

INDUSTRY  
LEADING  
**CARBON DIOXIDE  
REMOVAL  
TECHNOLOGY**

**PROVEN  
SUSTAINABLE  
SCALABLE**

**PYREG**  
NET ZERO TECHNOLOGY

JANUARY 2024:

**15** °C  
**YEARS,**  
**6**  
**MONTHS**

UNTIL GLOBAL CO<sub>2</sub> BUDGET IS USED UP

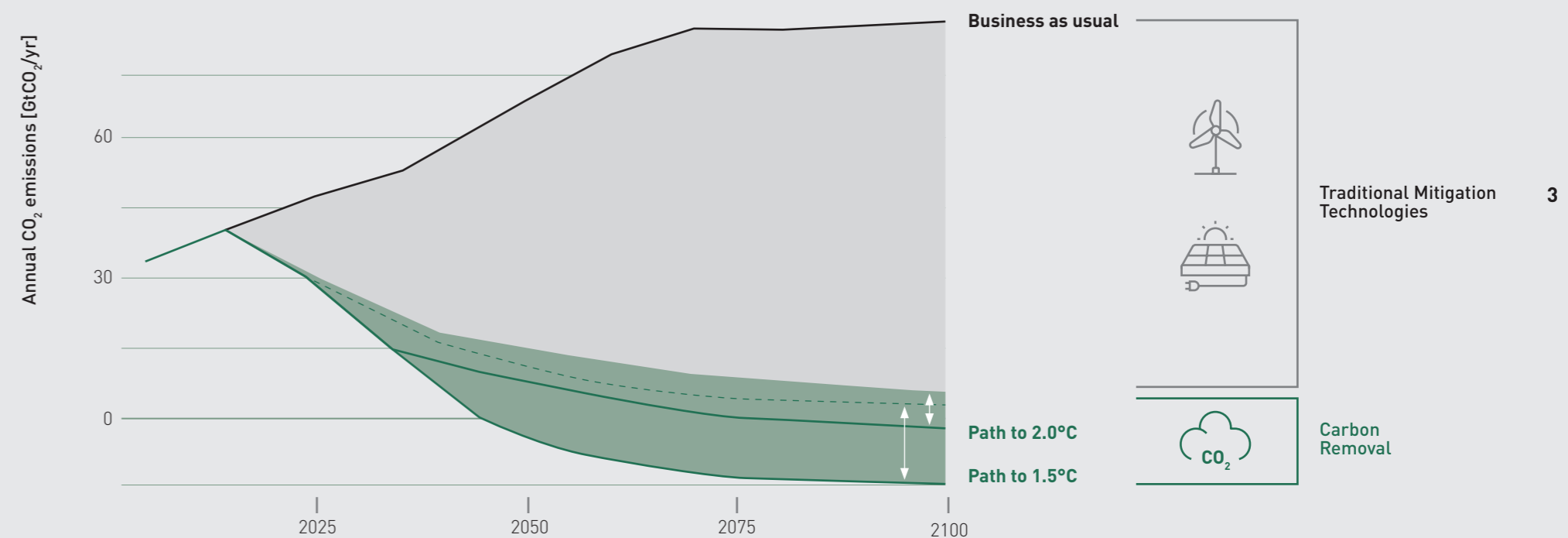
UN WARNS  
**Earth "firmly on  
track toward an  
unliveable world".**

IPCC REPORT  
**"Now or never" if  
world is to stave off  
climate disaster.**

GLOBAL WARMING  
**IPCC: Mankind is  
running out of time.**

CARBON DIOXIDE REMOVAL (CDR)

