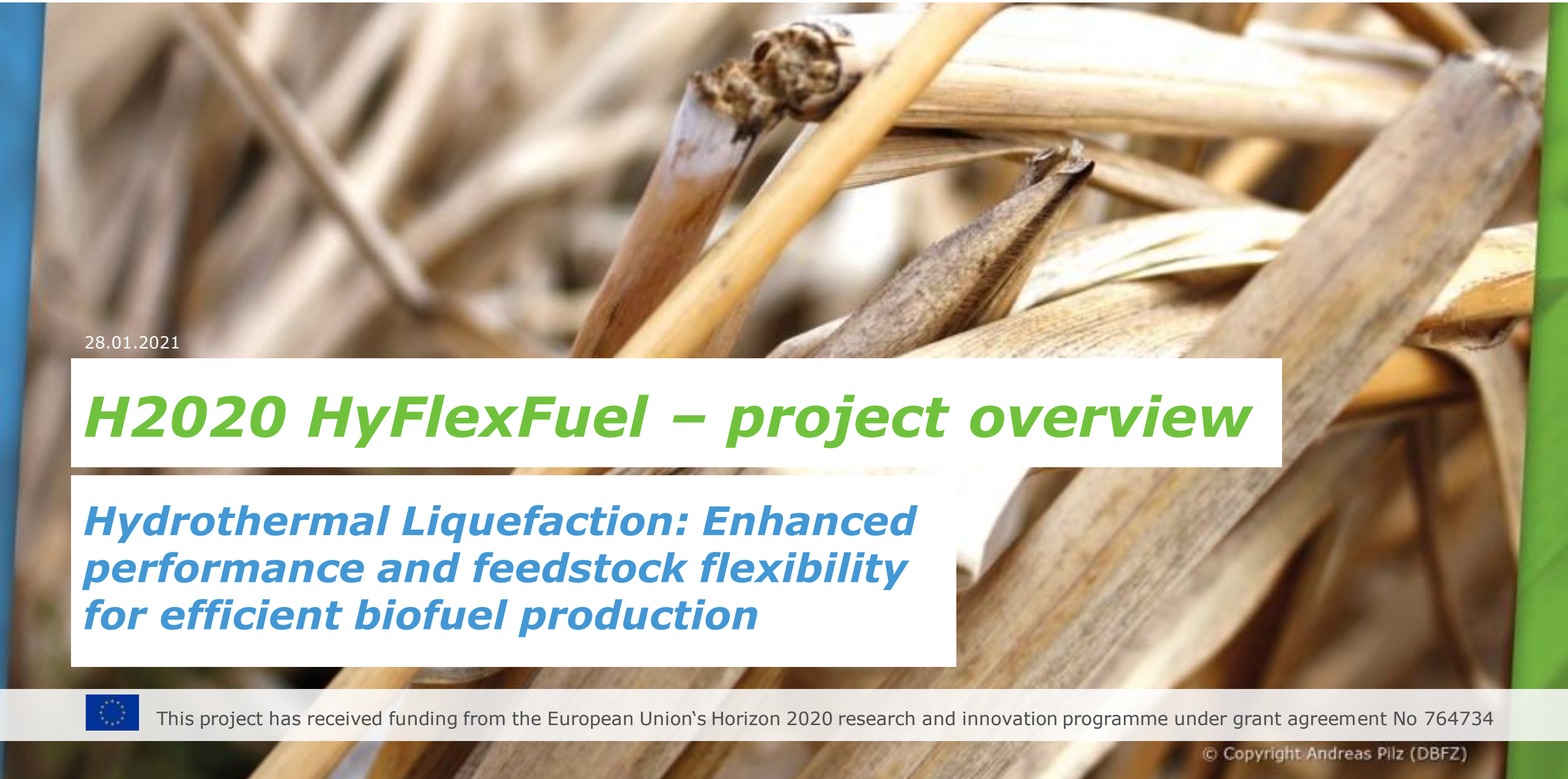

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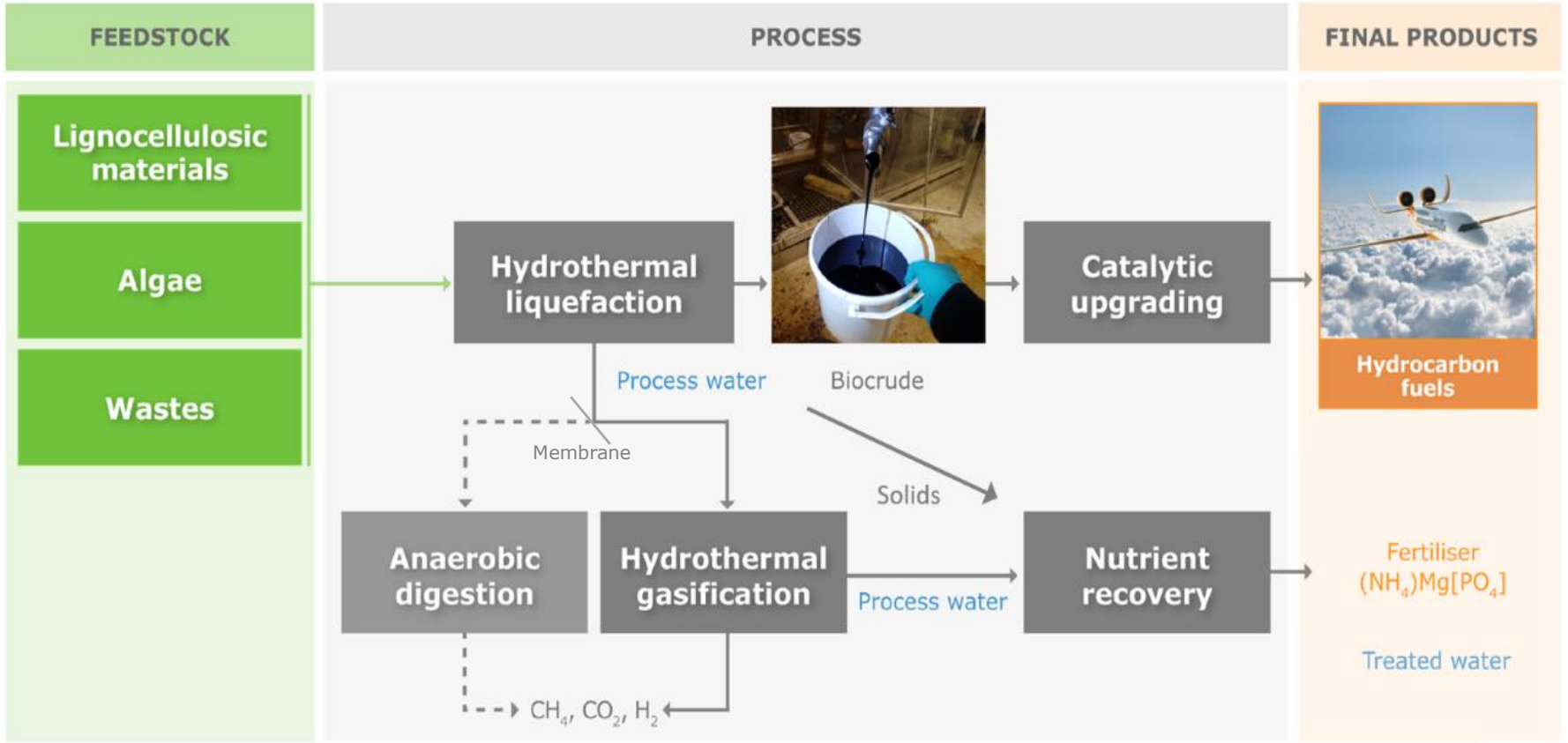
H2020 HyFlexFuel – project overview

Hydrothermal Liquefaction: Enhanced performance and feedstock flexibility for efficient biofuel production

