#### **btg bioliquids**

### Market Update on Fast Pyrolysis

European Bioenergy Future Brussels – November 23, 2022





### Market Update on Fast Pyrolysis

1. BTG Bioliquids short introduction

2. Commercial production

3. FPBO applications

4. Summary



## Company & Technology introduction

- As a **technology provider** and **product leader** we are committed to the commercial deployment of our fast pyrolysis technology.
- Explicitly made from biomass residues which is known as **second generation** (2G) or advanced biofuel which means that it does not compete with the food chain.
- We support our partners in **connecting** the biomass world and the Fast Pyrolysis Bio Oil (FPBO) off-take world.





### Our company history & milestones





**BTG** starts as a spin-off from the University of Twente



2008

BTG Bioliquids is established by BTG



2015

Start up of Empyro in the Netherlands



2016

Cooperation agreement with TechnipEnergies

> Starting BTG Bioliquids **Webshop**



2020

Start up of **GFN** plant in Finland



2021

Start up of **Pyrocell** plant in Sweden



ABLC Conference 2022

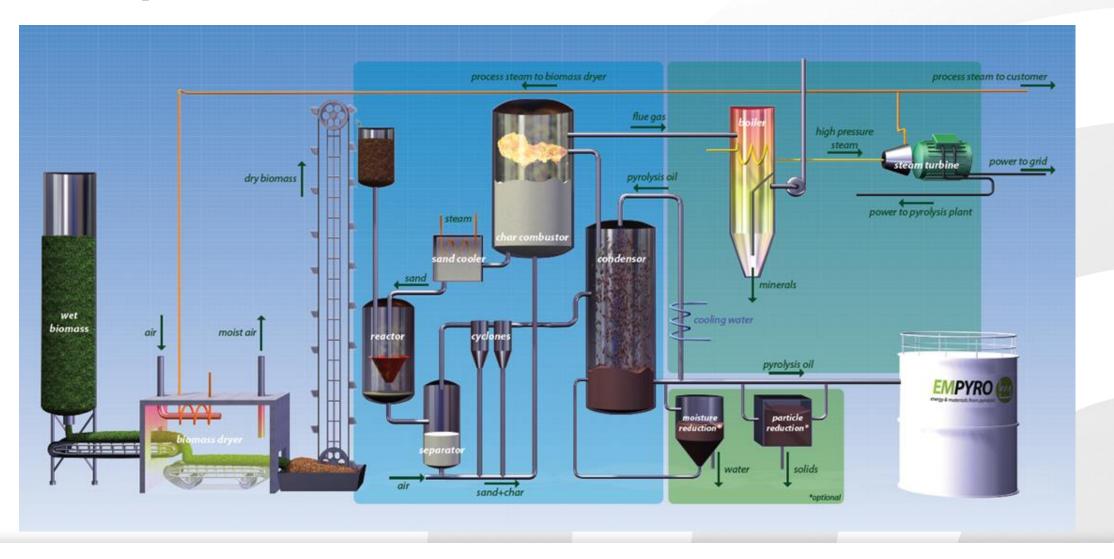
## Company & Technology introduction

- Fast pyrolysis is **thermochemical decomposition** of biomass residues through rapid heating (450-600 °C) in absence of oxygen.
- We support customers with different types of biomass residues that can be converted into homogeneous energy carrier Fast Pyrolysis Bio Oil (FPBO) to valorise their residue streams.





### Our process from biomass to FPBO





### The FPBO supply chain

#### **Biomass conversion**

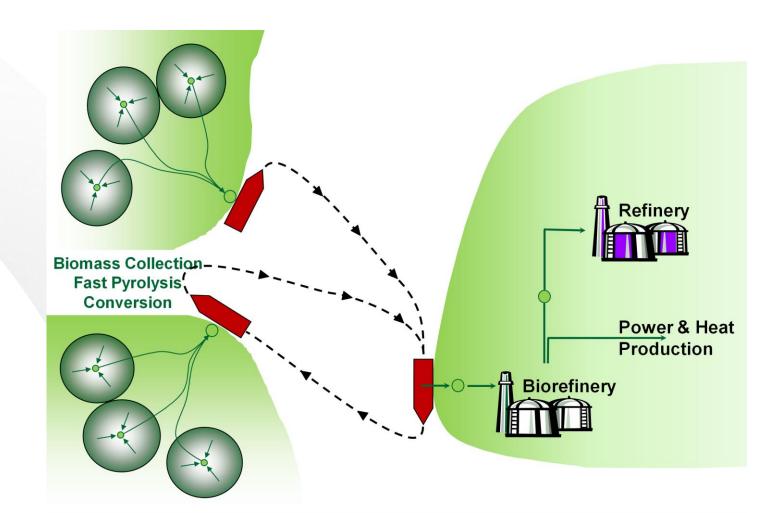
Local processing of biomass residueReturning minerals to the soil

