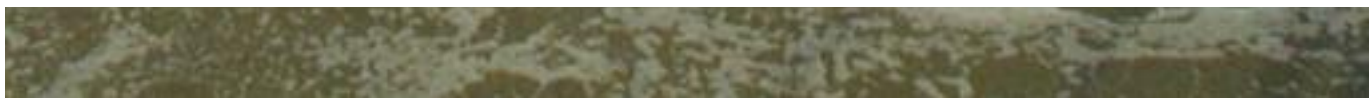


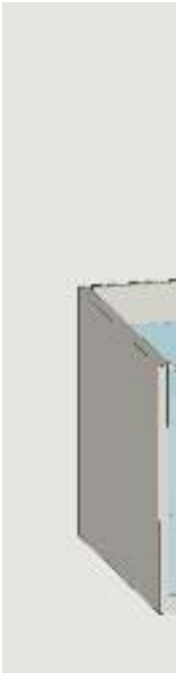
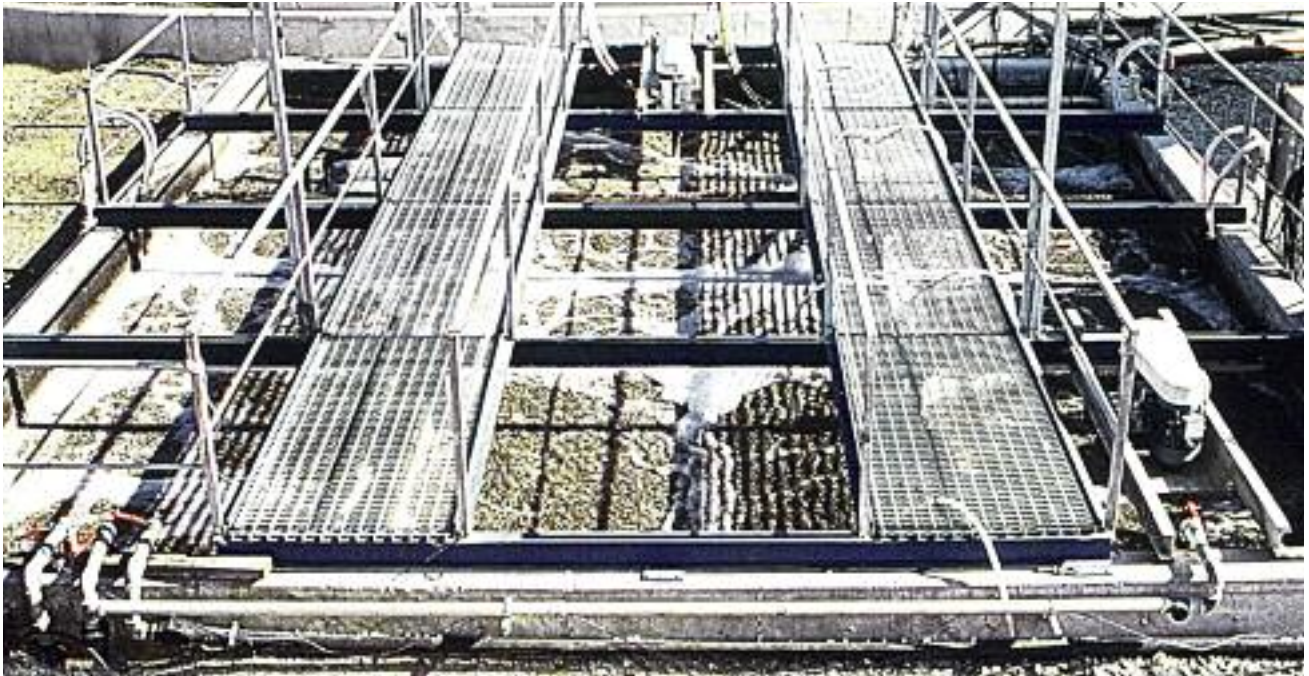


Increase Capacity Without Expanding Footprint with the AGAR[®] System

Water Technologies

SIEMENS





Enhanced Wastewater Treatment

The unique, patented AGAR® system from Siemens is the successful result of more than a decade of intensive research and development. The innovative, fixed-film moving bed system uses thousands of special suspended biomass carriers designed to create an enormous total surface area for biofilm growth – enhancing the biological wastewater treatment system without increasing plant footprint.