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 764734

H2020 HyFlexFuel (2017-2021): Project overview



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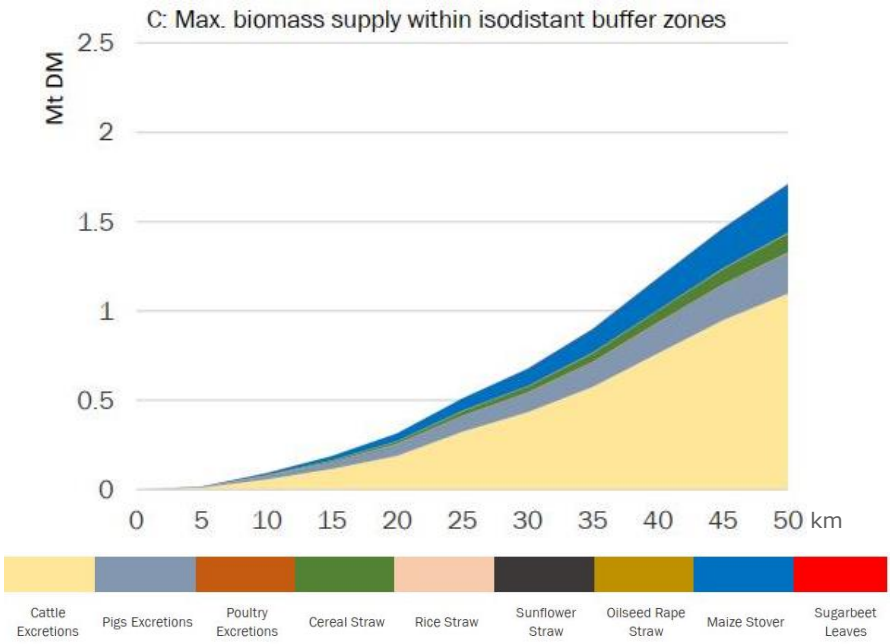
H2020 HyFlexFuel: Main objectives

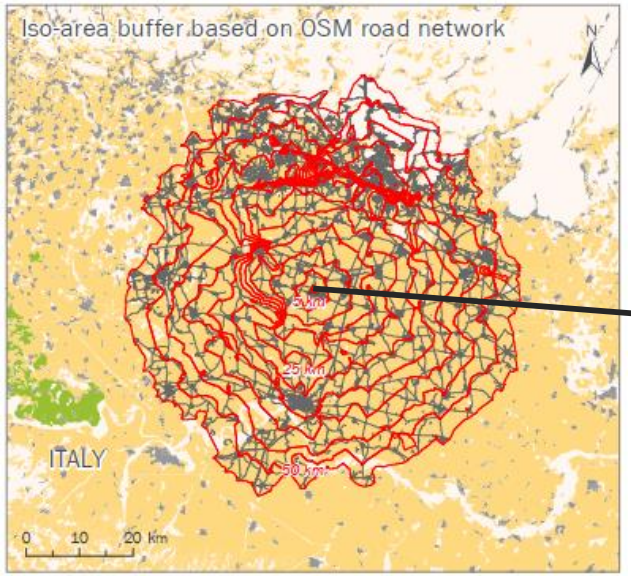
Develop process chain to sustainable liquid fuels via hydrothermal liquefaction of various biomass feedstock at TRL 5