#### **FPBO transportation**

- Biomass liquified
- 10x denser than solid biomass

#### FPBO (co-)processing

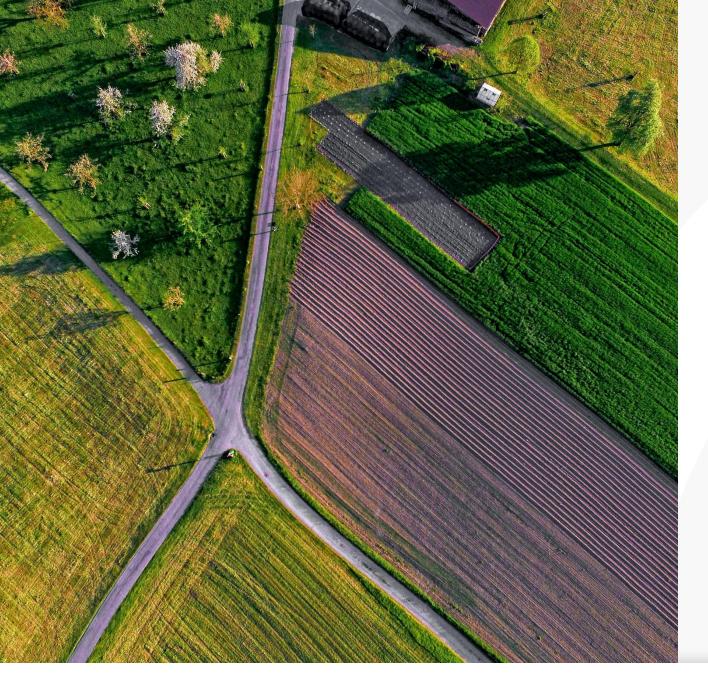
- Centralized location
- Make use of existing infrastructure



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### Fast pyrolysis bio oil key markets

- Sustainable transport fuels comply with e.g. RED II and production of RINS
- O Biobased chemicals renewable materials
- Heat application e.g. district heating or peak shaving
- FPBO can replace crude oil in all these sectors
- Our strategy is on the further development of the biorefinery concept





# FPBO heat application

At FrieslandCampina in the Netherlands:

- Sustainable heat is used for producing dairy products
- Switch from gas to FPBO provides 90% GHG reduction
- Boiler runs without problems since 2015
- In Finland FPBO is:
- Part of carbon neutral energy strategy of customers Savon Voima Joensuu heating plant and Fortum



### Bio based chemicals from FPBO

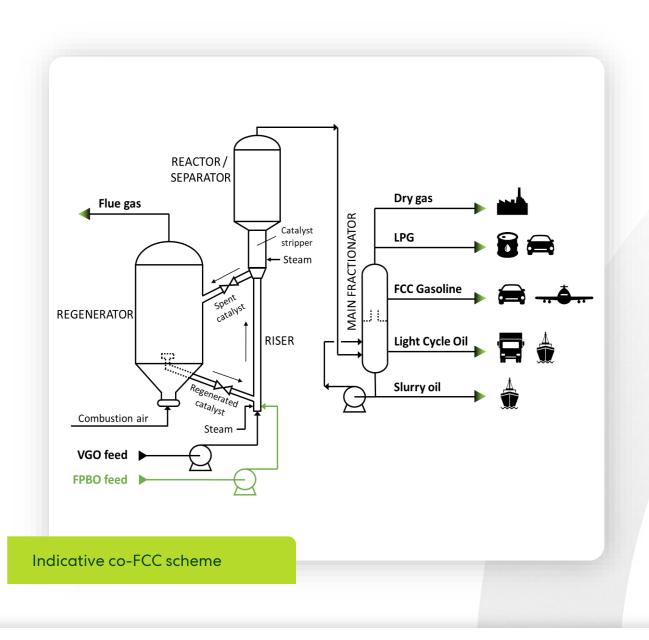
Based on **fractionation** of FPBO; key products are **pyrolytic lignin** and **pyrolytic sugars** 

At the **BTG R&D Centre** in the Netherlands we have made e.g.:

- Wood preservation material/modified wood
- Insolation foam
- Glue, resins
- Moulding compounds

Further development and **commercial up-scaling** will be done in cooperation with partner companies.