The AGAR® system can be installed in existing plants, increasing capacity and nutrient removal without requiring additional tankage. Therefore, upgrade costs are reduced, project duration is shortened and space required for additional reactors is not required. The system can be successfully used for both BOD₅ and nutrient removal, and is suitable for municipal and industrial wastewater treatment plants. The flexibility of the AGAR® system also makes it a cost-effective solution for the construction of new plants.

The AGAR® system can be installed either as an Integrated Fixed-film Activated Sludge (IFAS) system, or as a fixed-film system without activated sludge circulation. The system uses unique airlift hydraulics generated by either fine or coarse bubble diffusers, to provide complete aeration basin mixing coupled with enhanced oxygen transfer capabilities.

Flexible Operations

The AGAR® system can be operated as either a fixed-film only or an Integrated Fixed-film Activated Sludge (IFAS) system. When operating in the fixed-film mode, the AGAR® system is a

single pass system operated with no return activated sludge (RAS), resulting in:

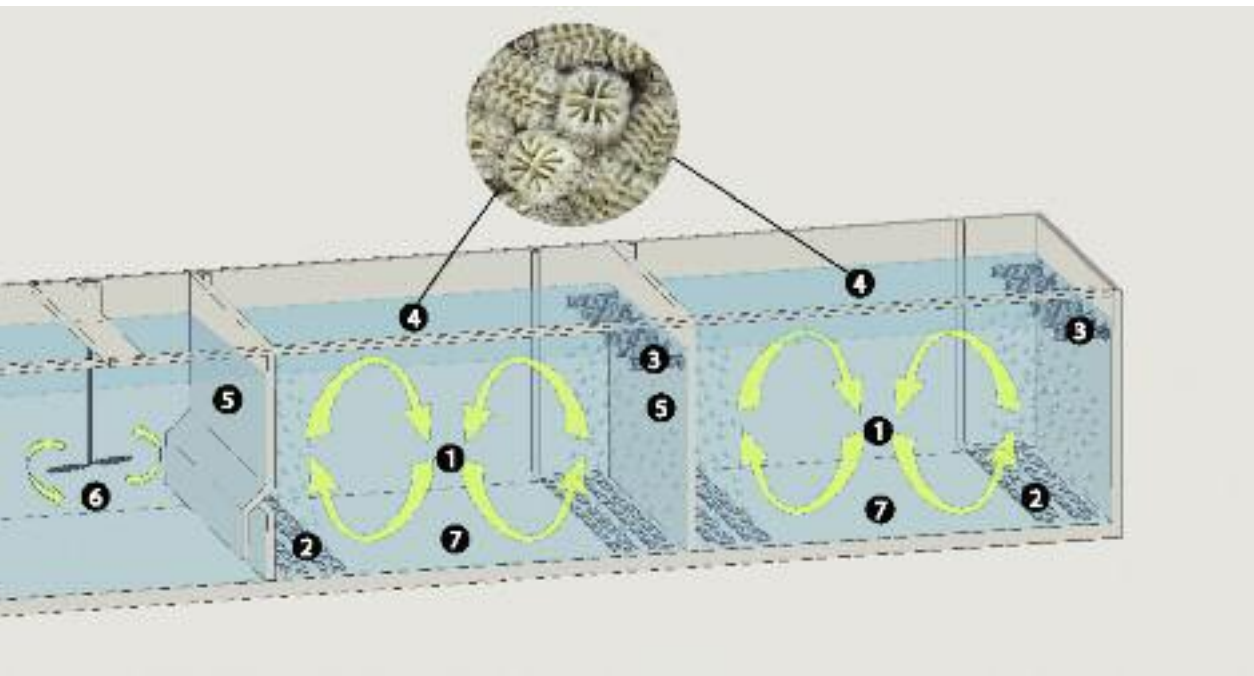
- a reduction of the suspended solids load on the clarifier
- elimination of dependence on the clarifier returning sludge for efficient performance
- efficient BOD₅ removal, as well as roughing and pretreatment applications
- ability to upgrade existing lagoon treatment systems

When the AGAR® system is operated in the IFAS mode, RAS is returned to the aeration basin and a suspended biomass is combined with the fixed-film biomass attached to the carriers. This mode of operation:

- enhances nitrogen removal for biological nutrient removal applications
- optimizes efficiency to minimize space requirements
- is similar in operation to conventional activated sludge

The System

1. AGAR® system mixing pattern, featuring airlift driven risers and down-comers
2. Fine or coarse bubble aeration system
3. Non-clogging wedge-wire screens, retaining the biomass carriers in the reactor
4. Biomass carriers, suspended in the aerobic zones of the reactor
5. Stage partitions, creating cascading reactors with optimal reaction rate and optimized biomass inoculation
6. Mechanically mixed denitrification reactor
7. Aerobic reactors filled with biomass carriers



AGAR[®] System Features & Benefits

Cost effective

Lower capital and operating costs than conventional alternatives.

