Biochar from Quonset Soil Solutions

Ancient Wisdom + Modern Technology

- Improve Soil & Crops
- Weather Drought Conditions
- Sequester Atmospheric $C0_2$

QUONSET SOIL SOLUTIONS

PEOPLE. PLANET. PURPOSE.

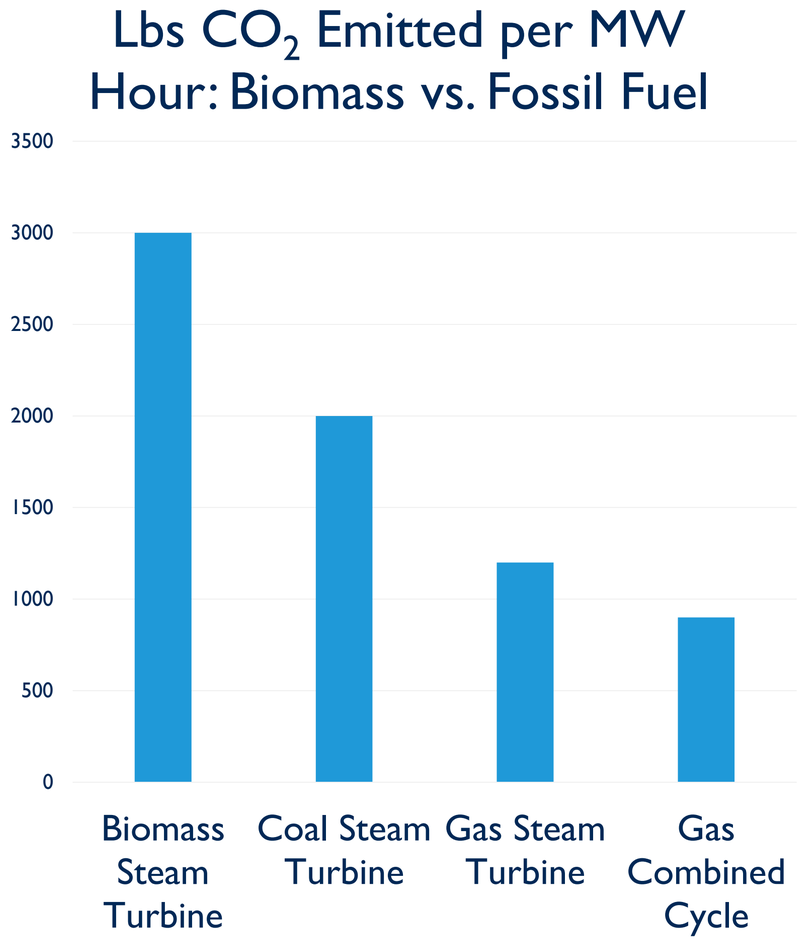
Why Biochar?

- Green Development's forestry division has been providing services to organizations & property owners in RI & surrounding states for the past several years.
- Options for disposing of clean forestry by-products are limited in RI.
- We thought, "Why not convert the wood waste to a useful product like biochar?"
- The new facility is powered by the excess energy generated by the biochar process and off-site solar energy.

The Big Problem With Forestry By-Products

Green Development Has Historically Shipped These Materials to a Biomass Plant in Plainfield, CT

- Wood chips and other forestry by-products are typically shipped to biomass plants or landfills.
- Biomass plants are touted as “carbon-neutral”, but $C0_2$ emissions exceed fossil fuel plants.
- Biochar is a better use of forestry by-products: Up-cycling a carbon-emitting component of our operations to a carbon-negative product that sequesters carbon.
- Biochar is processed in the absence of oxygen and is in high demand across a wide range of industries.



