CASE STUDY

AQUARIUS Technologies LLC

NEBULA® MultiStage Biofilm System Upgrades Nitrification and Reduces Sludge Production

Northern Moraine Utility Commission, Wisconsin – Dome Covered Package Plants Retrofitted with Fixed Biofilm Media

The Northern Moraine Utility Commission (NMUC) in Glenbeulah, Wisconsin operates an Aquarius Technologies, LLC Nebula MultiStage Biofilm wastewater treatment plant. From the outside, the two treatment systems appear to be typical circular package plants with fiberglass dome covers from the 1970s…

…but once inside the treatment basins, you will find treatment stages containing fixed biofilm media. The media is designed to provide surface area for attachment of the microbiology and creation of a biofilm layer. The fixed biomass consumes varying loads of contaminants in the wastewater to produce high quality secondary effluent and reduced sludge generation when compared to suspended growth systems.

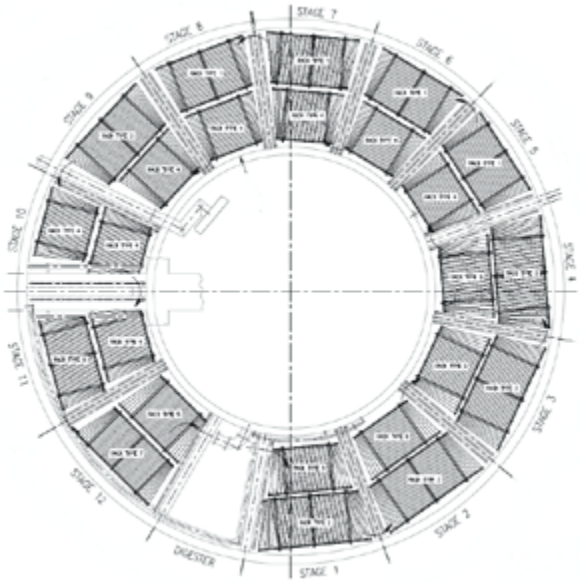
The outer ring of each circular package plant is divided into 12 treatment stages by non-hydrostatic baffle walls. The center of each plant continues to operate as a final clarifier. In each sequential stage, the contaminants are reduced and the food-to-microorganism (F/M) ratio decreases. As the food becomes limited, the microbiology feeds on other microorganisms lower on the food chain. The spatially separate trophic microorganism chains provide for conditions where primary microbes are later consumed by higher organized vulture filtrator microorganisms of higher trophic levels.

In 2007, Aquarius worked with NMUC's engineer Foth Infrastructure and Environment to pilot test the Nebula MultiStage Biofilm System. After achieving the test objectives, the full-scale design was completed and installed in 2010.

The original suspended growth circular package plant was not designed to remove ammonia nitrogen through nitrification. After the biofilm media was installed, nitrifying bacteria populated the basins due to the increased biomass retention times resulting in excellent ammonia nitrogen removal.

In addition to providing more treatment capacity, another benefit of using the staged treatment process with fixed biofilm media is that sludge production is reduced. The biomass remains attached to the media until it is sloughed off by air scouring and becomes a food source for the next treatment stage.

Prior to installing the Nebula MultiStage Biofilm System, NMUC was producing approximately **460,000 gallons** per year of waste activated sludge. After installing the system and upgrading the headworks to include grit removal and fine screening, annual sludge production is less than **60,000 gallons**.

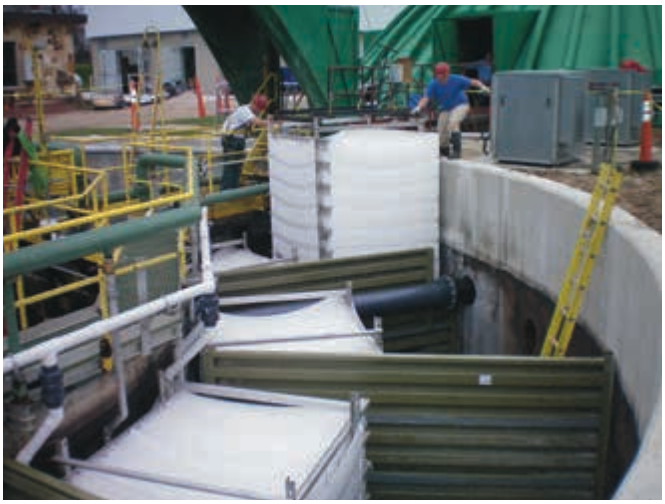


NMUC treats wastewater from multiple communities including Elkhart Lake, Crystal Lake, Glenbeulah, and Greenbush with an average flow rate of 0.300 million gallons per day (MGD).

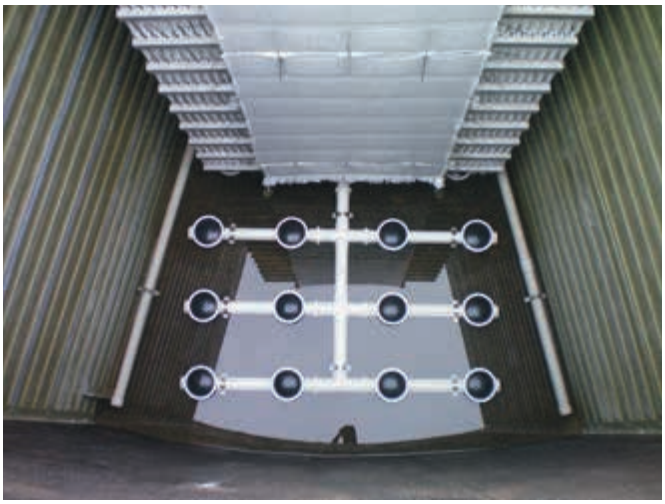
Five years of operating data (May 2010 to May 2015) produced the following values:

PARAMETER	INFLUENT	EFFLUENT	REMOVAL
BOD_5 (mg/L)	260	5.8	98%
TSS (mg/L)	270	4.0	99%
Ammonia (NH_3) - N (mg/L)	25	< 1.0	96%

Contact Aquarius to learn how a Nebula MultiStage Biofilm System can meet your treatment plant needs for increased treatment capacity, more stringent effluent requirements and reduced sludge production.



MultiStage Fixed Biofilm Media Installation



Aquarius Fine Bubble Diffused Aeration Provides High Oxygen Transfer Efficiency (OTE) and Media Scouring

Treatment Stages with Fixed Biofilm Media