

Application: **Wastewater treatment**Customer: **Municipality****Location:**

Village of St. Henry, Ohio

Problem:

Undersized system with inadequate aeration

Solution:

Reconfigure pond; reduce mechanical aeration run-time and install solar-powered circulators to mix

Result:

Reduced energy costs and odors

Village of St. Henry wastewater treatment plant cuts mechanical aeration run time by 60 percent with solar-powered circulation technology

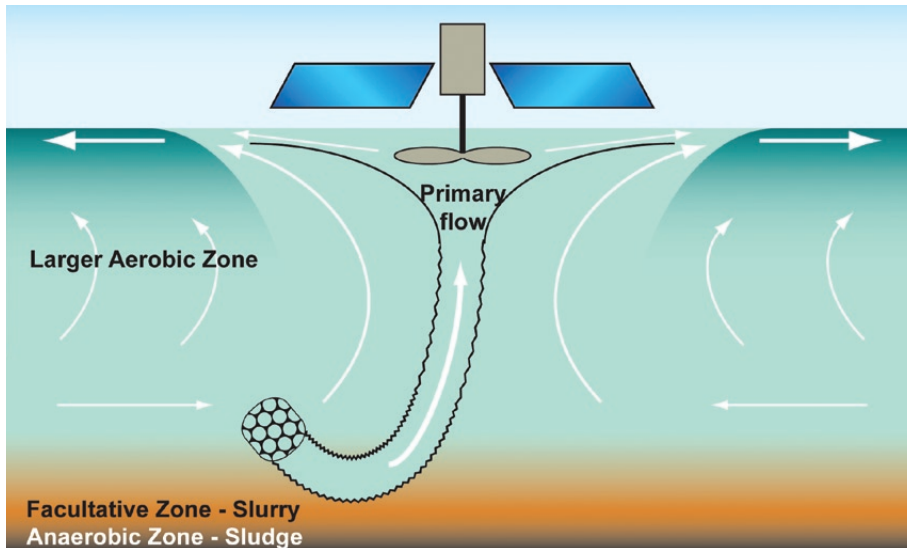
Rural community reduces utility costs and increases plant capacity by using solar-powered circulators to mix ponds and eliminate odor problems.

ST. HENRY, OHIO, USA — In the Buckeye State, the village of St. Henry, Ohio, is bucking the trend of many rural farming communities. Instead of losing residents and local businesses to bigger cities, this community 40 miles northwest of Dayton is growing. Local industries such as turkey processing are expanding as well. Consequently, the city of 2,700 was outgrowing the capacity of its wastewater treatment plant. But St. Henry is still a small town with a limited tax base, so when city officials learned that new wastewater treatment equipment would cost almost half a million dollars and add \$49,000 in annual energy costs, they looked elsewhere for a solution. Not only did they find an answer, they also saved on their utility bill. Instead

of adding energy-consuming aeration equipment, they saved \$100,000 in capital equipment costs by adding solar-powered circulation equipment to the existing plant. SolarBee circulation equipment thoroughly mixes the ponds and significantly reduces energy consumption.

“The problem with the old system was that it was undersized,” said Stan Sutter, public utilities supervisor for St. Henry. “We needed more aeration and we needed a new cell for extra storage capacity. Originally, we considered installing a diffuser blower system that would replace the surface aerators.” Three big blowers would blow air through a common header along the whole outside of the lagoon. “But the blower system

would have increased our horsepower by 30 percent and our utility bill as well. We were determined to solve our problems without all that extra expense.”



SolarBee circulation technology creates horizontal and vertical circulation patterns that help improve distribution of oxygen, algae, bacteria, and nutrients. During the day, dissolved oxygen is above saturation. Oxygen which would otherwise bubble out and be lost is captured and mixed throughout the pond. At night, when dissolved oxygen is at less than saturation, surface re-aeration adds dissolved oxygen to the pond.

The treatment plant not only had to meet the needs of the growing population, it also had to smell better. The solution that St. Henry staff and consulting engineers developed was to reconfigure the first pond, reduce mechanical aeration run time and add solar-powered circulation to thoroughly mix the ponds and reduce odors.

