BIOCHAR HELLAS

THE CARBON REMOVAL PROJECT

5U 2L

A project developed by GLOBALESCO

Our mission is to **use clean technologies** that **protect** and **heal** the **environment** while **eliminate agro waste**, **enhancing food** production and **yields**.

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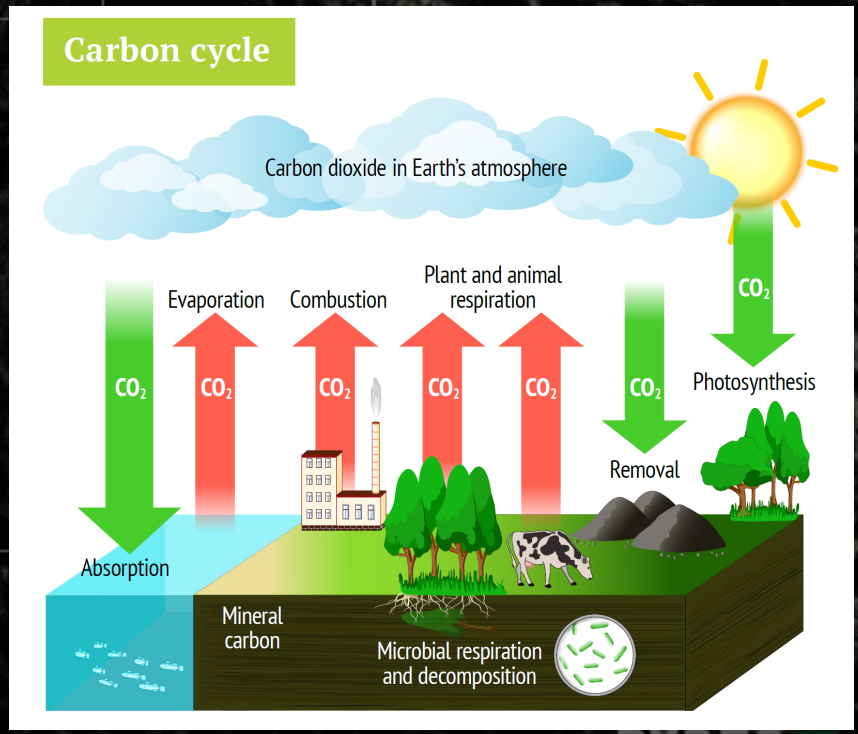
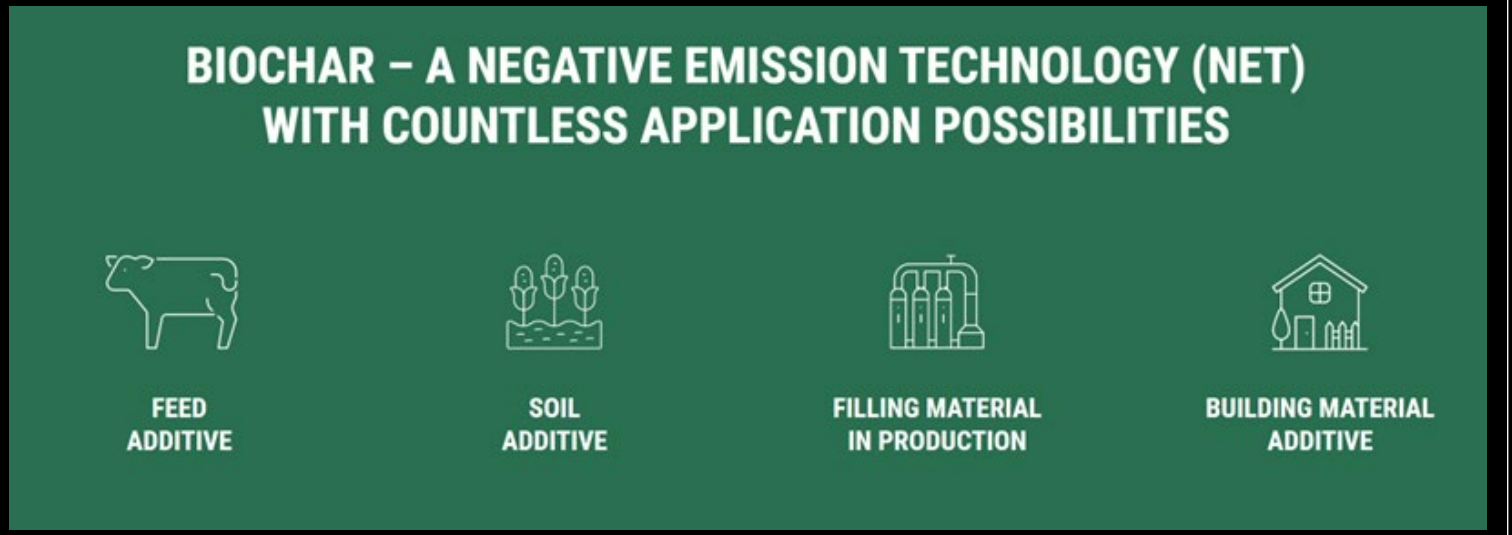


