BTG BIOLIQUIDS COMPANY PRESENTATION



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November 20th 2019, ETIP Bioenergy 9th Stakeholder Plenary Meeting

AGENDA

Company

Technology

FPBO applications

COMPANY 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 bio fuel which means that it does not compete with the food chain.

btg-btl
biomass-to-liquid

COMPANY MILESTONES

1987 - BTG starts as a spin-off from University of Twente

2005 - fast pyrolysis plant project in Malaysia

2007 - BTG established BTG-Bioliquids

2015 - start up of Empyro in the Netherlands

2016 - cooperation agreement with TechnipFMC
- starting BTG-Bioliquids webshop

2019 - Empyro sold to Twence, the Netherlands
- Green Fuel Nordic Oy, Finland
- Pyrocell, Sweden

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COOPERATION WITH TECHNIP-FMC

A World Leader in the Energy Industry

- Global footprint with ~45,000 people in 45 Countries
- Global expertise in Engineering, Procurement and Construction (EPC)
- Technology leader in Hydrogen, Ethylene, Refining & Petrochemical
- Advancing innovative, green solutions to meet the world’s energy challenges

Technip’s mission is to deliver safe, sustainable, quality and successful projects

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FIRST COMMERCIAL FPBO PLANT IN THE WORLD AT TWENCE/EMPYRO IN THE NETHERLANDS, IN 24/7 OPERATION SINCE 2015.

Plant Data

Plant Capacity	120 tonnes of dry wood residue /day
Plant Feedstock	Wood Residue
Plant Output per year	
• **Oil**	20 million litres
• **Electricity**	2,200 MWh
• **Steam**	80,000 tonnes
• **CO2- eq. reduction**	24,000 tonnes

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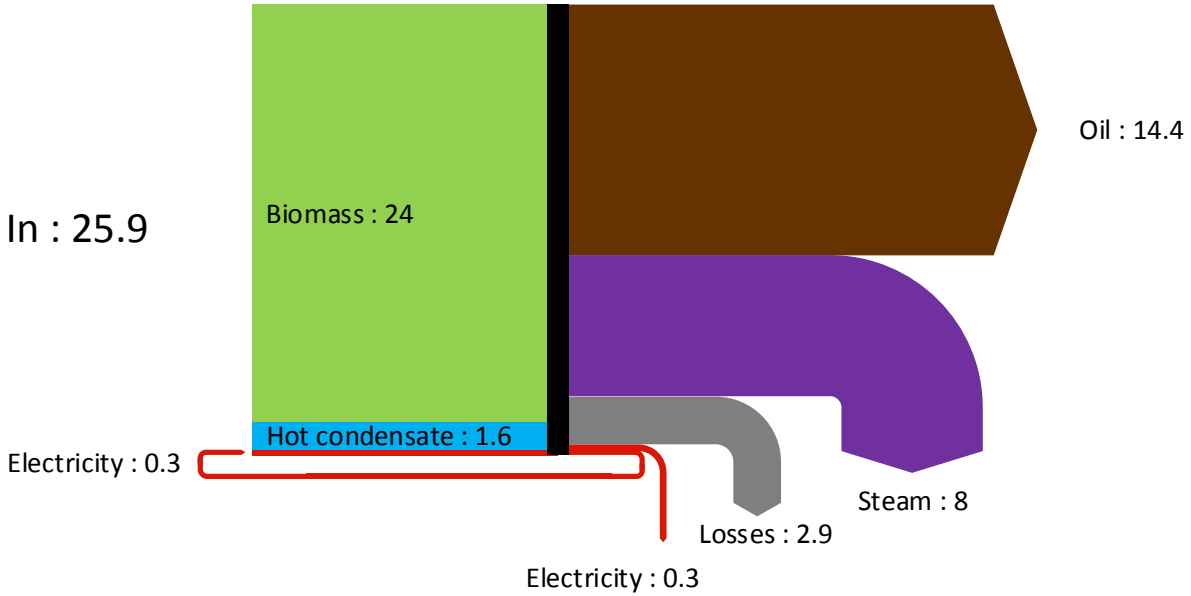
EMPYRO ENERGY BALANCE (MW)
OVERALL EFFICIENCY 85%