Solar-powered circulation technology can displace up to 40 hp of grid-powered mixing energy

The unique technology from SolarBee combines solar power with long-distance, near-laminar-flow circulation to provide radial, horizontal and vertical pond mixing. SolarBee circulators operate day and night to circulate and mix wastewater ponds of all types. They help to conserve dissolved oxygen by mixing and distributing saturated surface water throughout the pond, replacing 20 to

40 horsepower of aeration and mixing run time per unit. As a result of this mixing efficiency, St. Henry officials can offload a significant portion of their energy-intensive aeration and mixing functions, while significantly reducing biochemical oxygen demand (BOD), total suspended solids (TSS) and ammonia. Near-laminar-flow circulation also solved the odor problem and reduced sludge buildup.

SolarBee circulation equipment is designed around pumps capable of moving up to 10,000 gallons per minute, or 14.4 million gallons per day (mgd). Because of the unique hydraulic design, the system uses only 36 watts to power a one-half horsepower direct-drive motor that is 90 percent or more efficient. Three 80-watt photovoltaic panels charge an onboard battery, thus enabling the units to run day and night on solar power.

Reconfigured plant eliminates odor problems and saves \$20,000 annually in utility costs

Reconfiguring St. Henry's wastewater treatment plant meant dividing the first pond into two sections. The purpose of dividing the eight-acre, rectangular-shaped pond was to concentrate the treatment in a small, total-mix, high-solids lagoon and essentially create an activated-sludge basin without the expense of building one. In section A of the first pond, eight aerators and one SolarBee unit concentrate the aeration and provide deeper mixing. Approximately 800 to 1000 mg/l of carbon biochemical oxygen demand (CBOD) run through the first cell and about 100 mg/l of CBOD leave the pond after a three-day detention time.



SolarBee circulation equipment installed in St. Henry's wastewater treatment ponds provide thorough mixing, reducing the need for energy-consuming aeration equipment. As a result, St. Henry has reduced aeration run-time by 60 percent and utility bills by \$20,000 per year, according to Stan Sutter, public utilities supervisor.

After the first pond, the system returns to a facultative system. During the day, the gentle and continuous mixing of the SolarBee units brings nutrients to the surface of the pond to promote an increased and highly beneficial algae growth. The algae produce energy-free pure dissolved oxygen—up to 250 lbs. of dissolved oxygen per acre per day. A high pH also occurs near the surface. The high dissolved oxygen and high-pH water is continuously and thoroughly mixed throughout the pond, instead of being mostly underutilized, as in all-natural ponds. The higher dissolved oxygen throughout the pond helps reduce BOD by 70 to 90 percent. And, most noticeable to St. Henry residents is the fact that the bad odors have been virtually eliminated.

In total, seven SolarBee units and 11 aerators mix and aerate the lagoons to meet permit requirements. A new fourth pond was also installed, which provides an additional 67 million gallons of storage. By the time wastewater reaches the fourth pond,

there is not enough carbon, ammonia or phosphorous to cause permit problems, or to support algae growth high enough to result in BOD and TSS problems. Better yet for the St. Henry municipal budget, aeration run-time has been cut by 60 percent and the utility bill by \$20,000 per year.

To Stan Sutter, that's a "green" payback. "Green goes hand in hand with operational cost savings," he said. "We're not consuming near as much power as we were originally looking at. In fact, we've decreased our horsepower rather than increasing it, and any time we can use fewer resources, it benefits the entire community."

With a renewed wastewater treatment system designed with an eye on saving big bucks, St. Henry is well prepared for future population growth and new industries and to meet stringent regulatory requirements.

About SolarBee™

SolarBee, Inc., a division of Medora Environmental, Inc., manufactures and installs solar-powered, long-distance water circulation equipment. Introduced in 2001, the floating, up-flow circulators can move up to 10,000 gallons per minute from depths of more than 100 feet with a solar-powered pump. SolarBee circulators help solve water-quality problems worldwide in freshwater lakes, wastewater lagoons, storm-water ponds, estuaries, potable and recycled water storage tanks and other reservoirs.

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