FURMAN

January, 26th, 2011

To whom it may concern:

Furman's Living Machine, a constructed wetland wastewater treatment system located on campus, is a unique and innovative undertaking in both operations and academics. Furman installed the Living Machine in collaboration with Worrell Water Technologies in 2009 as part of the renovation of the Townes Science Center. This advanced wetland treatment system mimics natural tidal wetland processes and can treat up to 19 cubic meters of wastewater per day generated from the Townes Science Center and adjoining buildings. In this system, biofilms on wetland aggregate are submerged and exposed by filling and draining wetland cells 12-16 times per day. On each drain cycle oxygen is provided to the biofilms, allowing faster ecological treatment rates than earlier designs. After ecological treatment, the effluent is filtered, disinfected with ultraviolet light and chlorinated before being reused for toilet flushing and cage washing. This use of water treated on campus for nonpotable use is highly innovative, particularly in the southeastern region.

Additionally, the use of the system as a focus for supporting the academic mission of the university is innovative. The system was installed with the intention that Furman faculty and students would be highly engaged in research on the operations of the system. I have led this research effort with undergraduate students over the past two years. Standard installation of the system by Worrell Water Technologies includes the treatment cell system, plants in each treatment cell intended to increase the rate of ecological treatment, and a denitrification cycle to be implemented at the end of the treatment process. Furman's initial operation of the system used only the treatment cells, with no plant life. After one year of data collection, plants were introduced to the system, and data is now being collected on the changes in nutrient uptake to better understand the role of plants in removing nutrients. This sequential implementation of the system allows Furman faculty and students, in collaboration with the manufacturer, to study the basic workings of the system and perhaps make recommendations for improved functioning. Students, along with myself and other faculty, continue to study the biogeochemical functioning of the system, the feasibility of additional methods of nitrate removal, the efficiency of recycled water use, and energy and material consumption of various types of wastewater treatment systems. Brittany Lins '12 and I presented a poster at this year's AASHE conference sharing some of the results of this research and the efficacy of the system as a tool for teaching and research.

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In addition to research applications, the system has served as a learning laboratory for courses across the university. Courses in earth and environmental sciences, biology, and chemistry can use the system as a campus example for the study of biogeochemical processes. Courses on public and environmental health have contrasted the use of different methods for wastewater treatment using the system as an example, and students in communications courses have documented the work of the faculty, staff, and students who maintain the system and engage in research with it. Another remarkable aspect of this system is that staff and students work together to operate and maintain the systems. Students learn about insect control, plant maintenance, proper greenhouse cleaning and maintenance, and wastewater treatment system operations from the staff, so students see the incredible expertise on campus beyond the faculty members.
In sum, the Living Machine system on Furman's campus is an innovative and unique system for treating wastewater on campus and for engaging faculty and students in interdisciplinary research, as well as serving as an example in the classroom.

Sincerely,

Brannon Andersen
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