



NEBULA™ MultiStage Biofilm System

THE PROCESS

The Nebula™ MultiStage Biofilm System is a proprietary process for treatment of municipal and industrial wastewater based on spatial separation of microbial populations fixed on a media surface. Multiple successive stages of biofilm media provide different microbial environments. Spatial separation of microbial populations and food sources create a highly efficient food chain within the biological process.

High food to microorganism (F/M) ratios create feast conditions in the first stages encouraging rapid growth of lower life forms.

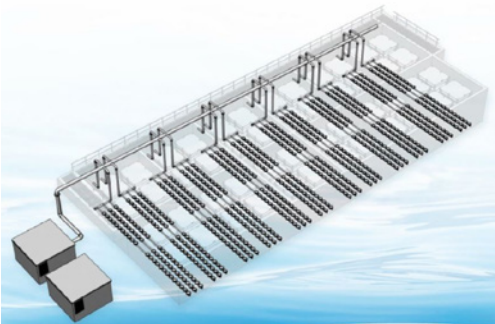
Low F/M ratios and famine conditions in later stages promote higher life forms that consume the lower life forms.

A plug flow system configuration with multiple stages reduces biological sludge up to 80% compared to suspended growth technology.

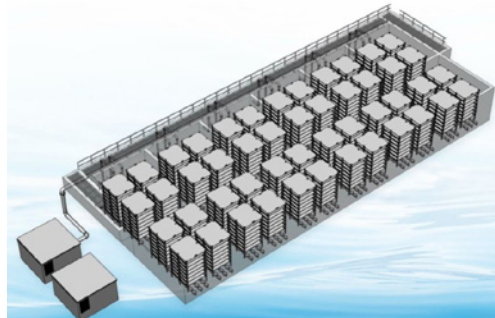
Fixed biofilm media can be added to an existing process to enhance removal efficiencies, achieve complete nitrification, and denitrification.

Process Advantages

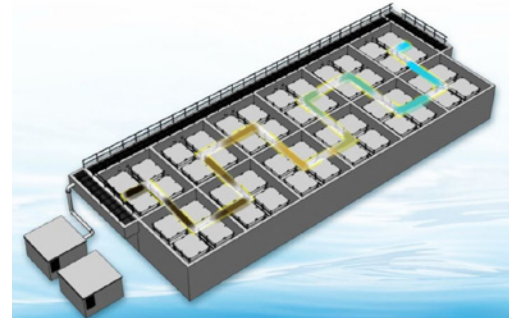
- Configurations Designed to Meet a Range of Biological Treatment Objectives
- Creation of a Microbial Food Chain Results in Low Biological Sludge Yield
- Sludge Minimization Saves on Costly Sludge Handling, Storage and Disposal
- High Density Fixed Biomass Tolerates Varying Organic and Hydraulic Loading Conditions
- Biomass Recycling is eliminated for Most Applications



Quantaer™ Aeration System



Nebula Biofilm Media Racks



Nebula Flow Pattern

Nebula MultiStage Biofilm System Configurations

Nebula systems can be installed in concrete (poured or pre-cast), steel, or fiberglass tanks / basins. They can be designed as packaged, retrofits to existing, side stream treatment, and new treatment plant systems. The number of treatment stages and the most efficient system layout is created within the basin/tank (new or existing) by baffle walls to create plug flow conditions.

Applications range from pretreatment to secondary and nutrient removal treatment objectives.

Treatment Objectives	# of Treatments
Organic (cBOD) Removal	2 or More
Ammonia (NH3-N) Removal	2 or More
Total Nitrogen Removal	2 or More + Anoxic Stages
Reducing Biological Sludge	8 to 12

NEBULA MULTISTAGE BIOFILM SYSTEM

THE SYSTEM

The Nebula System includes:

- Proprietary Biofilm Media and Media Racks
- Biofilm Media Pre-assembled on Racks (Package Systems)
- Diffused Aeration System
- Aeration Blowers
- Controls and Instrumentation
- Clarifier (Integral or Independent)

Every system includes a process operating strategy and an essential biofilm media and aeration system designed to ensure a successful installation.



Why a MultiStage Biofilm System is a Smart Choice

- Lowest Cost of Ownership
- Sludge Minimization Saves on Costly Sludge Handling, Storage and Disposal Costs
- Compact Footprint Due to Higher Surface Loading Rates
- Simple Operation with No Internal Moving Parts
- Energy-Efficient Diffused Aeration Systems
- Control Systems Designed with the Operator in Mind
- Proven Technologies
- Complete Package Treatment Systems to Meet Industrial or Municipal Treatment Objectives

The Nebula™ Biofilm Media/Media Rack

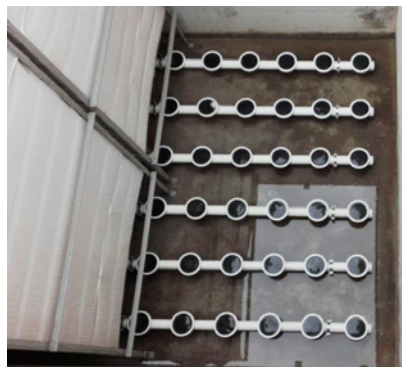
Successful fixed biofilm systems depend on the design of the media and media support rack.

Our chemically resistant, highly-durable, hydrophilic textile media provides more surface area than other types of fixed submerged media available.

Steel support racks provide a framework for attachment of the vertically arranged media. Combined our media has demonstrated over 15 years of useful life without replacement.



Nebula MultiStage Biofilm Media Rack



Quantaer Fine Bubble Aeration System



Nebula Biofilm Media Installation

The Quantaer™ Aeration System

Diffused aeration is integral to the success of the fixed biofilm system. It is designed to provide efficient and effective:

- Transfer of Oxygen to the Biomass
- Mixing within the Treatment Stage
- Scouring of the Media to Control Biofilm Thickness

The aeration diffusers are positioned beneath the biofilm media racks and anchored to the floor or attached to the media rack.

NEBULA MULTISTAGE BIOFILM SYSTEM

COST OF OWNERSHIP

When evaluating treatment solutions, the treatment process and mechanical system design are equally important to the cost of ownership and success of the installation.

We endeavor to understand our customer's needs and work together to evaluate each unit process required to meet the overall treatment objectives and cost of ownership.

Where the Nebula MultiStage Biofilm System is the right solution, we are committed to meeting or exceeding performance, operational and customer support expectations.

Customers We Serve

- Public Utilities
- Housing Developments (Condos, Single Home Subdivisions, Hotels)
- Schools, Universities, Commercial Buildings
- Parks, Camps, Recreational Areas
- Food & Beverage Industry
- Oil & Gas Industry
- Personal Care Products Industry
- Pharmaceutical & Chemical Industries
- Power Plants and Pulp & Paper Industries



NEBULA MULTISTAGE BIOFILM SYSTEM