What is Carbon Removal / Carbon Capture

Carbon capture and storage (CCS) or carbon capture and sequestration is the process of capturing carbon dioxide (CO2) before it enters the atmosphere, transporting it, and storing it (carbon sequestration) for centuries or millennia. Usually the CO2 is captured from large point sources, such as a chemical plant or biomass power plant, and then stored in an underground geological formation. The aim is to prevent the release of CO2 from heavy industry with the intent of mitigating the effects of climate change. CO2 has been injected into geological formations for several decades for enhanced oil recovery and after separation from natural gas, but this has been criticised for producing more emissions when the gas or oil is burned.

Carbon capture and utilization (CCU) and CCS are sometimes discussed collectively as carbon capture, utilization, and sequestration (CCUS). This is because CCS is a relatively expensive process yielding a product which is often too cheap. Hence, carbon capture makes economically more sense where the carbon price is high enough, such as in much of Europe, or when combined with a utilization process where the cheap CO2 can be used to produce high-value chemicals to offset the high costs of capture operations.

What is Biochar



Biochar a material with exceptional properties

- Biochar has a high carbon content of up to 90 % and binds carbon material reliably, long-term and without negative side effects.
- It is characterized by highly interesting physical and chemical properties and has a positive effect on biochemical processes.

Biomass pyrolysis is removing CO_2 from the atmosphere.

- Biomass captures CO_2 from the atmosphere during its growth. Carbon (C) is stored in plant material while oxygen is released into the atmosphere. A large part of the C can be captured during pyrolysis in a gas, a liquid and a solid phase. While providing climate-neutral energy using the gas phase (Syngas) and the liquid phase (Bio-Oil), the material use of the solid phase (Biochar) allows for carbon capture and storage, thus leading to a a net climate positive process

Biochar –
The Allrounder

High-quality biochar has a great variety of characteristics and effects; it acts like a sponge, retaining water and nutrients. These qualities enable biochar to be used in many applications:

Biochar

300m²/g

SURFACE

UP TO

905g/Kg

NUTRIENT CONTENT

5 TIMES

ABSORBS
THE AMOUNT OF ITS
OWN WEIGHT IN
WATER

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Biochar Creation

Input

Output

Challenges

- Disposal
- Sustainability guidelines
- CO_2-Emissions
- High costs

Goals

- Circular Economy
- Ecological Footprint
- Upcycling & saving cost
- Renewable energy-supply

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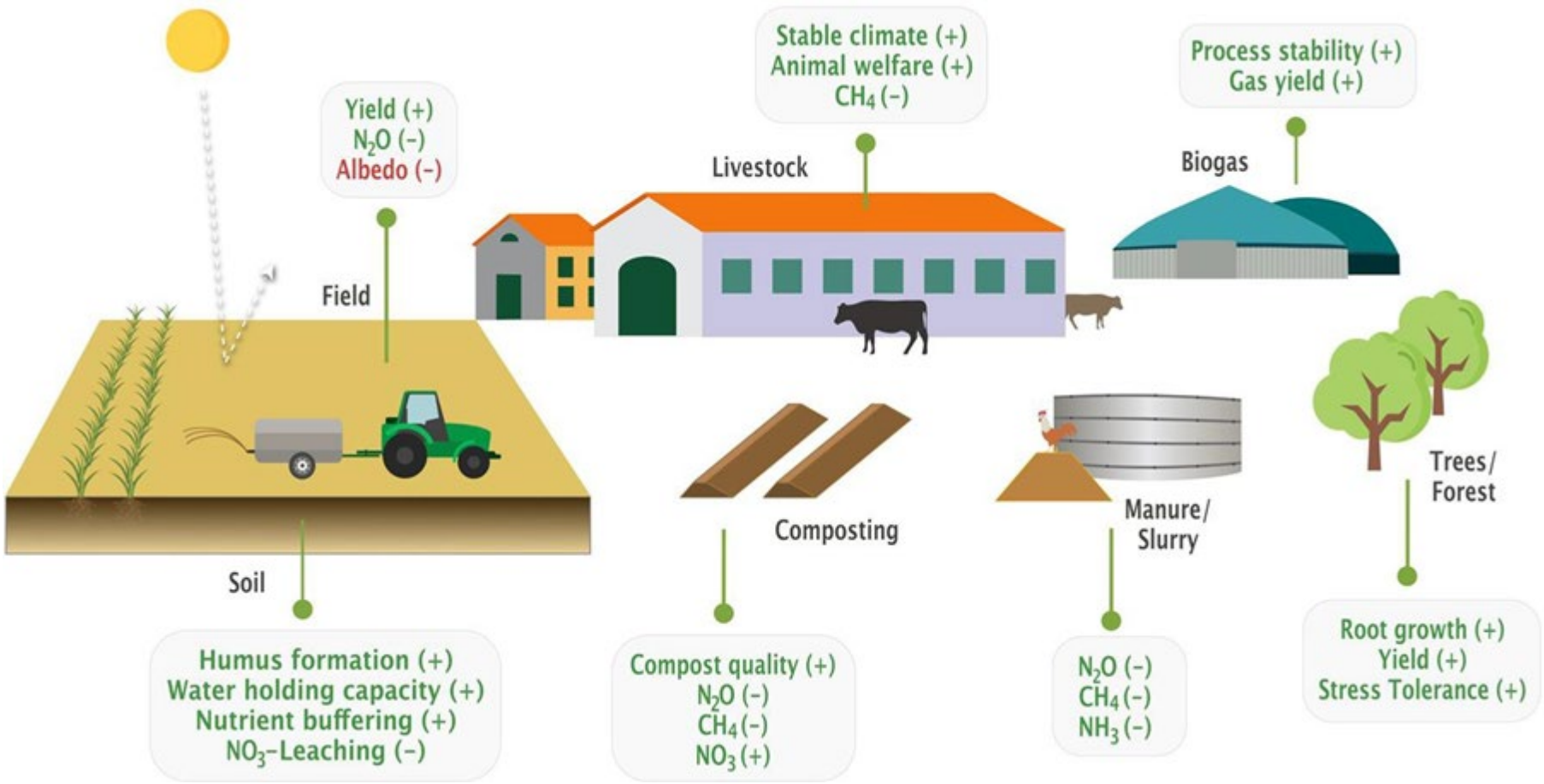
Biochar Creation