### Sustainable transport fuels

Co-FCC of FPBO how does it work?

• FPBO fed by separate injection line & nozzles

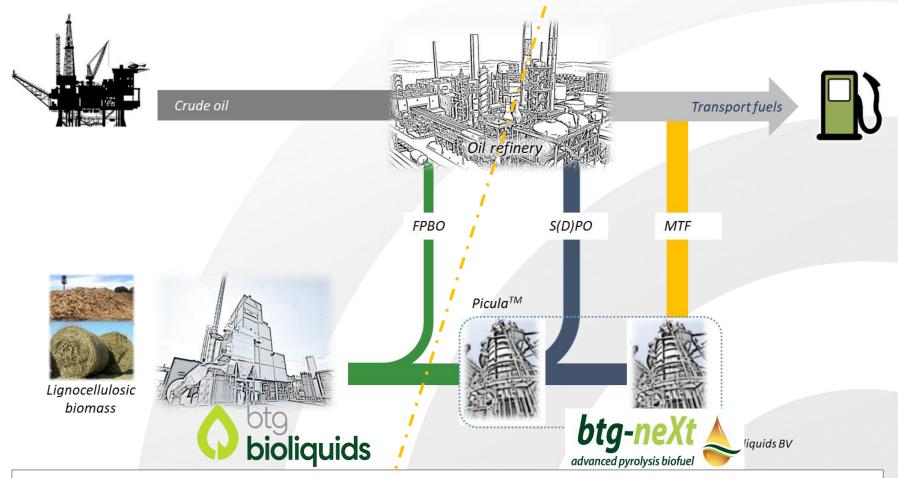
- Biomolecules cracked together with regular feed
- Acidity disappears upon contact with hot catalyst
- Green content distributed across the products
- Commercial FCC operability proven for 5 % FPBO
- Pilot scale operability proven for 10 % FPBO



## BTG neXt options to produce a drop-in fuel

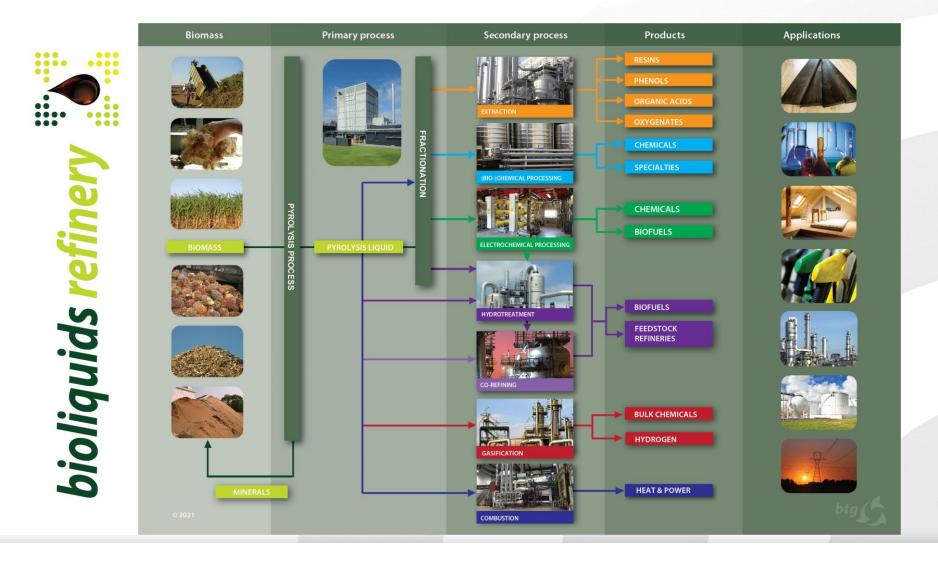
1. Co-feed of **FPBO** with VGO in existing FCC unit

