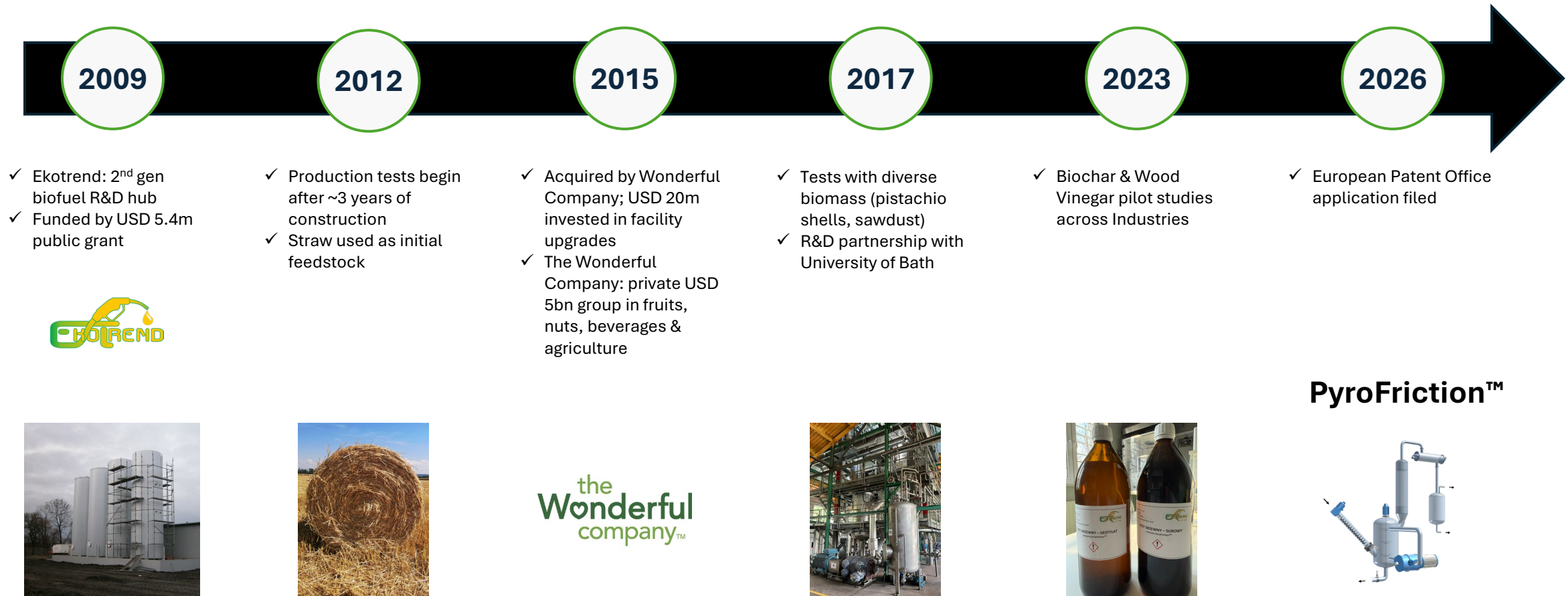




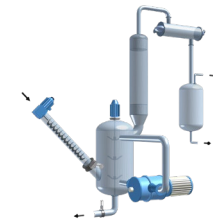
Low-Temperature Catalytic Pyrolysis of Biomass for Sustainable Biofuel Production Using PyroFriction™ Technology