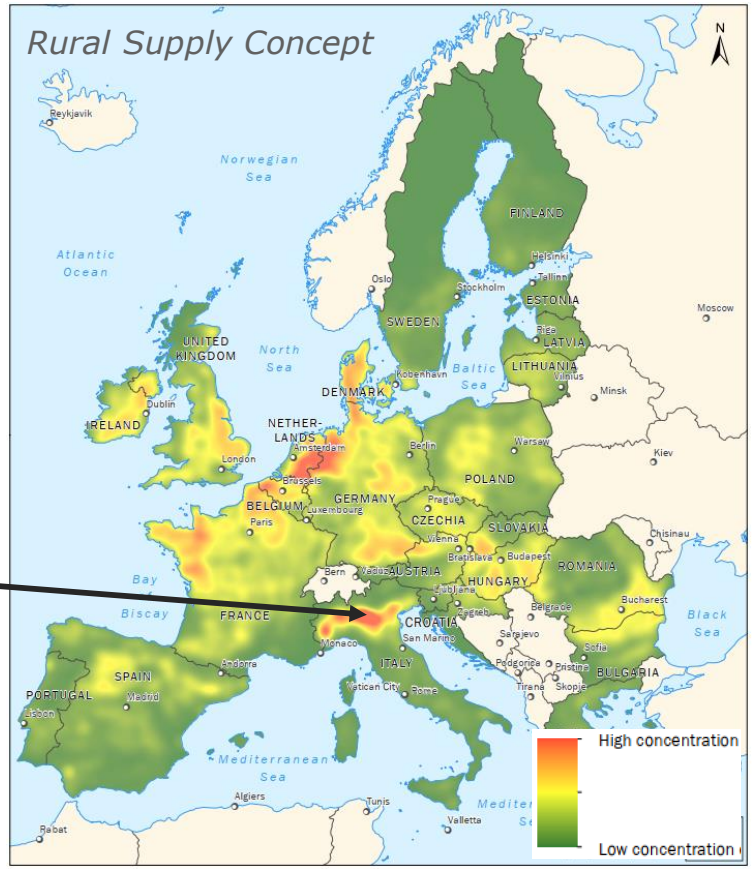
- ***Feedstock potential assessment***
- ***Hydrothermal liquefaction***
- ***Catalytic upgrading***
- ***Co-refining of biocrudes***
- ***Energetic valorization of HTL aqueous phase***
  - **Catalytic hydrothermal gasification/anaerobic digestion**
- ***Recovery of inorganic nutrients***
- ***System analyses***

HTL feedstock potentials, wastes and residues in EU

- ***Identification of HTL preference regions with high biomass concentrations for urban and rural supply concepts***
- ***Generation of biomass supply curves with 50 km road-distances for most promising plant locations***

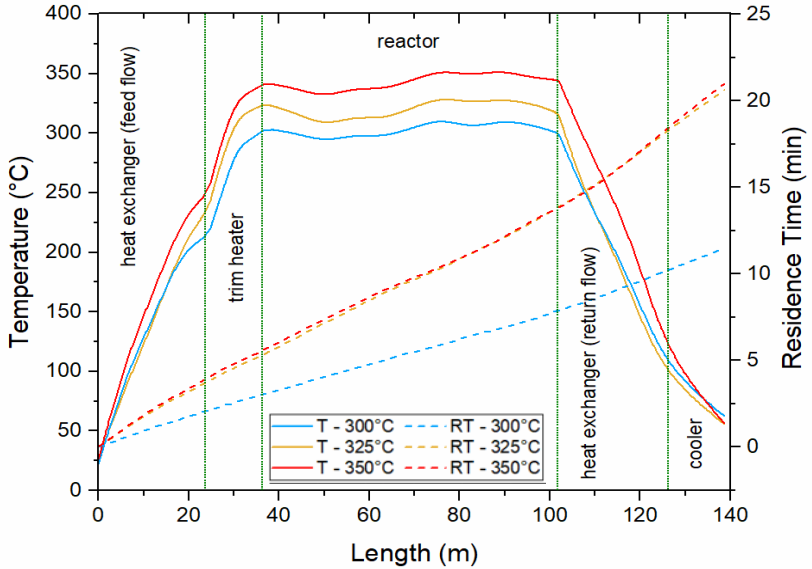






Pilot-scale HTL campaigns

- ***Typical conditions: 160-220 bar, 300-350ºC, 10-20 min, 60 L/h***
- ***Tubular system: 140 m, 14.7 mm diameter***
- ***Counter current heat exchanger***
  - **Heat recovery 75-85% (EROI* 3-7)**
- ***In-line filtration to separate solids***
- ***Feedstocks: Miscanthus, Spirulina, sewage sludge,*** *manure, wheat straw, corn stover, pine, digestate fibres…*
- ***Total biocrude production: > 300 kg***