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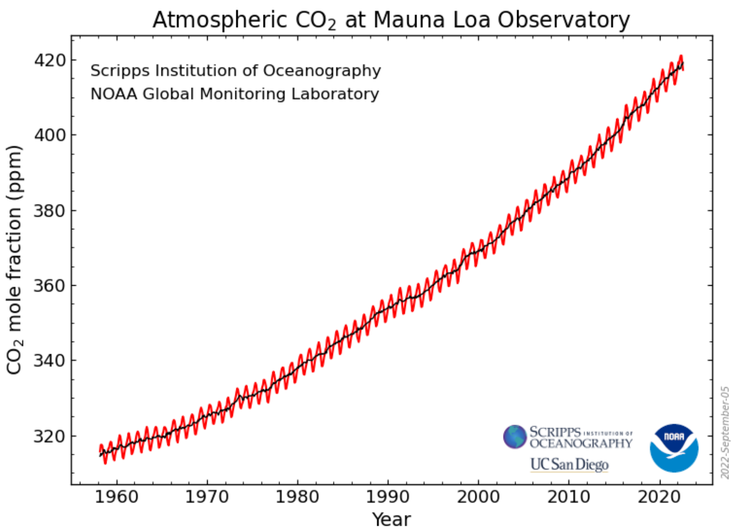
Terra Preta Inspiration for Modern Biochar

- Rich, fertile, man-made soil found in the Amazon Basin
- Developed over millennia, starting over 7000 years ago by some accounts
- Consists of layers of food and plant wastes, charcoal, and charred pottery shards
- Very different from the surrounding soils in the region, as seen on the right.

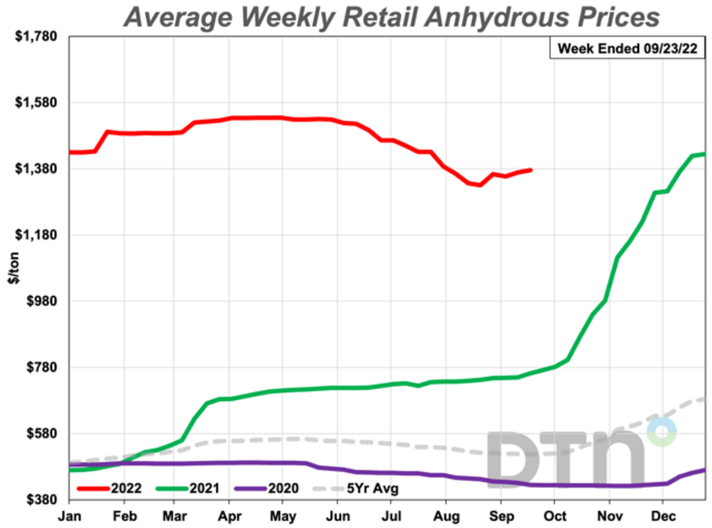
Additional Concerns Addressed by Biochar

#1 Atmospheric CO_2 Levels



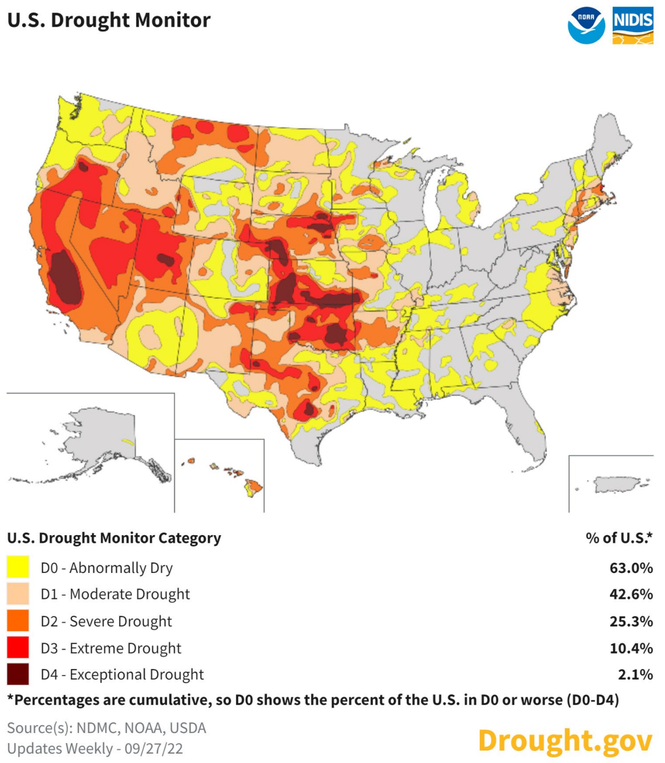
Level of C02 in the Earth's atmosphere is currently the **highest in 14 million years**.