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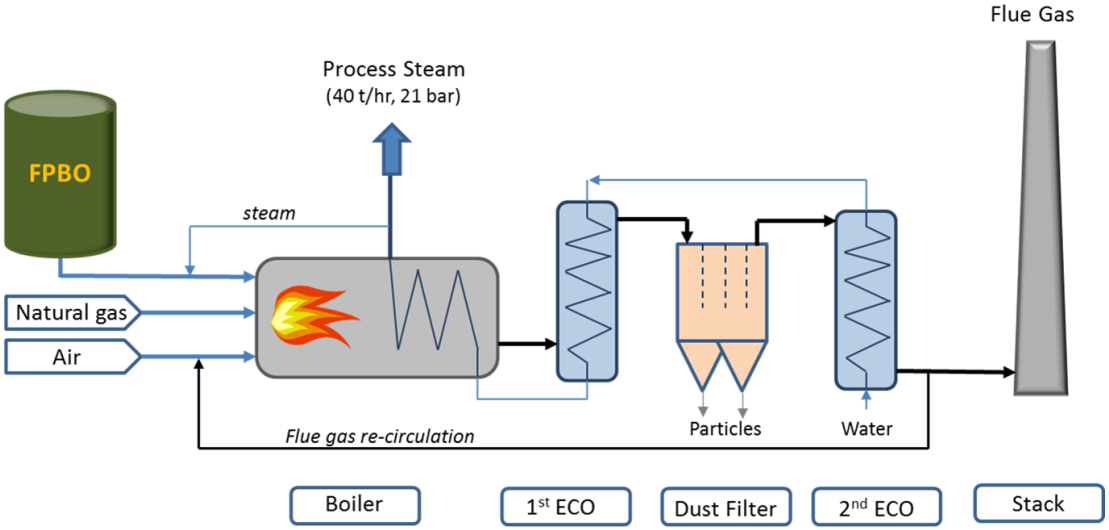
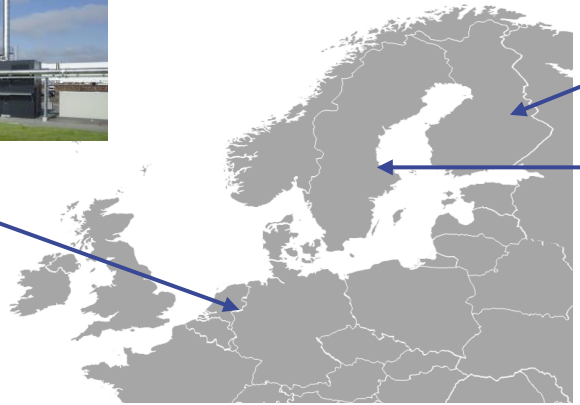
INDUSTRIAL STEAM GENERATION AT FRIESLANDCAMPINA



Schematic drawing of Process Steam Boiler at FrieslandCampina

EMPYRO AND MORE

Empyro Twence, Hengelo
The Netherlands



Green Fuel Nordic, Lieksa
Finland

Pyrocell Setra, Gävle
Sweden

GREEN FUEL NORDIC PROJECT (FINLAND)

Plant (start-up 2020)	
Capacity	120 tonnes/day
Feedstock	Saw dust
Output per year	
• **Oil**	20 million litres
• **Electricity**	2,200 MWh
• **Steam**	80,000 tonnes
• **CO2- eq. reduction**	24,000 tonnes

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PYROCELL PROJECT (SWEDEN)
FROM SAWDUST TO TANK

- Cooperation of Setra and Preem
- Production of bio-oil from sawdust - start-up 2021
- Fast pyrolysis technology - annual bio-oil production 25,000 tonnes - GHG reduction vs fossil oil 80-90%
- Equivalent of 15,000 family cars can be powered per year
- Comply with the European RED II directive

Setra

preem

TechnipFMC

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OUR KEY ADVANTAGES

- ***CO2 neutral*** process.
- To ***reduce transport costs*** fast pyrolysis plants located at biomass source.
- ***High operating plant efficiency*** (~ 85%)
- Plant functions ***autonomously*** operated / controlled by ***one operator***.
- ***Turn key*** plant delivery at ***low CAPEX***.

