Science4Fuels

OWI

an der RWTH Aachen

High Temperature Technology

Successful R&I in Europe 2025: 12th European Networking Event

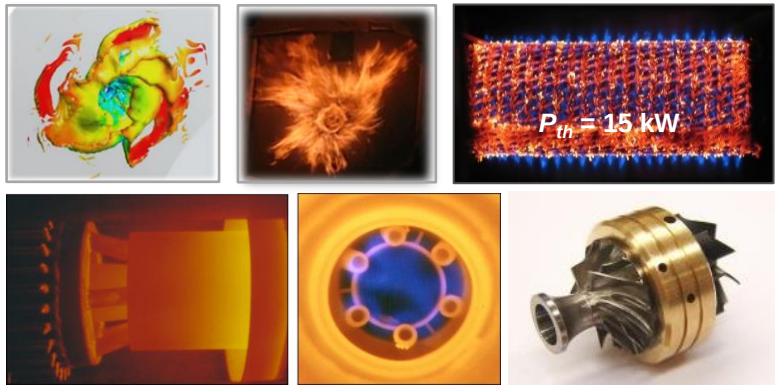
Siri Harboe-Minwegen, Düsseldorf

6.3.2025

High Temperature Technologies

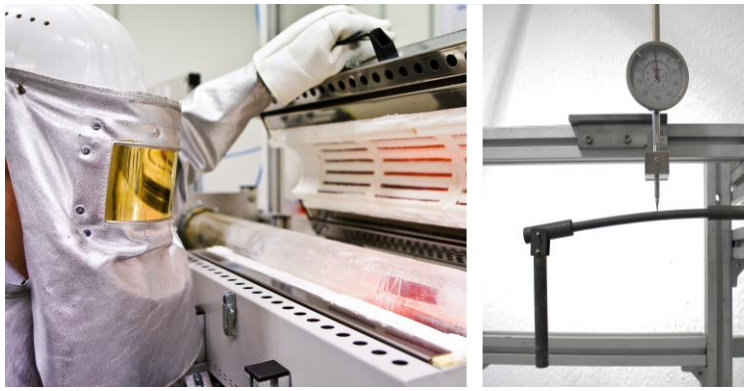
Bridge from theory to practice: fundamental & industrial research and development

Combustion research



- H_2, NH_3, NG and blends
- Reactive flow simulation
- Thermo-acoustic flame stability
- Laminar flame velocity measurements: Heat flux method
- Soot formation studies

High-temperature materials research



- Life-time predictions
- Furnaces, burners, turbines
- Creep tests
- Exposure tests in various gas and combustion environments
- Mechanical modelling

Thermal processing systems optimization

- Efficiency optimization
- Industrial thermal plants, reformers, fuel cells
- High-temperature, high-speed flows
- Process control, digital twin
- LCA

