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# Sustainable reuse at National Scout Reserve

Orenco's AdvanTex® graywater reuse system saves the Boy Scouts of America significant water and energy resources during its large National Scout Jamboree held every four years in West Virginia, United States (US). **Jeff Pringle** and **Grant Denn** of Orenco explain how the energy-efficient and sustainable decentralized treatment system works.

The Boy Scouts of America (BSA) installed an energy-efficient, graywater reuse system for disposing of the graywater generated by the 336 shower buildings at its showcase camping and training facility, the Summit Bechtel Family National Scout Reserve ("the Summit"), in the state of West Virginia, United States (US).

An array of AdvanTex® AX20-RTs – 224 in all – and two AdvanTex AX-Max™ units process the graywater and treat it for reuse in toilet flushing. This graywater system can save the camp up to 757 cubic meters (m<sup>3</sup>) of water per day during large events such as the National Scout Jamboree, a monumental gathering every four years of approximately 40,000 scouts, leaders, and support staff.

## Planning for sustainability

In 2009, the BSA purchased 4,290 hectares (ha) of property in West Virginia next to the New River Gorge National River. This property would become home to the National Scout Jamboree and the Christen National High Adventure Base, attracting scouts from around the country. The facility was named the Summit Bechtel Family National Scout Reserve and was completed in time for the 2013 Jamboree.

Boy Scouting places great emphasis on environmental stewardship. In fact, one of the requirements for becoming an Eagle Scout (the highest rank possible in the US) is earning either the Environmental Science or the Sustainability merit badge. In keeping with those principles while developing the Summit, the BSA contacted the US company Natural Systems International, an engineering firm specializing in environmental planning, restoration, and design-build services.

Natural Systems was acquired in 2011 by Biohabitats, based in Baltimore, Maryland, US, which also emphasizes ecological stewardship.

Sustainability was a major goal in the design and development of the Summit. While planning for onsite treatment of the facility's wastewater, engineers realized it was essential to minimize overall water use at the camp. A significant means of accomplishing this goal would be to capture graywater from the camp's showers and sinks for use in toilet flushing.

The Biohabitats' engineering team evaluated more than twenty different graywater treatment options with the following criteria in mind:

- Small footprint
- Quick start-up capability (from non-use to full treatment in 24

hours or less)

- Dependable operation and ease of maintenance
- Low energy use
- Effective treatment, even with highly variable flows
- Established performance record, especially for graywater systems.

In the end, Orenco's AdvanTex® Treatment Systems proved to be the best solution, meeting all of these requirements. Biohabitats recommended a total of 224 AdvanTex AX20-RT units and two 4.3-meter AdvanTex AX-Max™ units be installed throughout the camp in small clusters next to each shower/bathroom facility. This solution provides a capacity of 878 m<sup>3</sup>/day – enough to handle heavy flows during the National Scout Jamboree.

## Saving money

Both the AX20-RT and AX-Max graywater systems are pre-plumbed, plug-and-play units that are easy to install. The entire system – including treatment, recirculation, and discharge – is built inside a fiberglass tank. This simple design reduces costs not only for the initial excavation and installation, but also for ongoing operation and maintenance.

Additionally, the energy-efficient AdvanTex units use 0.37-kilowatt (kW), 115-volt pumps that consume fewer than 2 kWh per 3.8 m<sup>3</sup> of treated water, based on internal tests conducted by Orenco. For the AX-RT, that usage typically costs between US\$2 and \$3 per month, depending on local electricity rates.

And, most importantly, with the AdvanTex graywater treatment



The AdvanTex Graywater Treatment Systems in place at the Summit Bechtel Reserve are an important part of the facility's overall sustainability. AdvanTex technology is known for its low energy use and for effective treatment, even with the highly variable flows common to camping areas. Photo by Biohabitats, Inc.



At the BSA's National Jamboree site, AdvanTex® Treatment Systems from Orenco treat up to 757,000 liters per day of graywater for reuse. Photo by Biohabitats, Inc.

systems in place, the Summit saves up to 757 m<sup>3</sup> of water per day during its largest event, the National Scout Jamboree. This result is possible because every liter of water from the showers and sinks is available to be used not once but twice before it's pumped away to the wastewater treatment plant.

#### How it works

The AX20-RTs are installed in pairs at each of the Summit's shower/bathroom facilities. Graywater from the showers and sinks enters the first AdvanTex tank through an inlet tee. Any solids that may have accidentally gone down the drain are collected in a catch basin, leaving only liquid and air inside the tank.

