

## RIT institute doing its part to make industry more sustainable

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Rochester Institute of Technology's Golisano Institute for Sustainability, housed in Sustainability Institute Hall, lists nine different laboratories.

But one that's not on the list is the biggest of all – the building itself. With power or heat or both produced by a phosphoric acid fuel cell, wind turbines, solar panels, and a geothermal well, the building has more than enough power to run its lights, keep the building warm in winter and cool in summer. It shares the excess energy with the rest of campus. The hall also has 1,500 sensors, allowing researchers and graduate students to analyze all that data and make adjustments as they learn about the building and translate their findings for others.

The hall has a green roof with two levels of solar panels that can be replaced by new technologies, a living wall, and a cistern system that reuses rainwater to flush toilets, reducing the building's water use to 25 percent of similarly sized buildings.

Perhaps the biggest gee-whiz factor about the institute, however, is not its state-of-the-art building, but its hundreds, maybe thousands of interactions each year with local industries as staff and graduate students work to make them more sustainable. It's disseminating sustainability.

"They've provided us with technical help and research and development ideas," said Lauren Toretta, president of Ch4 Biogas-Renewable Energy, owner of Synergy Biogas, a manure-powered and food-waste-powered energy project on the Synergy dairy farm in Covington, Wyoming County.

"They've helped us to assess other sites we've contemplated over the years, and (are) currently contemplating," Toretta said. The company, headquartered in Connecticut, has another biogas digester in Ohio and is slated to create a third in Batavia.

A key bit of research RIT folks handled for Synergy was testing of microalgae in an experiment to see if they could produce an algal bloom in the digester as a feedstock to create more energy, she said. Typically methane from the food waste and cow manure is burned to create power, while after digestion the solids are dried and used for cow bedding in the barns and the remaining liquid is spread on farms for fertilizer.

"They were asking not just about science, but the overlay of economics," Toretta said of RIT researchers. "They're thinking through the hard



Photo by: Gabrielle Plucknette-DeVito/RIT  
Ph.D. student Diana Rodriguez Alberto

questions about the intersection of business and the environment."

One such questioner is Ph.D. student Diana Rodriguez Alberto, from the Dominican Republic, who is trying to create a substance from the biogas digester's waste stream that can bind needed nutrients in the soil instead of allowing them to wash away and potentially create runoff problems.

The material Rodriguez Alberto is working with, biochar, comes from digesting the solids left over after digesting manure and food waste.

Biochar, which is black, might also have potential for use in ink, said Professor Thomas A. Trabold, head of the Sustainability Department at RIT, as it could replace carbon forms of ink. A manure-based ink might seem pretty esoteric unless you know this: in the last year, one of the institute's seven centers, the Printing Applications Laboratory, handled 992 requests for help from companies, with many of the requests pertaining to custom ink formulations and the companies' interests in achieving industry-standard certifications.

Meanwhile, another center under the institute's umbrella is the New York State Pollution Prevention Institute, a joint project of RIT, the state Department of Environmental Conservation, the federal Environmental Protection Agency, and partner institutions Clarkson University and the University at Buffalo. This center assisted 33 companies in diverting waste, according to RIT.

The Sustainability Institute includes a state Center of Excellence in Advanced & Sustainable Manufacturing, a concept dreamed up by institute Director Nabil Nasr, who Trabold calls an international expert in the area of remanufacturing. Last year the center assisted 20



Photo by Elizabeth Lamark/RIT  
Professor Thomas Trabold

companies directly and provided 941 workshops and training for 422 companies.

Nasr's dream of a Center of Excellence won approval from the university's board of trustees in 2003. Funding to get the center and its academic twin off the ground came largely from the Luce Foundation in 2006 and then a \$10 million grant in 2007 from entrepreneur B. Thomas Golisano, the founder of Paychex. Hence the naming of the sustainability institute.

An early result was a Ph.D. program in sustainable systems starting in 2008, the world's first such doctorate program focusing on sustainable production, Trabold said. (Arizona State created a program earlier that focuses more on policy, he noted.)

Today, the institute fosters three advanced degrees – the original Ph.D. program, a master's degree in sustainable systems, and a master's degree in architecture that is heavily steeped in sustainability. Additional Ph.D. programs are under consideration,

as is a bachelor's degree in architecture.

"Sustainability by design is multidisciplinary," Trabold said. And for that reason, RIT doesn't offer undergraduate degrees in that field. The university expects graduate students to come from a variety of disciplines, Trabold said, and learn about how those disciplines interact with others to become sustainable.

Rodriguez Alberto's master's degree and undergraduate work were in chemistry. Trabold's background, before 20 years in industry, from nuclear-powered submarines to photoreceptors at Xerox to fuel cell development at General Motors, also came in the chemistry field. Other sciences and technical backgrounds feed into the degree, too, such as physics and engineering, Trabold said, not to mention social sciences, and economics.

While numbers of graduates from the institute varies, Trabold said, it averages eight doctoral graduates each year, and 10 to 12 masters of architecture and a similar number of masters of science in sustainability systems.

Doctoral theses require either an economic analysis or an environmental analysis of the project the student is working on, Trabold said, something he never was asked to consider during his years in industry.

Though sustainability, in the form of remanufacturing (a reusing of manufactured goods to lessen costs and eliminate waste) has been practiced at RIT for more than 25 years, the concept is still catching on in industry, Trabold said. Graduates of the program, many of whom go on to work at companies that have received research help from RIT, are spreading the word.

The larger applied science part of the institute has researchers working on industry and government projects without having specific teaching duties at the university. But they're directly and indirectly educating the industry and government workers, as well as the graduate students who work with them.

"The goal is to incorporate sustainability principles as a core skill set across the board," Trabold said, "to deploy principles of sustainability across industry and government. We're moving in that direction."

For decades and decades industry practiced a linear economy that Trabold described as "Take, make and waste." Newer is the concept executed in a myriad ways at the institute of "reusing, recycling and remanufacturing."

"We're moving toward this concept of a circular economy," he said.

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