

Stockholm, 12th of October 2023



Conversion of biomass into energy and carbon negative commodities



*Is there a solution
to combat
climate change?*



We are part of it by...



- *meeting technological challenges with consistent research and development for highly efficient energy production, circular biomass torrefaction and carbonization plants for the defossilisation of the global industry*
- *coupling decentralized biochar production with a highly efficient generation of green electricity and heat from the pyrolysis gases*
- *substituting fossil carbon in the steel industry with CO₂-neutral, high-quality biochar made from various inexpensive (previously unused) biomass raw materials*



Quality with tradition

A two-man operation has become a global player.

Since 1965, Polytechnik has built over 3,000 reference systems worldwide.

Today, around 240 employees work in over 15 offices and agencies worldwide.





Portfolio



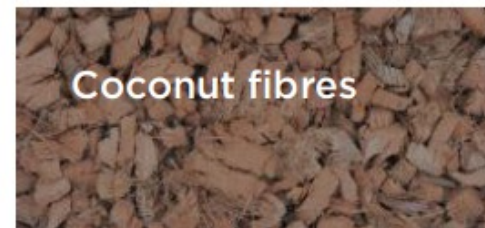
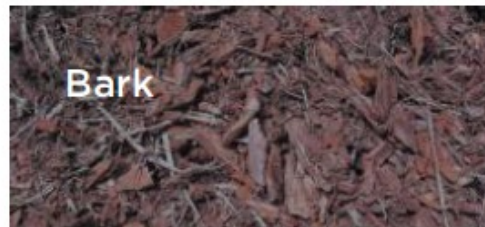
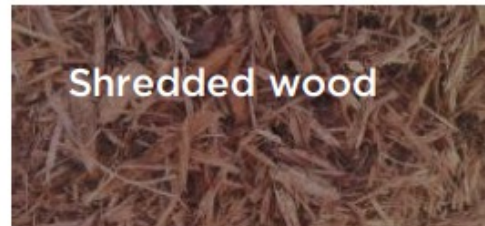
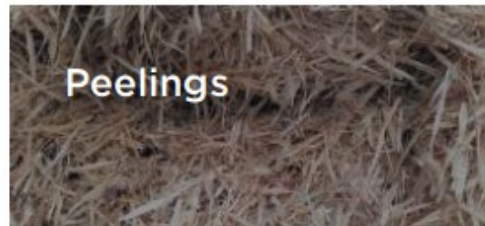
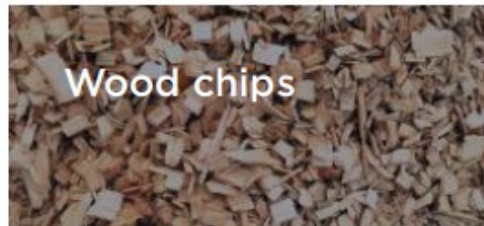
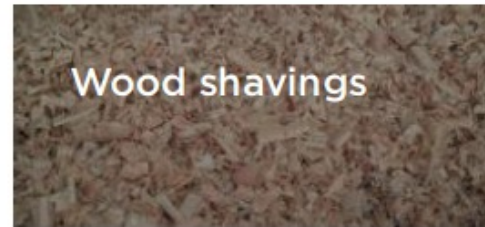
Biomass combustion, gasification and carbonisation solutions

Carbonisation / biochar plants 3,000 to 12,000 t/a biochar

Torrefaction plant up to 60.000 t/a



Flexible use of feedstock



Efficient use of biomass to heat and power

- thermal output of our boilers ranges from 1000 kW to 30 MW per unit
- power plants ranging from 200 kW to 20 MW electric
- advanced emission control and heat recovery for highest efficiencies and minimum environmental impact



Fonterra, New Zealand



Boiler performance:
15.6 t/h (11.5 bar/190°C)

Firing type:
hydraulic feed grate

Fuel:
Shredder wood, wood chips, bark

Year of construction:
2023

Fonterra is the second largest dairy company in the world and processes 2-3% of the world's milk supply. The dairy cooperative employs more than 20,000 people worldwide and generates sales of NZD 19.2 billion. At the Stirling site, an existing coal-fired boiler was replaced with a biomass plant.



