



**IEA Bioenergy**  
Technology Collaboration Programme



# Country Report Germany

## Task 33 Thermal Gasification of Biomass

### Update

Thomas Kolb, Mark Eberhard

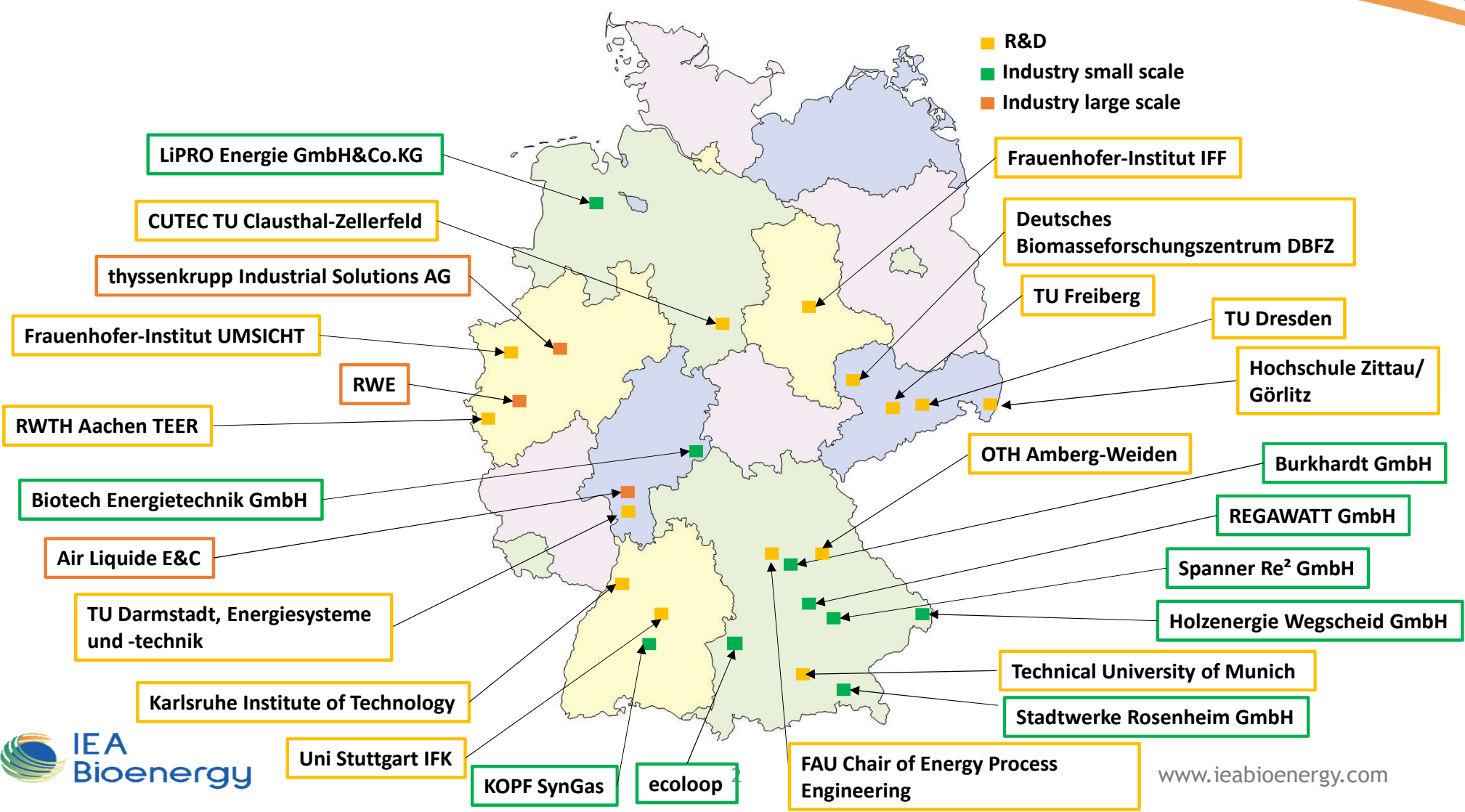
KIT - The Research University in the Helmholtz Association

