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Wastewater treatment goes

Wastewater treatment systems powered by wind and solar go off the grid for power and sewer. Tristian Bounds, PE, of Orenco Systems®, Inc. explains how the systems achieve the triple bottom line of sustainability.

For architects and engineers who are designing facilities that are off-the-grid – by necessity or by choice, finding a wastewater treatment system (WWTS) that can meet power, geographic, financial, and performance requirements can be a real challenge. In four recent wastewater projects, Orenco Systems' energy-efficient AdvanTex® Treatment System met those conditions. Each wastewater treatment project is powered by wind or solar and produces clear effluent of such high quality that it can be recycled for beneficial uses.

Off-the-grid wastewater systems powered solely by wind or solar can come in various configurations. Some are designed with a battery to store the energy from those intermittent power sources. A DC/AC inverter might then be added to accommodate typical household appliances. Other systems use DC to directly power the filter pumps. Whichever configuration is used, the financial feasibility of the project

depends on limiting the wattage requirements of the system.

Because aerobic (oxygen-using) organisms are responsible for most of the treatment in a packed bed filter, the media must have an adequate supply of oxygen from the air. To provide oxygen to the treatment media, air circulates in and out of AdvanTex Treatment Systems through a passive vent. Because residential AdvanTex systems use passive venting with no fan, they require only enough electricity to intermittently power the filter pump.

Some wastewater treatment systems, such as suspended growth aerobic treatment units (ATUs), require a blower that can run continuously to maintain adequate dissolved oxygen in the liquid and ensure mixing of the solids with the microbes that feed on them. Blowers consume a lot of electricity, so operation costs for a suspended growth ATU can be quite high – at more than 5,000 kWh per year for a single-family residence. That's US\$500/year at \$.10/kWh. Conversely, recirculating media filters use very low power – approximately 173 kWh per year for the same-sized system (or \$17/year at \$.10/kWh).

Off-grid projects

The pristine Wattamolla surf beach in Royal National Park, Australia, required an upgrade to its aging wastewater treatment system. Consequently, park officials decided that the new low-energy system should run on solar energy and be low maintenance, hassle-free, and able to handle seasonal peaks.

The engineering firm in charge of designing the new system, Strategic Environmental & Engineering Consulting, considered a

recirculating sand filter, which met the above criteria, but decided against it due to space constraints. Instead, they selected a compact AdvanTex recirculating textile filter, which operates in a similar configuration, with intermittent dosing by ½-horsepower (~375 watt) effluent pumps.

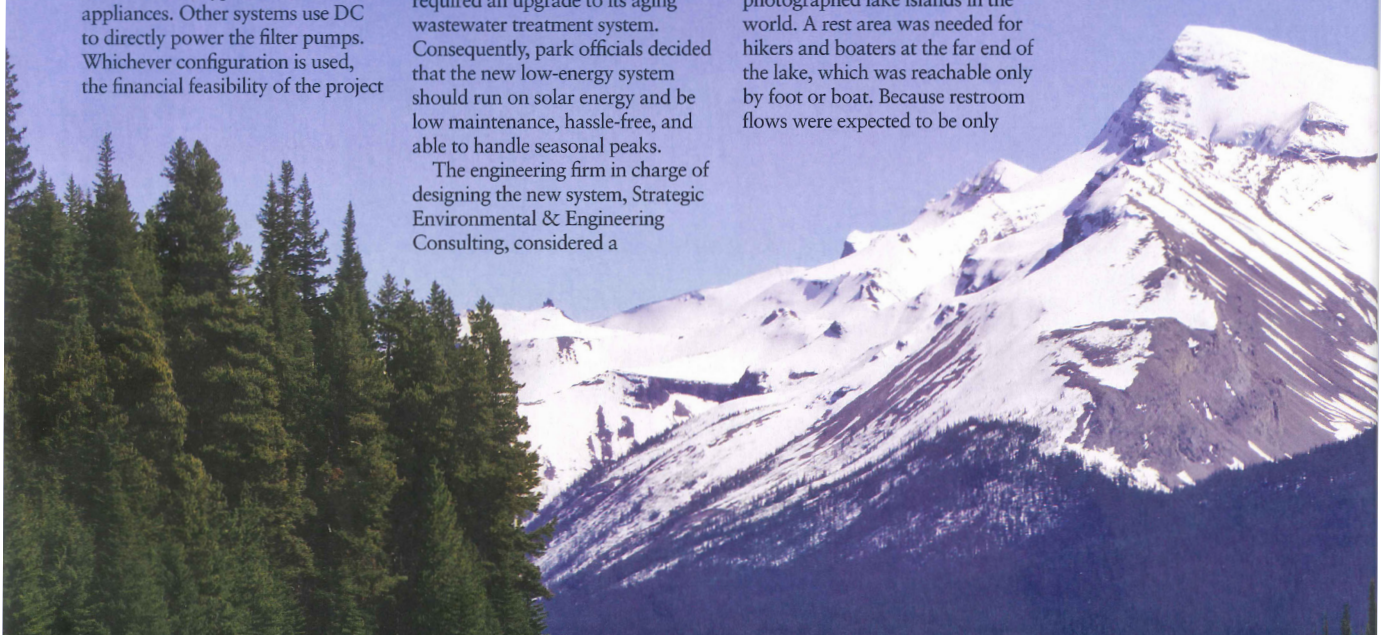
"The system was a breeze to install, and I was amazed how fast the treatment kicked in, with extremely clear effluent visible after only days," said Project Manager Kerry Flanagan of Kerry Flanagan Wastewater.

