



CARBOFEX

Vapaaehtoisen CO₂-poistomarkkinan mahdollisuudet

CEO Sampo Tukiainen
11.5.2021
Hiilensidonta 2021-webinaari



CARBOFEX Inc - THE MAKER OF CARBON

- Est. 2016
- CEO Sampo Tukiainen, carbonization and biorefining since 1995
- Carbonizer and supporting technologies developed 2003 - 2011
- First EBC-certified producer in the Nordics
- Now offers biochar production technology and CO₂-removal services

The vision of Carbofex and CEO Sampo Tukiainen

“To enable the removal of a gigaton of CO2 while helping secure food and water for 1 billion people...

...By introducing climate positive technology to enable new sustainable business

Carbofex Business idea

- We turn biomass and organic waste into biochar
- At the same time we permanently remove CO₂ and recover thermal energy



COMPANY



- Located in Tampere, Finland
- Built and operates the largest* “continuous type” biochar plant in Europe
- First company to trade biochar based CORCs
- Revenue 2020: 700.000 euros from biochar, energy and CO2-removal certificates
- CO2-removal certificates delivered to Microsoft, Shopify, Swiss Re, South pole, Nordic offset via Puro.earth



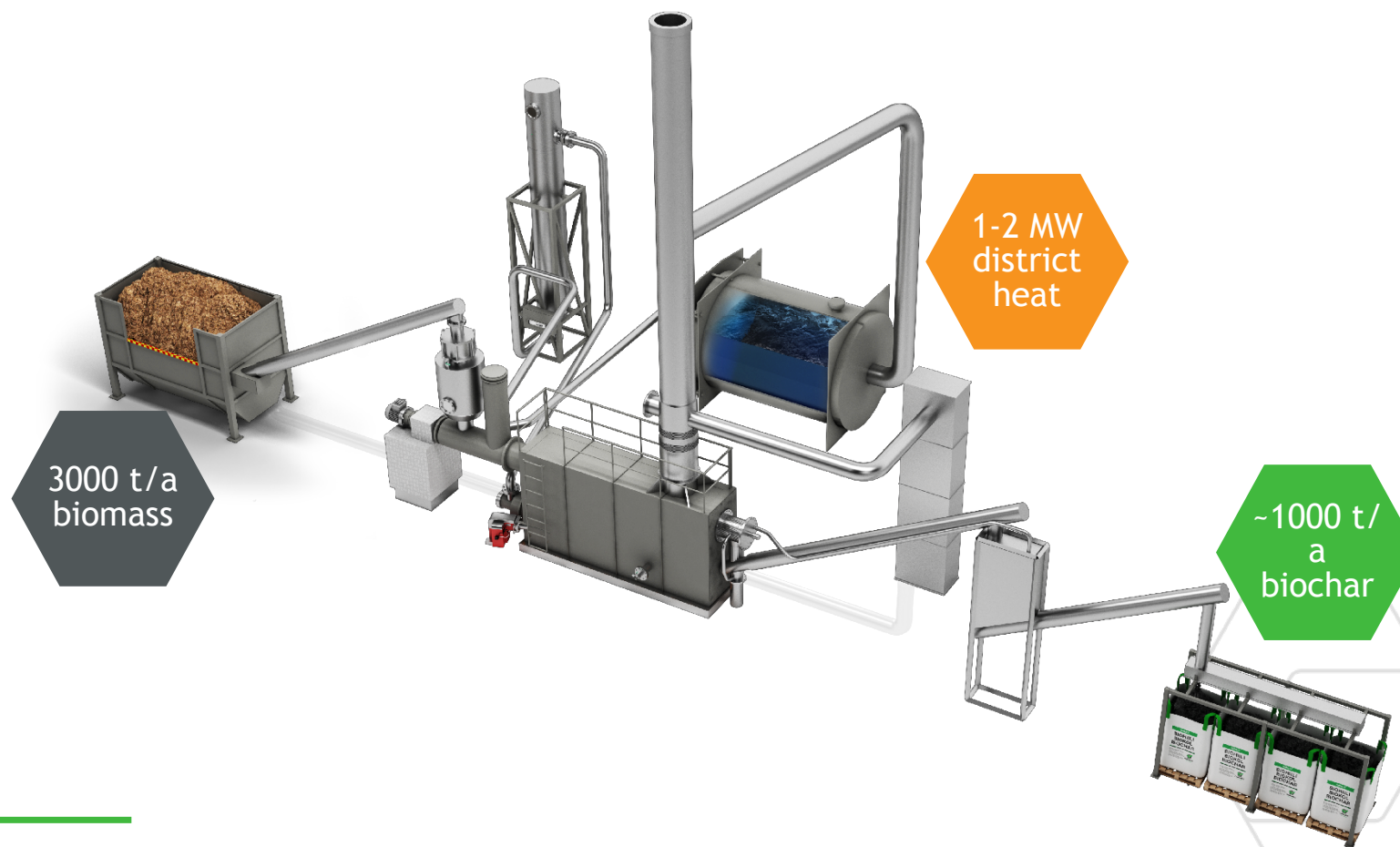
COMPANY



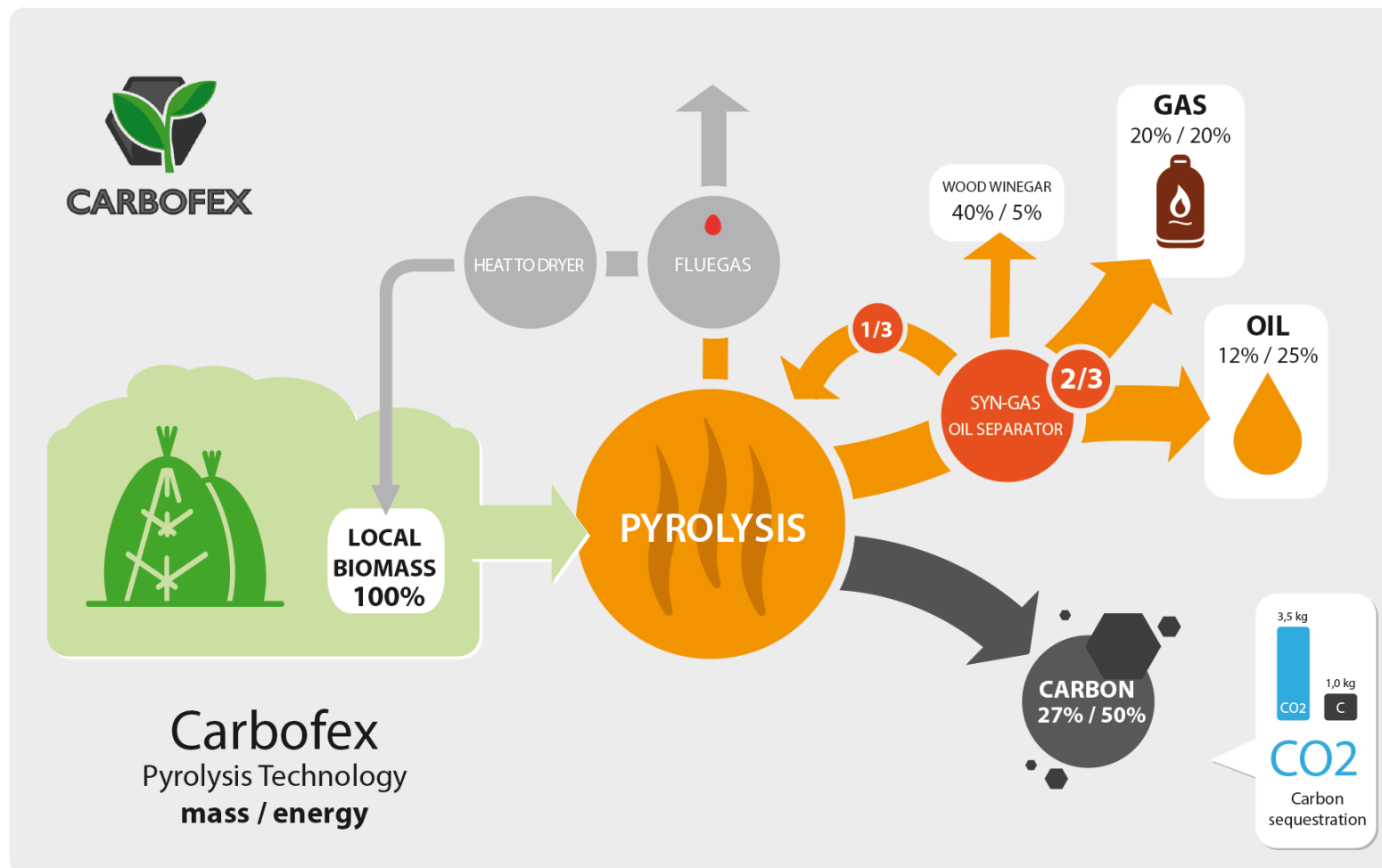
- Now also developing pyrolysis oil based CO2 removal via geological injection
- Total carbon removal efficiency 75% from feedstock
- Current price level 100 eur / t CO2 and rising fast with demand
- Massive opportunities globally and especially in developing countries