#2 Rising Fertilizer Prices



Prices of some widely-used fertilizers have **nearly doubled**.

#3 Abnormally Dry Conditions (12% of NE)



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Biochar as a Solution

Carbon Sequestration • Soil Amendment • Decreased Watering Needs

More Efficient Use of Nutrients in the Soil

Improves Soil Structure–All Types

Increased Soil Water Retention

Can Replace Peat, Perlite & Vermiculite

Re-use of Residual Biomass

Carbon Removal/ Sequestration for 100 to 1000s of Years

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What it is & How it is Made

What is Biochar & How is it Made?

What It Is

- A black, carbon-dense material produced from pyrolysis of a biomass
- Biomass is organic matter. One example is clean forestry by-products, like wood chips
- High porosity, large surface area & potential to sequester carbon for thousands of years

How It's Made

- Pyrolysis: A thermochemical transformation at high temperatures in the absence of oxygen
- Baked at 500°C – 900°C
- Leftover condensate is neutralized

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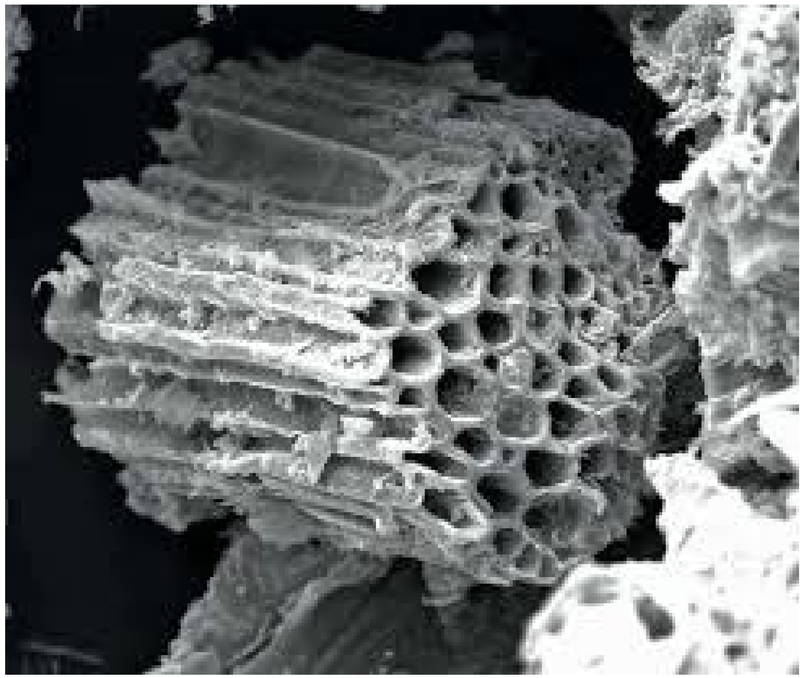
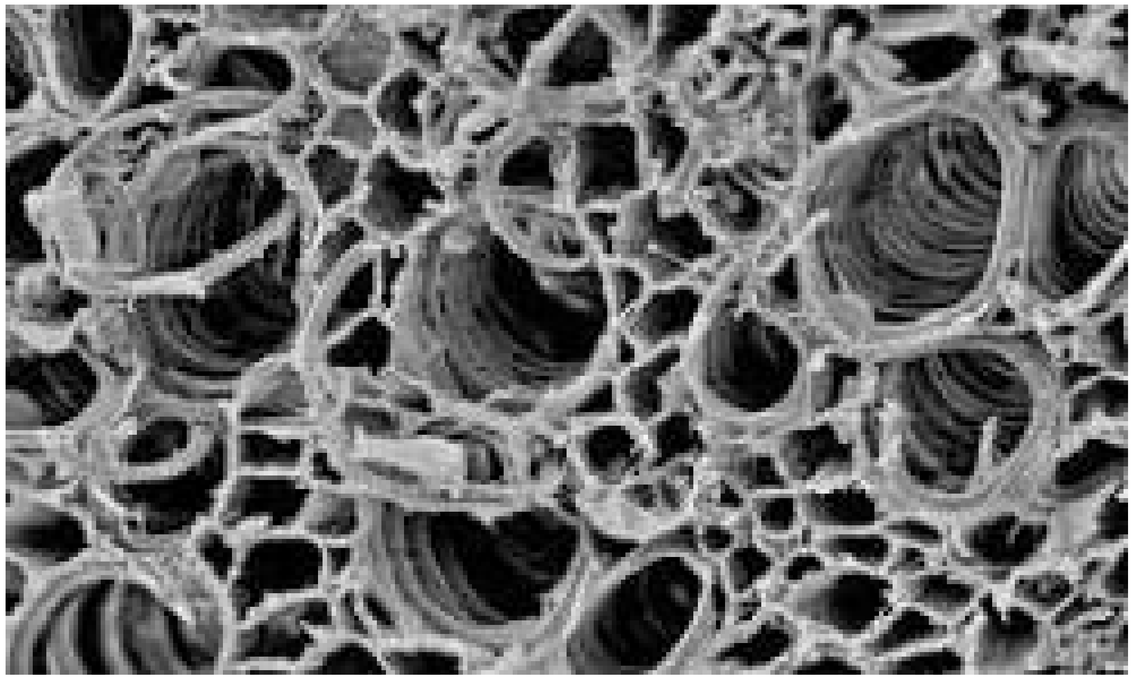
Large Capacity to Store Water & Nutrients