POLYHELD

HIGH EFFICIENCY LOW DUST

1. Inlet 2. Fuel bed 3. Gasifier grate 4. Ash removal 5. Heat exchanger 6. Special low-NO_x burner



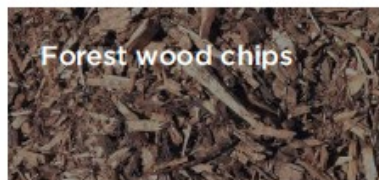
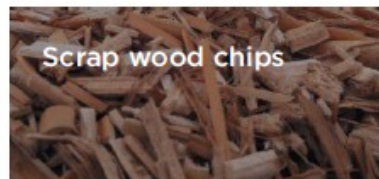
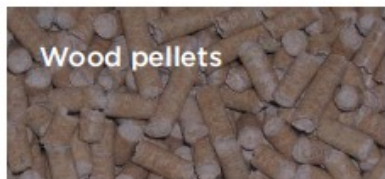
- use a variety of fuels: residual materials from the wood and forestry industries and most woody fuels (with a water content of up to M45)
- efficiency: >92% (+5% compared to traditional burners)
- dust: <20mg/Nm³; 11% O₂
> without additional emission purification)
- power range: 400 kW – 3,000 kW
- modulating between 25-100% load
- low maintenance costs
- CHP option with direct gas ORC available

POLYHELD

HIGH EFFICIENCY LOW DUST

USE A VARIETY OF FUELS

The innovative technology allows for the use of residual materials from the wood and forestry industries and most woody fuels with a water content of up to M45, as well as agricultural waste.





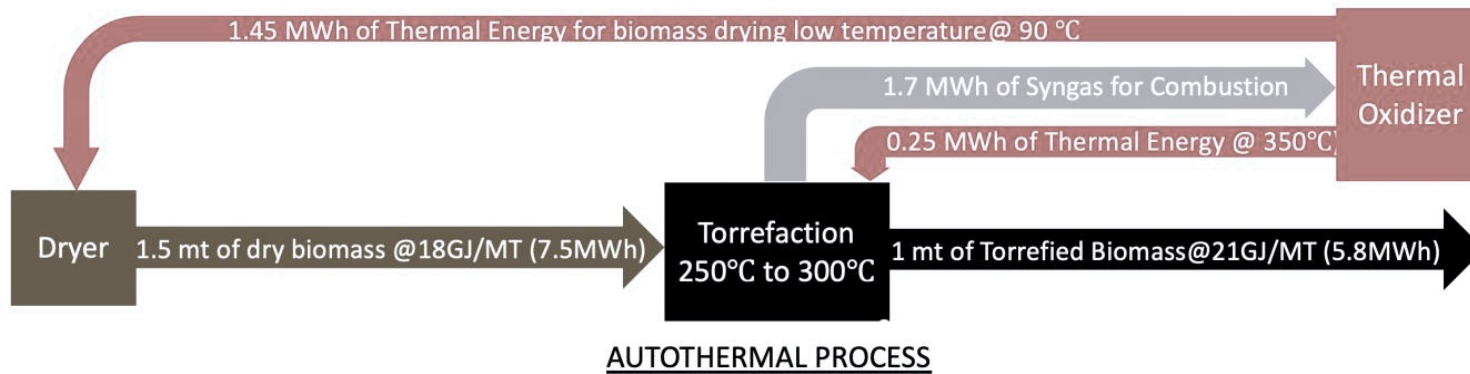
RegaWatt Gasification Technology

- *high efficient clean biomass gasification technology*
- *producing electricity, heat, cold, steam, synthesis gas or bio-oil*
- *power plants ranging from 2.000 to 10,000 kW thermal and 250 to 2,000 kW electric*
- *modular and easy to scale*
- *fuel flexibility up to 60% water content*