In an agricultural operation, Biochar can be used in the barn, with manure / slurry, in the biogas plant, for composting, in the field, in the forest and in the soil. The framed text boxes show which effects biochar has in the respective system. The signs in brackets (+) / (-) show how biochar influences the respective parameter: (-) reduction (+) increase. The color shows whether the change is positive (green) or negative (red).

(Source: EBI whitepaper)

EBI European Biochar Industry

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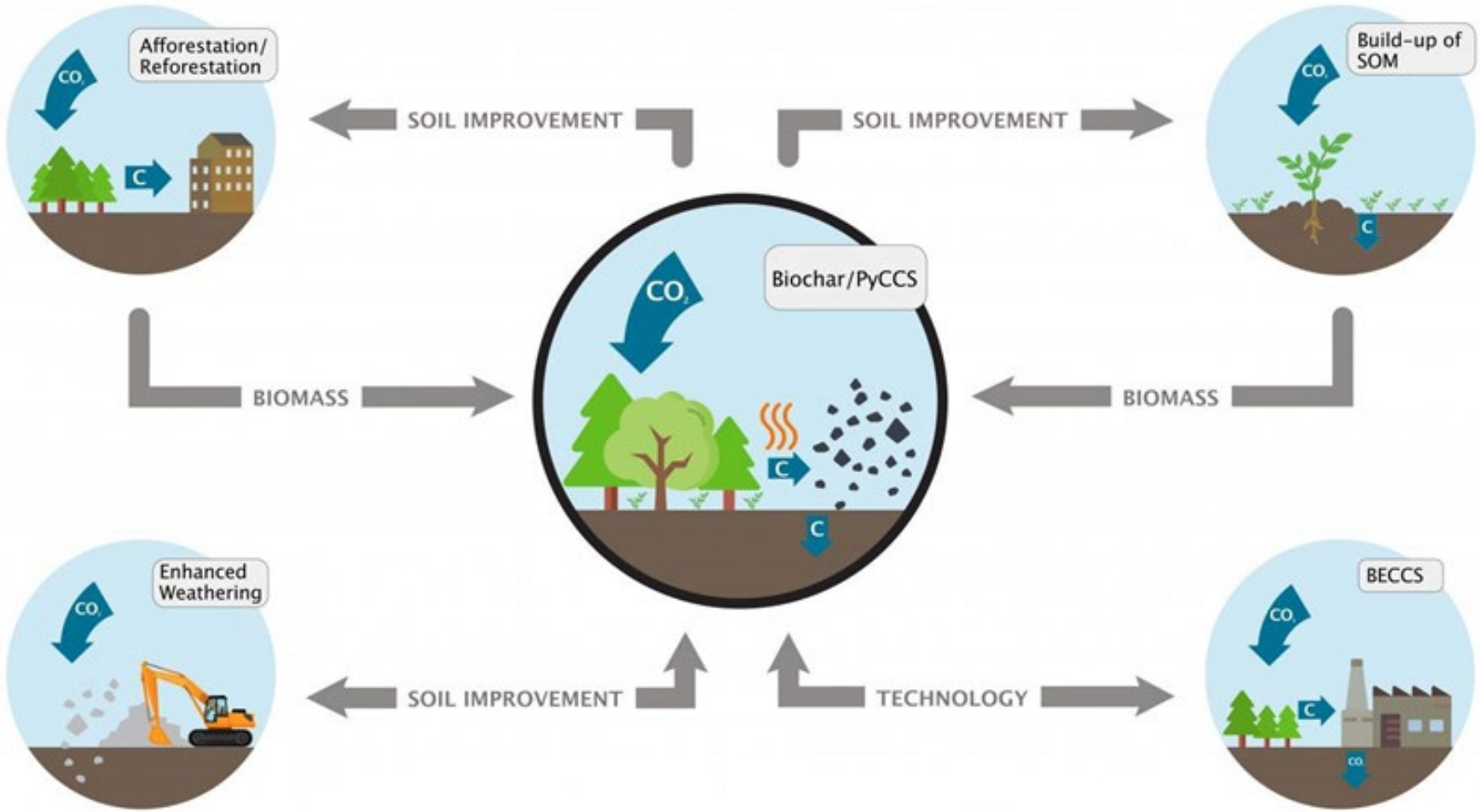
Biochar Agricultural applications overview



