

The SolarBee® solar powered water circulator: An Innovative Water Reservoir Treatment Process

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Disclaimer

The Pennsylvania Department of Environmental Protection does not endorse or recommend any of the technologies described herein. **The technical articles are provided for informational purposes only.** Persons seeking additional information about the described technologies should contact the parties listed in the article.

Overview

The SolarBee® solar powered reservoir circulator is a new treatment technology offered by Pump Systems Inc. for use in wastewater lagoons, fresh water lakes, and potable water storage tanks. First manufactured in 1998 the SolarBee® unit got its name in 2001 and by 2004 almost 600 machines were manufactured and installed nationwide. In wastewater systems, the SolarBee® system can provide mixing to reduce energy costs, control odors, and digest accumulated sludge to reduce dredging costs. In fresh water lakes, SolarBee® is effective in treating problems such as algae blooms, eutrophication, and fish kills. In potable water reservoirs the SolarBees® can reduce stagnation. The unit is solar powered so there is no energy cost. Most models run 24 hours per day from energy stored in a battery during the day.

How It Works

The SolarBee® unit floats on top of the reservoir/pond while it draws water up from below the surface, through an intake hose, and spreads it across the surface in a near-laminar long-distance-flow pattern. (See appendix A for pictures.) The intake system allows a specific depth to be treated without the risk of disturbing the sediment. There are units available that can circulate up to 10,000 gallons/minute.

The flow is created by a solar powered motor, which spins an axial flow impeller. The design allows for a mixed water of 3'-100' depending on the intake hose configuration. Machines are equipped with various styles of intake hoses to allow the machines to self-adjust for various water depths and, at the same time, never disturb the bottom of the reservoir. A flow dish under the impeller causes the flow to travel for long distances of up to 50 acres per machine on the large machines. All machines are constructed of 316 stainless steel and polymers. All components, including the electronics system and motor have a 25-year design life.

Reported Advantages Over Conventional Technology

- In wastewater systems there is usually a high-energy savings and a short payback time due to reduced run-time off the aeration system.
- In lakes, the machines can eliminate blue-green algae and get oxygen where it is needed.
- In potable water storage reservoirs the machines can reduce water age and the associated problems. They can also be used for breakpoint chlorination.
- Not damaged by running dry or being frozen in.
- Long life (25 years) with little or maintenance.

Potential Disadvantages/Concerns

- Data concerning the longevity and life cycle cost of the unit is not available because the technology is only 6 years old.
- Salt water applications may require regular cleaning of mussels and barnacles

Technology Verification and Usage

In September 2003 the Ohio EPA, Division of Surface Water, the Division of Environmental and Financial Assistance, and the Ohio Rural Water Association evaluated the SolarBee® 10000W running on the 24hour shore power kit at the Rockford, Ohio wastewater treatment system. The system consists of 3 partial mix lagoons, which were designed for a flow of 250,000 GPD and constructed in 1986. The 4.9 million gallon secondary cell was selected for this evaluation because of its size and its well-developed algae population. The test was performed with a rhodamine dye, which was introduced directly into the center of the dish. The test was run for 22 hours, after which the SolarBee® unit was turned off. The pond attained ‘complete mix’ in about 10 hours, which indicates a re-circulating rate of 8100 GPM. This number is in agreement with SolarBee®’s claims of about 8000 GPM when using the shore power kit. It was also concluded that temperature stratification could have a detrimental effect on the ability of the SolarBee® system. Since the water at the bottom is much denser the 7,000 GPM induced flow may not be able to achieve full mixing. It is possible however that the 3000 GPM of direct flow may be able to break the stratification allowing the induced flow to have a much greater effect. Rockford decided to use the SolarBee® system when their prop aeration devices began to fail in fall 2002.

In 2004 the City of San Francisco published the results of studying the SolarBee® mixing in an 89 MG reservoir. The study concluded that the SolarBees® thoroughly mixed the reservoir and could be used to successfully breakpoint chlorinate the reservoir.

Capital and O&M costs for the system vary depending on the model being used and include installation by a SolarBee® installation crew.