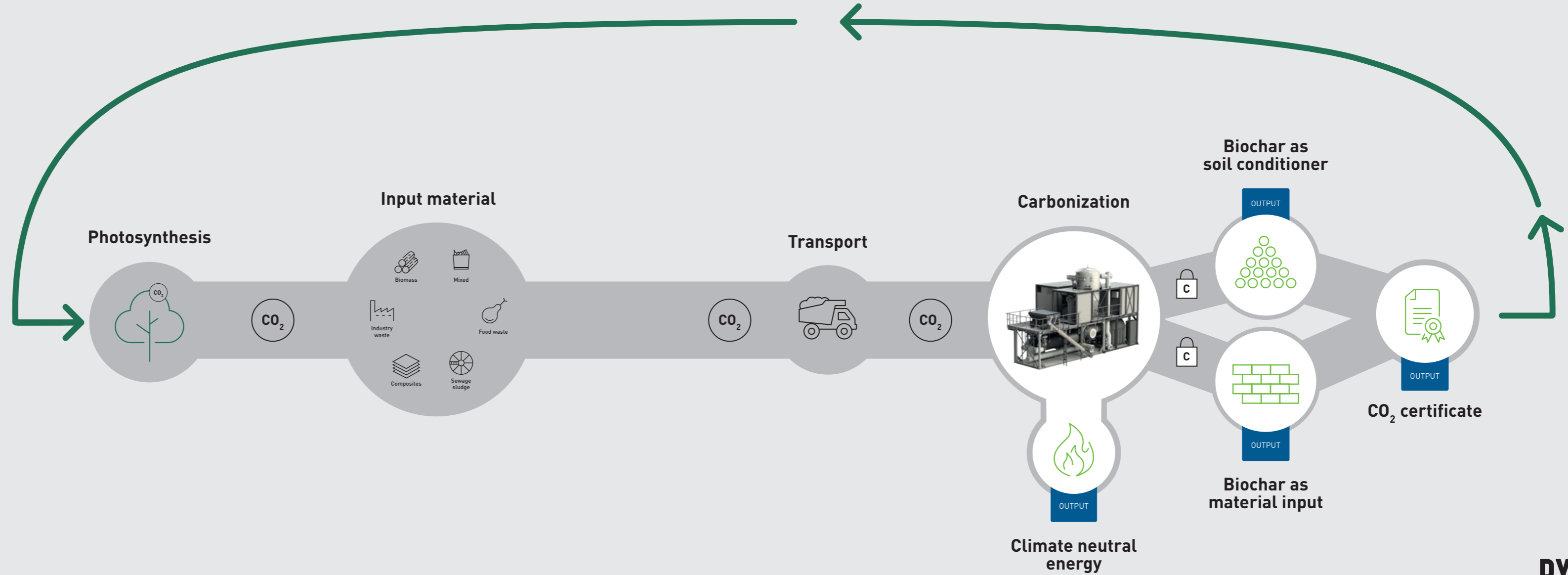
## HOW TO REACH OUR CLIMATE GOALS



Quelle MCC

# HOW DOES IT WORK?

As the worldwide market leader in Carbon Dioxide Removal (CDR) technology, PYREG's systems enable companies to convert their carbon-containing waste into premium biochar and, at the same time, to produce regenerative energy. Using biochar, for example, as soil improver, operators of PYREG plants not only close material cycles, but also create nature-based carbon sinks.



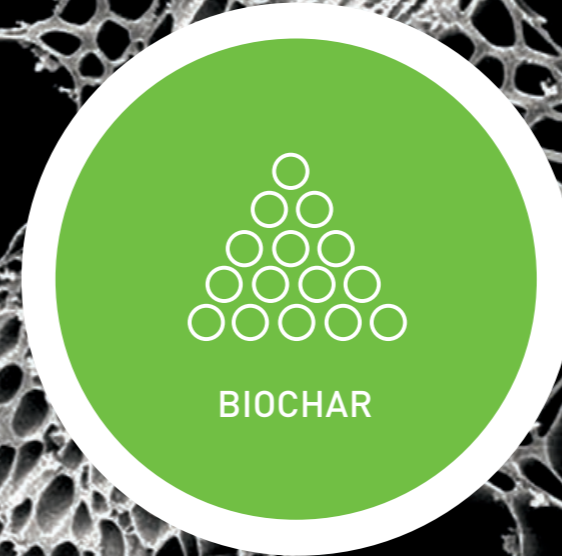
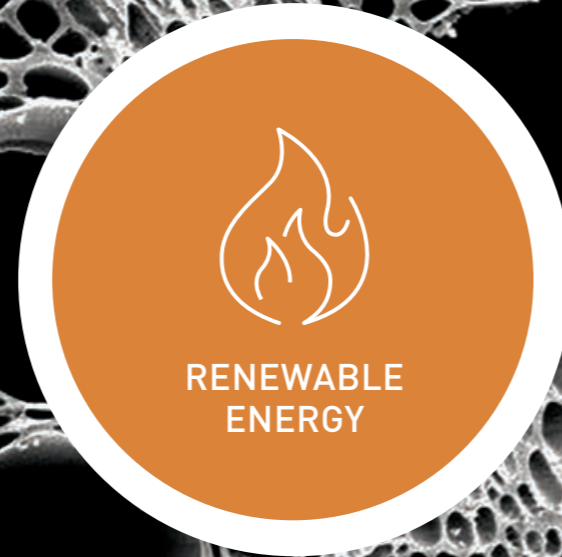
# YOUR BENEFITS



**BIOCHAR**

Biochar is defined by the International Biochar Initiative as „The solid material obtained from the thermochemical conversion of biomass in an oxygen-limited environment“. Biochar is a stable solid that is rich in carbon and can endure in soil for thousands of years.