August 25, 2026 | tcbiomass+2026 Denver | Marek Klaptoch

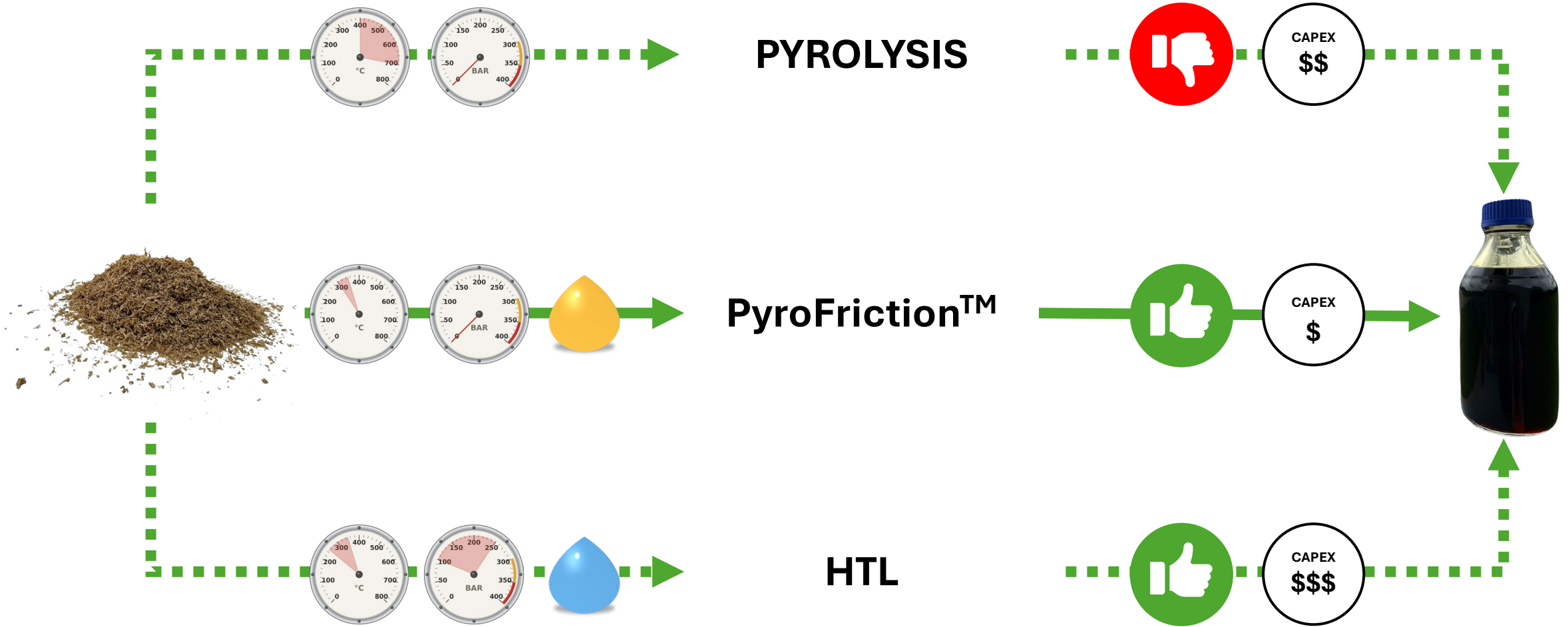
About the Ekotrend Company



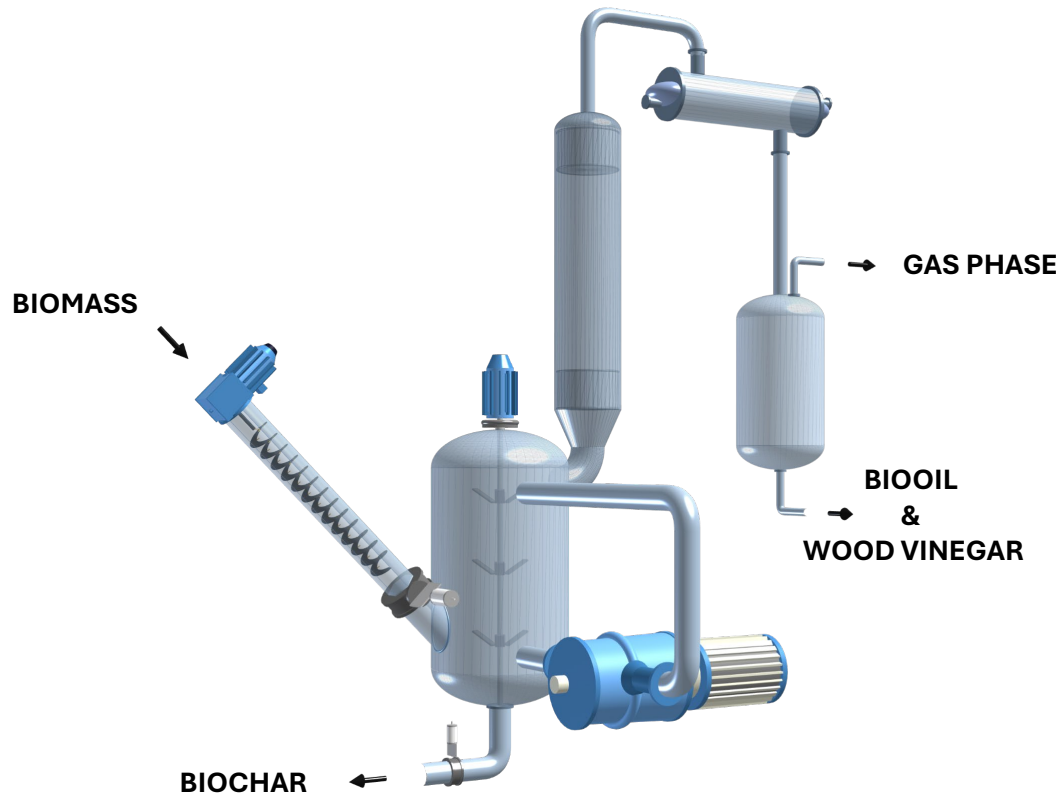
PyroFriction™



PyroFriction™ Technology



PyroFriction™ Technology



Technology at a Glance

- Catalytic depolymerization carried out in the **liquid phase**
- **Atmospheric pressure**
- Process temperature of **300 – 350 °C (572 – 662 °F)**
- Improvement of the physicochemical properties of bio-oil and reduction of process temperature using **catalysts**, e.g. zeolite 4A, CaO, or naturally occurring mineral substances in the biomass.
- The ability to process **any type of biomass** — preferred **moisture content <20%** and **particle size <3 mm**
- **Continuous process**



Sawdust
(hardwood & softwood)



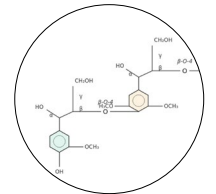
Straw
(wheat & rapeseed)



Wood waste
(pistachio & pomegranate)