CURRENT CAPACITY up to 4500 t CO₂ / a



MASS & ENERGY BALANCE



INTEGRATED THERMAL CONTINUED

- Carbonizer can be integrated for production of process or district heat (hot water or steam).
- Heat can also be used to run a chiller or multiple effect evaporator.
- Ag residues suitable in a shredded or pelletised form.
- With high nitrogen feedstocks the control of NO_x is easy and the EU waste incineration directive is fulfilled in terms of temperature and residence time. 850 C, 2 s

CARBOFEX SOLUTION



- **High capacity** 500 kg / h
- **Competitive pricing**
- **Highest product quality** – high surface area and carbon content
- **Low emissions and high efficiency** – 90 % utilisation rate
- **Very low polyaromatic hydrocarbons (PAH)** in the biochar
- **CO2 NET negative technology** – an existing solution for removing carbon from the atmosphere
- **Flexibility** – use energy for heating/cooling or to desalinate water

INTEGRATED THERMAL GENERATION

- The process will also yield
 - Bio-oil
 - Wood vinegar
- Flue gas is ultra clean
- Low NO_x, 30-40 ppm
- CO < 10 ppm
- Particle emissions > 1 mg m³



Carbofex Biochar

- Is made by processing biomass at 600-700 °C in an air free environment
- Residence time 5-10 min
- Surface area >500 m²/g
- Ash 1-3%
- Fixed carbon 90-95%