ENGLER-BUNTE-INSTITUT Fuel Technology, EBI ceb  
Institute for TECHNICAL CHEMISTRY, Gasification Technology, ITC vgt

Hybrid workshop, 01.12.2021

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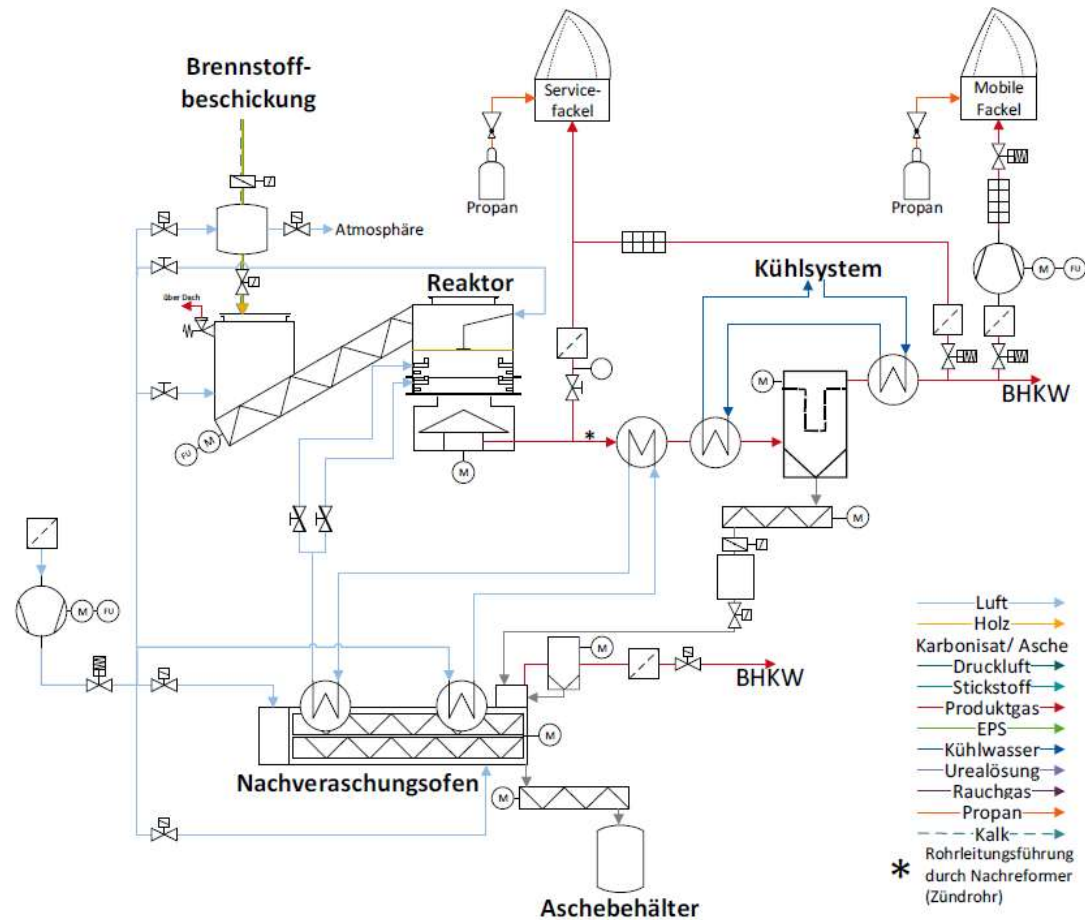
**Technology Collaboration Programme**  
by **iea**



## Industry Activities



Project owner	Ecloop GmbH
Status	operational
Start up	2020
Country	Germany
City	Lauingen
Type	TRL 7 Demonstration
Technology	Fixed Bed/Counterflow Power/CHP
Raw Material	lignocellulosics
Input 1 Name	<b>Wood chips</b>
Input 1 Capacity	28
Input 1 Unit	kg/h
Input 2 Name	<b>EPS (Expanded Polystyrene)</b>
Input 2 Capacity	11,4
Input 2 Unit	kg/h
Output 1 Name	Power
Output 1 Capacity	68
Output 1 Unit	kWel
Output 2 Name	Heat
Output 2 Capacity	123
Output 2 Unit	kWth