EBI European Biochar Industry

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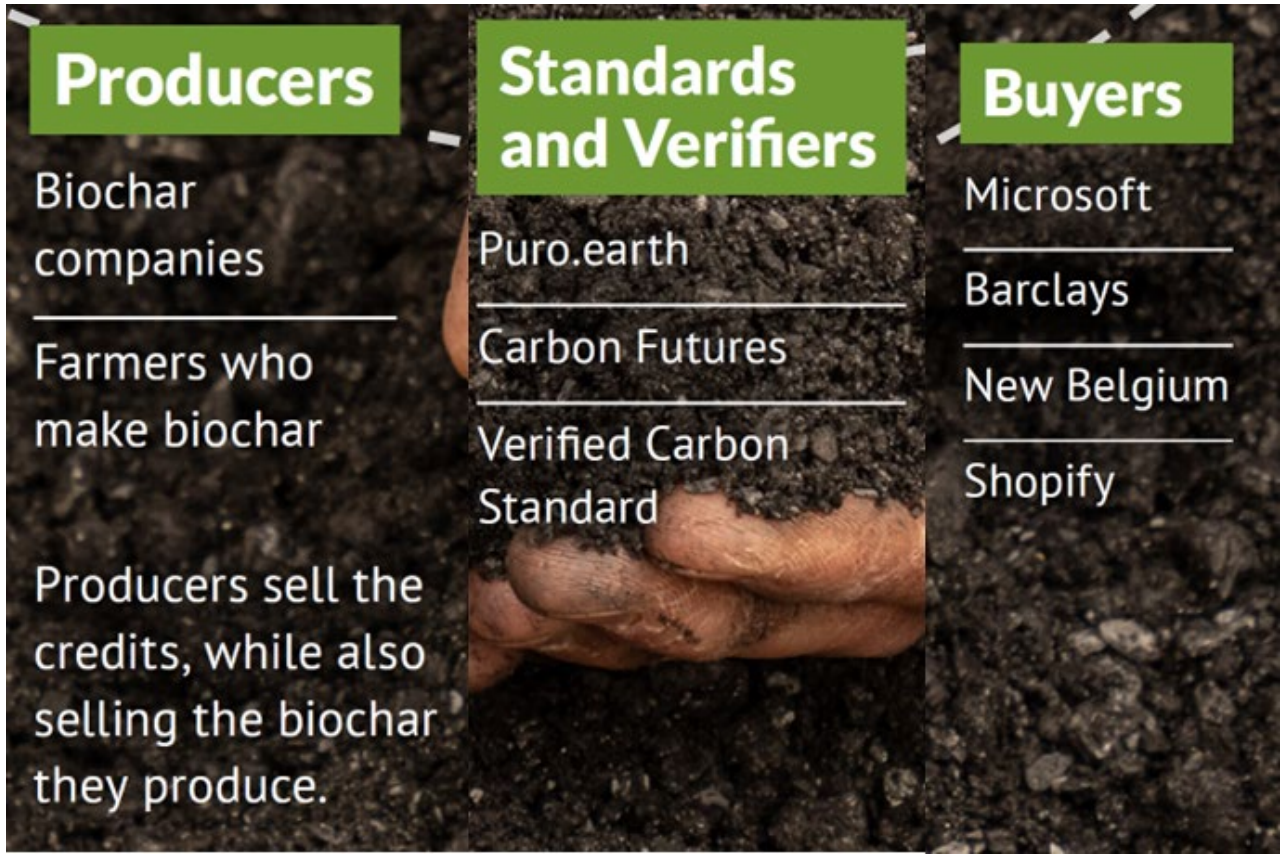
Biochar is a central tool for sustainable climate protection

- Scalable
- Permanent
- IPCC acknowledged
- Scientifically approved
- Business model

Selling the Carbon Removal Credits: biochar producers have two options to sell into the voluntary market: Puro.Earth or Carbon Future. Other voluntary carbon programs are under development through Verra and the Climate Action Reserve. According to Puro.Earth publicly available biochar project records the number of CORCs per ton of biochar produced varies by biochar type and company. One CORC is equivalent to one ton of CO2. For wood feedstocks, the range of carbon credits per ton of biochar is 2.57 to 3.26, with an average of 2.83. So CORC sales are an additional source of revenue for biochar producers above revenue from selling the biochar product.