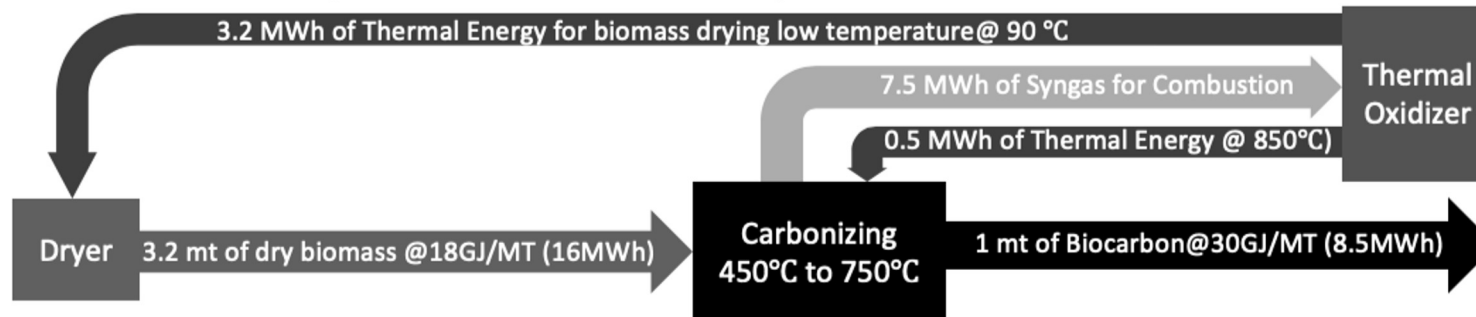
TORREFACTION

To produce 1 metric ton of torrefied biomass with an energy content of >21 GJ/mt we require ~ 1.5 metric tons of dry biomass @18GJ/metric ton (30% mass reduction)



CARBONIZATION

To produce high energy Biocarbon with an energy content of >30 GJ/mt we require 3.2 metric tons of dry biomass @18GJ/metric ton



AUTOTHERMAL + 7 MWh of Thermal Energy for production of 1.4 MWh of Electricity



Large scale client

Producer

Collaborative
Business Model

Investor

POLYTECHNIK[®]
Biomass Energy

Pilot torrefaction plant
operating since 2013 in Austria
8,000 t/a of briquettes



Carbonisation demonstration plant
operating since 2016 in Germany
3,000 to 12,000 t/a of biochar



Industrial Torrefaction plant
construction 2023 in Finland
up to 60.000 t/a of briquettes



Biomass Carbonisation

GreenCarbon



30,000 t/a
green waste

5,000 to 7,000
t/a
logs and wood

20,000 t/a
Terra Preta soil

3,000 t/a
biochar and char
and feed coal

Char coal sizes
from
25µm to
>200mm

Pyrolysis Plant

Green Carbon Plant Germany



Industrial scale demonstration plant

Operates continuously since 2016

First automated and controlled retort plant worldwide

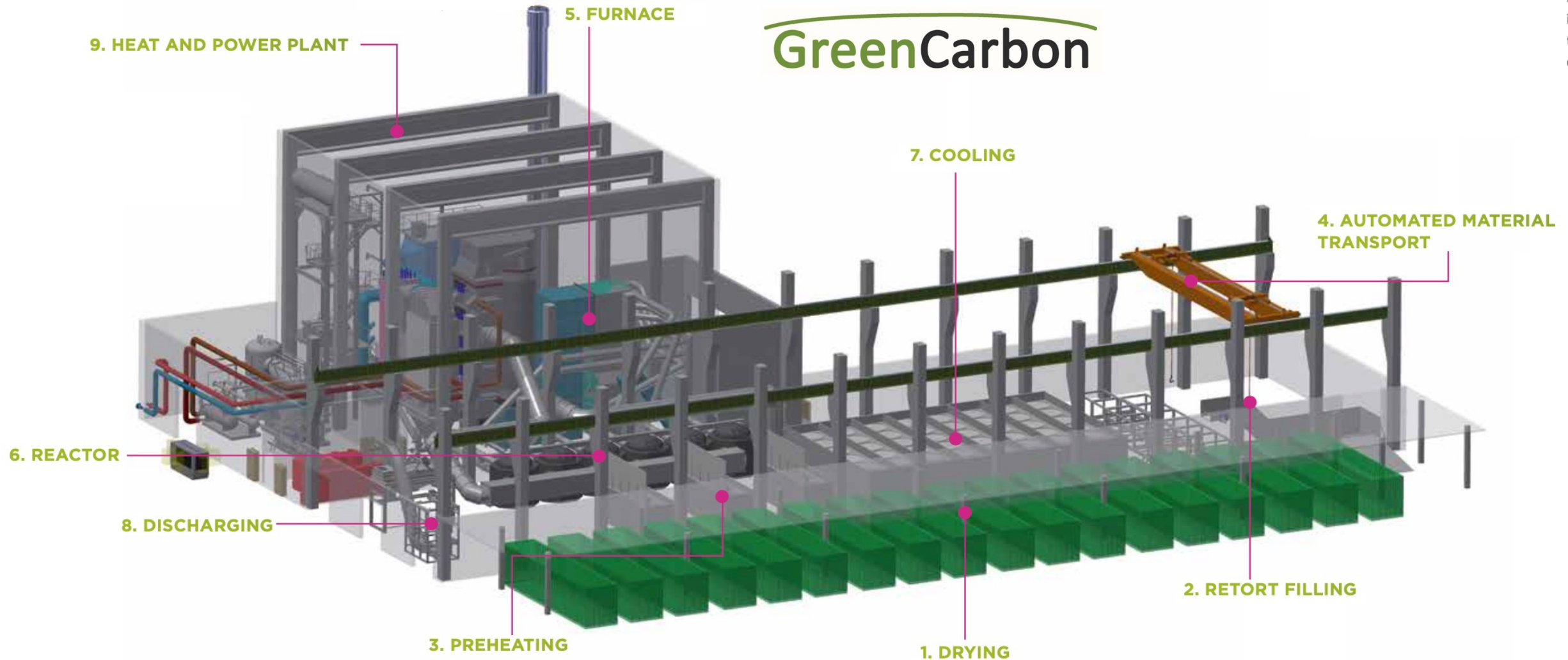
*Environmentally-friendly
with lowest possible emissions*