## Industry Activities

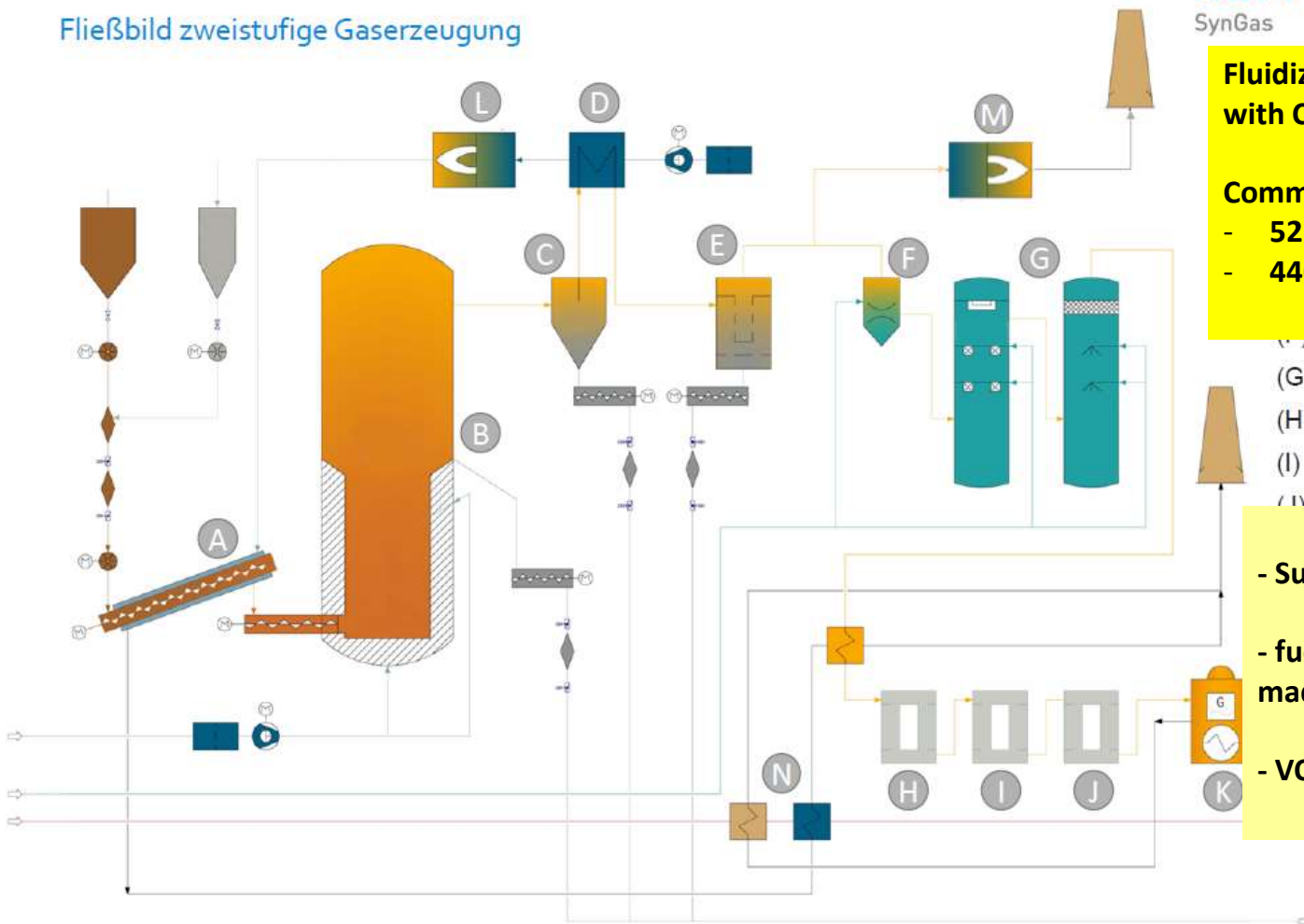
ecoloop



## Industry Activities

### Prozessdetails

Fließbild zweistufige Gaserzeugung



**SÜZLE**  
**KOPF**  
SynGas

**Fluidized Bed Gasifier for Sewage Sludge  
with CHP via Gas Engine**

**Commercial plant for Sewage Sludge in Koblenz**

- 525 kW heat
- 440 kW power

(G) Wäschergruppe  
(H) Hg-Filter  
(I) H<sub>2</sub>S Filter  
(J) Particulatefilter