- Demonstrated on fullscale by Preem with cofeeding rate between 1 and 3 % (2022). Max cofeed around 5-10 wt%
- 2. Co-feed of **SPO** with VGO in existing FCC unit
- Higher co-feed ratio's possible (20-30 wt%)
- 3. Stand-alone upgrading of FPBO to drop-in **HPO** (or MTF)
- HPO is fully miscible with fossil fuels



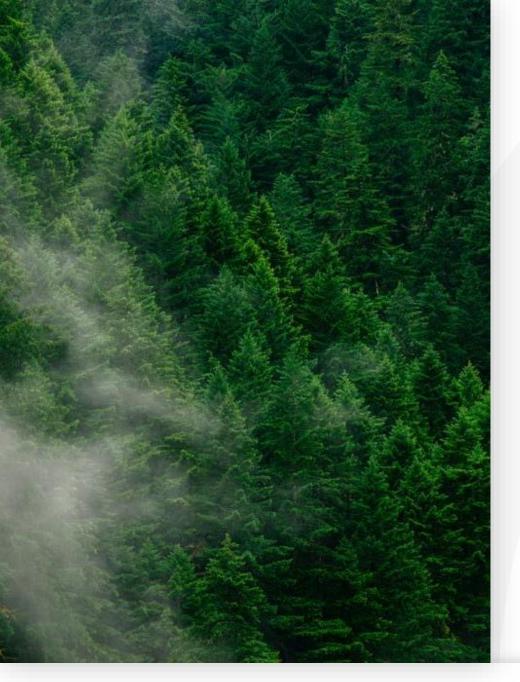
FPBO = Fast Pyrolysis Bio-Oil S(D)PO = Stabilized (Deoxygenated) Pyrolysis Oil HPO (or MTF) = Hydroprocessed Pyrolysis Oil

### **Bio-liquids refinery**



**bioliquids** 

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### Summary & Conclusions

 Fast Pyrolysis Bio-Oil production at 3 commercial production plants with BTG Bioliquids technology in Europe, USA to follow soon

#### ALDERFUELS

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**BTG Bioliquids Fast Pyrolysis Technology Chosen by Alder Fuels as Part of** 

**Pioneering Southeast Facility** 

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Alder Fuels & BTG Bioliquids partnership

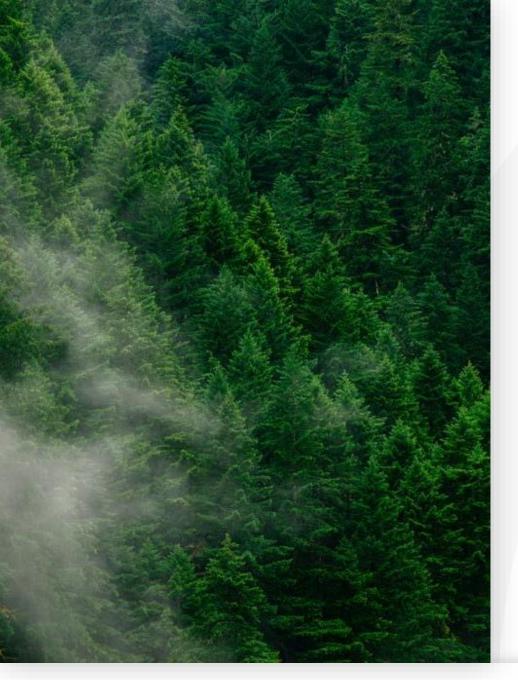
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October 27, 2022 - Alder Fuels selected BTG Bioliquids Fast Pyrolysis Technology in producing Sustainable Aviation Fuels.

First step into the North American market!

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### Summary & Conclusions

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#### • Advanced biofuels from FPBO co-processing has high potential

Low CAPEX, Short time-to-market, Fast GHG emissions reduction

#### • Feasibility of FPBO co-processing in FCC is proven up to 5 wt-%

- > Demonstrated at commercial scale, favourable gasoline yield
- > Exact yields depend on unit, feedstock and process conditions

#### • Other refinery pathways of FPBO possible

> Hydrotreating, Hydrocracking, Gasification (Fischer-Tropsch)

#### FPBO bio-based chemical applications at various stages of maturity

> Wood preservation, paint, resins, insolation foam, ...





### **BTG Bioliquids**

we replace fossil fuels

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