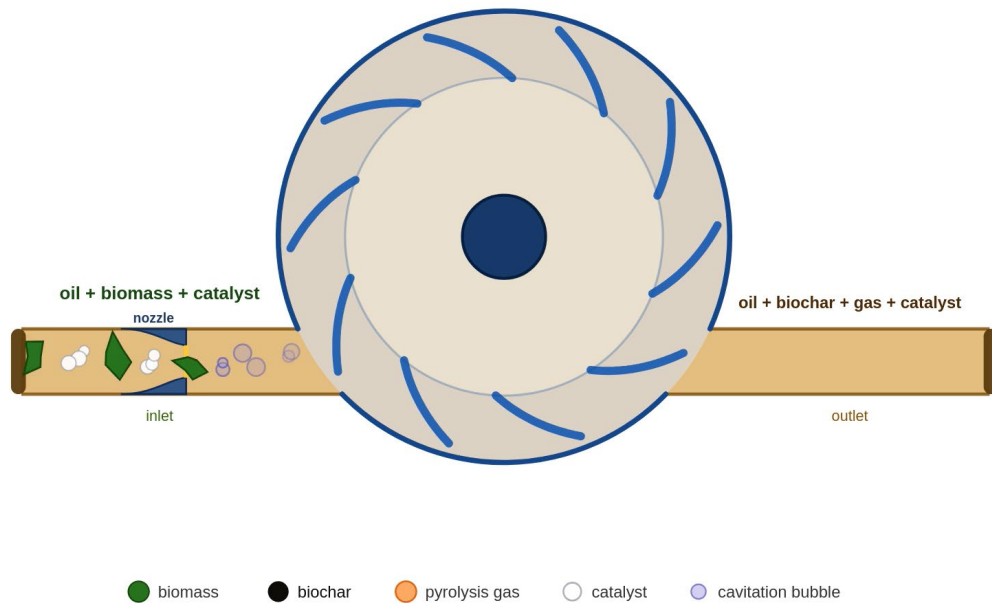


Nut shells
(pistachio)