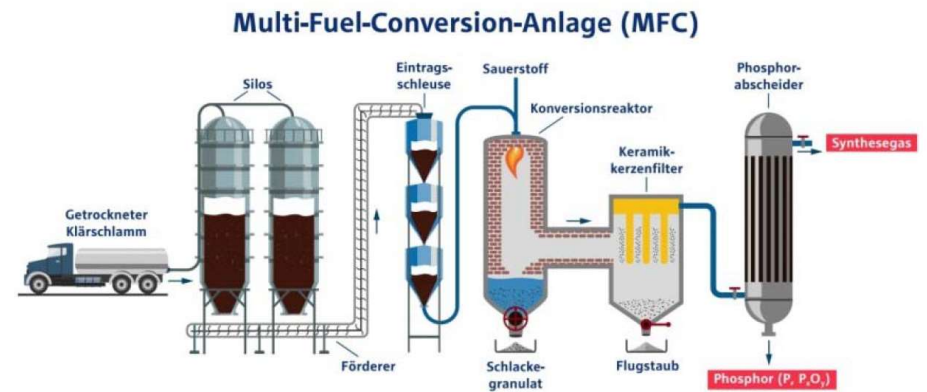
- Successful acceptance run in 2021
- fuel quality adjustments are currently being made to ensure more stable operation
- VOB acceptance is scheduled for in 2 weeks

## Industrie activities

# RWE Phosphorus from Sewage Sludge

MFC (Multi Fuel Conversion) within  
ITZ-CC (Virtuelles Innovations- und  
Technologiezentrum Carbon Conversion)

- Pilot plant in Niederaußem
- Atmospheric entrained flow gasifier
- Three-component fuel mixing, refractory lining, dip quench, liquid ash discharge
- Fuels: Sewage Sludge, Sewage Sludge Ash, Lignite (ca. 130 kg/h, max 800 kW<sub>th</sub>)
- Temperature ~1,500°C
- Objective: Prove recovery of phosphorus from sewage sludge / sewage sludge ash
- Erection in 2020, Funding provided by State of North Rhine Westphalia (Ministry of E
- Total project budget (incl. cost for plant operation): 6.7 Mio. €
- Partners: Fraunhofer UMSICHT, Ruhr Universität Bochum
- Perspective: Waste gasification



**Start-Up July 2021**

**Operating Tests since July**

Source: RWE; <https://versuchsanlage-gewi>

<https://www.rwe.com/presse/rwe-power/2021-07-06-mit-multi-fuel-conversion-anlage-forscht-rwe-an-gewinnung-von-phosphor-aus-klärschlamm>

## Industry Activities

# Blue Energy CHP

Up date 2021

### Blue Energy Europe Holzgas-Heizkraftwerk Senden

Wood gas cogeneration plant to be converted into an advanced bio-energy park

Future Products:

- Heat and Power
- Bio-oil
- Hydrogen

- Plant out of operation due to lack of approval from licensing authority
- Wood oil was initially classified by the authorities as waste and wanted to approve the plant only according to waste law
- **Currently: Submission of new permit application**
- **hope for start up again in the middle of 2022**



Source: BlueEnergy: <https://blue-energy-group.de/bioenergiepark-senden/>

# PLAGAZI<sup>®</sup>

## GREEN HYDROGEN FROM WASTE

- **Pure green hydrogen** production from any type of waste via plasma gasification
- **Fully enclosed process:** CO<sub>2</sub> is captured in a Carbon Capture System (CCS).
- **Energy efficient process:** 70% of the energy need is recycled internally.
- **Production cost:** 25% of electrolysis from water.
- **Unit Dimensions:** 40 000 MTpy waste to 6000 ton/a green hydrogen.
- **Financial Dimensions:**
  - Investment: EUR 70M.
  - Breakeven: 5-6 years.
  - ROI 15-years: EUR 70M / 100%