*Removal of over 10,000 t CO₂ per annum
from the atmosphere*



Pyrolysis Plant

Plant Layout Co-Generation



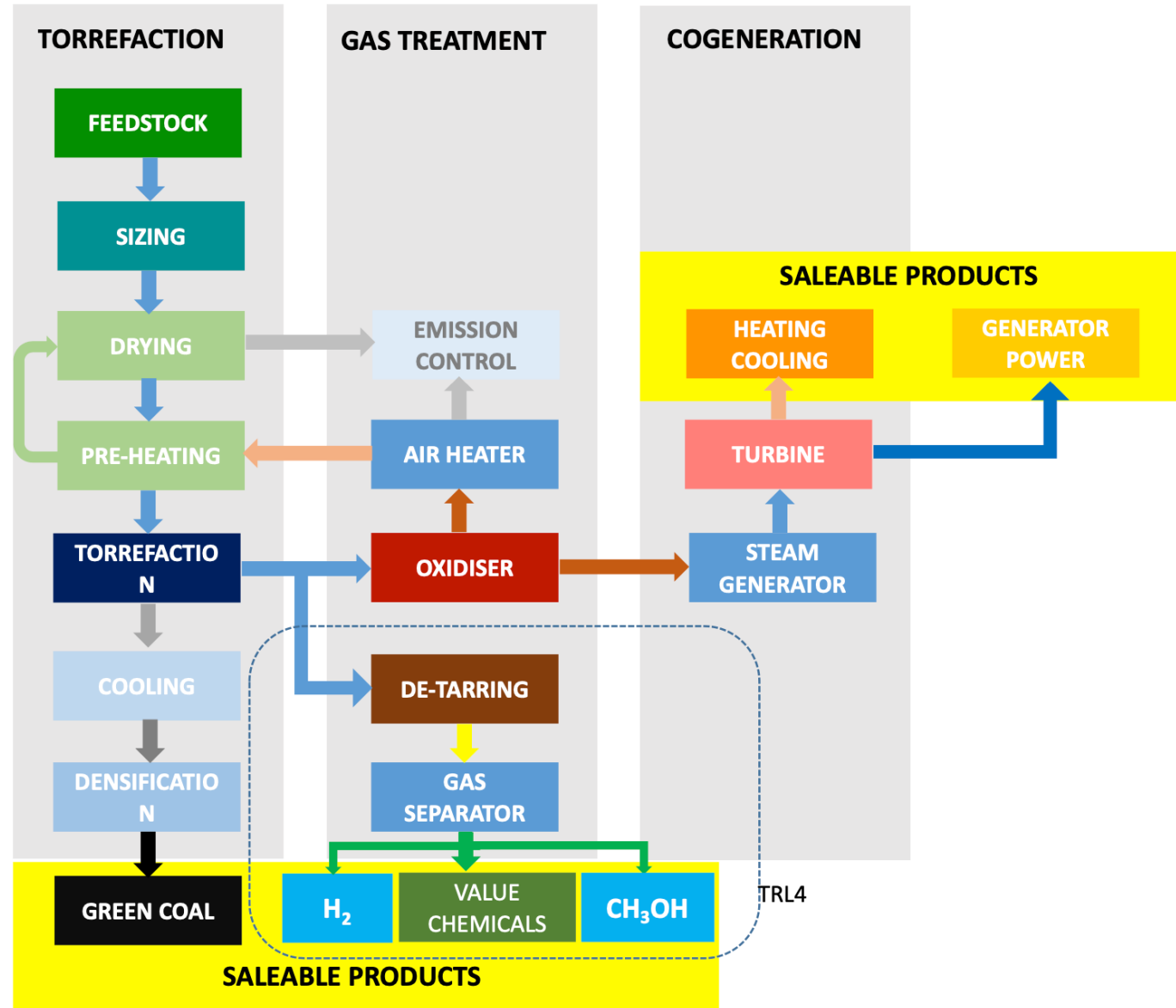
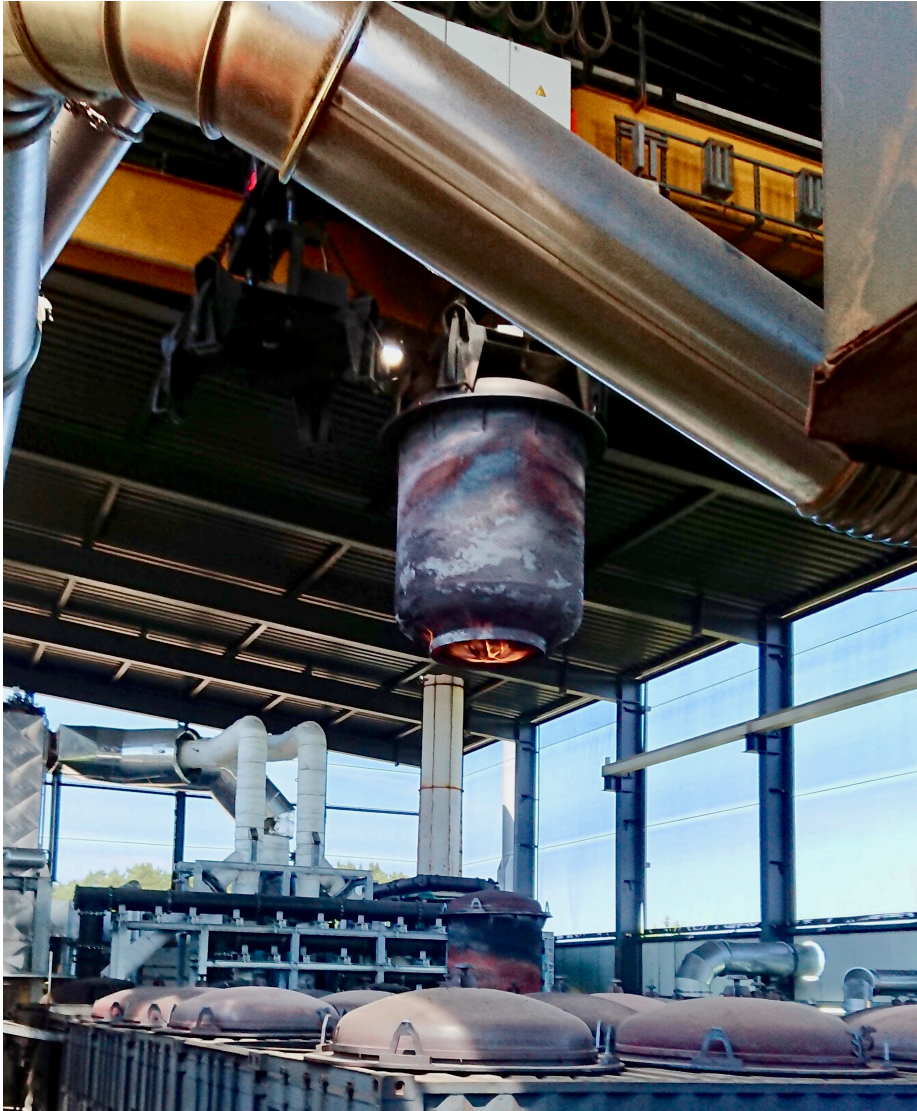
Pyrolysis Plant

