



Tyson Industrial Waste Lagoon Upgrade



One of the twelve Restorers installed at a chicken-processing waste lagoon

Background and Design

Before consulting with Ocean Arks International and the John Todd Ecological Design team in 2001, Tyson Chicken was levied several fines by the Maryland Environmental Protection Agency against their Berlin, Maryland chicken processing facility. Effluent from the Tyson Lagoon was frequently out of compliance with Maryland-EPA standards and was unfit to discharge into Chincoteague Bay, a local fishing and shell fishing area.

With the help of John Todd's Restorers, Tyson Foods Inc. turned their sludge-filled lagoon into a thriving ecosystem and compliant wastewater treatment site. Restorers were installed to work in collaboration with existing traditional treatment elements. The result was a 95% reduction of contaminants, 70% reduction in energy use, 20% reduction in sludge production, and a discharge that complies with Maryland's open water effluent parameters. 25,000 native plants were used to create a balanced and complex ecosystem providing habitat for a variety of microbial communities all of which perform unique functions in the wastewater treatment process. Suspended root surface, aeration and water circulation are used to accelerate natural treatment processes.

Operation and maintenance of the system is simple and low in cost. The ecological diversity in the system results in a highly resilient system that is better able to handle sudden overloads than a traditional system. Over the first years of operation several local plants and turtles have migrated into the lagoon creating a unique self-organizing eco-system.



Treatment Process

The ecological treatment system is an upgrade to an existing lagoon used as a decant pond following a conventional dissolved air flotation and sequencing batch reactor (SBR) process. The original SBR utilized approximately 280hp of aeration equipment. The 9 million gallon lagoon was retrofitted with a Restorer system that treats water to a higher standard, uses less energy, and produces less sludge than the former SBR system.

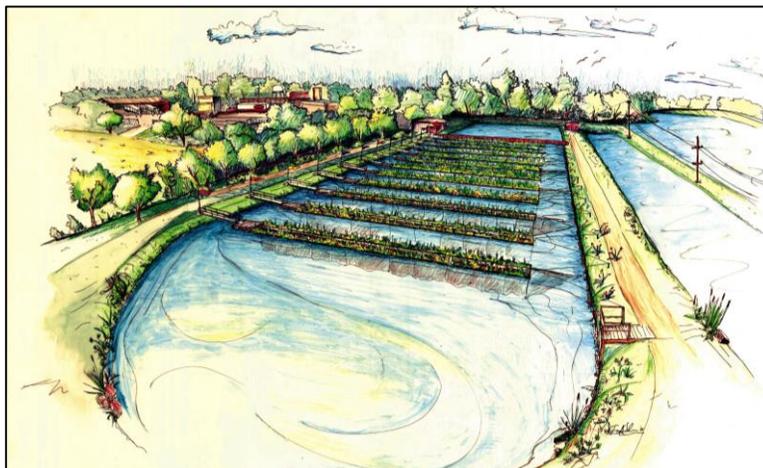
12 Restorers run 140 feet across the lagoon and are planted with twenty-five species of native plants. Fine bubble linear aerators installed at the bottom of the lagoon provide energy efficient aeration and gentle mixing. The center zones of the Restorers, equipped with fixed-film media, are submerged aerobic reactors. The Restorers and fabric baffles are arranged to create a serpentine flow pattern which, combined with the gentle rolling action of the linear fine bubble aeration, forces the water to continually roll past four distinct aquatic ecologies: plant root zones, fabric media, sludge mounds and open water. This spiraling flow pattern mimics the natural movement of water in streams and maximizes the exposure of waste particles to diverse biological communities.



Fine bubble aeration creates mixing within the lagoon

The 20% reduction in sludge after installation of the Restorers translated into a savings of over \$55,000 per year in reduced sludge disposal costs. The estimated total savings in energy compared to previous operations were approximately 3,500 kWh/day (a reduction of 60%) which equates to an annual savings of approximately \$71,000. The lagoon system, treating ~1 million gallons/day, has been successful at nitrification and removal of organic matter. The effluent from the Restorer Lagoon has an average ammonia level of 0.8 mg/l and TSS of 4.3 mg/l.

The Berlin system emphasizes the compatibility of the Restorer technology with conventional technologies. In similar cases we would recommend a constructed wetland instead of a clarifier for improved BOD and suspended solids reduction with enhanced denitrification.



Artist's rendering of the system