

Floating Treatment Wetlands Remove Propylene Glycol from Airport Stormwater

Project Location: Bangor International Airport, Maine USA

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

Overview:

In early 2008, Bangor International Airport personnel began evaluating FTWs to enhance water quality discharged from the airport property, with three objectives:

- 1. Reduce trace amounts of propylene glycol, which is added as a deicing agent in the winter;*
- 2. Reduce levels of nutrients such as nitrogen and phosphorus; and*
- 3. Reduce the water temperature.*

Results from other FTW sites had already shown that Objective #2 could be achieved. Shade provided by the FTWs would achieve Objective #3. Thus, testing focused on the efficacy of glycol removal by the FTW.

Results:

The FTW was installed in 2008 but because of its small size (0.2% of the pond surface area) and the pond's low glycol concentration even before FTW treatment (consistently below the detection limit of 5 mg/L), its effect was unknown. To better determine the efficacy of this technology, a pilot scale FTW with an area of 0.88 ft² was used in a series of lab tests. These tests were run in batch mode and outstanding glycol removal was measured, with results shown in the table below.

Conclusion:

Glycol concentrations were reduced from greater than 500 mg/L to less than 1 mg/L in lab-scale FTW tests. It is believed that glycol is converted to carbon dioxide by aerobic bacteria attached to roots and other underwater surfaces of the FTW.

The full-scale FTW vegetation has survived three Maine winters and thrived each summer. To better determine its efficacy, this FTW may be moved to a smaller pond farther upstream in the process where glycol concentrations are 5-10 mg/L or higher. In the current location, a series of larger FTWs may be required to measurably improve water quality.



FTW in Bangor Airport stormwater pond, August 2010

Installation Data

Location	Bangor, Maine USA
Parameters Studied	Propylene glycol
System Type	Aerated stormwater pond
FTW Size	Area of 64 ft ² (5.9 m ²); thickness of 8 inches (20 cm)
Water Source	Stormwater runoff from paved surfaces at airport
Installation Date	June 2008
Flow Rate	Variable, depending upon precipitation
Water Body Depth	Approximately 4 ft (1.2 m)
Water Body Area	33,000 ft ² (3,065 m ²)
% Coverage	0.2% of pond covered by FTW

Operational Data

Average O&M Costs (Labor, Materials)	1 hour/week; no materials
Training Required to Operate	1-day training seminar
Additional Inputs	Aeration from windmills
Anticipated Lifespan	At least 10 years

Pilot Results

Duration	Glycol Removal Rate (mg/day/ft ²)	% Removal
3 days – April 2010	3300	84%
5 days – March 2010	4500	94%
7 days – June 2010	4800	95%
14 days – June 2010	2500	>99%