A Few Ounces Has Surface Area of a Football Field





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Benefits of Adding Biochar to Compost

US Biochar Research Study

- Speeds up the composting process by 20% through better aeration of the pile and increasing microbial activity
- Captures odors
- Generates a compost with higher nutrients because biochar retains nitrogen

The Process

How it works

- Like baking a cake
- Temperature and time
- Controlled conditions
- Conditions depend on the ingredients
- No oxygen = no combustion

Not All Biochar Created Equal

Source & process dictate characteristics and best applications for the biochar

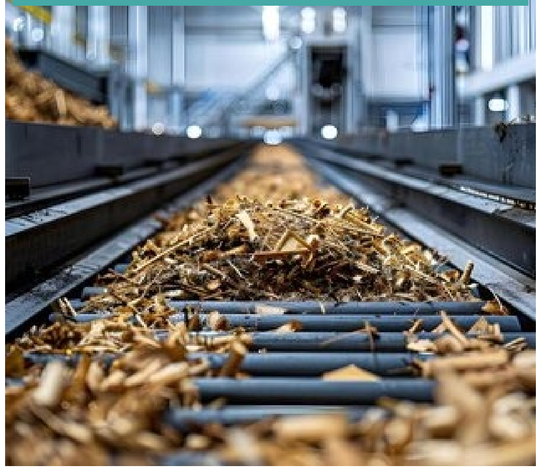
Carbonization → 300°C – 800°C → Pyrolysis

