

Lotus Filter Systems treat wastewater without using much energy, producing sludge or foul odors.

Introduction

After years of research and development Lotus Filters Systems has obtained a patent pending technology that synthesizes the best of a variety of wastewater treatment technologies. This technology:

- Requires virtually no energy to operate.
- Is a complete primary, secondary and tertiary wastewater treatment system.
- Requires simple low-cost civil engineering.
- Establishes installations with an unlimited life span.
- Has very low maintenance costs – simple analysis and gardening.
- Eliminates sludge and the need to administer it.
- Eliminates odors.
- Eliminates mosquitos and a host of waterborne pathogens.
- Establishes treatment facilities that are pleasant looking and ecologically functional areas to which all types of fauna are attracted.

To understand why this technology has been developed we should consider state-of-the-art wastewater treating operations work in three stages. In the first stage solid waste materials are separated from the water and in the other two stages oxygen is injected into wastewater allowing bacteria to metabolize the waste therein. The two latter stages require technologies that are expensive to install, difficult to maintain and expensive to operate because of the great amount of energy required. Thus, on one hand the rising cost of energy is making conventional treatment of wastewater a luxury available to a smaller number of sectors of the economy and on the other hand our ecology and society are crying out for more treatment facilities at lower costs.

To combat the rising costs of energy associated with wastewater treatment processes, over the last several decades thousands of wastewater treatment projects using “Wetland” technologies have captured the imagination and pocketbooks of societies throughout the world by capitalizing on the inherent ability of certain aquatic plants to oxygenate their roots and rhizomes using nothing more than the sun’s energy and a little wind. Wetland technologies capitalize on this simple and “free” phenomenon to do the same job as conventional technologies with virtually no operating costs. Through careful study of these conventional approaches, and some of the energy consuming ones, Lotus technology has developed a unique means of suspending plants at or near the surface for them to develop their roots and rhizomes into thick floating mats with a far greater oxygen producing potential than other “Wetland” technologies.



Lotus technology has a wide range of applications in industrial, commercial, agricultural, petrochemical, mining and municipal markets. It drastically increases the output of oxygen produced by aquatic plants growing in highly populated and structured environments at all feasible depths within a body of wastewater in accordance to the quantity and quality of waste to be treated. Some of the technologies incorporated in Lotus Filter Systems have been able to, more or less, successfully treat wastewater in which of nitrogen, phosphorus, pathogenic organisms such as bacteria, viruses, protozoa and helminthes, and heavy metals such as cadmium, copper, chromium, lead, mercury, selenium, and zinc, and the trace organics including highly stable synthetic compounds were present. By producing more oxygen and following far more developed treatment protocols Lotus technology can be adapted to any application with far greater success treating residuals from:

Industry.

- a) Concentrated Animal Feeding Operations (CAFO's) such as pork, beef and poultry – specifically elimination of purines.
- b) Aquaculture.
- c) Food Processing.
- d) Meat Processing.

Municipal utilities.

Address the needs of small communities with under-dimensioned, antiquated, or dysfunctional wastewater treatment facilities with new energy efficient plants.

Agricultural.

Clean water for irrigation.
Treat run-off residuals.

Oil and Gas Industries.

Processing wastewater produced as by-products of Petroleum extraction and processing.

Mining.

Removing a wide variety of metals from the water used to process extracted minerals.

Commercial and Residential Developments.

Providing residential developments, malls and shopping areas with treatment facilities able to meet effluent standards required by EPA as well as State and local ordinances..



A simple explanation of Lotus Filter Systems technology.

The basics of Lotus Filter Systems are quite simple. Each treatment facility has a great number of platforms on which a variety of aquatic plants grow to create a floating mat and injecting oxygen into a body of wastewater. This is made possible by providing a stable and adaptable system that relies on floatability as shown in Figure A.

