removal in the FTW lagoon continues to be significant. The rate of ammonia removal is 9% greater than in the control lagoon, while the rate of nitrate removal is 17% higher. The FTW lagoon has shown a 3% improvement in phosphorus removal as well. These results are of particular interest considering that the FTWs occupy only about 2% of the lagoon surface area (the FTW size was limited by grant funding available). Additionally, algae control costs have declined, as reduced nutrient levels in the FTW lagoon curtail or eliminate algae.

Conclusion:

Although facultative and aerated lagoons can successfully reduce BOD and TSS, their ability to remove nitrogen and phosphorus from municipal wastewater is extremely limited. FTW technology enhances these lagoons with the "concentrated wetland effect" to facilitate compliance with increasingly stringent nutrient standards for wastewater effluent.

Mature FTWs with vegetation

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Installation Data

Location	Wiconisco, Pennsylvania USA
Parameters Studied	Ammonia, nitrate, total phosphorus
System Type	Aerated facultative lagoon
FTW Size	Three 250 ft^2 (23 m^2) FTWs plus one 200 ft^2 (18.58 m^2) FTW Thickness: 10 inches (25 cm)
Water Source	Municipal wastewater from approximately 185 households
Installation Date	January 2006
Flow Rate	16 gpm (3.6 m^3/hr)
Water Body Depth	10 ft (3 m)
Water Body Area	40,000 ft^2 (3,700 m^2)
Installed Cost	$64,000* in 2006 (*Estimated $30,000 today due to lower material costs and imporved efficiencies)

Operational Data

Average O&M Costs (Labor, Materials)	2 hours/week; no materials
Training Required to Operate	1 day training seminar
Required Additional Inputs	None
Power Costs	$0 (solar-powered pumps)
Anticipated Lifespan	To be determined (10+ years est.)

Results (2009 - 2010 Data)

Parameters	FTW Removal Rate (mg/day/ft^2)	Improvement Compared to Control Lagoon
Ammonia	567	9%
Nitrate	144	17%
Total Phosphorus	36	3%