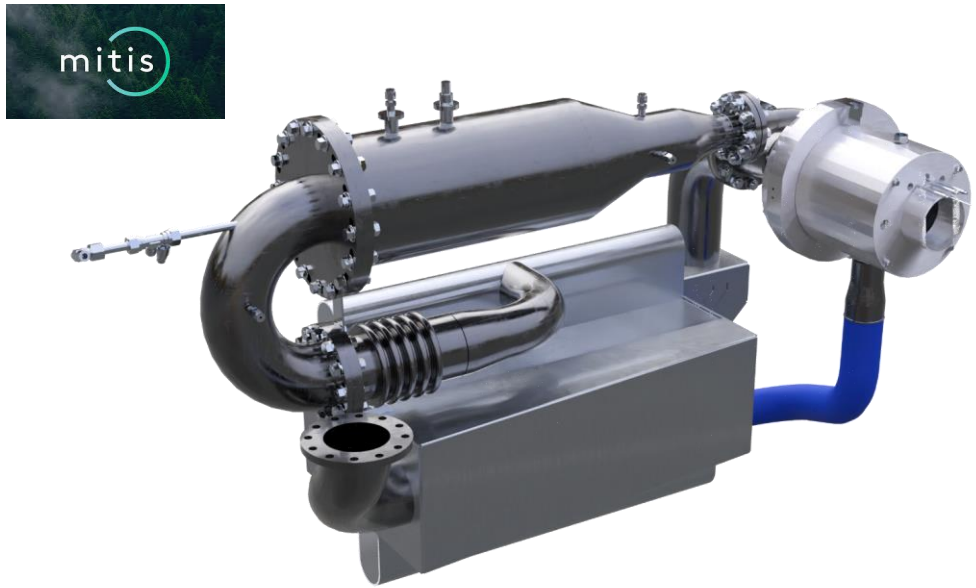
Fit4Micro

MICROCHCP HYBRID HEATING AND COOLING SYSTEM RUNNING ON SUSTAINABLE LIQUID BIOFUELS

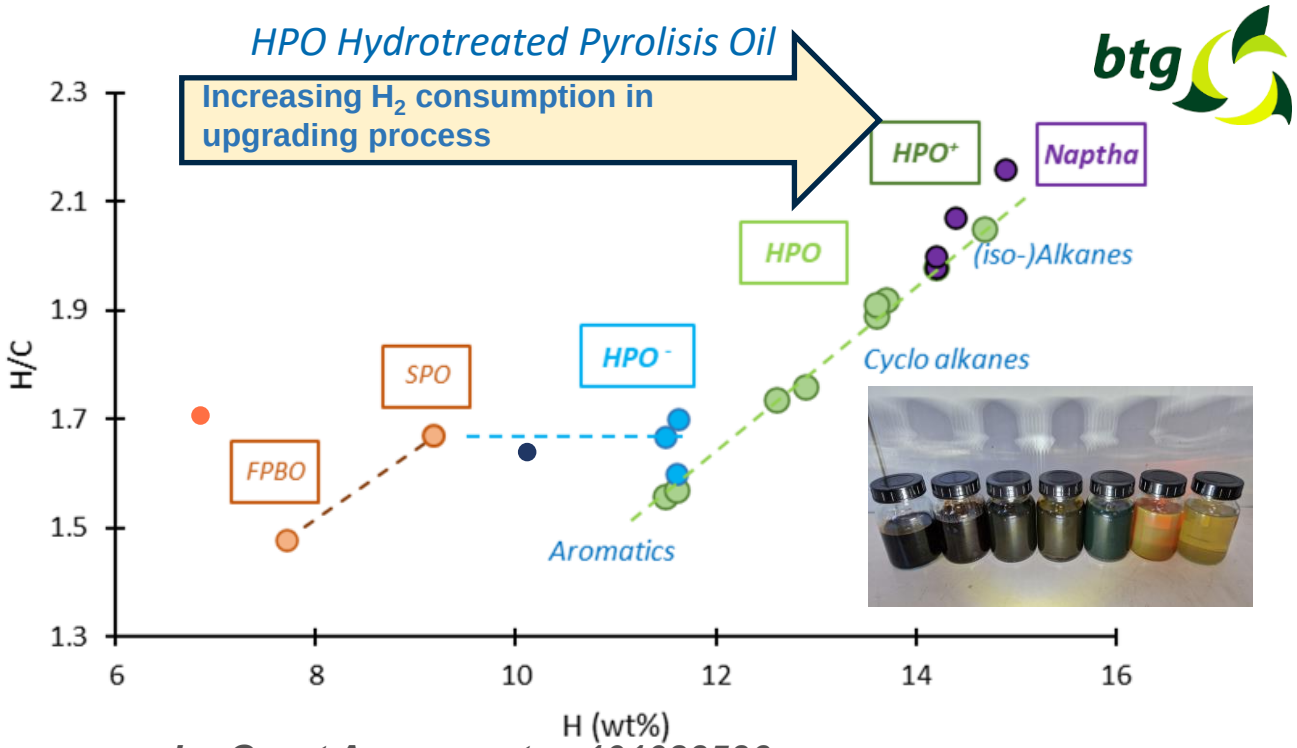
Science4Fuels OWI an der RWTH Aachen

- Aims to develop a flexible hybrid energy system, able to provide renewable heating, cooling and power for demand-driven domestic (multifamily) usage, 20kWel
- A system operating on renewable biofuels produced from residue and waste streams