Conventional Charcoal

Open Burning

Gasification Furnace

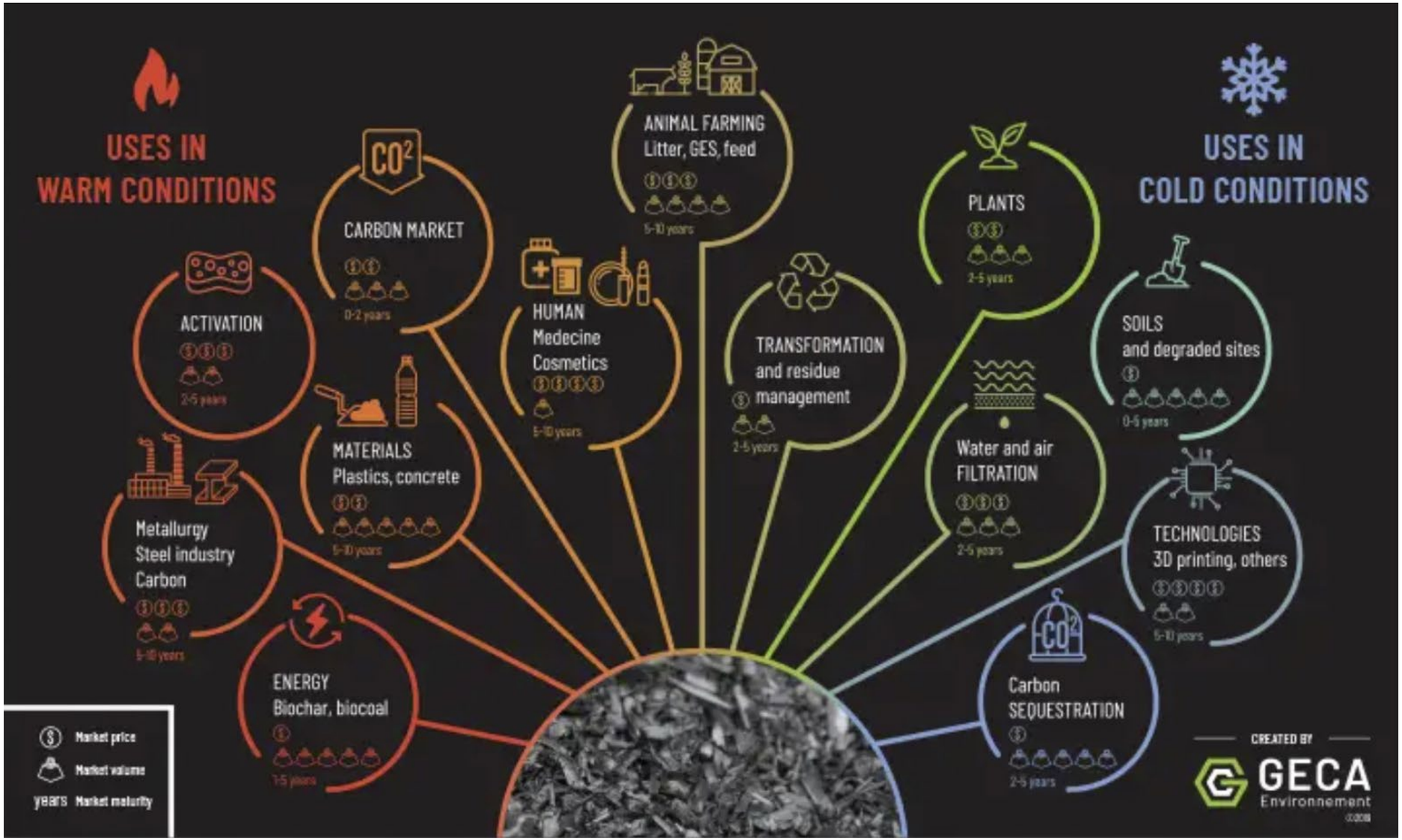
Fast & Slow Pyrolysis



- Difficult for microbes to thrive with random molecular structure
- Higher ash content, high emissions
- Well suited as a fuel source, arsenic absorbent & bioremediation