Lignin

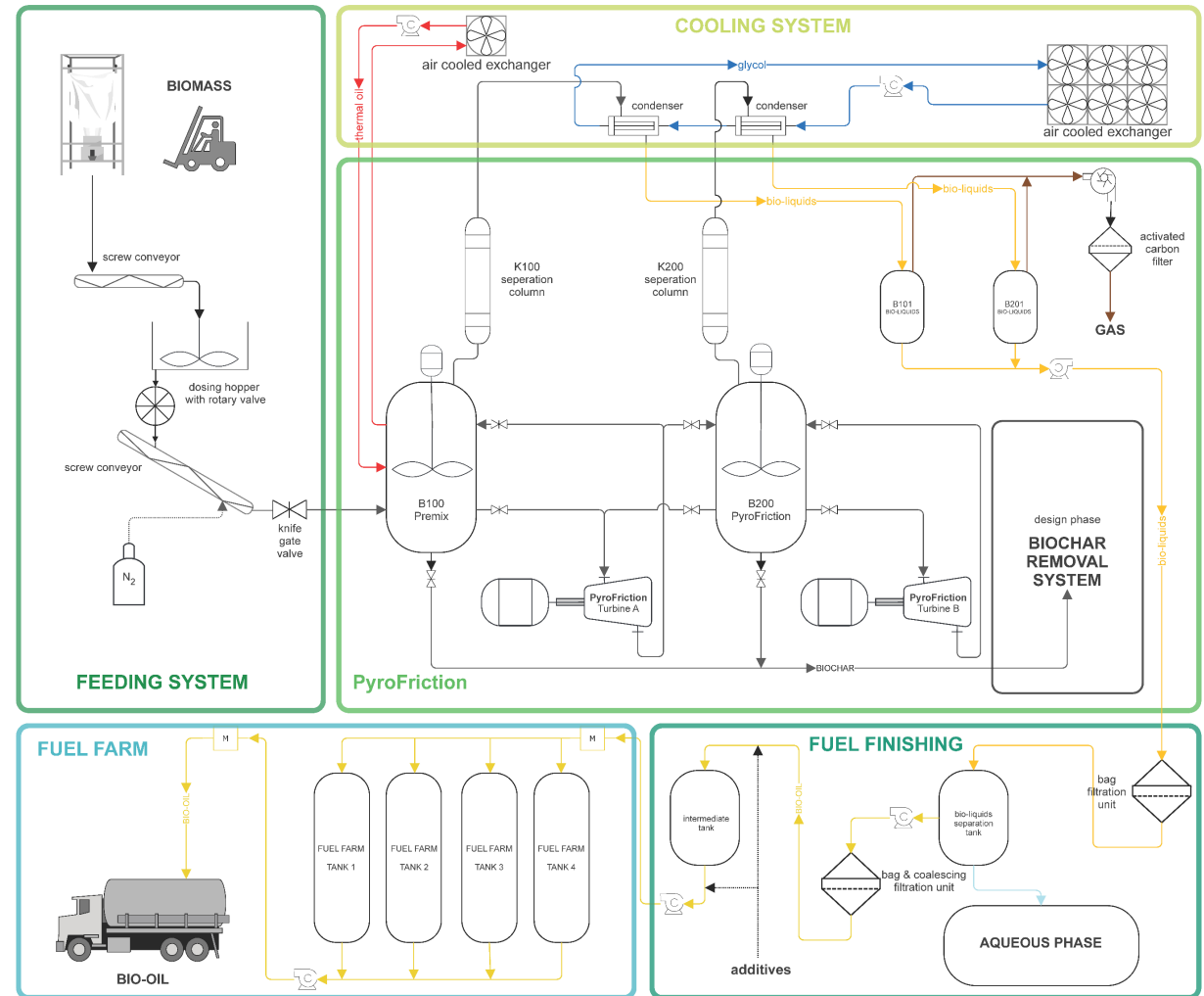
PyroFriction™ Technology



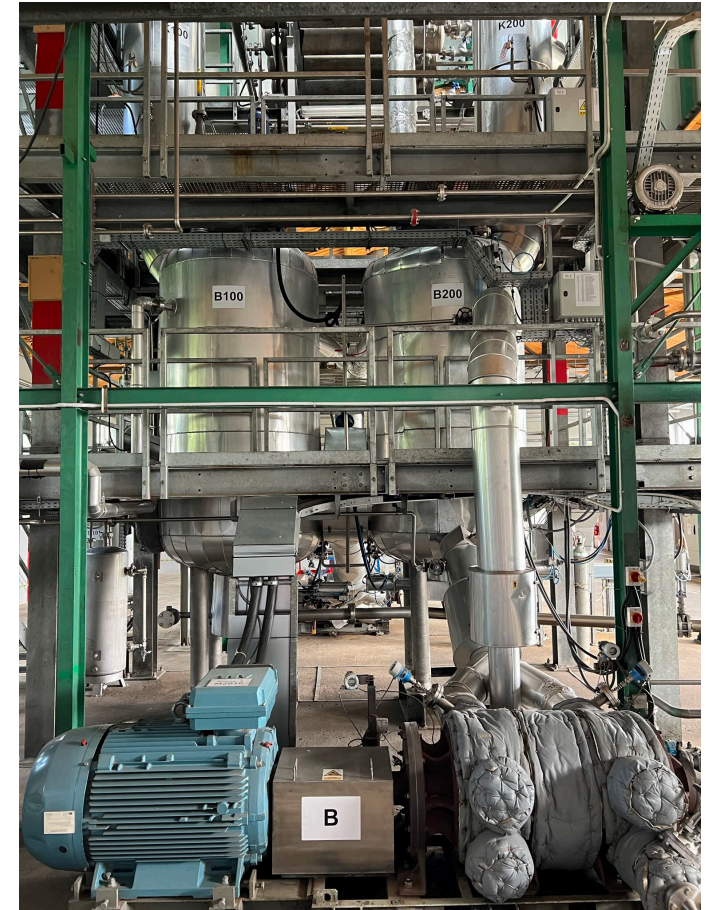
The Turbine: Powering the Entire System

- Direct mechanical-to-heat conversion in the carrier oil — no heat exchangers, no conduction/convection losses
- Rotor-biomass friction breaks cellulose & lignin structures, increasing surface area and accelerating pyrolysis kinetics
- Avg. oil temp 350°C, but local rotor surface reaches 500–600°C; cavitation collapse points ~5,000°C — actual energy delivery far exceeds thermocouple readings
- Circulating catalyst in carrier oil steers reaction selectivity, boosting desired bio-oil fractions and improving quality