10kWel Mitis Microgasturbine



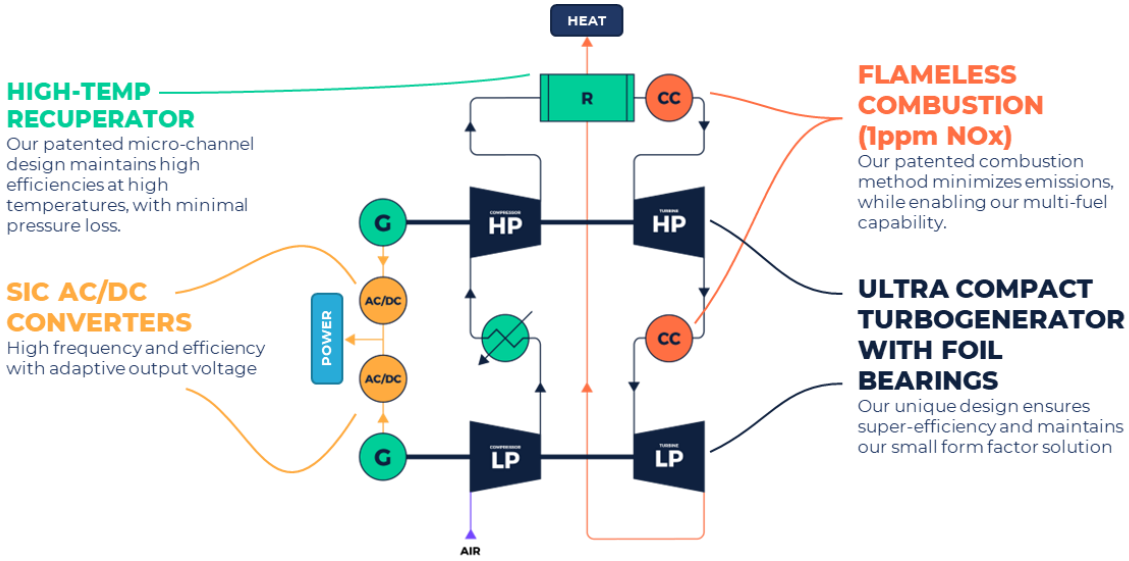
HPO Hydrotreated Pyrolisis Oil



Fit4Micro: funding by European Union's Horizon Europe programme, under Grant Agreement n. 101083536

Fit4Micro, technology and specific objectives

- Achieving at least 40% electrical efficiency.
- Flameless combustion of liquid biofuels
- Pollutant emissions to be 50% of the actual norms or lower, with NOx < 60 mg/kWh fuel
- Achieving economically competitive operation for the microCHCP system.
- Investment costs for the microCHCP < 2500/500 €/KWe for a 20 KWe system, achieving pay-back times < 10 years. (*)



