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Green treatment: Onsite wastewater system helps a corporate center achieve LEED certification

Steve Kingsland

<p>Project OFS Cool Springs Corporate Education Center, Huntingburg, Ind.</p> <p>Architect/engineer Hafer Associates, Evansville, Ind.</p> <p>Contractor OFS</p> <p>Product application An Algawheel system supplied by Oldcastle Precast provides onsite wastewater treatment for a corporate education and conference center.</p>	
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OFS Brands' new Cool Springs Corporate Education Center, shown here in an architect's rendering, includes a lodge with 12 bed and breakfast rooms, kitchen facilities with a dining area, and conference rooms. Photo credit: Hafer Associates

The company, OFS Brands describes itself as "a family owned corporation ... committed to providing socially responsible furniture and logistic solutions through better design, excellent performance, and innovative products and services." So when OFS, based in Huntingburg, Ind., built its new Cool Springs Corporate Education Center, one of its primary goals was to build in an environmentally sensitive and sustainable manner. Certification under the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) Green Building Rating System will confirm achievement of that goal.

The new corporate education center serves as a location for OFS employee training and a community educational and conference center. It includes a lodge with 12 bed and breakfast rooms, kitchen facilities with a dining area, conference rooms, a horse barn with two apartments, and a maintenance building. The facility will have an archery range, skeet shooting range, golf course, hiking trails, and boating.

To support its green goals, OFS and architect/engineer Hafer Associates of Evansville, Ind., faced three challenges associated with disposing of wastewater from the facility. First, and most importantly, they needed to ensure that the onsite wastewater treatment system would not experience any problems and

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would protect the environment indefinitely. Poor soil conditions in the Pike County area meant that subsurface discharge would require construction of a sand mound system for final effluent water discharge. Sand mounds are typically used where poor soil conditions exist so that preferred clean sandy material can be built up above the poor soil conditions. The sandy material provides an effective above-grade soil treatment zone for septic tank effluent. In extreme situations, as in Pike County, even use of sand mounds has not avoided some system failures.



Each bacpac treatment unit contains a series of Algaewheels that rotate using a small air blower. As the wheels rotate, algal colonies grow on the wheels, fueled by the combination of nutrients in the wastewater (nitrogen and phosphorous), carbon dioxide, water, and sunlight.

The second challenge was to treat the wastewater in an environmentally sensitive and sustainable manner without significant operations and maintenance expenses. In the process, it was hoped that this would help to attain LEED certification.

The third challenge was to construct a wastewater system that would allow OFS to expand the educational facility easily in the future without a large capital investment for a treatment plant that initially would be oversized and underutilized.

Architect and Project Designer Jack Faber, AIA, of Hafer Associates, turned to Indianapolis-based Algaewheel, Inc., for an onsite wastewater system using proprietary Algaewheel technology to meet these challenges.

System features

According to Chris Limcaco, president of Algaewheel, "The Algaewheel system incorporates components of standard onsite wastewater systems, including bacteriological digestion, but with a few significant additions. These additions enhance the system's design and prevent the two most common causes of onsite system failure—hydraulic and organic overloading."

The most significant factor that differentiates the Algaewheel system from other advanced systems is the bacpac treatment unit, containing a series of

algaewheels that rotate using a small air blower. Full-strength wastewater passes through the wheels in one or more bacpac units. As the wheels rotate, algal colonies grow on the wheels, fueled by the combination of nutrients in the wastewater (nitrogen and phosphorous), carbon dioxide, water, and sunlight.

"Algae are green plants that grow through photosynthesis," explained Mark Bauer, environmental solutions specialist for Oldcastle Precast, which now has exclusive rights to sell Algaewheel technology for onsite systems in the United States. "As they grow, they convert nutrients in the wastewater to plant mass. Conventional and other advanced wastewater treatment systems are strictly bacteria-based. This system uses a unique combination of algae and bacteria to digest nutrients for a more efficient and effective eco-treatment process."

The proprietary design of the wheels and bacpac unit is such that the wheels are self-cleaning. In addition, although the wheels are primarily an algae production mechanism, a significant amount of bacteria will grow on the algae and within the wheel to further digest the wastewater.

The single-pass, flow-through treatment process includes several strong environmental benefits. First, the system uses solar energy through photosynthesis, resulting in significantly lower energy consumption. As an added benefit, the Algaewheel technology produces oxygen as a byproduct and consumes carbon dioxide, thus reducing greenhouse gases. According to Bauer, the system is constructed from off-the-shelf and recycled materials. And since the system is constructed of simple components with simple functions, it is virtually maintenance free.



Based on the daily expected flow rate of 5,000 gallons per day for the OFS onsite wastewater system, the Algaewheel system design includes six bacpac units for pretreatment

Design, operations, and maintenance

The daily expected flow rate for the OFS onsite wastewater system is 5,000 gallons per day (gpd), based on the maximum daily capacity of 100 people. Anticipated waste strength, equivalent to that of standard domestic waste, is approximately 170 parts per million for biological oxygen demand and total suspended solids. The resulting system design includes six bacpac units for

pretreatment, two 5,000-gallon primary septic tanks with the added conservative measure of having an effluent filter on each, and a 1,500-gallon dosing tank to dose the treated wastewater effluent to the absorption field.

A soil investigation at the project site in conjunction with the proposed facility layout dictated that the most appropriate location for the wastewater system was approximately 2,400 feet from the main facility. Limcaco explained that because the Algaewheel system includes pumping of the wastewater into the bacpac treatment units, the location of the system on a site is flexible. To overcome the distance challenge and at the same time equalize hydraulic flows in the system, a combination duplex grinder pump station/equalization tank was installed outside the main conference center building. A separate combination pump station/equalization tank was installed near the maintenance building and horse barn. Flow from the two pump stations goes to a single precast flow splitter box to disperse to the six bacpac units. By regulation, and for added conservative measures, a 1,000-gallon grease interceptor was installed prior to the pump station at the conference center to capture any grease from kitchen waste.

Construction of the wastewater system occurred during five days in June 2007. Installation of the system was relatively fast since many of the system components were assembled prior to delivery by Oldcastle Precast.

The key component to any onsite system is the soil absorption field where the partially treated effluent is discharged. Through that field, final treatment takes place as bacteria flourish and further digest waste in the water. For OFS, the required field was an elevated mound system with a 0.5 loading rate based on soil conditions and the wastewater flow rate. The site has two mounds, and each mound has a sand basal area measuring approximately 5,000 square feet.



The onsite wastewater system contributed points to the LEED certification for Innovative Wastewater Design

OFS's system is maintained by Ron Hall, a 20-year Class IV wastewater operator from Huntingburg. Hall takes monthly influent and effluent samples for testing and performs visual inspection to ensure everything is operating properly. Test

results have shown that the system, which was commissioned in September 2008, is performing well within established effluent limits. According to Hall, the algae-based system "is relatively maintenance free, utilizes solar energy to drastically reduce operational costs as compared to other systems, is operator friendly, and consistently produces an effluent that equals or exceeds modern activated sludge plants."

The onsite wastewater system is running quietly and efficiently processing waste for the maintenance facility and horse barn while construction of the conference center continues. OFS anticipates achieving LEED certification for the project upon completion.

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