Source: Wikipedia, the free encyclopedia



7

Microscopic image of biochar shows the tremendous surface of up to 300 m<sup>2</sup>/g



CLOSING THE LOOP

# FROM WASTE TO VALUE

PYREG offers a sustainable future proof business solution to meet today's and future environmental requirements.

We help you to close the loop in your carbon cycle and reduce your carbon footprint by transforming your organic waste into valuable resources.



BIOMASS



MIXED



INDUSTRY WASTE



FOOD WASTE



COMPOSITES

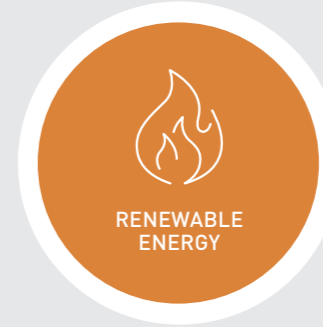


SEWAGE SLUDGE

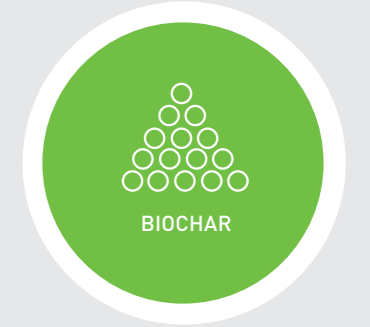
Waste



Value



RENEWABLE ENERGY



BIOCHAR



WASTE REDUCTION



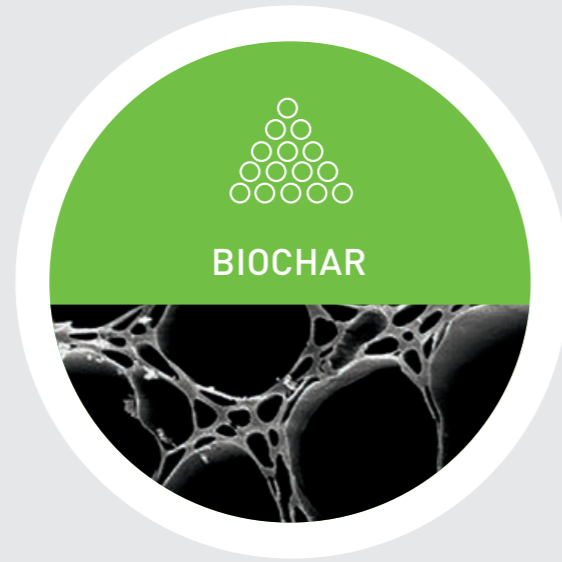
GOING CIRCULAR



FOOTPRINT REDUCTION

# YOUR BENEFITS

PYREG systems locally upcycle your organic waste into valuable biochar and renewable energy, thereby closing the loop. During the carbonization process, the majority of the carbon is sequestered in the resulting biochar, thereby inhibiting the release of CO<sub>2</sub> into the atmosphere, for centuries.



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, such as:

- **Soil improvement, Animal Feed-additive, Filling Material**

The quality and therefore the application areas depend on the input material. Low-quality biochar can be used as filling material in production or as a building material additive in asphalt or concrete.

Either way – residues can be used again in a sustainable way to close the loop, demonstrating a true Circular Economy.



The carbonization process is self-sustaining; after completion of the start-up phase no further external energy is required to run the process, as the energy from the waste is sufficient for the continuance of the thermal treatment. It is even possible to benefit from the excess heat produced, that may be used for drying of humid biomass, for heating or power generation.

Up to 5 GWh<sub>th</sub> renewable energy per year can be used as:

- **Hot Water, Steam, Thermal Oil, Electricity**



With our modularly manufactured plants, industrial, agricultural and sewage treatment companies can convert their carbon-containing *residues* on site into premium biochar and, at the same time, provide renewable energy. In this way, a residual or problematic material is turned into high-quality, climate-protecting biochar.

