
BUILDING A BUSINESS CASE WITH PYROLYSIS OF WOODY BIOMASS



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IEA Bioenergy workshop, Tallinn

AGENDA

- Company
- Technology
- Business model
- Key challenges

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.

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



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 success!



BTG BIOLIQUIDS PYROLYSIS TECHNOLOGY

FAST PYROLYSIS TECHNOLOGY

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

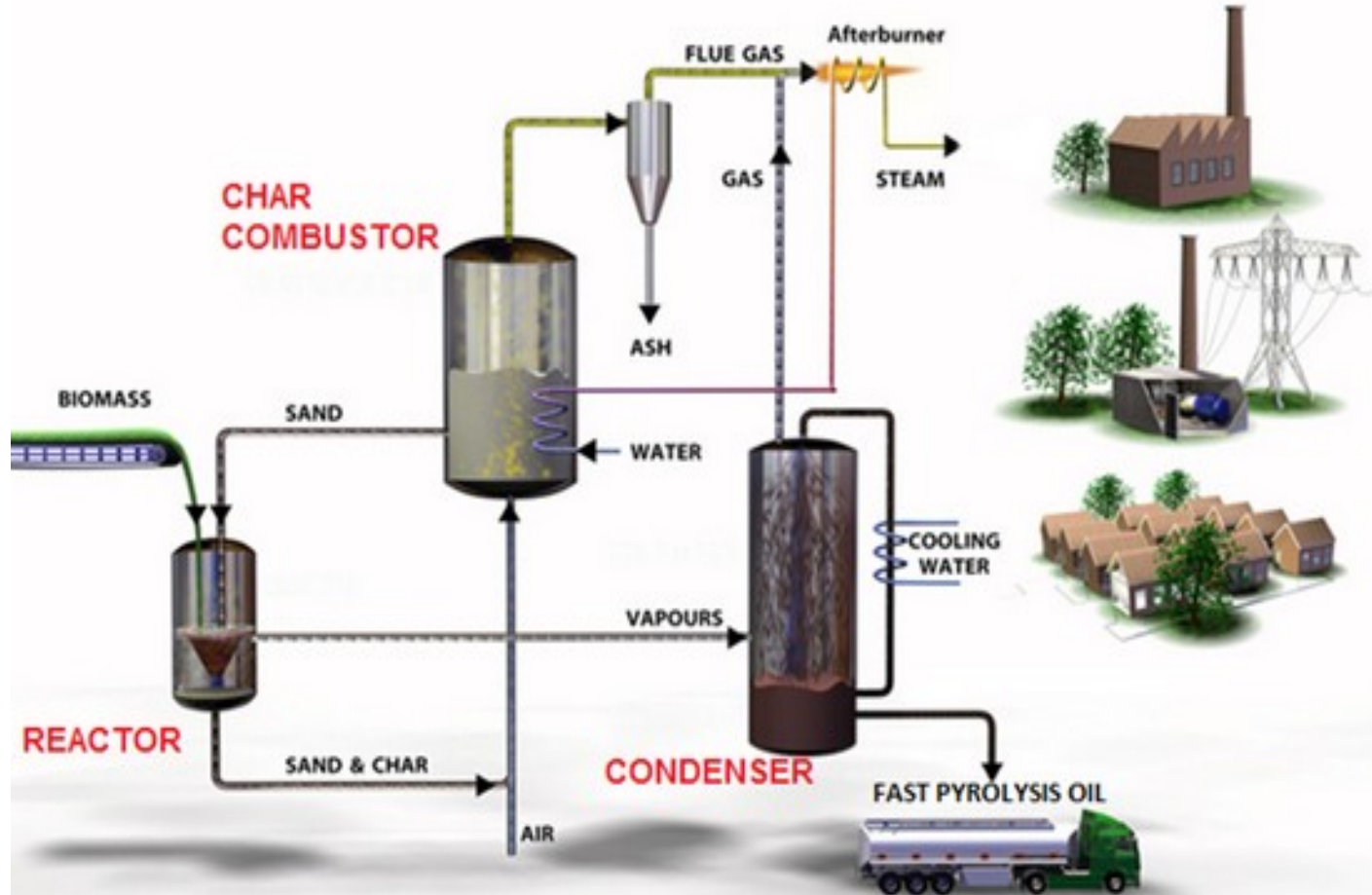
Different types of biomass can be converted into a homogeneous energy carrier: **Fast Pyrolysis Bio Oil** (FPBO).

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

Typical Pyrolysis Oil Characteristics	
Composition	$C_2H_3O_2$
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

OUR FPBO PROCESS

From biomass to fast pyrolysis bio oil (FPBO).