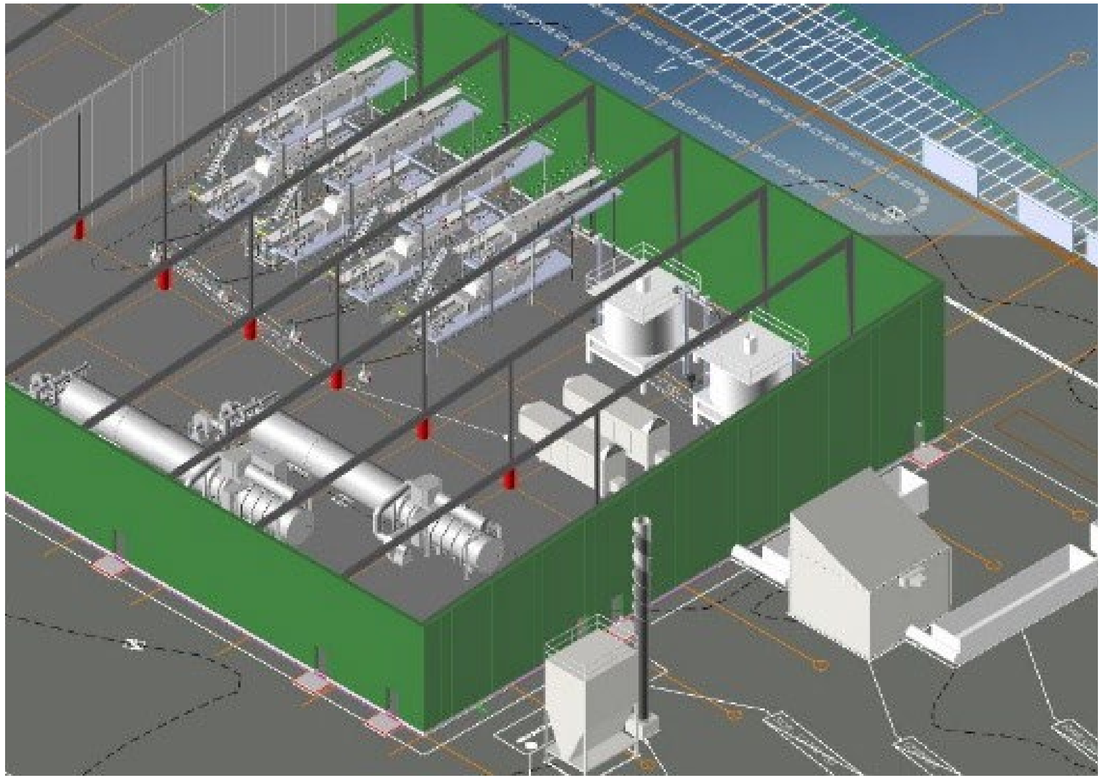
- Stable structure with pores for slow-release microbial acidity
- Lower ash content, lower emissions
- Well-suited as a soil amendment, filtration material & compost catalyst