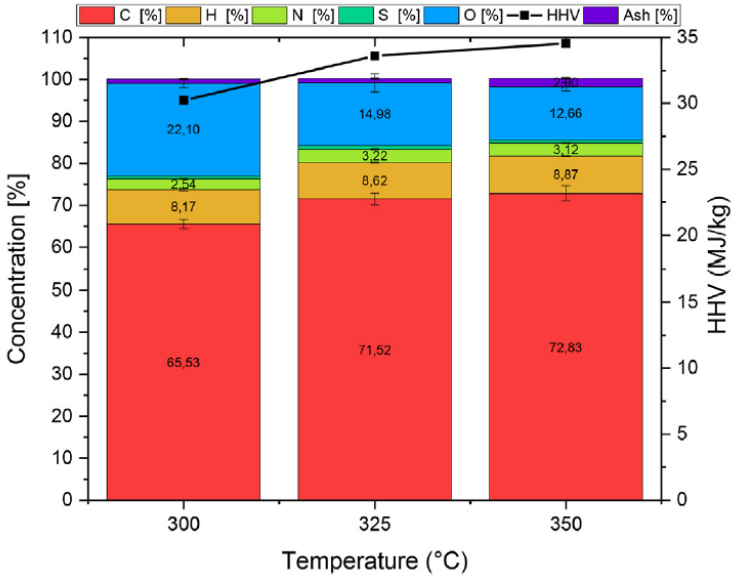


Source: K. Anastasakis et al, Continuous Hydrothermal Liquefaction of Biomass in a Novel Pilot Plant with Heat Recovery and Hydraulic Oscillation, *Energies* **2018**, *11*(10), 2695

***EROI reactor**: heating value of the bio-crude/ energy input in the system (heating, pumps).

Pilot-scale HTL campaigns

- ***HTL of sewage sludge:***
  - **Dry matter content after rotary vacuum drum filter & mixer: 16%**
  - **Campaign: 15 h, 970 kg feed slurry, 39-94 L/h**
  - **325°C: Highest biocrude yield (40.8%) & EROI (3.4)**
  - **Destruction of micropollutants**



- ***HTL of further feedstocks:***
  - **Dry feedstock: Water phase recycling enhances yield**
  - **High DM slurries produced (up to 23% DM content)**
  - **Co-liquefaction can increase yields (batch experiments)**

Source:
Thomsen et al, Hydrothermal liquefaction of sewage sludge; energy considerations and fate of micropollutants during pilot scale processing, Water Reseach 183, 2020, 116101

Valorisation of aqueous phase and solids

- ***Energetic valorization of aqueous phase***
  - **Catalytic hydrothermal gasification (cHTG)**
  - **Anaerobic digestion**

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- ***Nutrient recovery (phosphates)***
  - **Precipitation of struvite from solids, cHTG brine and HTL process water**