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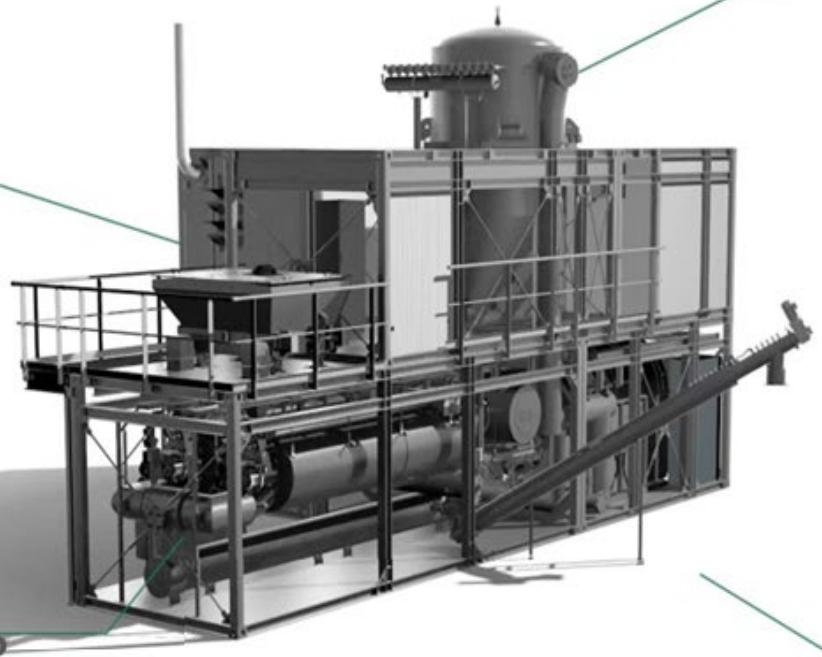
Carbon Removal Credits

The PX1500



Process gas filter

<10mg/m³

>99% elimination

Variable heat system

600kW

up to

PYREG® - Reactor

500-800C°

FLOX®- Burner

~1MW

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The Production Units

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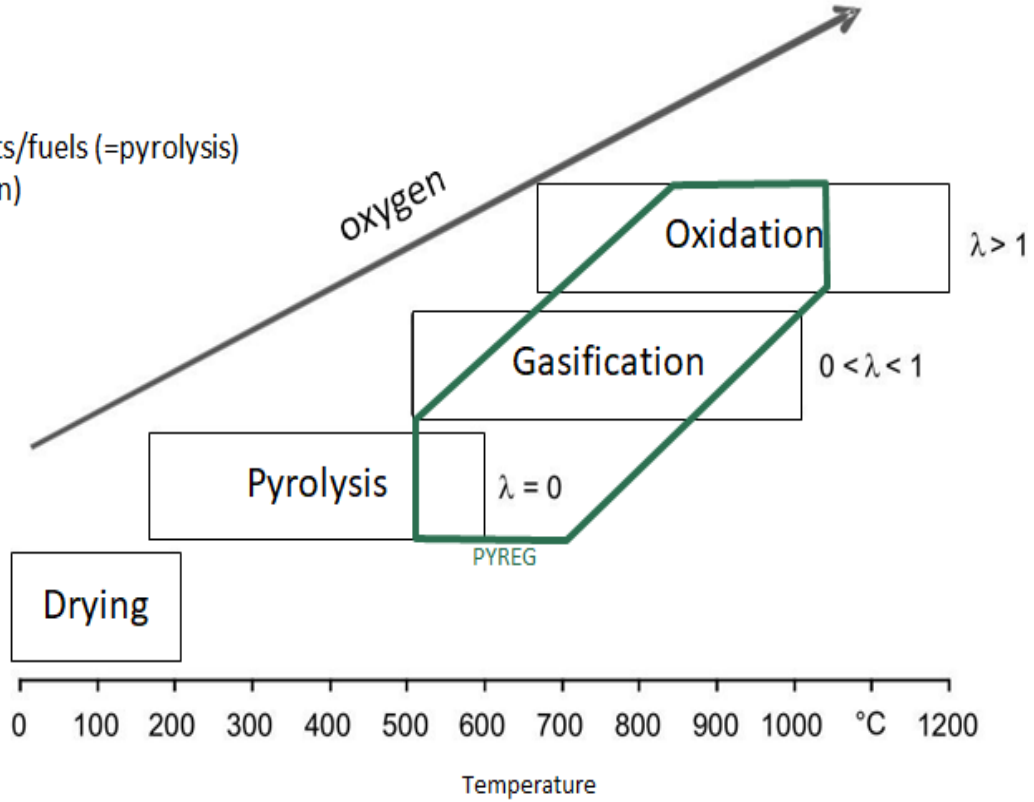
The Technology

PYREGs carbonization process aims at the production of high-quality carbon products and/or the safe and residue free utilization of (hazardous) wastes/residues.