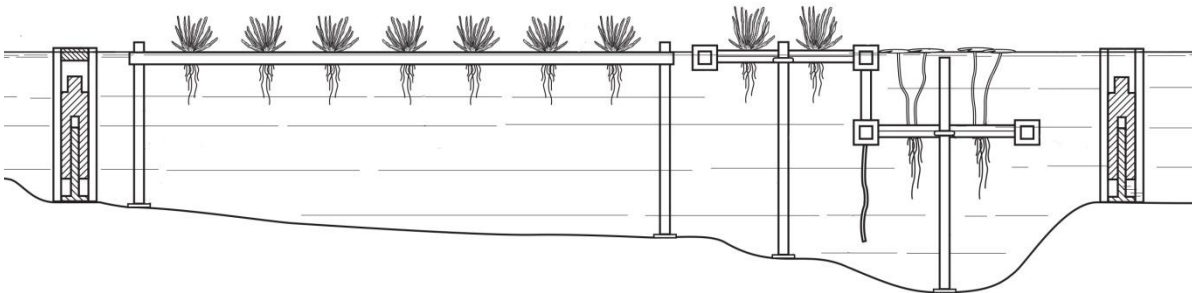


Figure A

These platforms, floating on all levels of wastewater, help emergent macrophyte plants create an oxygen producing mat that works with the help of floating broad-leaved plants which provide a steady circulation of air, and submerged plants upon which bacterial populations create steadfast biofilms.

The Lotus platforms (Figure B and C) are placed in the waste water to maintain the plants at their optimum depths. Initially these platforms may house up to eighteen plants per square meter but eventually these turn into dense mats with a depth of about half a meter. Some of these platforms are adapted with Hydraulic and Biological Skirts to perform two essential functions.

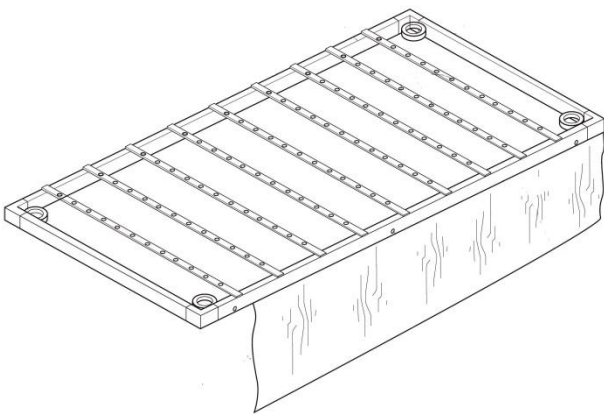


Figure B

The Hydraulic Skirts pictured in Figure B channel the influent waste and create a convective flux which is responsible for repeatedly exposing waste products to large bacterial populations in a wide spectrum of environments ranging from highly oxygenated ones to completely anaerobic ones. The dark lines in Figure D indicate the placement of the Hydraulic skirts to channel water from its entry into the treatment areas as influent on top of the figure to its exit as treated effluent on the bottom.

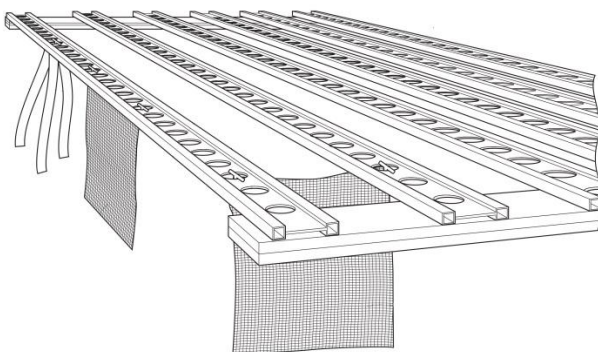


Figure C

The Biological Skirts (Figure C) and Hydraulic Skirts (Figure B) provide bacteria a surface upon which they may develop biofilms and increase the system's capacity to degrade waste. These Skirts control the flow of waste so it is repeatedly exposed to the widest range of bacterial populations inhabiting these biofilms and dictate the convective processes governed by the changing weight of the degrading waste. Thus, Lotus technology is unique in that it provides a wide range of environments in which aerobic, facultative and anaerobic



bacteria consume all the residuals without leaving sludge or creating foul odors.