PyroFriction™ Ekotrend Plant



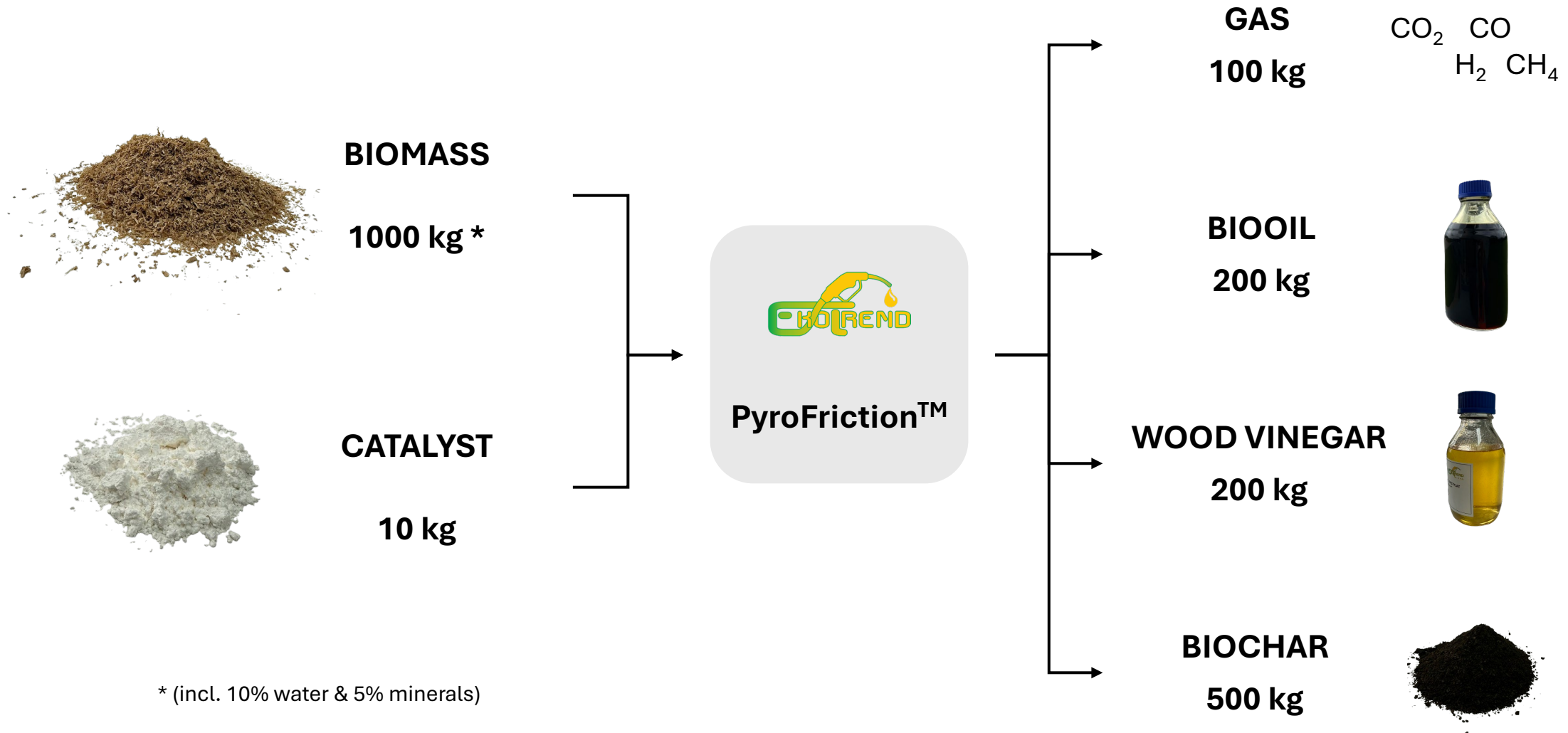
PyroFriction™ Ekotrend Plant



PyroFriction™ Ekotrend Plant

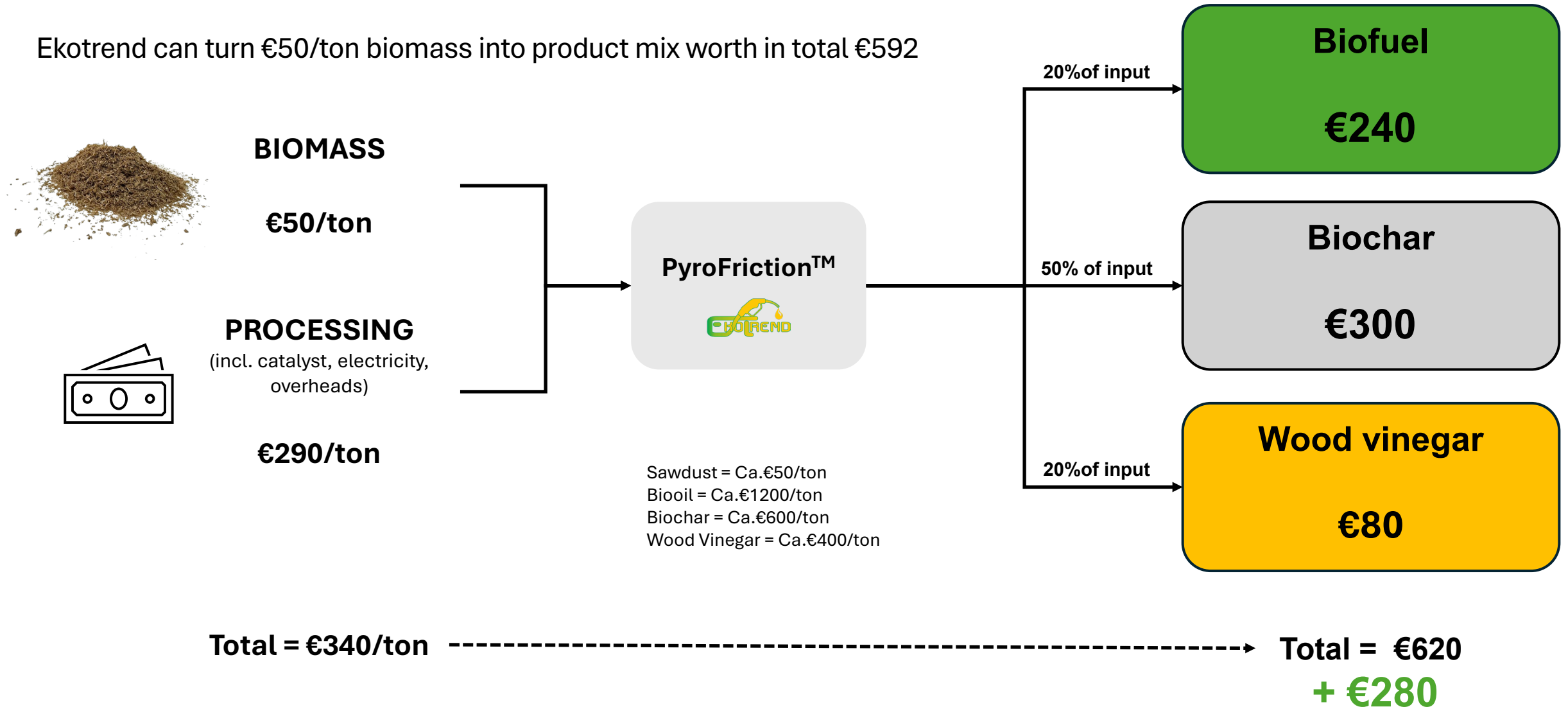


PyroFriction™ Mass Balance

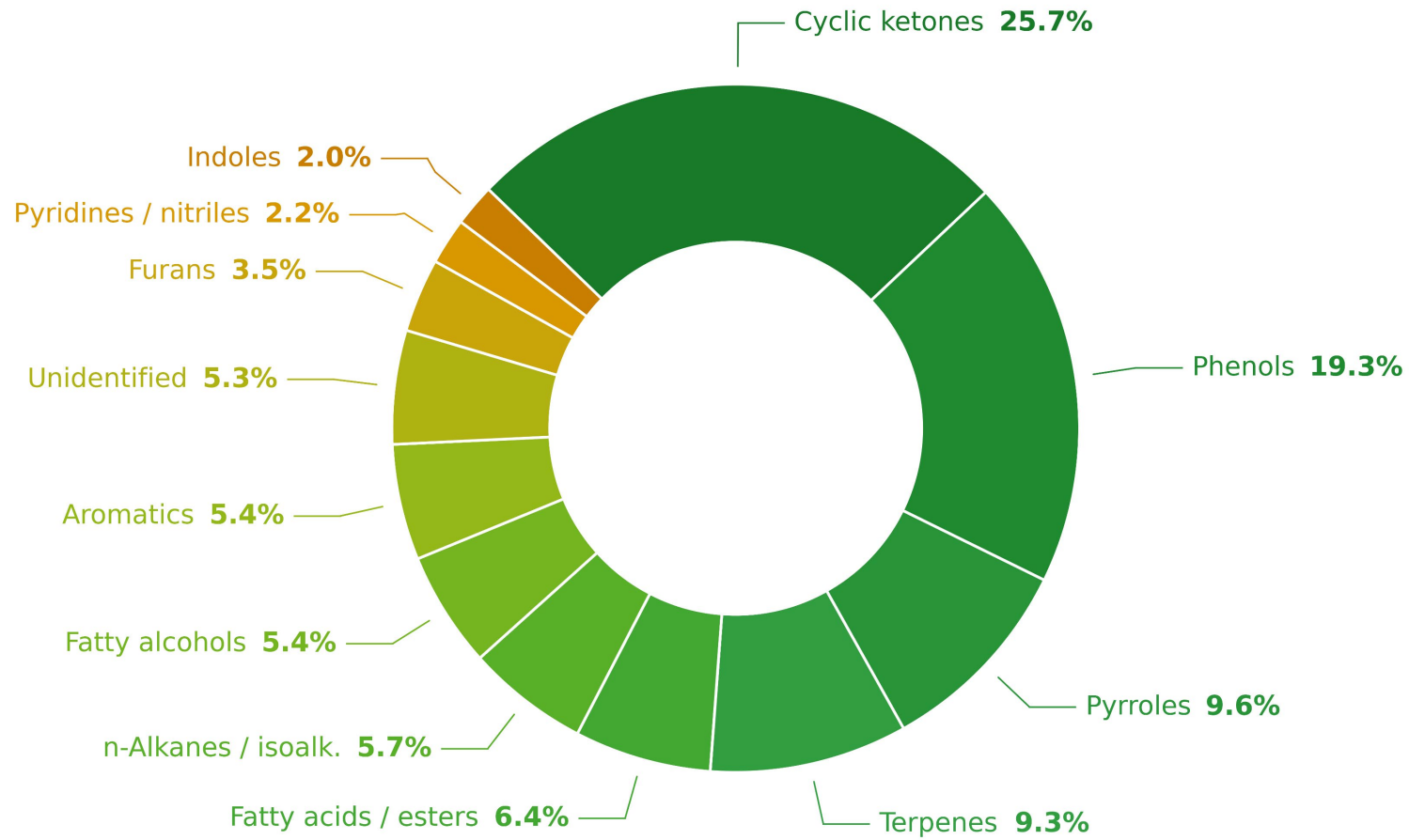


Ekotrend Business Case For Sawdust