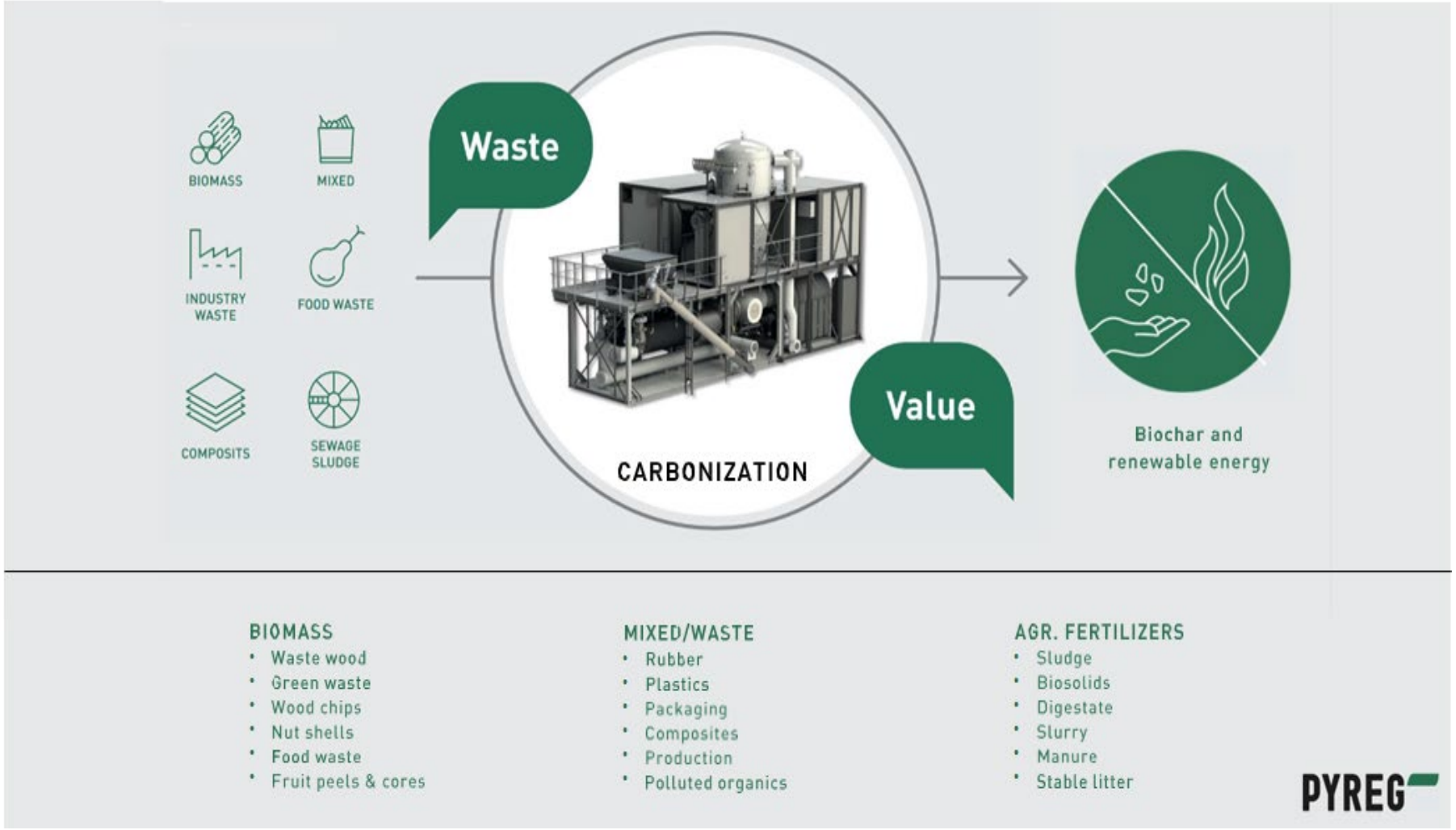
The PYREG-process does **not** aim at:

- Condensating the process gas to recover synthetic lubricants/fuels (=pyrolysis)
- Energetic use of the gas to generate electricity (=gasification)

Parameter	unit	values
Pressure reactor IN	Pa	50...150
Pressure exhaust fans	Pa	> 3.000
Lambda reactor		0,1...0,4
Lambda combustion		1,05...1,2
Temperature reactor	°C	500...800
Temperature combustion	°C	850...1100
Temperature exhaust (chimney)	°C	60...300



