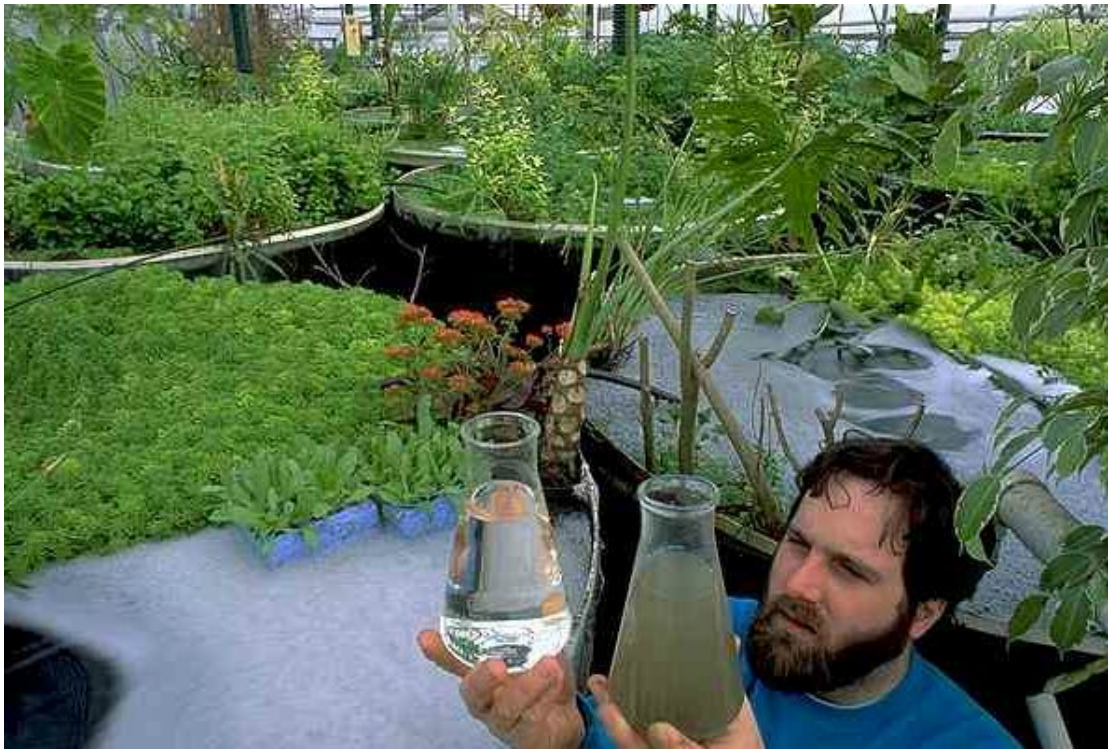
Growing clean water with Solar Aquatics Systems

- an attractive asset to a property or community
- effective, adaptive and easily expanded treatment
- an educational tool for teaching lessons in applied practical biology

Solar Aquatics Systems are at work worldwide. Contact the Ecological Engineering Group for more information. Call toll-free: 866-4-ECOENG



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Super-Cleaning • Educational • Recycling • Beautiful • Advanced

Solar Aquatics Systems®

Growing Clean Water

Ecological Engineering Group, Inc.
Ecological Engineers and Designers
Where Life informs design™

Solar Aquatics® Systems
Growing Clean Water

The Solar Aquatics System, or SAS, treats effluent to advanced secondary and tertiary standards through a series of aerated translucent tanks that host plant communities and aerobic microorganisms.

SAS duplicates and optimizes the natural water purification processes of freshwater wetlands. Wastewater is circulated inside a greenhouse through a series of clear tanks, each with its own aquatic ecosystem, and marshes. In this treatment process, sunlight, oxygen, bacteria, algae, plants, snails and fish work together to purify the water. SAS uses aeration and mixing in the tanks to prevent sludge from settling. This enhances degradation of solids and results in fewer solids than conventional wastewater systems.

The cleaned effluent from these systems can be used for irrigation or groundwater recharging or disinfected and used to flush toilets.

Solar Aquatics Systems are in use throughout the world, particularly for attractive super-cleaning and publicly viewable wastewater systems, such as in tourable industrial facilities and educational institutions. Solar Aquatics Systems offer a treatment process that produces high-quality water at a low cost.

The Treatment Process

The treatment process occurs in four stages that can be completed in one day for domestic wastewater. More concentrated wastes, such as septage and dairy wastes, require longer process time.

1. Aeration, Bioaugmentation and BOD Reduction
Air is diffused into the wastewater as it enters the facility. The naturally occurring bacteria are augmented with commercial strains of natural bacteria which, in the presence of air, break down soluble organic chemicals into carbon dioxide and water. The process also degrades fats, starches, and proteins into compounds which can be metabolized by other organisms downstream.

2. Nitrification and First-Stage Nitrogen and Phosphorus Removal
Nitrifying bacterial, algae, and higher plants begin to metabolize nutrients in the waste stream. Ammonia (NH_3) is oxidized into nitrates (NO_3). Nitrates, ammonia, and soluble orthophosphates are metabolized directly by green algae and higher plants. Snails and other zooplankton begin the process of sludge digestion.

3. Nutrient Removal, Reduction of Suspended Solids, and Nitrate Uptake
Higher plants on the surface, with their root masses reaching down into the water column, take nitrates and phosphorus from the waste stream to promote leaf and flower production. Very large populations of grazing zooplankton inhabit the extensive surface area of the roots where the water is filtered.

4. Pathogen Reduction, Filtration and Denitrification
As the water passes through the marsh, solids are filtered in the sand and stone substrate, nitrate is reduced to nitrogen gas and water, and certain pathogenic bacteria are destroyed by the action of the marsh plants, induding bullrush, cattail, water iris, and reeds. An optional ultraviolet light at the discharge point disinfects the effluent.

The Natural System Advantage

Solar Aquatics Systems replicate and optimize natural wetlands processes to treat wastewater. Unlike mechanical treatment processes, these systems are complex, dynamic, self-organizing, and resilient, so they can adapt to changing effluent quality better than mechanical and chemical systems.

Natural systems appeal to the public, because they treat waste in a way that is in keeping with the high value many cultures and communities place on ecological integrity.

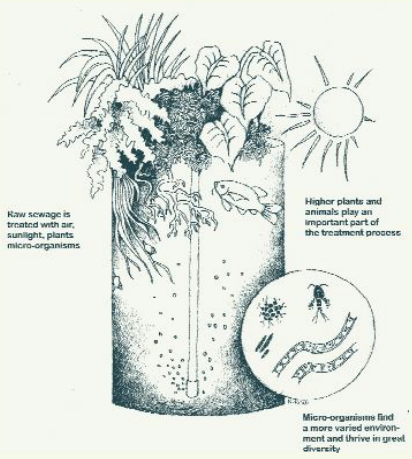
Wastewater Treatment, Recycling and Reuse

Solar Aquatics Systems can treat effluent to be used for:

- irrigation of plants, both indoo planters and exterior landscapes
- flushing toilets
- groundwater recharge

A Beautiful Amenity

With their arboretum-like abundance of plants, Solar Aquatics are often chosen when a super-cleaning wastewater treatment system is called for. Communities appreciate that a Solar Aquatics System is attractive—a good neighbor that fits into nearly any site without odors or unsightly equipment.



Modular: Grows with Your Needs

Their discreet enclosed components allow Solar Aquatics Systems to be easily expanded to manage increased capacity or stronger effluents.