Small footprint

No additional tankage required.

Durable

Heavy duty carriers have a life expectancy that can exceed 20 years, even under the intense mixing conditions of the reactor.

Flexible design

The AGAR[®] system can fit into most existing activated sludge reactors. It may also be applied as a roughing filter for pre-treatment, or as a post treatment polishing reactor.

Expandable

Simple media addition to the system allows for easy plant expansion to accommodate population growth or other increased capacity needs.

Non-clogging media

Intense media mixing within the reactor, coupled with the unique “fully-open, fully-protected” biomass carrier design, eliminates the possibility of carrier clogging.

Stable system

Toxic upsets and hydraulic “wash out” events will not affect the entire microbial population in the bio-film, making system recovery fast and smooth.

Intensive and low-temperature nitrification

The AGAR[®] system enables quantitative nitrification, even at a low activated sludge age, by holding a separate population on the biomass carriers. And a biofilm rich with Autotrophs allows stable nitrification, even at low temperatures.

Reliable media retention

Efficient use of non-clogging “wedge wire” screens allows for reliable retention of the biomass carriers in the reactor.



Biomass carriers are specially designed to protect the bio-film growth areas against mechanical shear, without limiting mass transfer areas.



System Configurations and Applications

AGAR® IFAS System for Nitrification/Denitrification

The AGAR® IFAS system configuration combines the attached biofilm system with the activated sludge system.

This configuration is specifically designed for:

- Adding nitrogen removal to existing activated sludge plants
- Increasing WWTP capacity and improving effluent quality

AGAR® IFAS System for Biological Nutrient Removal

An AGAR® system configuration for biological nutrient removal (BNR) includes anaerobic, anoxic and aerobic system stages.

This design is used for:

- Retrofitting existing plants for biological Nitrogen and Phosphorus removal
- Design of new plants for compliance with nutrient removal requirements

AGAR® IFAS System for BOD Removal

The AGAR® system can be configured for achieving intensive BOD removal in a very short Hydraulic Retention Time (HRT). This solution is best suited for:

- Increasing the BOD removal capacity of an existing plant
- Compact plants for BOD removal

AGAR® Roughing Filter for BOD & Ammonia Removal

The AGAR® roughing filter configuration offers a solution based on fixed bio-film, which provides COD/BOD removal and nitrification without the use of activated sludge. This configuration also requires minimal operator attendance.

Low concentration of suspended solids in the reactor's effluent enables the use of dissolved air flotation (DAF) or filtration systems instead of clarifiers, reducing the total area required for the wastewater treatment plant.

This system configuration is especially suitable for:

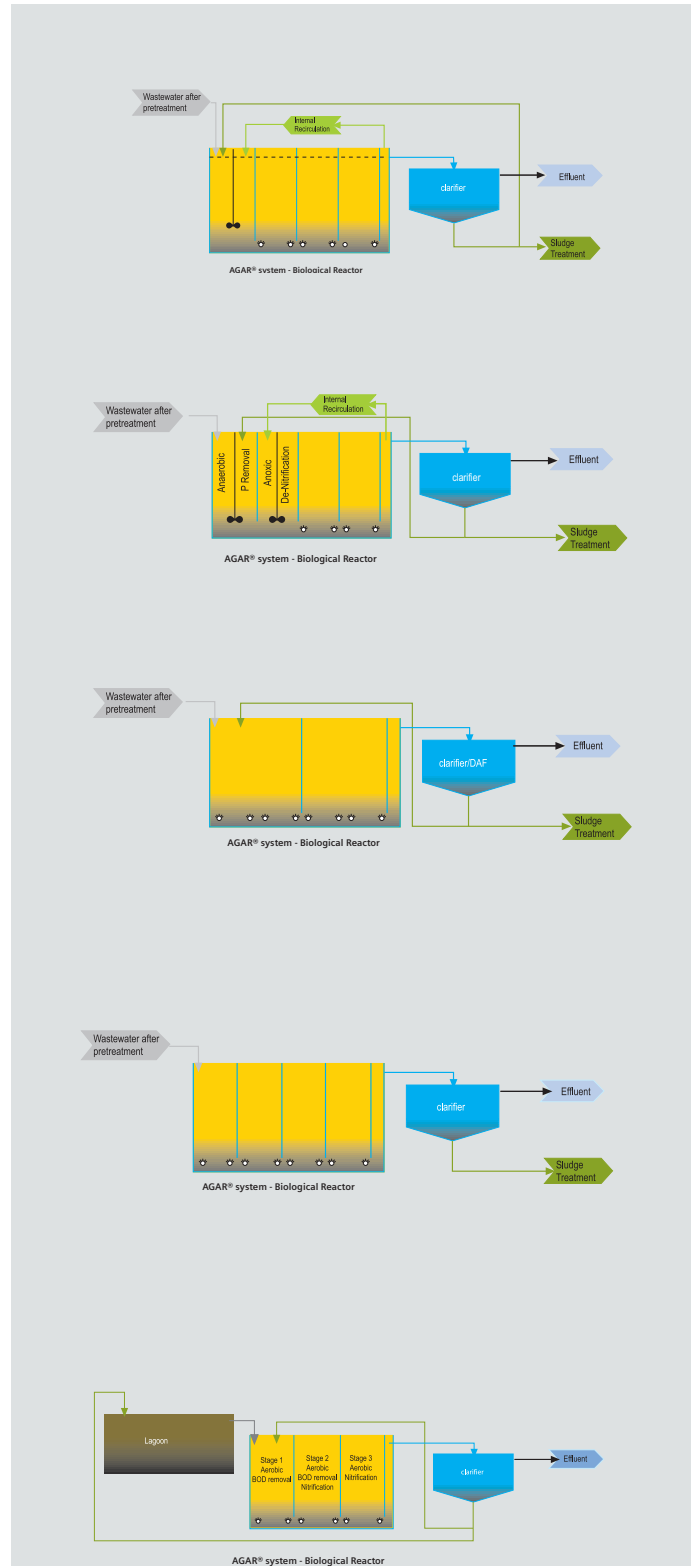
- Industrial wastewater treatment
- New plants with area limitation and/or low wastewater temperature

AGAR® System for Existing Lagoons

Upgrade the effluent quality of existing lagoon systems by adding a polishing AGAR® system.

The result is an easy to operate, flexible and cost-effective solution which offers:

- Ammonia removal from lagoon effluents
- Lagoon effluent BOD polishing





Performance Capabilities

Siemens Water Technologies has extensive test facilities, capable of conducting bench-scale as well as continuous flow pilot-scale studies, treatability testing, and wastewater characterization. Results of bench-scale testing are used to establish preliminary design criteria for a full-scale design, allowing for further evaluation of system economics.

Continuous flow pilot studies can be performed under a wide range of operating conditions. Pilot plant studies are done to optimize the design conditions for customized applications, produce representatively treated product for evaluation and further testing, and to give the customer a better understanding of the operating characteristics of the system. Our nationally accredited analytical laboratory, is used to support in-house test work.

Our in-house engineering staff can provide complete engineering and design for a full-scale system. Certified welders and electricians work in our 25,000 square foot, ASME-certified manufacturing facilities.

Applications

- Wastewater treatment plant expansions (increase in capacity)
- Wastewater treatment plant upgrades (more stringent effluent requirements)
- Biological Nutrient Removal (BNR)
- Industrial wastewater pre-treatment

The AGAR System is covered by the following patents:

US6616845

AGAR is a trademark of AqWise-Wise Water Technologies Ltd

ASME is a trademark of the American Society of Mechanical Engineers.

The information provided in this brochure contains merely general descriptions or characteristics of performance which in actual case of use do not always apply as described or which may change as a result of further development of the products. An obligation to provide the respective characteristics shall only exist if expressly agreed in the terms of contract.

262.547.0241 tel

EN-AGARdr-BR-0809

Subject to change without prior notice.

©2009 Siemens Water Technologies Corp.