Biochar enables permanent storage of CO<sub>2</sub> bound in residual materials. Therefore, operators of PYREG plants not only close material cycles, but also create carbon sinks. A smart solution for the end-of-life challenges of your products: *Closing the loop* with added value while achieving climate improvement goals.



Carbonization is a climate protection instrument. During this carbonization process, most of the carbon is actually sequestered in the resulting biochar, thereby inhibiting the release of CO<sub>2</sub> into the atmosphere, for centuries. This sequestered CO<sub>2</sub> amount can be certified and used either to achieve sustainable corporate goals (CSR) or to trade them on the open market as CO<sub>2</sub> sink certificates (CORC`s).



Industry waste / mixed waste is becoming increasingly demanding due to high environmental requirements, increasing disposal costs and capacity bottlenecks.

The carbonization process allows a final mass reduction of up to 90 %, which not only reduces your waste materials but also your transportation and disposal costs, significantly.



PROVEN, SUSTAINABLE & SCALABLE

# THE PYREG NET ZERO TECHNOLOGY

**PROVEN**

50 systems worldwide

**SUSTAINABLE**

renewable energy  
CO<sub>2</sub> removal  
biochar

**SCALABLE**

modular

## German pioneering technology for biochar production

- Since 2009 in market
- Technology Readiness Level (TRL) 9
- World market leader
- Meets all emission requirements
- End of 2022 with 50+ plants in service worldwide
- > CDR of 30,000 t CO<sub>2</sub> eq per year**

## Meets 8 of the UN SDGs

- Produces renewable energy
- Closes the loop
- Produces pollutant free, EBC-certified and highly porous biochar to be used as soil improver against drought and erosion

## Modular and decentralised setup

- Fast assembly and commissioning because of modular design
- Easily expandable with add-on components
- Installation of machine is location independent
- Installed in a couple of days
- Small footprint allows machines to fit in historically small industry sites

# THE PROCESS

## Highest quality



The PYREG process is a continuous method and uses the principle of dried carbonization. For that purpose, the biomass is not incinerated, but first degassed at a temperature of 500 - 700 °C and then, by admission of a well-defined air stream, carbonized. The material passes through the PYREG reactor, hauled by conveyor or screws. As this process enables users to precisely adjust treatment parameters like temperature control, carbonization time and admission of primary air, the optimum quality of the final product can be achieved.

## No problematic substances



The process gas from the input biomass is separated from the material inside the PYREG reactor. Dust is removed by an automated process gas filter and finally burned at a temperature of 1,000 °C by the FLOX® burner (flameless oxidation) inside the separat combustion chamber. Consequently the formation of problematic substances like oils or tar is suppressed, because the carbonization gas is not cooled, but purified by complete oxidation in the combustion chamber.