[https://www.pu-bw.de/wp-content/uploads/2021/06/Plagazi-Short\\_Company-Presentation\\_freigegeben.pdf](https://www.pu-bw.de/wp-content/uploads/2021/06/Plagazi-Short_Company-Presentation_freigegeben.pdf)





# PLAGAZI

GREEN HYDROGEN FROM WASTE

- **Neue Energie Premnitz: Plagazi AB and Richter Recycling GmbH have entered an agreement to conduct a pre-study for constructing a Plagazi waste-to-hydrogen plant in Potsdam. The aim of the project team is to have the plant up and in operation by 2023.**

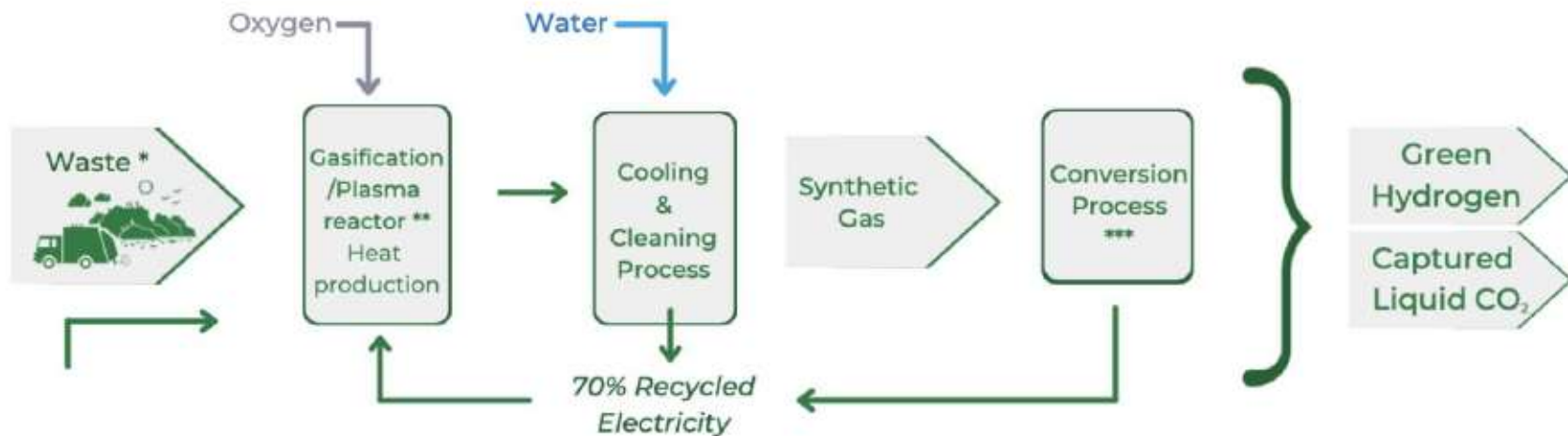
- **Dillinger GmbH have entered an agreement to conduct a pre-study for constructing a Plagazi waste-to-hydrogen plant.**

**The pre-study will highlight the feasibility to include a Plagazi plant at their steel mill facility in Dillingen, Saar.**

- **CH: Feasibility study for Automotive Shredder Residue (ASR) Recycling in Switzerland**

**[www.plagazi.com](http://www.plagazi.com)**

# THE PLAGAZI PROCESS



- \* Any type of waste: Auto Shredder Residue, Car Tires, Plastic, Household-, Industrial-, Hazardous- or Medical Waste.
- \*\* Exposed to Temperatures > 3000°C in a Plasma Reactor, where the waste is broken down to atomic level.
- \*\*\* The Product is then rebuilt to form *Green Hydrogen and CO<sub>2</sub>*, which the latter is captured directly.