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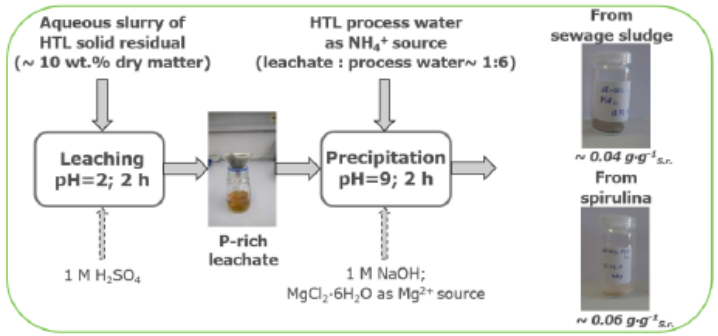
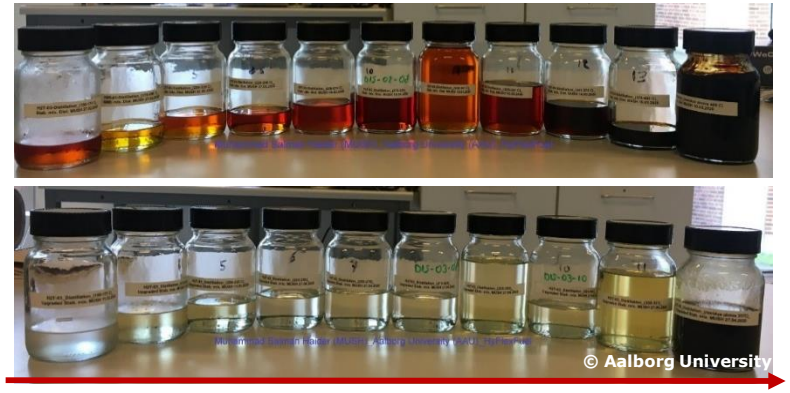


Source: E. Ovsyannikova et al., Feedstock-Dependent Phosphate Recovery in a Pilot-Scale Hydrothermal Liquefaction Bio-Crude Production, *Energies* **2020**, *13*, 379

Biocrude upgrading

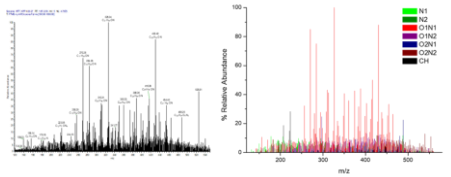
- ***Continuous catalytic hydrotreatment (Spirulina & sewage sludge)***



Boiling point

- ***Co-processing of HTL biocrudes***

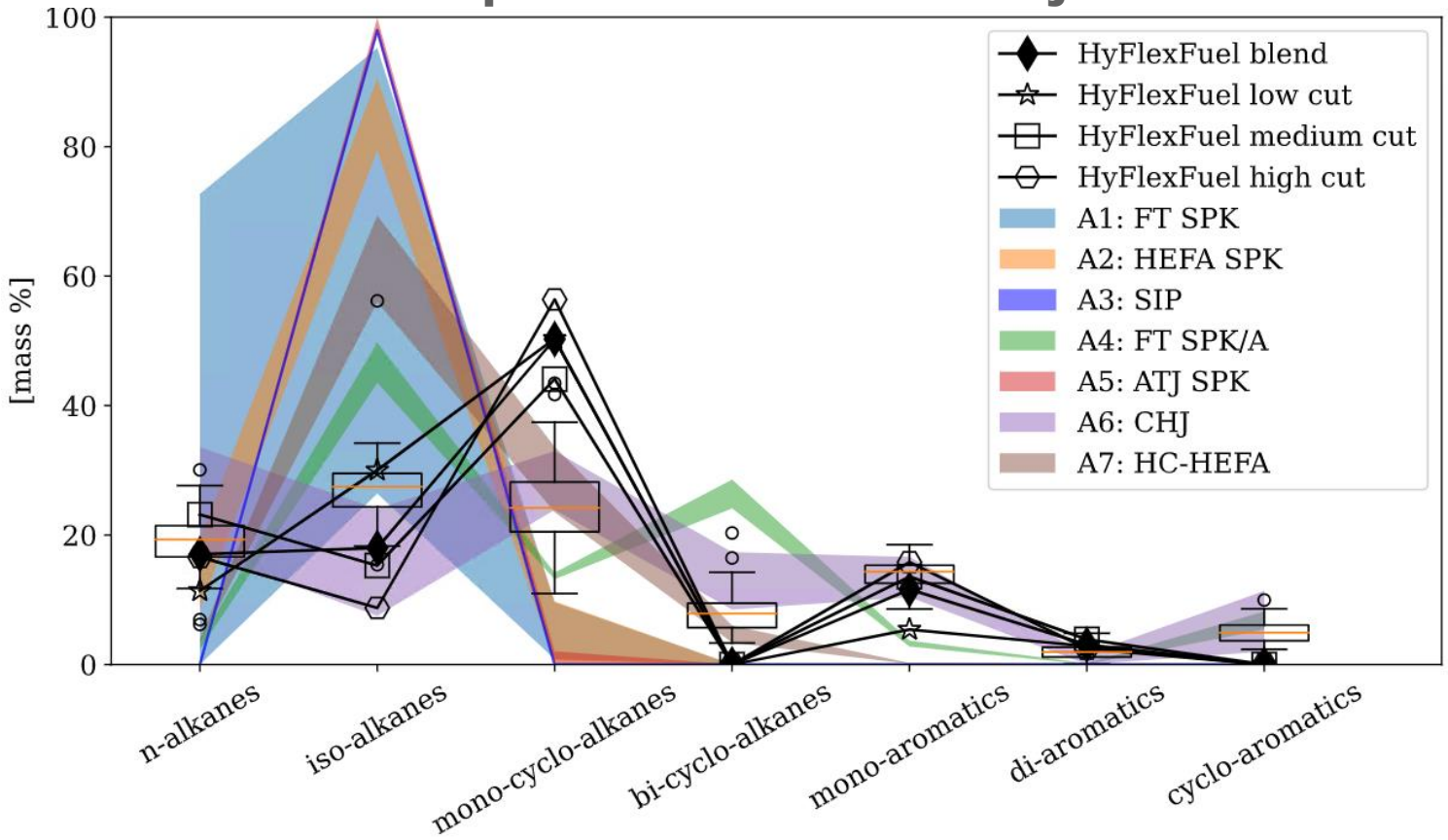
Petroleomic Characterization of Bio-Crudes