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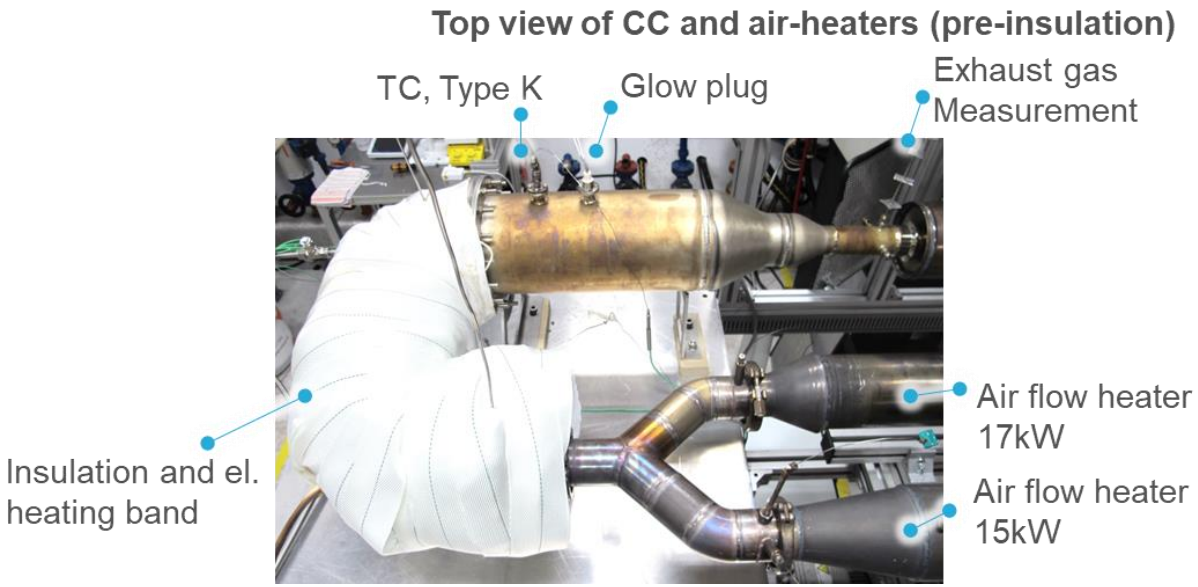
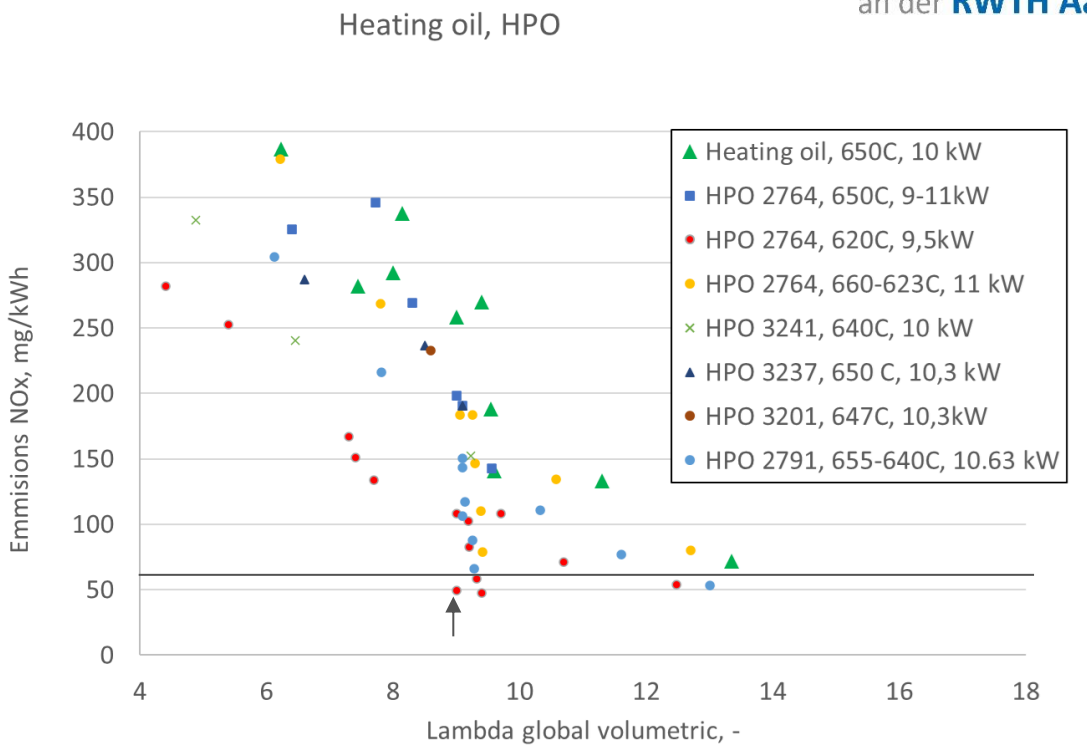
Combustor tests at OWI





- ✓ Pollutant emissions to be 50% of the actual norms or lower, with NO_x < 60 mg/kW_h fuel

Operation conditions: Lambda= 9

Tests under atmospheric pressures, T of incoming air 620-650°C

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Restore:
flaRE gaS boTtoming sOfc hybRid cyclE