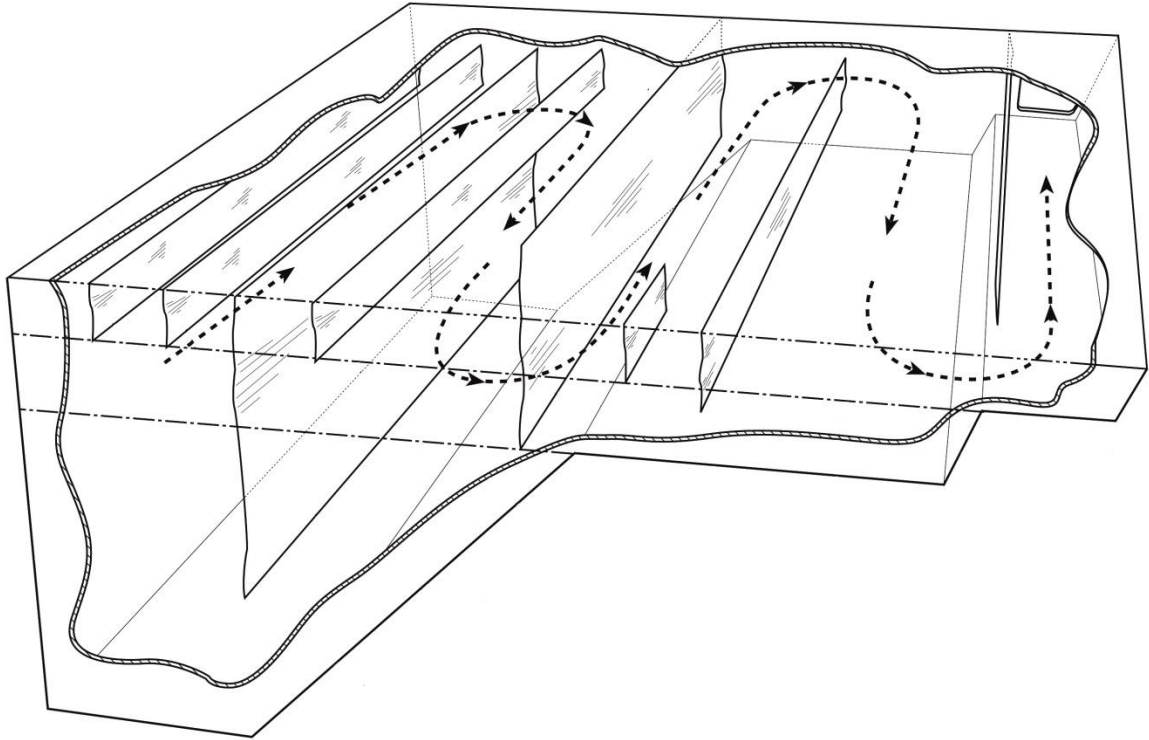


Figure D

To maintain the highest possible level of waste treatment, Lotus technology establishes a variety of optimal dimensions and configurations of the treatment zones which on the surface may range up to several thousand square meters with depths ranging from five meters to fifty centimeters in accordance to the quantity and quality of effluent to be treated. In these different depths anaerobic, facultative and aerobic bacteria treat all types of waste without the use of external sources of oxygen.



