

CONTRIBUTION



Tucker RNG system inventor Richard Tucker (right) and Nate Anderson, project director of the Rocky Mountain Research Station Biomass Research Development Initiative, stand in front of Tucker RNG.

PHOTO: ROCKY MOUNTAIN RESEARCH STATION

Tucker RNG: Little Machine, Big Impact

Public and private collaboration has resulted in a unique and highly efficient distributed-scale fast pyrolysis system.

BY MAUREEN ESSEN, CAROLINE MORRIS AND NATE ANDERSON

When the Tucker RNG thermal conversion unit connected to the power grid for the first time April 23 in Charlotte, N.C., Richard Tucker, president of Tucker Engineering Associates, could feel the weight of the world coming off his shoulders. After more than a decade of developing his high-temperature, fast pyrolysis system, he was finally seeing it export electricity for the first time. This installation marked a significant step toward commercializing a new and exciting conversion technology, and demonstrates the success of a long-term, public-private partnership.

"It was a really great moment to see the machine doing exactly what it was designed to do," Tucker says. "This has been a long journey for us and we couldn't have done it without the help of the U.S. Forest Service, The ReNewable Gas Company, and ReVenture Park. Seeing the electricity produced as a result of this technology made it all worth it."

Tucker RNG

The Tucker RNG system was initially designed by Tucker over a decade ago. Its research and development has included not only Tuck-

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er's engineering firm, but public agencies and other private companies. Tucker and the team invented solutions to a host of technological challenges that had previously kept pyrolysis from being widely adopted, such as the production of tars, and nagging issues in material handling and gas cleanliness.

The patented, high-temperature pyrolysis system is a distributed-scale biomass conversion technology capable of processing a broad range of feedstocks to produce high-Btu gas for a variety of uses, such as steam or electricity generation via an off-the-shelf genset. Heating feedstocks to up to 2,000 degrees Fahrenheit in an environment devoid of outside air, this technology uses a proprietary gas upgrading and cleaning system to further refine its gas, producing energy-dense renewable natural gas with 600 to 850 Btu per standard cubic foot, depending on feedstock properties. In addition, the system yields a high carbon by-product with an 80 to 95 percent fixed carbon content and usable process heat for on-site applications, such as drying feedstock. The Tucker RNG system is highly customizable, able to process between 20 and 250 dry tons of biomass per day depending on equipment configuration, which allows the technology to be scaled appropriately to meet specific and changing needs.

The Tucker RNG System is especially well-suited to applications where it can be used to reduce energy costs, process waste feedstocks, and produce heat and electricity for customers interested in green energy. The system is uniquely engineered for economically efficient renewable gas production, and designed and sited in an environmentally conscious manner. While the unit can use a wide variety of feedstocks, including municipal solid waste and refuse-derived fuels, using woody biomass decreases total carbon emissions and lessens the environmental impact of the energy produced compared to other sources, including coal. The system also reduces net carbon emissions by capturing heat and carbon generated in the conversion process.

Collaborative Approach

Tucker RNG's operating outputs and commercial design suitability have been independently evaluated by third-party engineers and scientists, and by the U.S. Forest Service. The commercialization of this technology is an example of a successful public-private research and development partnership. In addition to major private funding, the development of the Tucker RNG system was partially funded by a research joint venture with the U.S. Forest Service Rocky Mountain Research Station through the USDA National Institute of Food and Agriculture, Biomass Research Development Initiative. The joint venture provided opportunities for the company to cooperate with researchers and capitalize on the existing efficiencies and engineering of the Tucker RNG system, as well as develop new knowledge that will facilitate decision making by industry, policymakers and other stakeholders.

"This project is the perfect opportunity to grow ongoing research relationships between the forest industry, the U.S. Forest Service and Tucker Engineering Associates," says Nate Anderson, project director for RMRS BRDI. "It is a chance to contribute to a technology that has

the potential to increase renewable energy production, create jobs and minimize the environmental footprint of producing energy from woody biomass."

In addition to providing funds to help bring the technology to market, the resources of the BRDI project have allowed scientists to conduct a full life-cycle assessment of the Tucker RNG system's products and compare their environmental impacts to fossil fuel alternatives. The team is also examining the environmental impacts of harvesting woody biomass from forest ecosystems, developing catalysts for liquid fuel and chemical production, developing new products and applications for wood-based carbon products and assessing the potential economic impacts of system deployment.

Private investment has also played a key role in developing and launching the first commercial installation of the Tucker RNG system. Specifically, Tucker Engineering Associates partnered with The ReNewable Gas Company to develop projects domestically, and entrepreneurs at ReVenture Park purchased the first installation of the Tucker system. This location and the business partnership with ReVenture Park, situated on a former Brownfield Superfund site, helped support the remediation of the large industrial park, resulting in positive impacts on the environment and the local community.

While the RNG company is in the final stages of commissioning the first installation at ReVenture Park, Charlotte's first eco-industrial park, it is also hosting a myriad of visitors from around the world who are interested in the technology. RNG will take on the role of developing projects, both directly and through partnerships, in the U.S. The team of people who supported the first commercial installation, which includes private investors and government groups like the Rocky Mountain Research Station, sees a bright future for the technology.

"For me, one of the most rewarding aspects of working on this project has been seeing the different government and private entities come together to bring Richard Tucker's technology to fruition," says Van Morris, president of RNG.

The team has also received additional support from other RMRS and USDA technology development programs. These collaborations have produced a unique and highly efficient distributed scale thermal conversion system. The group will continue to work together into the future to develop new and viable energy technologies and projects.

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