Feedstock



Pyrolysis Plant

Carbon Negative Co- and Tri-Generation



Markets for torrefied and carbonised biomasses

Energy

Power plants
Industrial Process Energy
Gasification Feedstock

Niche markets

Animal feed additive
Toner black etc

Industrial Production Component

Additive to many products
Activated Carbon
Carbon Black substitute
Carbon additive for plastics
Steel Industry

Water Treatment

Soil application

Sequestration
Soil quality upgrading

Input for Biorefinery Processes

Carbon Sink

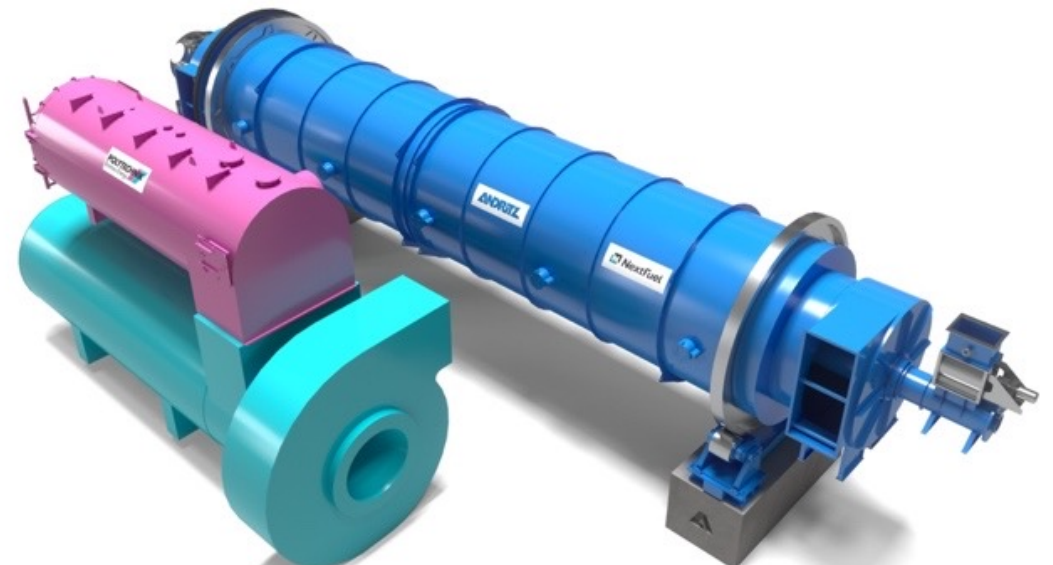
Permanent sequestration

BBQ



Biomass Torrefaction

- *bio-industrial plant in Finland, planned commissioning late 2024, largest of its kind in Europe*
- *60,000 tons of biocoal briquettes per year which will replace fossil coal in various industrial processes*
- *utilising sustainably sourced by-products of local forestry (bark and low-grade biomass)*
- *enormous potential for CO₂ savings for large-scale defossilisation*



Speeding up by collaboration

Lukas Schirnhofer, CEO about the need for new collaborative business models to achieve the much-needed speed in the defossilization of the global industry:

“Biomass torrefaction is going to play a key role in global coal substitution. Biomass sourcing and increasing the production capacity up to a reasonable scale will be key to achieve this.

Furthermore, we will require a collaborative approach of off-takers, producers and financiers to share the development risk rather than leaving it to the producers.”



*THANK YOU FOR YOUR
ATTENTION!*

Mag. Lisa Schmidt, MBA

Corporate Communications & Marketing

l.schmidt@polytechnik.at

+43 699 171 44890



POLYTECHNIK Luft- und Feuerungstechnik GmbH

HEADOFFICE Hainfelderstraße 69, 2564 Weissenbach, Austria

E-MAIL office@polytechnik.at **TEL. AT** +43 (0) 2672 890-0 **TEL. DE** +49 (0) 7191 911 525-0

www.polytechnik.com