Research:

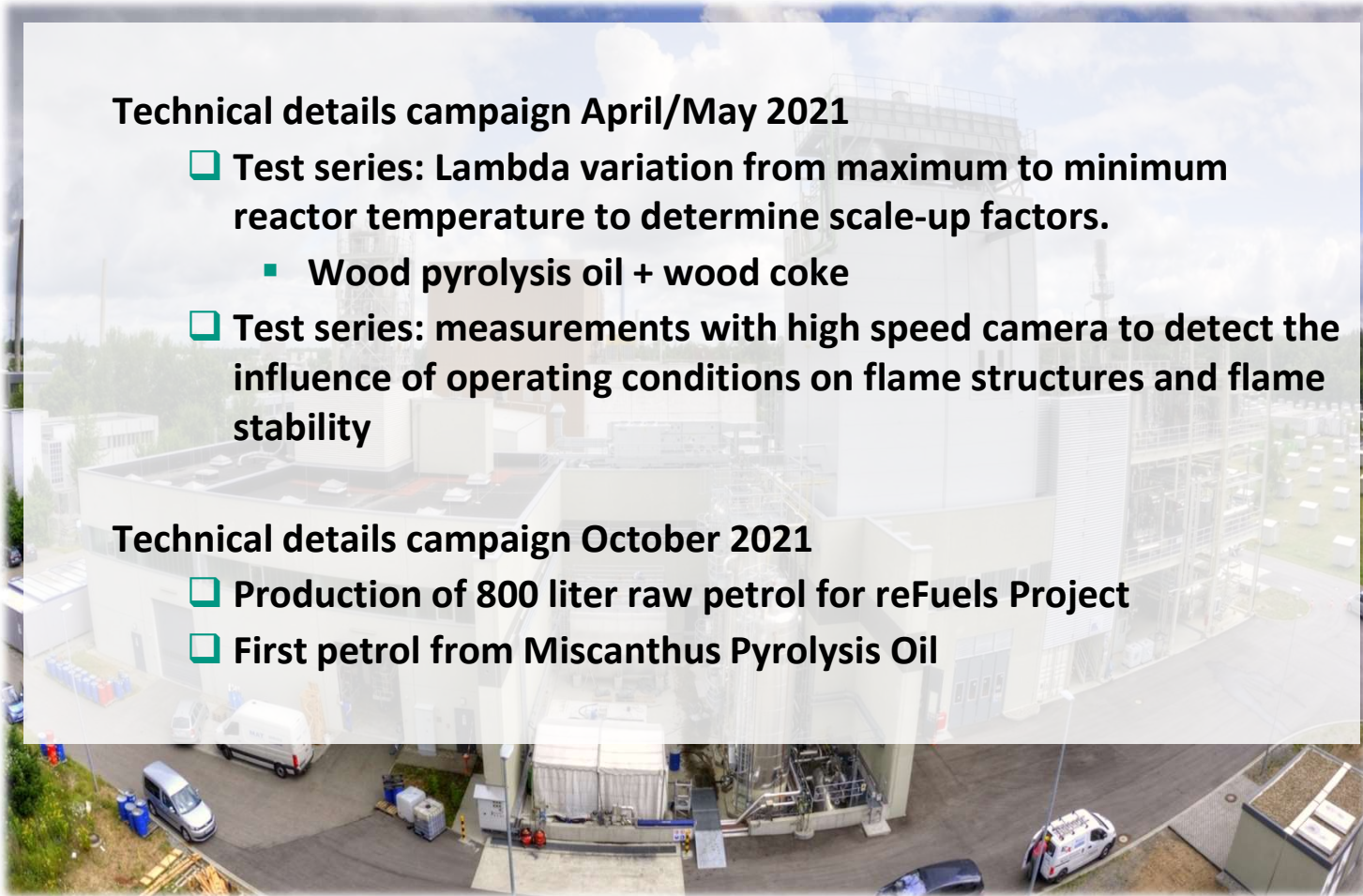
## Bioliq<sup>®</sup>-Projekt

### Technical details campaign April/May 2021

- ❑ Test series: Lambda variation from maximum to minimum reactor temperature to determine scale-up factors.
  - Wood pyrolysis oil + wood coke
- ❑ Test series: measurements with high speed camera to detect the influence of operating conditions on flame structures and flame stability

### Technical details campaign October 2021

- ❑ Production of 800 liter raw petrol for reFuels Project
- ❑ First petrol from Miscanthus Pyrolysis Oil



Mark Eberhard



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