Co-Distillation - Refining Tests: Ratio between Biocrude:Fossil Feed determined according to BioCrude quality

Analyses of kerosene samples by H2020 JETSCREEN

- ***Typical composition of upgraded sewage sludge HTL product***
  - **Potentially valuable blend component to adjust the density and cold flow properties of other more paraffinic alternative jet fuel blend components**



HyFlexFuel further information

- **HyFlexFuel information, publications and media material:**

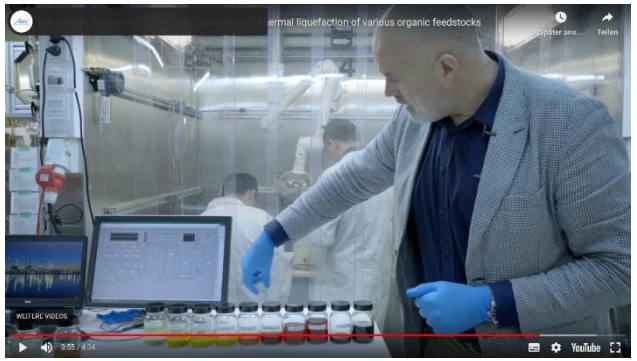
www.hyflexfuel.eu/media-centre

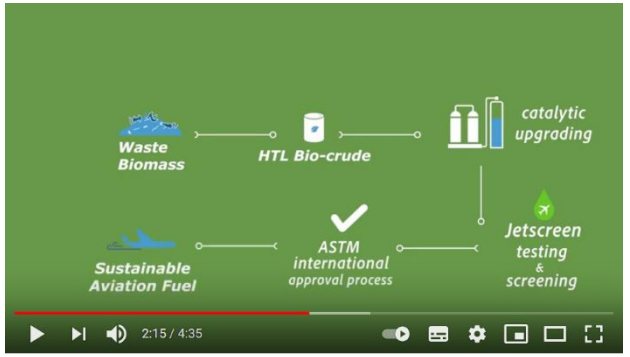
- **HyFlexFuel project video:**

www.youtube.com/watch?v=yDBlxPf06go

- **JETSCREEN project video:**

www.youtube.com/watch?v=VQinw9QCECs





Thank you!