Multi-Material-Capability



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Multi Feedstock Flexibility

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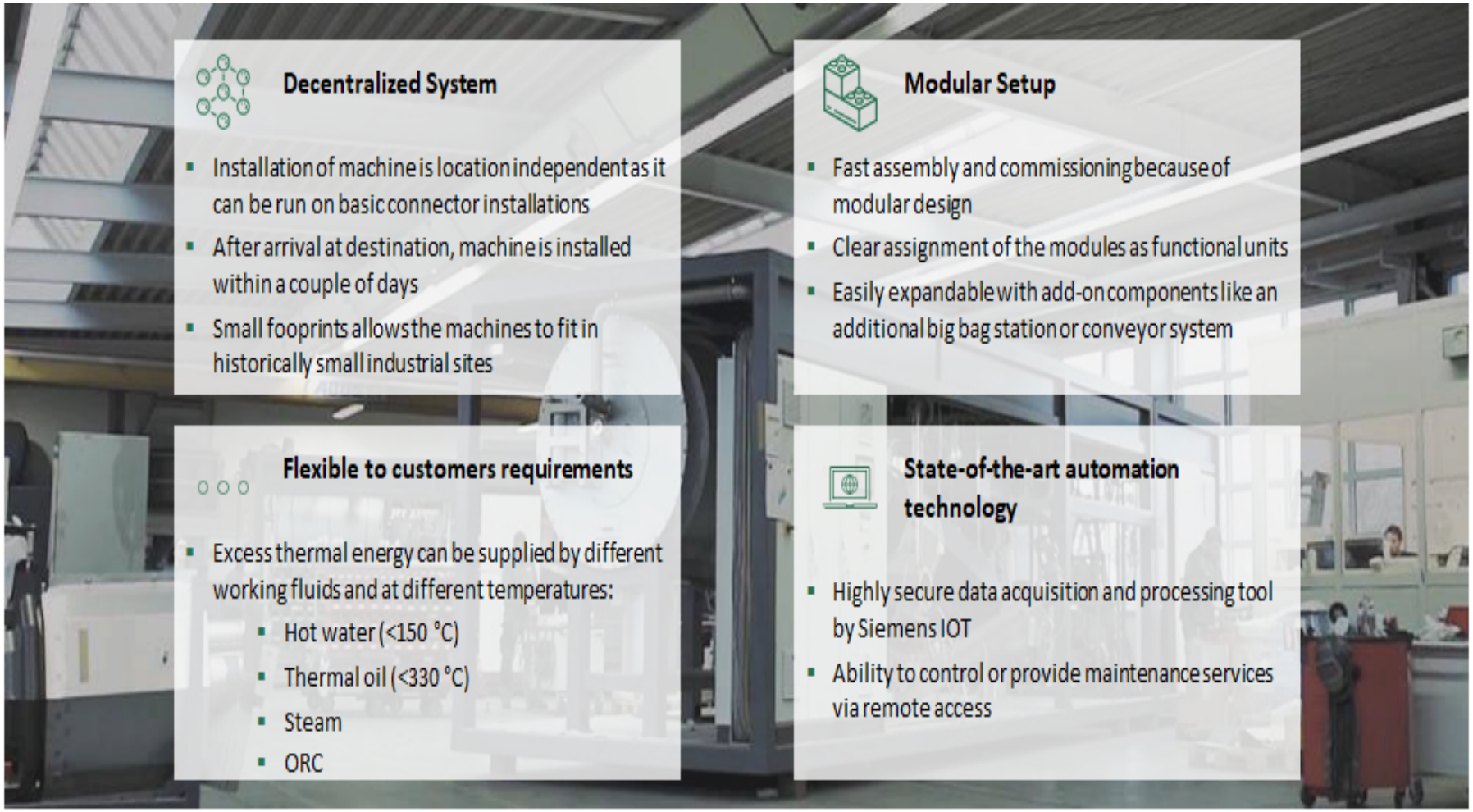
PYREG modularity advantages



Decentralized System

- Installation of machine is location independent as it can be run on basic connector installations
- After arrival at destination, machine is installed within a couple of days
- Small fooprints allows the machines to fit in historically small industrial sites

Modular Setup

- Fast assembly and commissioning because of modular design
- Clear assignment of the modules as functional units
- Easily expandable with add-on components like an additional big bag station or conveyor system

Flexible to customers requirements

- Excess thermal energy can be supplied by different working fluids and at different temperatures:
  - Hot water (<150 °C)
  - Thermal oil (<330 °C)
  - Steam
  - ORC

State-of-the-art automation technology

- Highly secure data acquisition and processing tool by Siemens IOT
- Ability to control or provide maintenance services via remote access

PYREG machines provide customers with a low barrier to enter the carbonization market as systems are customizable, not limited by complex installation requirements and equipped with the newest technology to allow an fast and easy customer support

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AN END-TO-END ARTIFICIAL INTELLIGENCE DESIGN

Maestro Impact: Dynamic Decision-Making in production, Delivered.