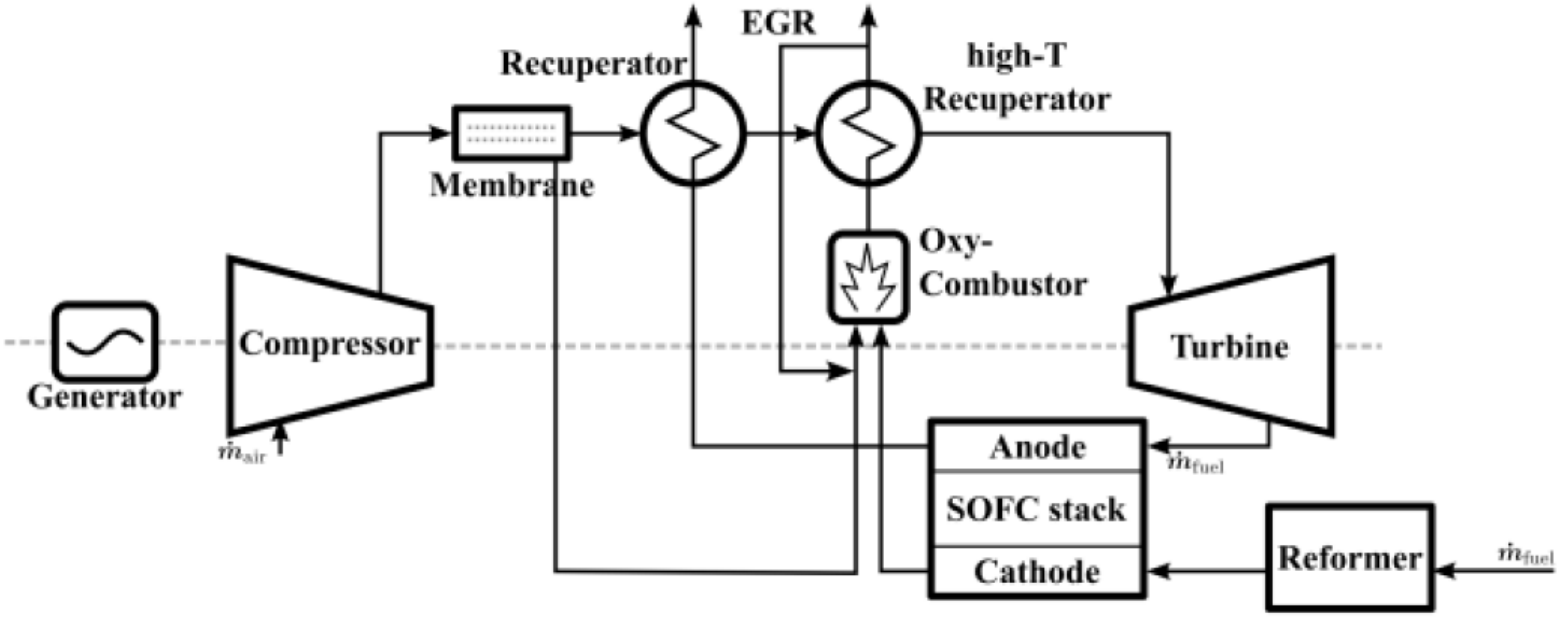

Figure 1: Bottoming RESTORE SOFC/MGT hybrid system

- Project duration Jan 2025-Dec 2028
- RESTORE aims to develop a very efficient combined heat and power system for flare gas, by implementing a hybrid cycle combining a micro gas turbine and a SOFC, to avoid flaring while still enabling the reduction of carbon dioxide emissions through carbon capturing.

Funded by Clean Energy Transition Partnership

Interests

- Topics we would like to explore in future Horizon Europe projects
  - Novel energy systems, for instance
  - Hybrid Heating concepts, such as combustion in combination electrification
  - Thermal storage concepts
  - Digitalisation concept for the above in relation to e.g. predictive maintenance

- Type and role of partner(s) we are seeking
  - Industry and research institutions
    - for instance, those which are focusing e.g. on material, component and system developments, concepts that we can test in our lab- technicum scale

Thank you!

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