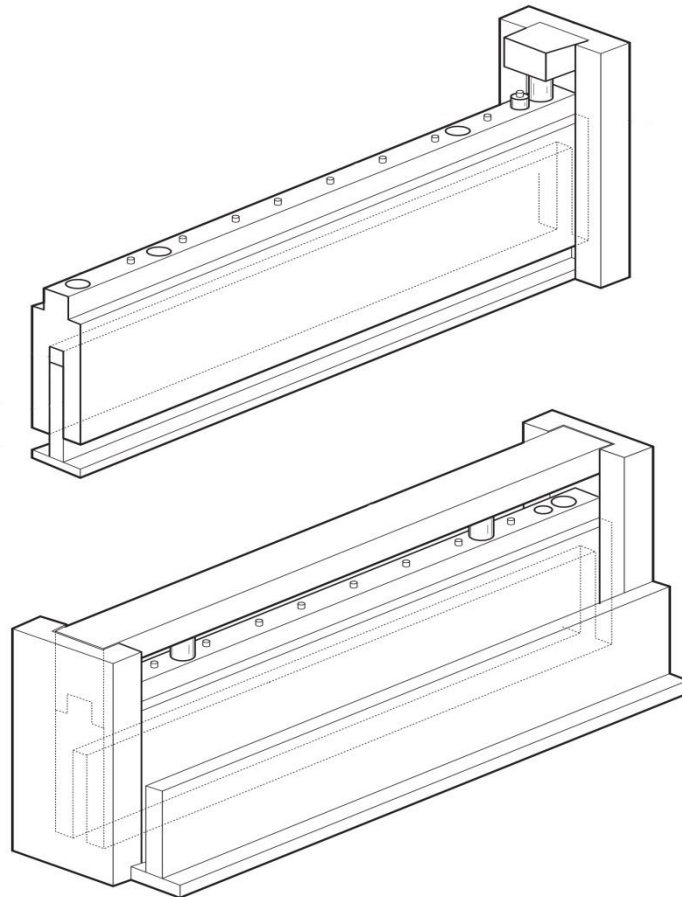


Figure E

Lotus installations are also unique in that they may be adapted with an Influent Barrier (upper drawing in Figure E) to prevent oils and other materials floating on the surface of the water from entering the facility and harming the plants and bacteria. The amount of effluent discharged from the installations may also be controlled by an Effluent Barrier (represented in the lower drawing of Figure E) that is calibrated to float at a certain distance from the surface and allow only a predetermined volume of water to exit the facility. Thus if there is a change in the volume of influent water into the treatment area (let us say it is due to a rainstorm) these barriers automatically raise in relation to the bottom of the treatment area and increase the volume of

wastewater in the installation to proportionately increase the retention time of the waste assuring it will be homogeneously treated independently of how much water enters the system.

Differences between Lotus technology and other “Green” technologies.

1) Lagoon Systems.

Most lagoon-type systems have an anaerobic pond with depths of more than three meters, facultative ponds of about a meter and a half, and maturation ponds with depths of less than one meter. Working in series these types of installations are not very efficient because they are not able to provide bacteria with the oxygen to efficiently digest waste. They require vast treatment areas with very long retention times that create sludge and odors. Lotus installations eliminate all these shortcomings in relatively compact installations with ample areas dedicated to intense aerobic as well as anaerobic digestion.

2) “Wetland” Technologies.

Vertical or Horizontal Flow Systems use aquatic plants to aerate filtering mediums and provide bacteria therein the necessary oxygen to metabolize a great variety of wastes. These systems however require lots of space and have a tendency to clog. Lotus technology is in an aquatic medium that can never clog up, eliminates the replacement of any filtering medium, and requires a fraction of the space.

3) Bio-Filters and Percolators.

These technologies are designed to create biofilms on the surface of plastic devices for the bacteria to develop a biofilm and digest waste with a certain amount of exposure to air. This approach is limited in that it requires a steady supply of air and a homogenous influent to maintain a steady source the waste bacteria use as nourishment. These processes are energy intensive and usually disturb the environment in which bacteria live. The Hydraulic and Biological Skirts used in Lotus installations are in constant contact with wastewater in the aerobic, facultative and anaerobic zones providing bacterial communities a steady environment in which they can carry out their respective digestion of waste.

4) Other systems using floating Macrophyte plants.

Lotus technology is the only patented system with the means of channeling waste from the moment it enters a treatment facility and exposing it to large biological populations attached to biofilms on Hydraulic and Biological Skirts. This type of channeling increases the exposure of waste to three hundred percent more bacteria than systems without these novel skirts. It also



distinguishes itself in that it provides a very large base for the plants to grow in without toppling over, or sinking.

5) Mixed bacterial treatments.

Instead of using bacteria as the sole means of treating wastewater Lotus installations are designed to establish very dense bacterial populations and providing them with large amounts of oxygen. These populations are to be maintained through bioaugmentation especially in cases where bacterial populations in the treatment facilities suffer a traumatic exposure to wastes toxic to them.

6) Active sludge systems.

These systems require massive amounts of air to be injected into treatment zones. With the price of energy spiraling upwards undoubtedly these technologies will be mothballed in the coming decades. Lotus waste treatment facilities rely on the plants to provide large amounts of oxygen without paying for this high-priced commodity. Moreover, they create oxygenated environments that trap noxious gasses in the lower levels of the wastewater and help with the complete elimination of sludge as well as the costs associated with its disposal.

7) Final polishing.

In the final phases of treatment Lotus installations expose whatever waste may be left over from the previous treatment areas to shallow highly oxygenated environment. Having passed this zone water enters into an even shallower area where it is exposed to the sun's ultraviolet radiation and solar panel powered UV lamps. Finally, the treated water passes through a patent pending filtering system.

Considering all that has been said it is evident Lotus technology is the ideal waste treatment system to use in towns with a population of up to five thousand inhabitants – for larger populations the treatment areas are simply recreated in adjacent treatment areas.

