University Of South Florida's NEWgenerator Provides Safe Sanitation To Remote Locations

University of South Florida

Hundreds of elementary school students in South Africa lack access to clean water and sanitation due to their remote locations. They rely heavily on dangerous pit and chemical toilets, particularly in areas where water is scarce.

Now those students and others have a new option for safe sanitation: NEWgenerator, designed and developed by Dr. Daniel Yeh and his team at the University of South Florida (USF). The solar-powered innovation provides off-grid sanitation and generates nutrients, energy and water by safely recovering them from human wastewater.

NEWgenerator's unique technology uses microbes to break down waste and is different than typical wastewater treatments because it recoups what other methods cast off. Byproducts such as nitrogen and phosphorus can be harvested as fertilizers, and the clean water can be used for irrigation or other applications.

The USF invention requires little energy to use and creates an energy source in the form of methane gas. The entire process is net energy positive, which means it generates more energy than it consumes. This innovative technology, which is self-sustaining and operates completely off-grid, is designed to help take the strain off sewage infrastructure and help solve water and sanitation problems worldwide.

Recognizing the potential impact of this breakthrough technology, the USF Tech Transfer Office (TTO) collaborated with the inventors, lawyers and the university to secure IP protection. To ensure this technology could reach the people who needed it most, the TTO team negotiated non-exclusive license agreements with companies in foreign countries and partnered with organizations like the Bill & Melinda Gates Foundation.

After successful testing with electronic toilets in India in 2016, Yeh and his team installed NEWgenerators in Durban, South Africa as part of a $1.14 million grant from the Gates Foundation through its Reinvented Toilet program. NEWgenerators were connected to restroom facilities that include toilets, showers and sinks to recycle water for toilet flushing, cutting down on water demand. They also captured nutrients for fertilizers to help local community gardens, creating a potential food source.

“As an engineer and an educator, I feel blessed to be in the position to witness our team’s invention make a direct improvement on the lives of the school children,” Yeh said.

Yeh and his team are in talks with disadvantaged communities throughout the US as well, bringing safe sanitation to challenging rural environments.

It wasn’t an easy journey for the team, which includes senior development engineer Robert Bair, who’s been working on the project since he was an undergraduate student at USF.

“It has been an incredible opportunity to have worked on the technology since its inception. Plenty of hours, blood, sweat and tears were necessary to get us to this point. All that effort was worth it, knowing that we are making a positive impact in people’s lives," Bair said.

Since entering mass production, the NEWgenerator has been modified to reduce costs – utilizing locally made materials and adjusted for local customer requirements.

The NEWgenerator took home top prize from the Cade Museum in 2014. Other funding awards received include the USF Bull Ring Accelerator Grant (BRAG), NSF I-Corps Team and Florida High Tech Corridor. Yeh’s team was also recognized by the USPTO, winning a 2020 Patents for Humanity Award.

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