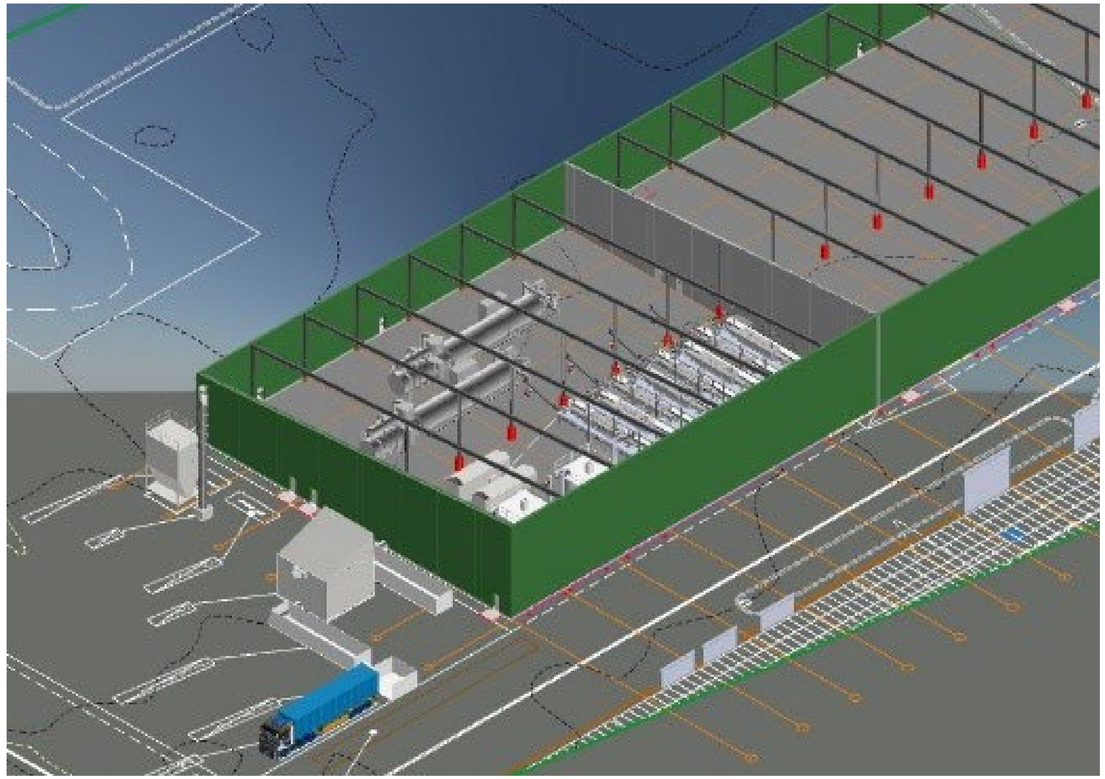
Biochar Market Applications



Building Exterior & Entrance

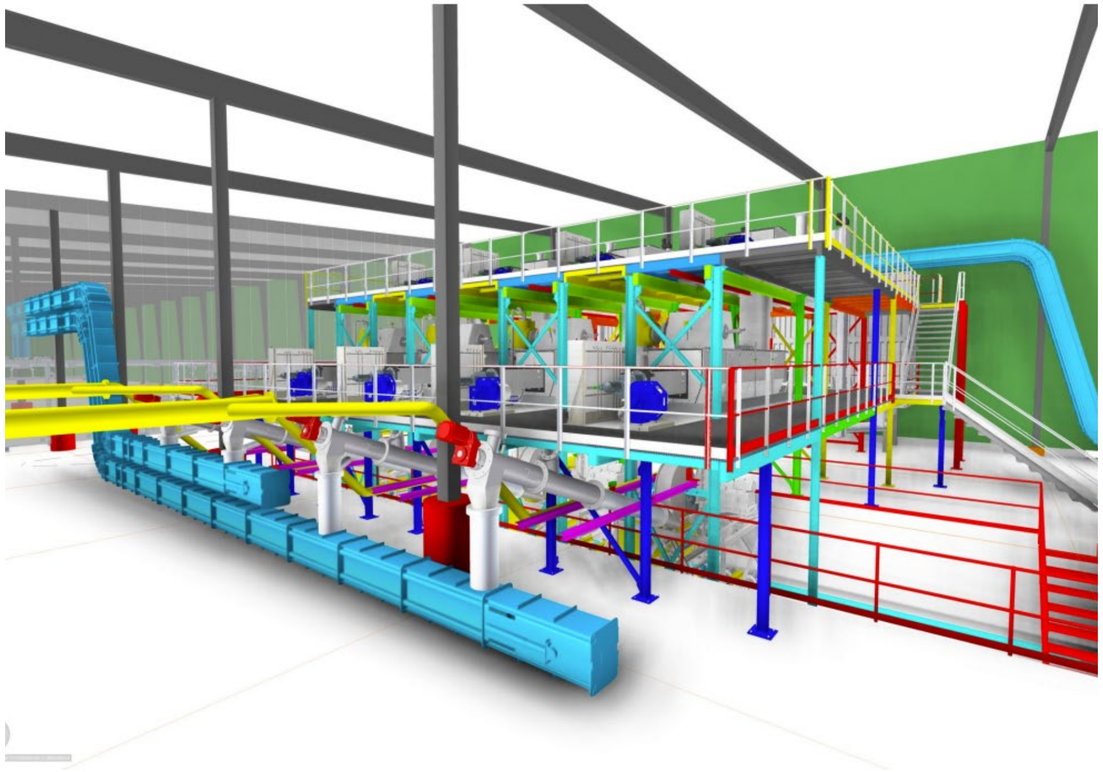
Equipment Views

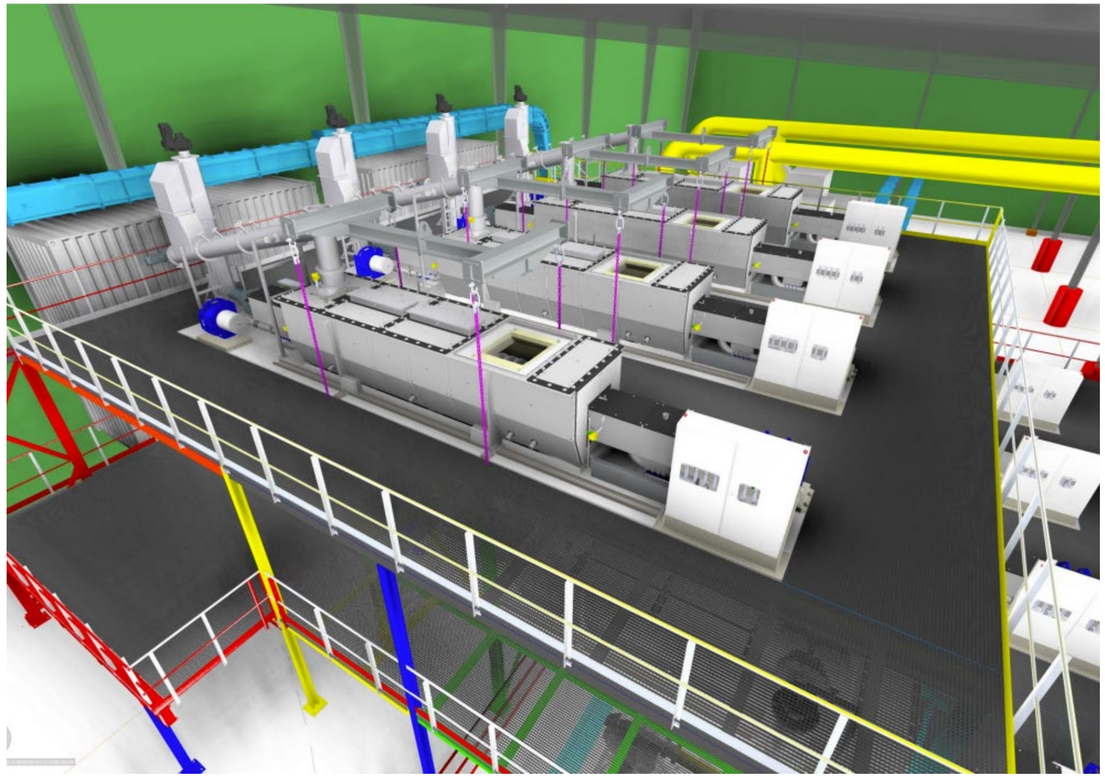




Additional Exteriors

Additional Equipment Views





Resources Biochar News & Education

- **US Biochar Initiative** Learning Center: biochar-us.org/welcome-biochar-learning-center
- **International Biochar Initiative** Resource Center: biochar-international.org/resources
- **Biochar for Environmental Management – Science, Technology, and Implementation** *by Johannes Lehmann and Stephen Joseph (eds.)*

Biochar Trials & Adoption

Examples of Successful Applications Across a Few Key Market Sectors

- Oasis Vineyard Trials (2016-24, Pacific Biochar)
  - 35% higher fruit & wine yields with biochar+compost blend
- Remediation of PFAS-contaminated agricultural soil
  - Initiated in July 2024 in Unity, Maine (Standard Biocarbon)
- Corn trials across extreme drought & rainy conditions
  - Multi-year trial in S. Korea saw grain yield increase by 18.5%
- Asphalt additive to replace fossil fuel derivatives
  - All-season cold process has industry approval (Verde, Sept 2024)

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Please call or write to us with questions or suggestions. We would love to hear from you!

Thank You.

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