Maestro empowers leadership with accurate, real-time information and unmatched predictive models to guide strategic, operational and financial decisions across the entire value chain; Maestro's directives automate the implementation of tactical and operational decisions, ensuring the strategy is delivered.

Tactical Decisions

- Strategic sourcing, formulation and inventory management
- Demand and commodity price forecasting capability
- Dynamic adjustment to market changes (availability of RM and Energy)
- Inbound and outbound logistics (on time delivery)
- Production operational planning and scheduling
- Planned and predictive maintenance scheduling
- Optimized processing to reduce the unit cost of production

Strategic Decisions

- Annual and multi-year business planning and operational planning
- New projects, expansions and Capex
- Plant turnaround and inspection optimization
- Raw material storage, finished goods warehousing and transport capabilities
- Energy, utilities, and CO2 emissions
- Customer price elasticity and product mix

Operational Decisions

- Predict and respond dynamically to real-time operating and market conditions
- Dynamically plan and schedule value chain activities underpinned by maximizing margin
- Meet the per unit of production required demand and increase product yield, while optimizing the specific consumption of raw-materials
- Inventory optimization as a critical component to managing working capital
- Eliminating logistical bottlenecks
- Optimized production modes and operational elements
- Optimized yield value and resource efficiency
- Prediction and avoidance of production slowdown/downtime.

Financial KPIs

- Management of Working capital
- Total planning and procurement cost
- Raw material cost
- Energy cost per unit produced
- Capex / Return on Investment

Maestro's overarching impact on the end-to-end value chain would result in the maximization of realized business potential, by immediately increasing earnings and operating margins, founded on a culture of continuous improvement and creating a cadence of objective accountability.

Customer Experience KPIs

- Market price/forecast
- Timely delivery
- Customer experience/service

PYREG

NET ZERO TECHNOLOGY

puro · earth

VINCI CONSTRUCTION

Nobilis Pro

TITAN CEMENT GROUP

OMEXOM

greenco agribusiness

pezzolato

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PARTNERS

Project Scope: To investigate the Efficiency of Different Methods of Biochar Production and Application in Agriculture, Industry, Construction and Livestock and Their Impact on Reducing Carbon Emissions and create relevant application protocols.

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RESEARCH PROJECT PROPOSAL

Agreed with Partners and to be submitted

Context:

Biochar is biological carbon derived from biomass, e.g. crop residues, green waste, wood chips, chicken manure, etc.

The idea is that carbon sequestration causes a drastic reduction in global warming while improving soil function, e.g. plant production, with the enhancement of soil properties, water and nutrient retention and the environmental impact of construction processes, e.g. replacing clinker in the cement industry with renewable sources while increasing the hardness of concrete with less cement use.

In addition, there may be benefits for waste management and energy production. The target is to produce, transport and apply (on soils or in structures) biochar with best practices and efficient protocols that minimize overall greenhouse gas emissions and significantly improve the performance of soils and the green sustainability of construction methods.

PARTNERS

Research Institutes:

- Agricultural University of Athens, Dean [Framework Agreement]
- Hellenic Agricultural Organisation-DEMETER[Framework Agreement]
- Alexandrian Technical University of Thessaloniki [Framework Agreement]
- University of Western Macedonia [Framework Agreement]
- National Technical University of Athens, School of Chemical Engineering, Dean

Biochar Production Technologies:

Global Esco, Pyreg

Biochar Production:

Biochar Hellas

Cement Factory:

Titan Cement, Larsinos Cement

Application Partners Real Estate Developers:

Dimand

Lamda Development

Bio Organic Fertilizers:

Interallis, Greenco

Application Partners Agriculture:

Growers Cooperatives' Union

Livestock Farmers Cooperative

Farmers Unions

Supporting Ministries:

Ministry of Development & Investments

Ministry of Agriculture Development

Ministry of Environment and Energy

International Organizations:

Carbon Standards International

The European Biochar Certificate

Joint Research Centre - European Soil Data Centre (Esdac)

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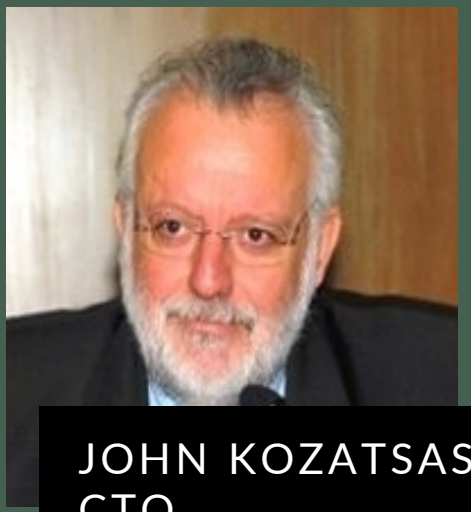
PYREG

IN TEAM WE TRUST

GEORGE SANIDAS
CEO



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