BTG BIOLIQUIDS BUSINESS MODEL

WHAT WE DO

- Variety of 2nd generation biomass feedstocks
- Turn key plant delivery at low cost
- Plant located at biomass source
- Versatile application: heat, power and transportation fuels
- Utilize existing fossil fuel infrastructure
- Value chain approach
- Proven technology on commercial scale

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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

EMPYRO AND MORE



Empyro Twence, Hengelo
The Netherlands



Green Fuel Nordic, Lieksa
Finland



Pyrocell Setra, Gävle
Sweden

FAST PYROLYSIS BIO OIL APPLICATIONS

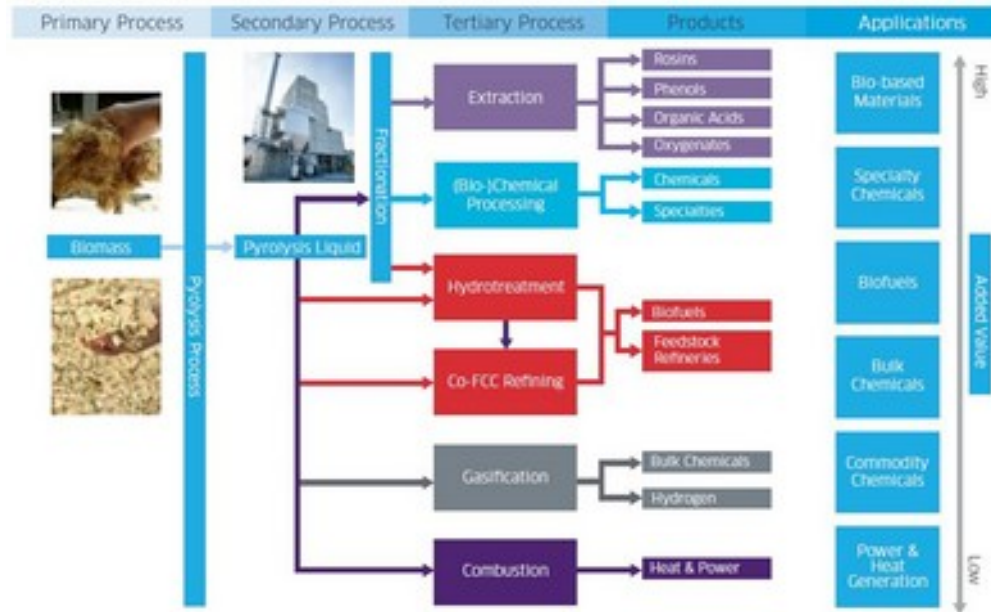
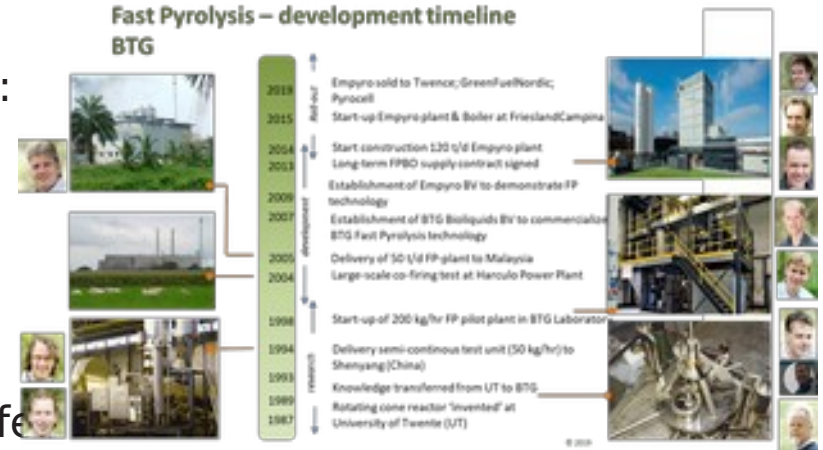


Figure based on BTG Biomass Technology Group B.V. intellectual property

DRIVERS OF OUR SUCCESS

Roll-out of pyrolysis technology through e.g.:

- Team and dedication
- Time and timing
- Be modest - not shy
- Prove what we say and do
- Information sharing and knowledge transfer
- R&D for more viable FPBO applications
- Partnership with TechnipFMC
- Value chain cooperation



KEY CHALLENGES

Some hurdles to overcome :

- Policy and legislation
- Public opinion
- Feedstock diversity



THANK YOU

***BTG Bioliquids
technology for a sustainable future***