Ekotrend can turn €50/ton biomass into product mix worth in total €592



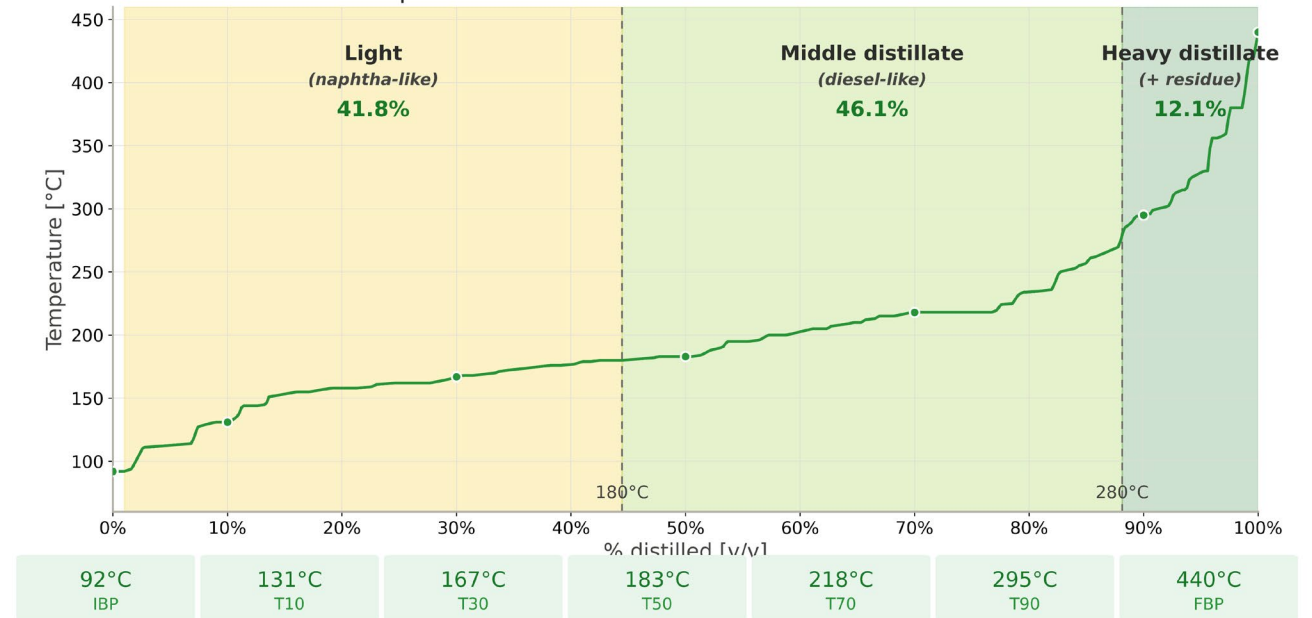
Bio-oil Properties



Feedstock: hardwood & softwood sawdust

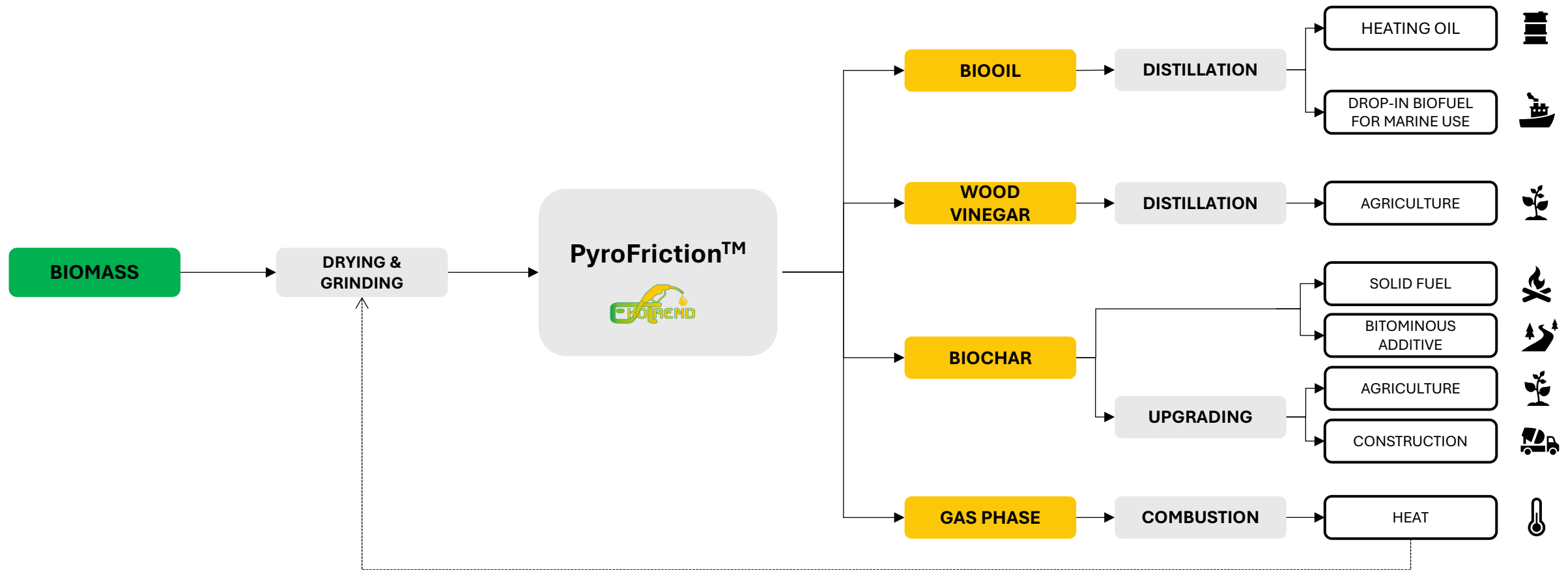
Bio-oil Properties

Parameter	Value	Unit
Density (15°C)	0.950	g/cm ³
Kinematic viscosity (40°C)	4.5	mm ² /s (cSt)
Flash point (PMCC)	61	°C
CFPP	−7	°C
Total acid number (TAN)	68.0	mg KOH/g
Carbon (C)	77.9	wt.%
Oxygen (O)	12.7	wt.%
Hydrogen (H)	8.9	wt.%
Nitrogen (N)	0.4	wt.%
Sulphur (S)	0.08	wt.%
Water content	0.10	% v/v
Net calorific value (LHV)	33.8	MJ/kg
Gross calorific value (HHV)	36.2	MJ/kg

