Samson Environmenatal Center Eco-Machine™

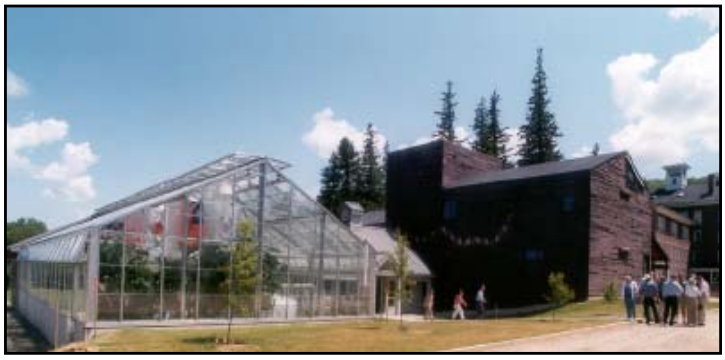
Darrow School, New Lebanon, New York

In the mid 1990's Darrow school administrators were seeking a cost-effective, environmentally friendly solution for their failing septic system. Rather than installing traditional septic tanks and leach fields, they decided to invest in an Eco-Machine™ to meet their wastewater needs. The Eco-Machine™ and the Samson Environmental Center, which officially opened in 1998, are the most visible embodiments of Darrow's commitment to sustainability.

The Darrow School occupies the site and buildings of the original Shaker village located on Mount Lebanon at the far western edge of the Berkshires in New Lebanon, New York. Darrow is a boarding and day school for grades 9-12 offering a comprehensive, hands-on, college-preparatory curriculum.

Using a natural ecosystem as a model, the Eco-Machine™ treats wastewater from school dorms and other campus buildings before returning the water to the Hudson River watershed. In this alternative system, nature's "processors"—a diversity of microorganisms, snails, oxygen, fish, and higher plants—are used to break down and digest organic pollutants. For a portion of its energy requirements, the Eco-Machine™ utilizes photovoltaic panels and gravity as renewable sources.

Lush vegetation of the five open aerobic aquatic cells enclosed in a vented greenhouse



The Eco-Machine™ is closely integrated with the historic buildings that make up the majority of the campus.

"Bringing balance to our campus is an ultimate goal of the Darrow School's interest in ecological sustainability and we try to imbue each of our students with this sense of one's personal responsibility to their environment."

– The Darrow School

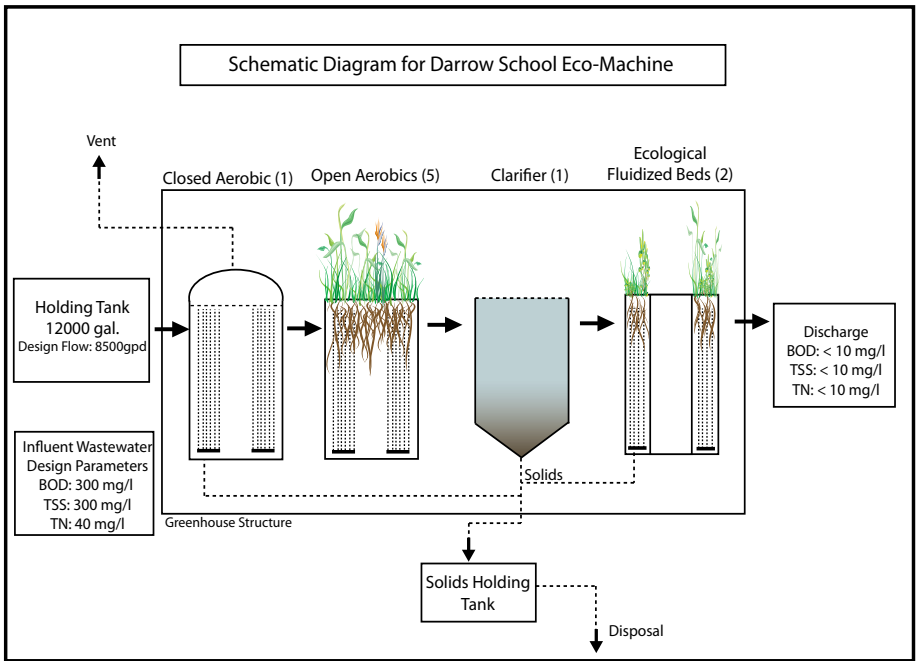
Process

Wastewater, at a rate of 8,500gpd, flows into the Eco-Machine™. A 12,000 gallon tank initially holds and distributes the wastewater into the first component of the treatment system; a single aerobic digester. This closed tank contains a diverse microbial community that begins the process of breaking down the organic waste. Aeration and mixing is provided by air diffusers at the bottom of the tank. There is approximately 1.4 day retention in this anaerobic tank. This component and the following aquatic cells are all housed in a 1,500SF greenhouse. This infrastructure allows for waste to be treated throughout seasonal fluctuations and still treat it to high standards.

The effluent from the closed aerobic tank then flows, via gravity, to the first in a series of five open aerobic tanks. These open aerobic cells are covered with surface plant racks whose prime function is to provide ideal habitat for a wide range of organisms that function to further breakdown the waste. Organic matter and solids are digested

by communities of bacteria, zooplankton, phytoplankton, snails, and fish. This robust, and increasingly diverse sequence of ecologies within the cells provides highly stable, resilient treatment that minimizes the production of bio-solids. Any remaining solids are then settled out by a clarifier.

Following the open aerobic tanks, the waste flow enters the first in a series of two ecological fluidized beds (EFB's). These serve as a final polishing step in the treatment process. An outer ring of open water surround a central, media filled core. The flow first enters the outer zone and is circulated down through the media in the center zone. Residual organic matter is removed within this component. Polished effluent from the Eco-Machine™ is then safely discharged into the Hudson River watershed.



Education

In addition to processing the school's wastewater, the Eco-Machine™ provides a setting for a wide variety of educational activities. This hands-on learning opportunity offered to Darrow students is one of many unique, forward thinking educational approaches at the school. Students routinely monitor levels of bacteria, phosphorous, nitrogen, and other biological and chemical levels. They observe and maintain plant life which grows in the aquatic treatment tanks throughout the facility. By participating intimately in this ecological solution, concepts of sustainability are more effectively conveyed.

Above: An educational tour of the Eco-Machine™.
Left: A student monitors water paramters within the aquatic cells.

Outreach

Since its opening in 1998, the Samson Environmental Center has been visited by more than 500 guests a year wanting to learn more about environmentally responsible solutions to wastewater treatment. Educational, civic, corporate, and environmental groups have explored the center and have used it as a resource for their own investigations and studies. Led by student tour guides, visitors learn how the Eco-Machine™ works and gain a broad perspective of sustainability in our world today.

For more information or to schedule a tour of the Samson Environmental Center please email Craig Westcott at westcottc@darrowschool.org