The liquid passes through an Orenco Biotube® effluent filter and is then pumped intermittently in very small amounts over the textile treatment media, which hangs in sheets at the top of the AdvanTex unit. The microorganisms attached to these sheets extract and digest the organic waste in the water, cleaning it as it trickles through the media. This textile media has exceptional water-holding capacity, providing more time for the bacteria to feed.

Another advantage of the AdvanTex textile is its large amount of void space, which allows for greater movement of air as well as more room for the accumulation of inorganic solids. Additionally, the attached-growth surface area of the textile is 4 to 8 times larger than typical recirculating filter media, providing more area for microbial growth and a greater opportunity for both air and effluent to come in contact with the microbes.<sup>1</sup>

After the effluent passes through the textile media, it flows by gravity from the second AX20-

RT to a dose tank before undergoing UV disinfection. Following disinfection, the effluent is kept in a pressure tank that provides water for the camp's toilets. If there's more effluent than is needed for toilet flushing, the excess is routed to the blackwater collection system, and conveyed to the Summit's wastewater treatment plant.

#### Happy campers

Five years after installation, the AdvanTex graywater treatment systems at the Summit continue to meet high expectations. Biohabitats Senior Engineer Pete Muñoz says, "[Orenco's] proven dedication to quality and their continued investment in research and development gives us the confidence that Orenco's system will perform as designed. When we were designing the innovative graywater recycling system to be installed at each of 112 shower complexes at the BSA Summit, AdvanTex technology met all criteria and helped ensure a successful project outcome."

The Summit Bechtel Reserve is a state-of-the-art facility offering youth a wide variety of outdoor adventures, from whitewater rafting to rappelling to BMX biking – all with minimal environmental impact. Orenco is proud to have had a part in its development and to play a continuing role in its sustainability.

#### Authors' Note

Senior Account Manager Jeff Pringle and Senior Manager for Engineered Products, Grant Denn are based at the corporate headquarters of Orenco Systems, Inc., located in Sutherlin, Oregon, United States.

#### Reference

1. Bounds, Terry R, (2002) Performance of Textile-Based Packed Bed Filters, World Congress on Environmental Health

## AdvanTex® treatment offers cost savings

Mountain Top Condos, St. Thomas, US Virgin Islands

**Problem:** The owners of a 23-unit condominium complex on the island of St. Thomas recognized the need to replace their failing wastewater system. They needed an easy-to-maintain replacement as soon as possible, but the steep hillside location and very limited land area made installation a challenge. In addition, the owners wanted a system that could be phased in for budgetary reasons. Also, the wastewater had to be treated to reuse quality for use in toilet flushing and outdoor watering.

**Solution:** Susan Parten, PE, had long been familiar with Orenco Systems® technologies. After evaluating the situation at the condominiums, she determined that an AdvanTex® Treatment System would provide effective treatment and also offer several cost-saving advantages, including low electricity and maintenance requirements.

To reduce up-front costs, Parten recommended that the project be completed in two phases. Phase I included the installation of an Orenco T-Max™ tank for primary treatment. This was followed by a new sand filter for tertiary polishing and then a cartridge filter and UV disinfection unit. An Orenco MVP control panel was also installed.

As soon as Phase I was completed, effluent quality immediately improved, even though primary-treated wastewater was still being dosed to the existing SBR prior to sand polishing. For the next year, flow tracking from the Orenco control panel was used to determine actual wastewater flows. This tracking turned out to be very important because flows were found to be significantly lower than estimated. This allowed for a reduction in the size – and the cost – of the secondary treatment unit that would be installed later.

Phase II involved the replacement of the old SBR with a 4.3-meter (m) AdvanTex AX-Max™ Treatment System. Due to their sturdy construction, neither the T-Max tank nor the AX-Max unit require complete burial or high retaining walls, both of which would have raised the cost of installation considerably. Additional savings were realized through the AX-Max system's low power requirements: fewer than 2 kWh per 3.785 cubic meters (m<sup>3</sup>) of treated domestic wastewater. And because both units are fully enclosed, they're not prone to odors, allowing for installation near the swimming pool.

Parten says, "In the case of the Mountain Top condos, using the AdvanTex AX-Max recirculating packed-media treatment process following ample primary treatment enabled meeting several key project needs and avoiding certain high costs."



On the beautiful island of St. Thomas, an AdvanTex AX-Max™ Treatment System replaced a failed sequencing batch reactor at the Mountain Top condominiums.