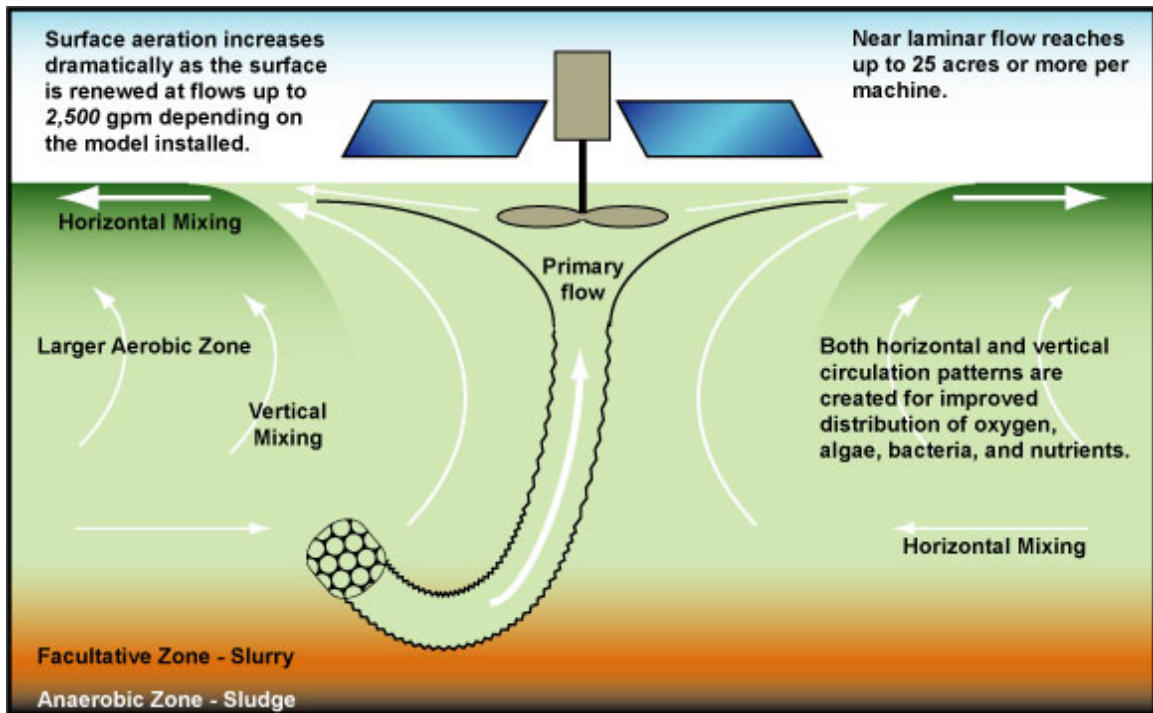
Appendix A

A SolarBee® in action:

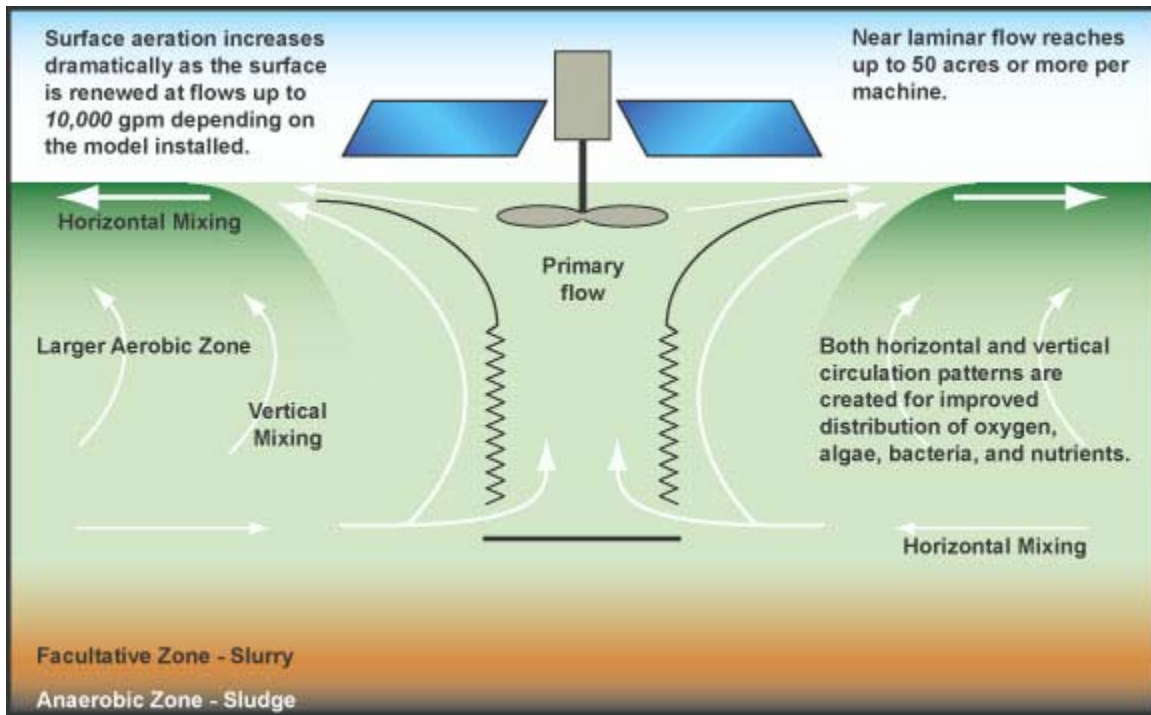


Appendix B

Small Diameter Intake (12''):



Large Diameter Intake (<36''):



Sources of Additional Information about the SolarBee® solar powered water recirculator is available by mail at SolarBee Sales, PO Box 1940, 530 25th Ave E Dickinson, ND 58601, by e-mail at SolarBee@SolarBee.com, by phone toll free: 866-437-8076 and online at www.SolarBee.com.