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BTG BIOLIQUIDS PYROLYSIS TECHNOLOGY

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WHY PYROLYSIS ?

- Works with a variety of biomass feedstocks
- GHG savings well above other biofuels
- Versatile application: heat, power and transportation fuels
- Utilize existing fossil fuel infrastructure
- Viable link agriculture and (petro-) chemical industry
- Renewable feedstock for second generation biofuels

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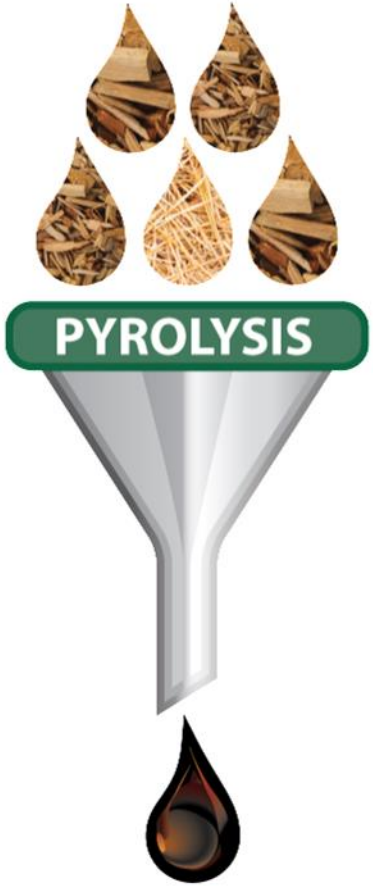

FAST PYROLYSIS TECHNOLOGY

Thermochemical decomposition of biomass through rapid heating (450-600 ℃) in absence of oxygen.

Different types of biomass can be converted into a homogeneous energy carrier: ***Fast Pyrolysis Bio Oil*** (FPBO).

By products are ***heat*** (steam) and ***power*** (electricity).

Typical Pyrolysis Oil Characteristics	
Composition	$C_2H_5O_2$
Density kg/m^3	1100 - 1200
Heating value	17 - 20 GJ/m^3
• Water content	20 - 30 wt.%
• Ash	< 0.1 wt.%
• Acidity (pH)	2.5 - 3