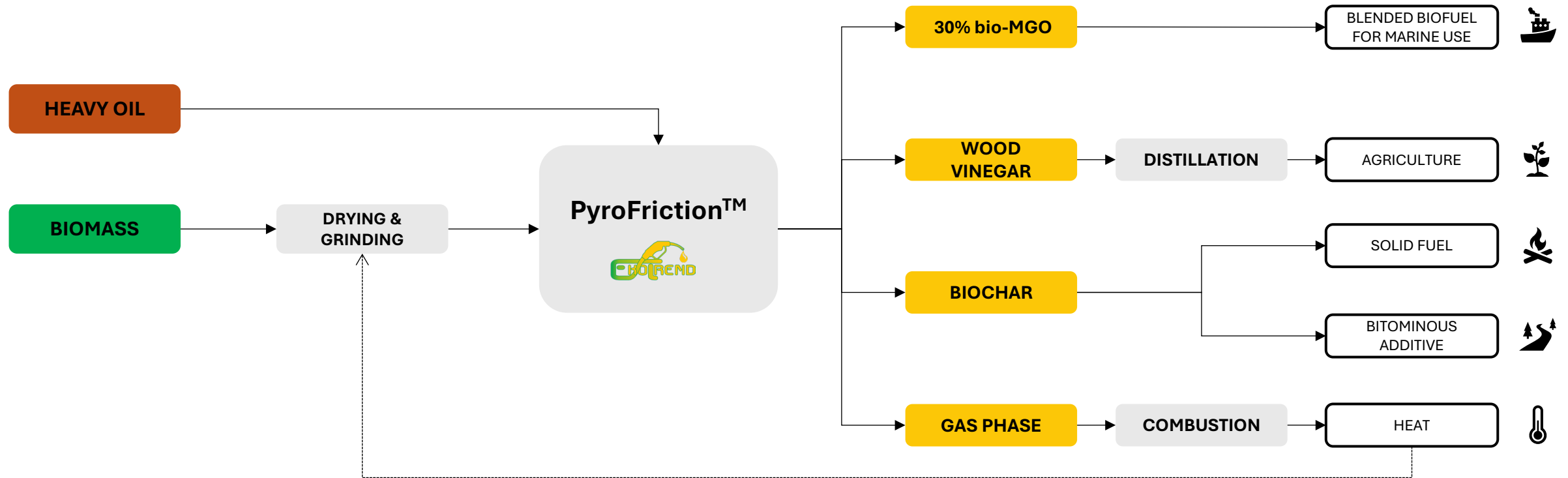


ardwood & softwood sawdust

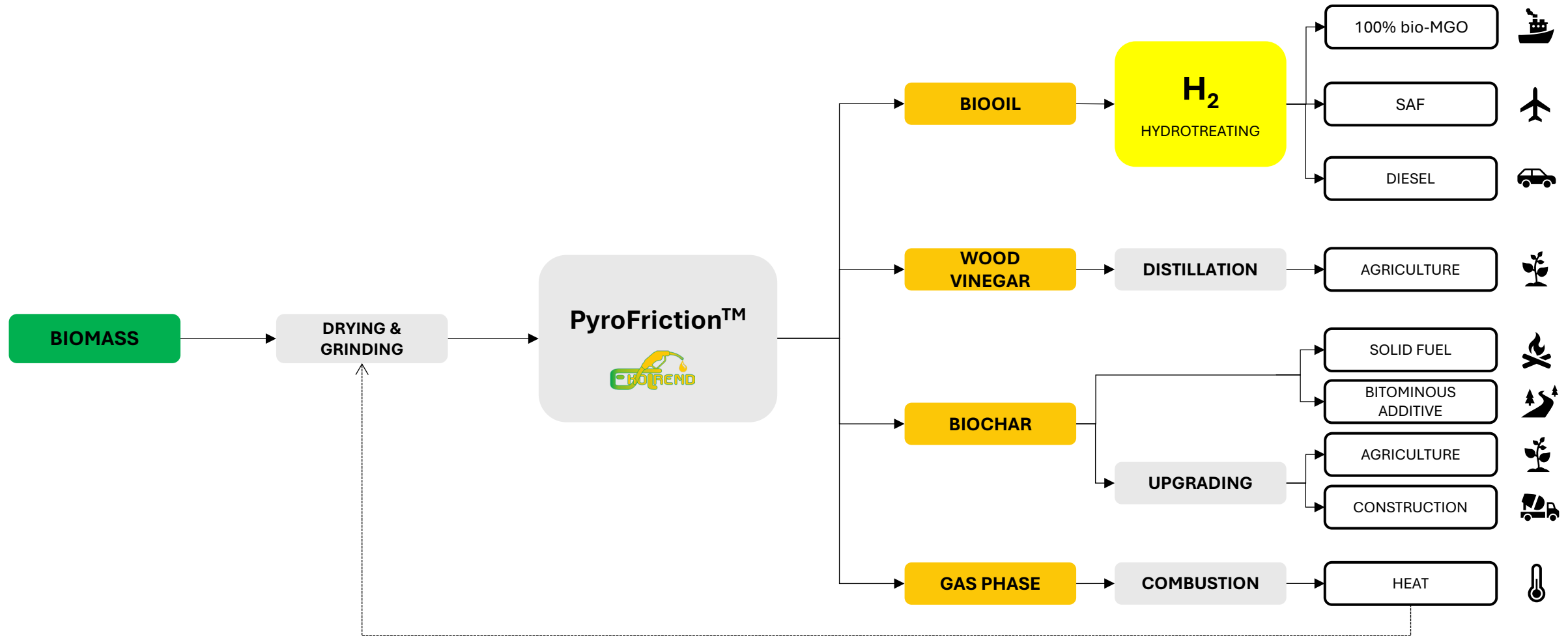
Scenario 1: Drop-in biooil for marine use



Scenario 2: Co-processing in refinery



Scenario 3: PyroFriction™ & Hydrotrating



Summary & Conclusions

- **PyroFriction™** – an innovative biomass conversion process **developed by Ekotrend**
- **Low temp (300–350°C), atmospheric pressure** — simpler, safer, lower CAPEX & maintenance
- **Direct friction heating** in carrier oil — no thermal losses through reactor walls
- **In-situ catalysis** improves bio-oil quality & reaction selectivity
- **Feedstock flexibility** — handles any biomass type, unlike classical pyrolysis
- **Modular scale-up** — add reactor modules, no plant redesign needed
- **Bio-oil far better than conventional pyrolysis oil** — can be blended with diesel or marine fuels, used directly as heating oil, or as a SAF feedstock.
- **Valuable co-products: biochar & wood vinegar** (agriculture, construction, chemicals)



Contact details



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Touch, See, Experience Production!

- ✓ Join us in an Open Day Demonstration of PyroFriction™ Technology
- ✓ Explore the Ekotrend plant and learn about our concept

September 30, 2026

Ekotrend Sp. z o.o.

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POLAND

