

KEEPING IT SIMPLE

Treating More Water and Managing Less Sludge
at the Reynolds, GA WWTP



Fine Bubble Membrane Disc Diffuser Used to Deliver Oxygen Necessary for Organic Treatment and Scour Media

The City of Reynolds, Georgia, previously operated an aerated lagoon treatment system at its wastewater treatment plant (WWTP). To meet more stringent NPDES Effluent Discharge Limits, the City of Reynolds had to upgrade to another system that provided improved treatment. The City of Reynolds worked with their consulting engineer, Carter & Sloope, to find a solution that could provide adequate treatment to meet discharge limits and offered simplicity and minimal operator attention.

The City considered suspended growth processes such as a conventional activated sludge system, but it was too time-consuming for the City of Reynolds limited operator staff. Due to its simplicity, minimal operator attention, reduced sludge production, and reduced capital and operating expenditures, the City upgraded to Aquarius Technologies, LLC Nebula MultiStage Activated Biofilm Process (MSABP) and has operated since 2013.

From the outside, the treatment system appears to be a typical concrete rectangular aeration basin with an aluminum cover ... but under the cover of the treatment basins, you will find treatment stages containing fixed biofilm textile nylon media. The hydrophilic media is designed to provide surface area for attaching a biofilm layer. The fixed biomass consumes varying loads of contaminants such as BOD and ammonia in the wastewater to produce high-quality secondary effluent and reduced sludge production compared to other alternatives considered for the City of Reynolds WRF.

One key advantage of staged treatment with fixed biofilm media is reduced sludge production. The biomass remains attached to the media until it is sloughed off by air scouring and becomes a food source for the subsequent treatment stage. The Nebula MSABP at the City of Reynolds WRF consists of two parallel systems with twelve treatment stages. In each sequential stage, the contaminants are reduced, and the food-to-microorganism (F/M) ratio decreases. As food becomes limited, the biomass is reduced from endogenous respiration and microbiology, feeding on other lower microorganisms on the food chain. Creating environments where these biological conditions will occur is the reason for reduced sludge production.

Having a system with minimal sludge production, separate tanks such as digesters and dewatering equipment are not required, resulting in minimal capital expenditures. This also reduces operating



Fine Bubble Membrane Disc Diffuser Grid Integrated below the Fixed Media Structure

expenditures by not aerating additional tanks, adding polymers necessary for dewatering sludge, and minimizing sludge disposal costs. According to Scott Jones, the City of Reynolds Public Works Director, "The City did not want to deal with sludge, so the system works very well. By not having to handle sludge, the City saves tens of thousands of dollars associated with having equipment, electricity, workforce, and disposal required to manage sludge."



Fixed Hydrophilic Textile Nylon Media Unit that is used to Attach the Biofilm

Simplicity and reduced operator attention were other critical needs of the City when selecting a wastewater treatment plant. Scott Jones mentions, “The MSABP plant itself is simple to run and works well. The only maintenance is the drum screen and auger. The incoming solids feed through the auger into a roll off dumpster. They are pressed into a squeeze box and drop into the dumpster dry. They are taken to a local landfill. The blowers need belt, oil and filter changes every few years. I only run 1 blower at a time. I have 3. I run both Nebula MSABP systems all the time. I have not had any issues within the treatment stages of the MSABP plant itself.”

The original aerated lagoon plant was not designed to treat BOD and TSS to meet the current NPDES discharge limits. After the biofilm media was installed, increased biomass retention times resulted in excellent removal of BOD, TSS, and ammonia.

The City of Reynolds is designed to treat a daily wastewater flow rate of 400,000 gallons.

The City of Reynolds is required to meet treatment standards for BOD < 20 mg/L, TSS < 20 mg/L,

and ammonia-N of 1 mg/L. The three most recent years of operating data (2022 to 2024) show the Nebula MSABP system consistently exceeded these standards and produced the following results:

PARAMETER	INFLUENT	EFFLUENT	REMOVAL
BOD ₅ (mg/L)	307	5.7	98.2%
TSS (mg/L)	531	13.5	97.5%
Ammonia (NH ₃) - N (mg/L)	NR	1.0	N/A

In conclusion, the Nebula MSABP at the City of Reynolds, GA WWTP, provides outstanding treatment by consistently meeting NPDES discharge standards and contributes to significant savings in capital and operating expenditures related to sludge management. The Nebula MSABP installation truly lives up to its **“Treat More Water “ tagline. Manage Less Solids.”**

Please get in touch with Aquarius to learn how a Nebula MSABP can meet your treatment plant needs for increased treatment capacity, more stringent effluent requirements, and reduced sludge production.



Covered Multi Stage Nebula MSABP Reactors



Perforated Plate Drum Screen Used to Protect Integrity of the Media and Improve Biological Process Efficiency



CASE STUDY

NEBULA MULTISTAGE BIOFILM SYSTEM UPGRADES NITRIFICATION AND REDUCES SLUDGE PRODUCTION

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