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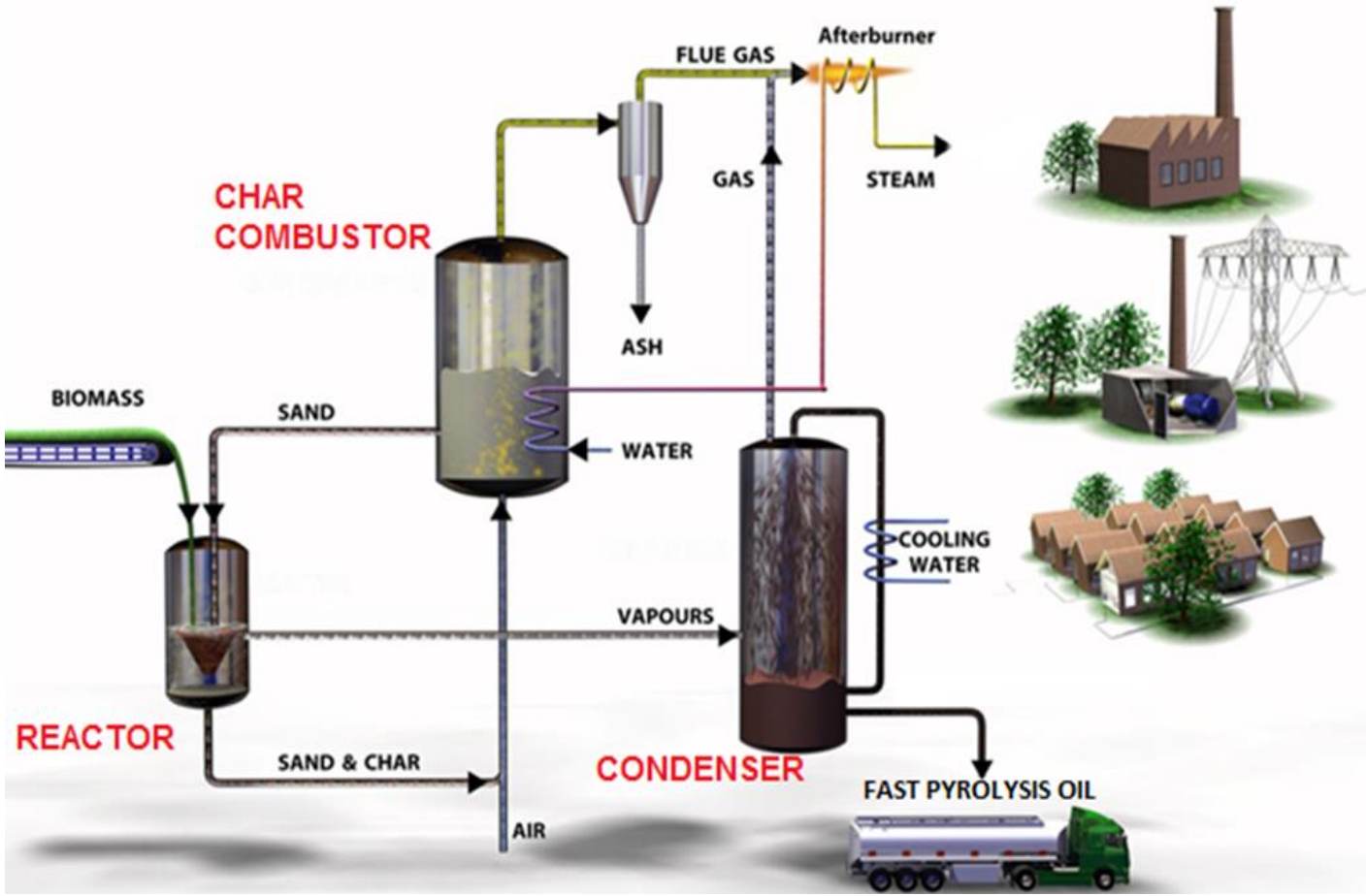
OUR FPBO PROCESS

From biomass to fast pyrolysis bio oil (FPBO).



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BTG BIOLIQUIDS FPBO APPLICATIONS

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FAST PYROLYSIS BIO OIL APPLICATIONS