Valentin Batteiger

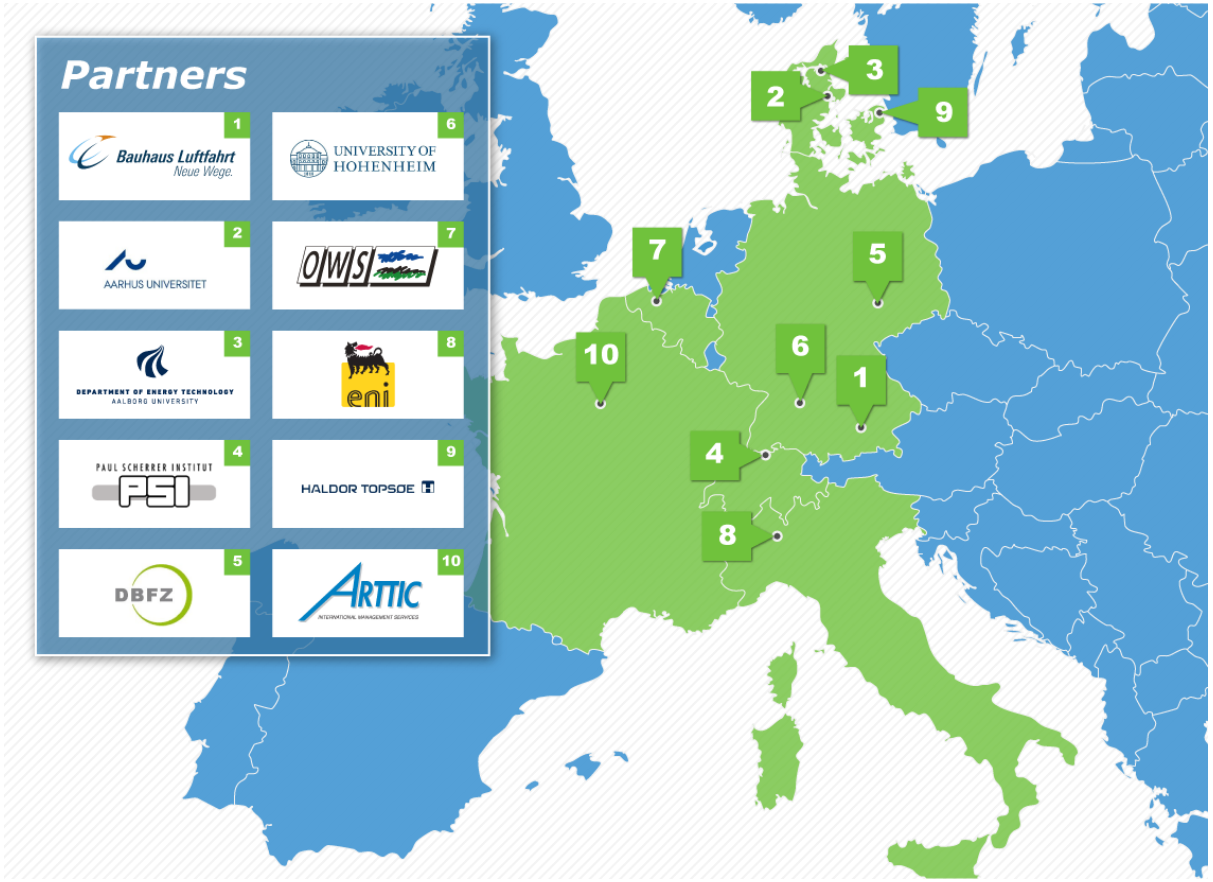
Bauhaus Luftfahrt e. V.

Willy-Messerschmitt-Str. 1

82024 Taufkirchen, GERMANY

+49 (0)89 307 4849-61

Valentin.batteiger@bauhaus-luftfahrt.net



www.hyflexfuel.eu

hyflexfuel-arttic@eurtd.com

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