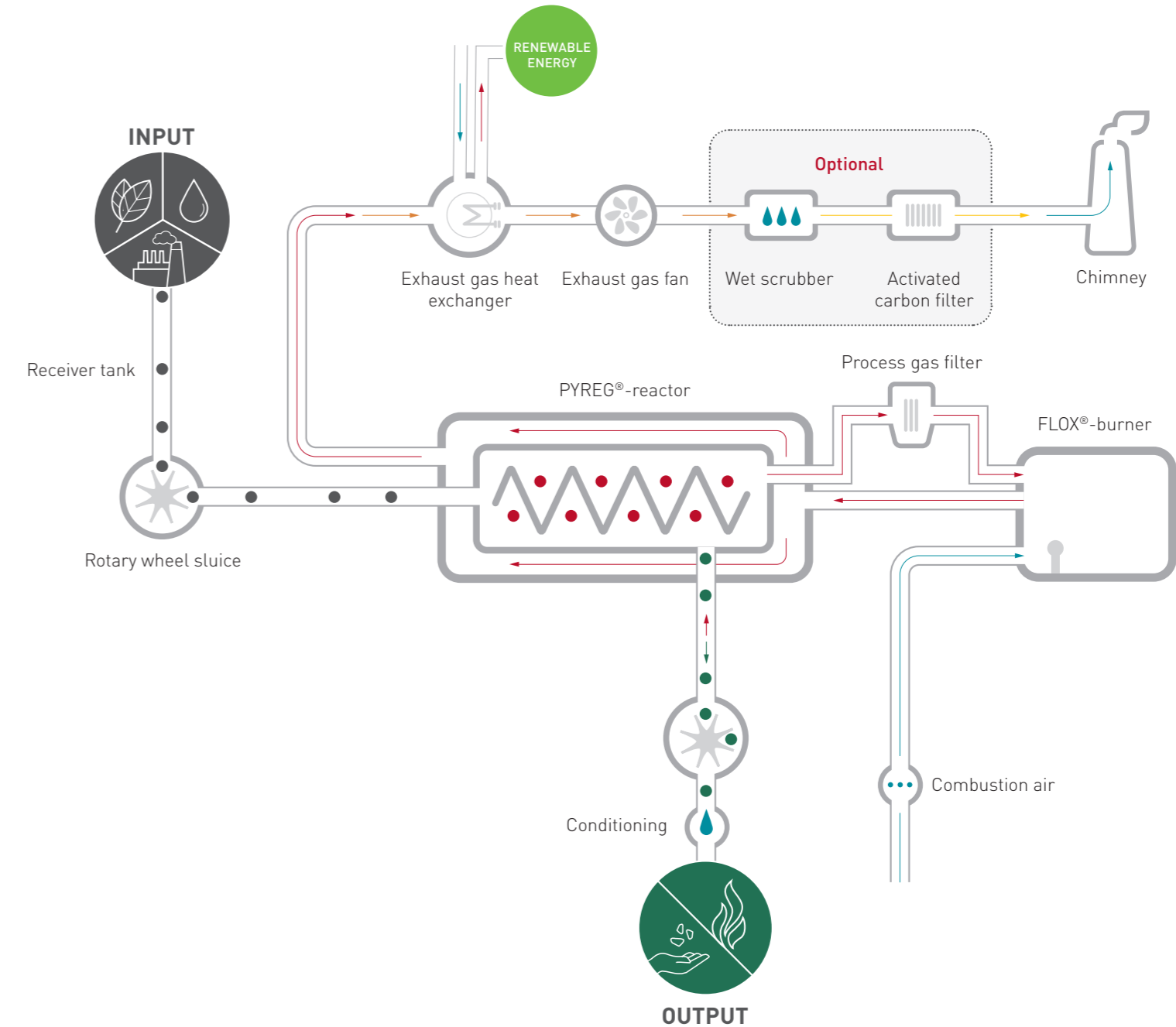
## Usable energy



# 625

kW<sup>th</sup>

The entire process is self-sustaining; the only energy required to maintain the process, originates from the biomass itself. For that purpose, hot flue gas from the combustion chamber is directed into the outer jacket of the reactor, in order to support drying, degassing and carbonizing of the biomass. It is even possible to benefit from the excess heat produced; an amount of up to 625 kW<sub>th</sub> may be used for drying of humid biomass or for heating.







# INPUT

## INPUT REQUIREMENTS

AVERAGE RANGE  
**3-30 mm**  
PARTICLE SIZE

**> 80%**  
DRY-SUBSTANCE

MINIMUM CALORIFIC VALUE  
**10**  
MJ/kg

POURABLE AND FREE FLOWING

MARKET LEADER

# SUCCESS STORIES

Our technology can be used in a wide range of **biochar** applications. With more than 50 systems installed worldwide our customers not only solve typical waste and recycling challenges, they also generate renewable energy and CO<sub>2</sub> removal certificates.



**50+**  
systems worldwide



**90,000 t**  
**CARBON DIOXIDE**  
**REMOVAL**

7 million trees

up to now



**68 GWh**  
**RENEWABLE**  
**ENERGY**

8,000 households

per year





**PYREG**  
NET ZERO TECHNOLOGY

SERVICE

## FROM PLANNING TO COMMISSIONING AND BEYOND

### Our experience

Unchallenged: more than 50 plants worldwide and more than 12 years on the market. As the biochar pioneer and market leader, we focus on continuous development of our patented high-tech systems and cooperate with numerous research institutes. Only PYREG systems are modular, multi-material capable and have been certified by the European Biochar label EBC.

### Additional services

To ensure that PYREG technology fits optimally into your recycling cycles, we offer you a wide range of optional additional services. This includes, for example, a selection of different conveyor technology, storage technology and integration into the heat concept at the site.

### On-site service

Once your PYREG system is up and running, you also benefit from our comprehensive support. This includes remote monitoring and diagnosis as well as on-site service from our technicians.

### AWARDED TECHNOLOGY



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