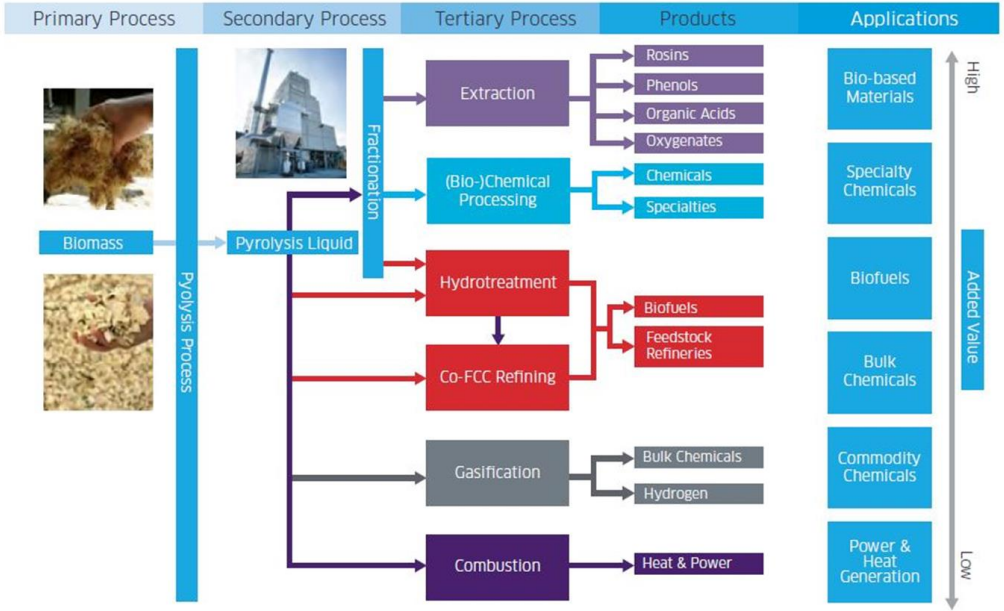

Figure based on BTG Biomass Technology Group B.V. intellectual property

CO-REFINING OF FPBO, HOW DOES IT WORK ?

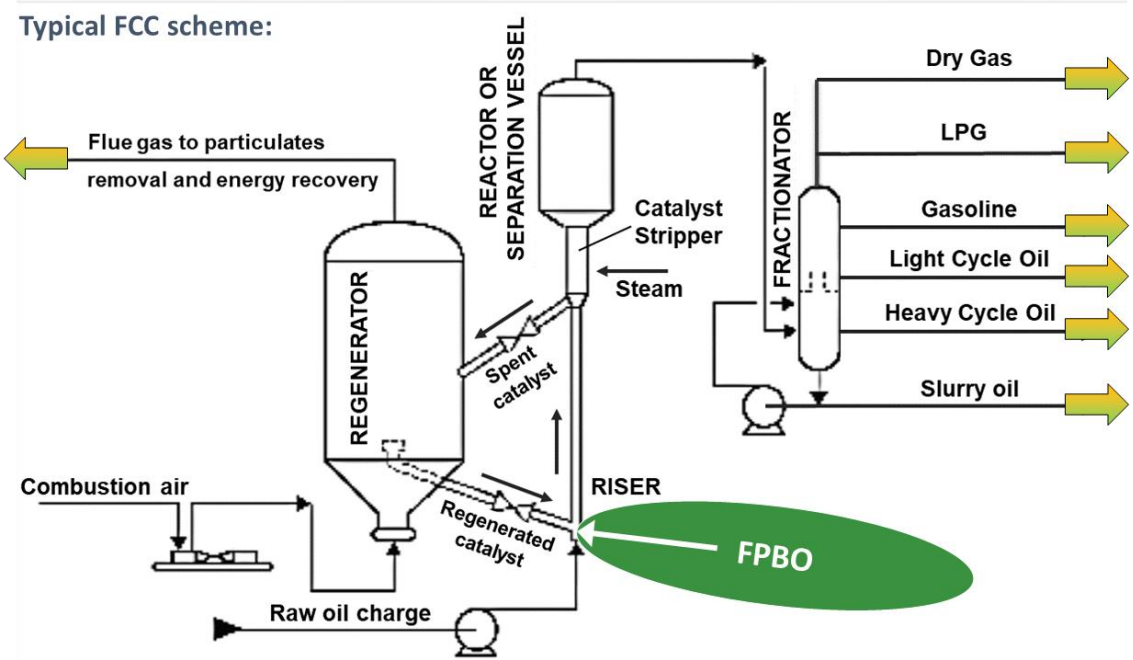

Figure adapted from
U.S. Energy Information Administration

SUMMARY AND PERSPECTIVES

- Fast pyrolysis is proven at commercial scale, worldwide capacity is expanding.
- Current FPBO application is as renewable heating oil (replacing e.g. natural gas).
- Co-processing crude Fast Pyrolysis Bio-Oil in FCC units is a low-capex option to comply with RED2.
- More applications of pyrolysis oil under development. Pyrolysis as starting point of bio liquids refinery.

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THANK YOU

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technology for a sustainable future

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