Another remote installation requiring an off-the-grid advanced wastewater treatment system was the Esther's Island Retreat, accessible only by boat, off of coastal Nantucket, Massachusetts, United States. Wind and solar are the only available power sources; they feed a battery storage system with a DC/AC inverter which, in turn, provides power to an AdvanTex Treatment System's pumps. The effluent is treated to reuse standards, and the wastewater system's design contributed to the retreat's qualification for a prestigious LEED Silver rating, awarded by the US Green Building Council.

A major tourist attraction near Jasper in the Canadian Rockies, beautiful Maligne Lake is the site of Spirit Island, one of the most photographed lake islands in the world. A rest area was needed for hikers and boaters at the far end of the lake, which was reachable only by foot or boat. Because restroom flows were expected to be only

about 750 liters (200 gallons) per day during the summer tourist season, a septic tank followed by an AdvanTex® Model AX20 and dispersal to a shallow, pressurized drainfield was recommended. The materials for the project had to be barged to the site, except for the Orenco fiberglass septic tank, which was floated over on two canoes. The installation is totally off the grid, powered by solar panels. Water for the restroom is pumped from the lake, but the glacial lake water is so cold it inhibits nitrification, so nitrifying bacteria are added at the onset of each season. An upflow filter for denitrification and phosphorus removal was installed to provide additional protection for the lake's pristine, turquoise waters.

The Audubon Society, a US nonprofit organization dedicated to conservation, also chose AdvanTex treatment systems for two of its educational centers in Los Angeles, California, and Phoenix, Arizona. The Audubon Society won approval by the city of Los Angeles to go "off" the sewer grid so it could capture, treat, and reuse wastewater with an AdvanTex wastewater treatment system. Flow through the AdvanTex filters is accomplished by solar-powered DC pumps. Treated effluent is of such high quality that it is often reused for irrigation and will ultimately be reused for toilet



off the grid



flushing. The Audubon Center is designed to treat all wastewater on site, and it uses 70 percent less water than a comparable conventional building.

Similarly, the design team for the Audubon Center in Phoenix installed an AdvanTex Treatment System, which uses the output from its system for subsurface irrigation to the adjacent Rio Salado Habitat Restoration Area. That also helps preserve potable water for other uses. The center is also powered by a photovoltaic system.

Both of those Audubon Educational Centers earned LEED Platinum ratings. The Los Angeles facility won the first LEED

Main image: Maligne Lake, Alberta, Canada With its glacier fed waters and location near Jasper in the Canadian Rockies, Maligne Lake is one of the most photographed in the world.

Above: Solar panels feed a bank of batteries that then power recirculation pump for the AdvanTex wastewater treatment filter installed at Spirit Island.

Platinum ever awarded. According to the US Green Building Council, the center won its award by “garnering particularly high marks for its efficient water system and renewable energy sources.”

Going off the grid is a green, environmentally friendly thing to do, but true sustainability must also be economical and socially acceptable. Affordable technologies that are quiet, non-intrusive, and high-performing can meet that “triple bottom line” of true sustainability.

