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Turboden installed 1.8 MW Biochar-Based Power Generation Project Using ORC Technology

Carbon-negative Biochar production combined with renewable, grid-independent power generation

Houston, TX May 12 — Turboden America LLC, subsidiary of the technology provider for power generation and heat electrification Turboden S.p.A. (a Mitsubishi Heavy Industries Group company), has installed the **first Biochar Waste-to-Energy production plant worldwide integrated with Organic Rankine Cycle (ORC) technology**, marking a significant milestone in sustainable and carbon-negative power generation.

The project has been developed for **Quonset Soil Solutions, LLC (QSS)**, a U.S.-based waste-to-energy facility established to transform underutilized forestry byproducts into renewable electricity and Biochar.

"Biochar production by slow pyrolysis of waste vegetal biomass is a very promising way to transform biomass into a valuable product. In addition to Biochar, the QSS plant produces electric power, thanks to ORC technology. This solution is economically viable in the US, and it has a very large potential for application in many countries all over the world, enhancing agriculture and providing distributed power generation. I am very proud of the involvement of Turboden in the QSS project". Stated **Mario Gaia – Founder and Honorary Chairman Turboden**.

Biochar is increasingly recognized as a **carbon-negative pathway** that delivers climate, environmental, and energy benefits simultaneously. Produced through the pyrolysis of sustainably sourced wood chips, Biochar permanently stores carbon in a stable form, preventing its release into the atmosphere while transforming forestry residues into a high-value resource. When paired with advanced energy-recovery technologies, Biochar production can become a fully self-sustaining, circular industrial process.

"This project with Quonset Soil Solutions confirms the ORC's flexibility and easy integration with the Biochar process" said **Ilaria Peretti, Senior Business Development Manager Turboden America LLC**, "It's the most efficient way to turn wood biomass waste into carbon negative power and high-quality Biochar".

At the core of the project is a pyrolysis system that converts wood chips into renewable electricity and Biochar. The **exhaust flue gas generated during pyrolysis**, traditionally considered waste, is recovered as a renewable energy source. Through a dedicated heat exchanger and thermal oil loop, this waste heat is transferred to a 1.8 MW Turboden ORC system, which converts it into clean electricity, capturing all the value from the production operations. The electricity generated by the ORC unit is used to **offset the internal power consumption of the Biochar plant**, enabling QSS to operate independently from the electrical grid. Grid Renewable electricity

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generation was a key customer requirement, ensuring energy security, predictable operating costs, and reduced exposure to grid-related emissions.

“This project allows us to turn biomass into both renewable energy and long-term carbon storage, while operating as a fully energy-independent, carbon-negative facility,” said **Mr. Kevin Hirsch, Chief Financial Officer of Green Development LLC, a Quonset Soil Solutions (QSS) affiliate**. “We thank Turboden for the ease of operation and the high energy efficiency delivered by their ORC technology.”

The entire power plant has been designed to be **fully sustainable**. The ORC solution requires no patent processes, no highly specialized operators, and no changes to the customer’s core business, making it a straightforward and economically attractive addition. The project also allows QSS to benefit from the **Investment Tax Credit (ITC)**, enhancing the overall financial performance of the investment.

This state-of-the-art facility delivers multiple benefits, including **reduced operating expenditures (OPEX), lower emissions, long-term CO₂ sequestration**, and full integration into a circular economy model that minimizes air and water pollution. The total amount of CO₂ emissions avoided are 16,000 tons/year.

The Biochar Industry is rapidly evolving, and we will see more and more integrated waste-to-energy systems that produce high value carbon removal credits.

By combining ORC-based waste heat recovery with Biochar production, Turboden demonstrates how innovative energy integration can transform waste-to-energy facilities into carbon-negative, energy-autonomous plants, paving the way for a new generation of sustainable industrial solutions.

*The project has also been recognized with the **Ira W. Leighton, Jr. Outstanding Innovative Technology Award**, honoring Quonset Soil Solutions for developing Rhode Island’s first commercial-scale wood pyrolysis facility that transforms locally sourced forestry residues into Biochar and renewable energy through an innovative, collaborative approach.*

About Biochar

Biochar is a strategic renewable resource at the intersection of **carbon sequestration, sustainable waste management, and clean energy generation**. Produced through thermochemical conversion of biomass [i.e., wood chips, plant residues, manure or other agricultural waste products] via pyrolysis—it retains up to 70% of the original carbon in a stable form, enabling long-term CO₂ storage and supporting net-zero and climate-positive pathways.

Beyond its applications in soil health and environmental remediation, Biochar production creates valuable energy streams. Heat and valuable oils generated during pyrolysis can be efficiently recovered and converted into

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electricity using **Organic Rankine Cycle (ORC) technology**, which is particularly suited to medium- and low-temperature heat sources. By valorizing agricultural and forestry residues, these Biochar waste-to-energy systems reduce greenhouse gas emissions while delivering both renewable power and high-value carbon products, reinforcing circular economy principles.

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About Turboden:

Turboden America LLC, based in Houston, Texas, is a subsidiary of Turboden S.p.A.

Founded in 1980, Turboden S.p.A. is an Italian company and part of the Mitsubishi Heavy Industries Group, providing global technological solutions for power generation and heat electrification for industries and utilities. Turboden is a recognized supplier in the design, manufacture, and maintenance of proprietary turbomachinery, including Organic Rankine Cycle (ORC) systems, gas expanders, high-temperature heat pumps, and Mechanical Vapor Recompression (MVR) systems.

Today, Turboden is a reliable technology partner, throughout the entire project lifecycle, supporting decarbonization and enabling higher energy efficiency in district heating networks and energy-intensive industrial processes worldwide. www.turboden.com

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