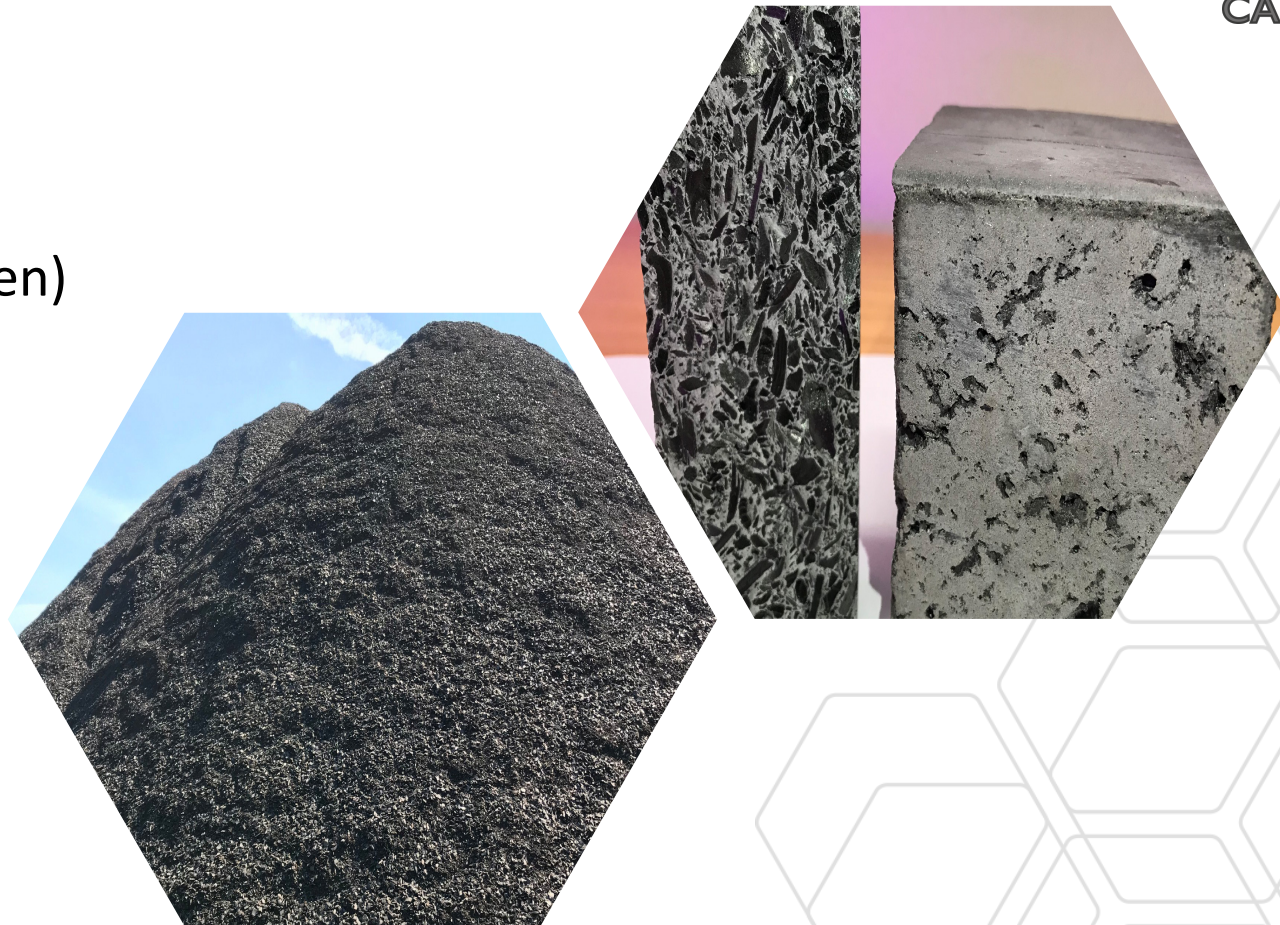
Specs



ANALYTICAL METHOD		RESULT	ACCREDITED	METHOD
Ash content (550 °C)	A	1,6 %, d	x	SFS-EN ISO 18122, SFS-EN 15403
Volatile matter	Vol	3,7 %, d	x	SFS-EN ISO 18123, SFS-EN 15402, ISO 562
Sulphur content	S	<0.01 %, d	x	ASTM D 4239 (mod), SFS-EN ISO 16994
CHN	C	94,1 %, d	x	SFS-EN ISO 16948, SFS-EN 15407, ISO 29541
	H	1,3 %, d	x	
	N	0,61 %, d	x	
Oxygen content (calculated)	O	2,4 %, d		SFS-EN ISO 16993
Fixed carbon (calculated)	FC	94,8 %, d		
Volume weight and dry bulk density	Volume weight	295 g/l	x	SFS-EN 13040
	Bulk density	142 g/l	x	SFS-EN 13040
Moisture	M	51,7 %	x	SFS-EN 13040
ICP-OES measurement	Ca	787 mg/kg, d	x	SFS-EN ISO 11885
	Mg	10 mg/kg, d	x	SFS-EN ISO 11885
	Na	42 mg/kg, d	x	SFS-EN ISO 11885
	K	1120 mg/kg, d	x	SFS-EN ISO 11885

MAIN USES OF BIOCHAR

- **Removal of nutrients** (phosphorous, nitrogen) from industrial and municipal effluents, ponds and lakes
- **Growing substrates**
- **Building** – biochar concrete, vacuum insulation





Future projects

- Carbofex and Tampere electric utility have agreed to build a large combined biochar / peak district heating station with total value of 20 million euros.
- The unit will initially produce 60.000 m³ of biochar and have a peak heating capacity of 30 MW. Start up is scheduled for mid 2021.
- The project will be one of the first industrial scale biochar production schemes, with reservations to expand to 240.000 m³.

THANK YOU.



CARBOFEX

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