EURO-K

succeeding energy systems

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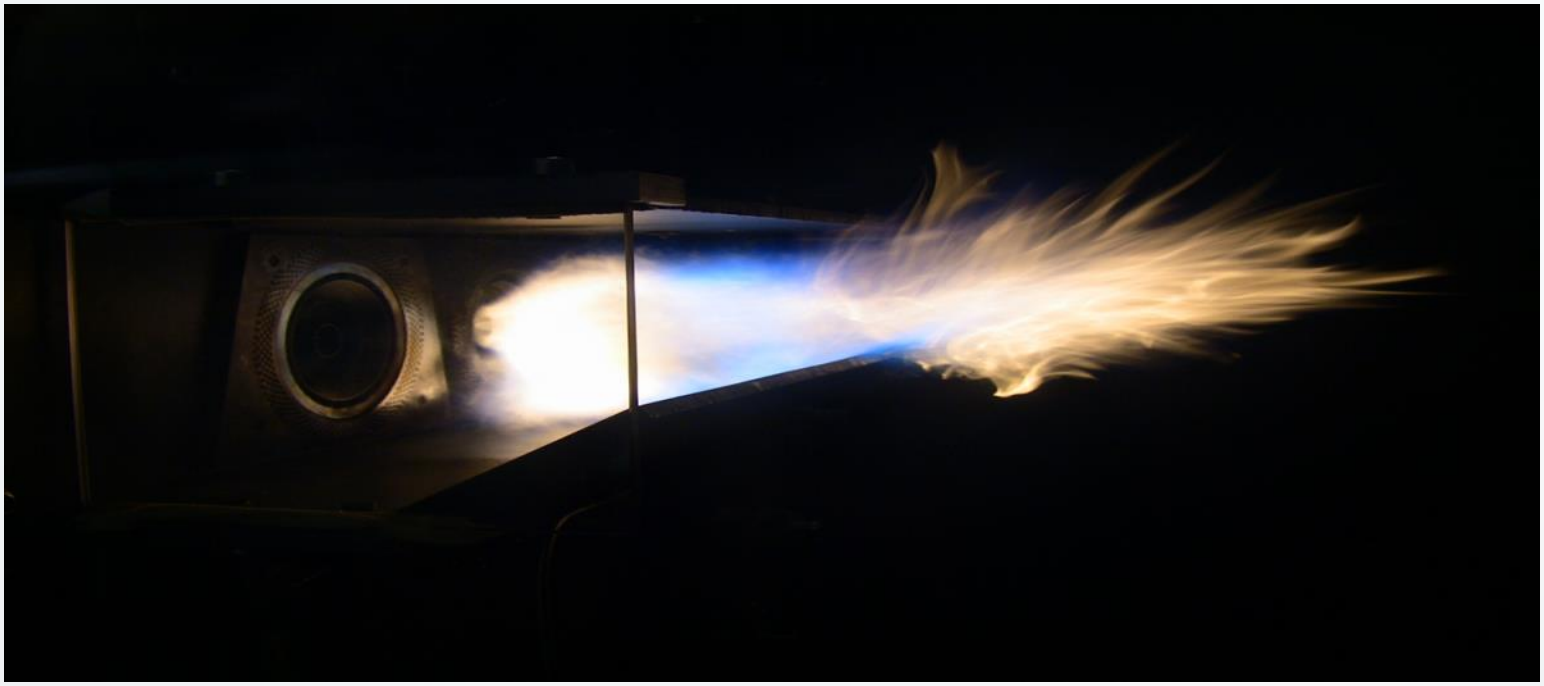
Micro Gas Turbine Technology and Combustion Systems

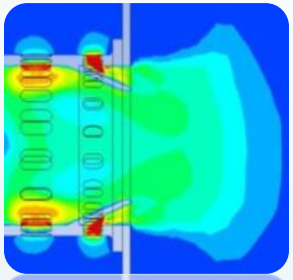


At a glance

- Founding: April 2011 as a GmbH
- Team: 17 employees
- Sites: Berlin, Cottbus
- Focal point: development of energy converters

- Orientation:
  - open minded for strategic partnership
  - Manufacture of products and sales carried out by specific project companies in partnership

Design/Construction



Simulation and Calculation

Prototypes

Validation

Small Series-Production

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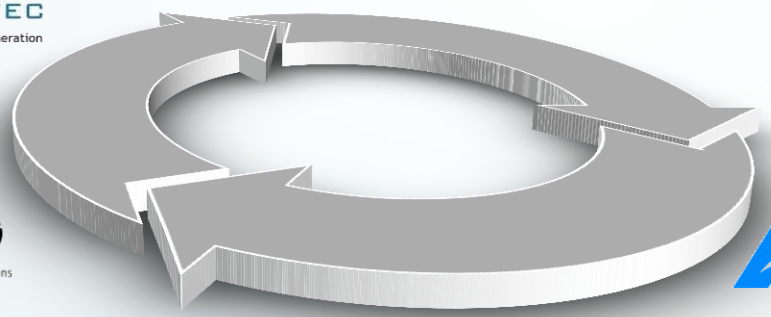
Electric Conversion

Turbo Machine

Fraunhofer IKTS

b-tu

WANKEL SUPERTEC
Power of the new generation



Turbo Science

Combustion

eos
e-Manufacturing Solutions

ACTE

Recuperation

DLR

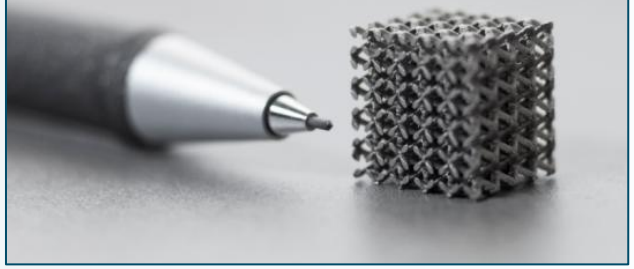
b-tu

Fraunhofer IPK

Bearings

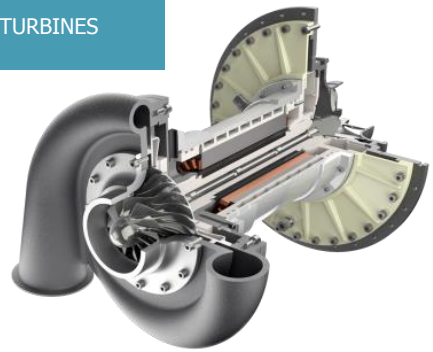
Field of Activities

RAPID PROTOTYPING



MULTI FUEL BURNER

MICRO GAS TURBINES

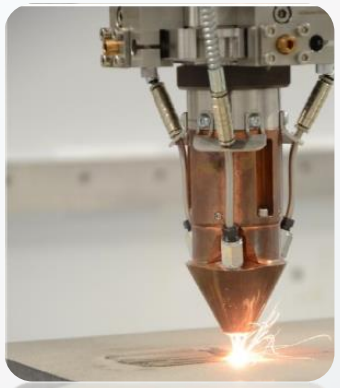


EXTERNAL COMBUSTION SYSTEMS

MGT - SOFC

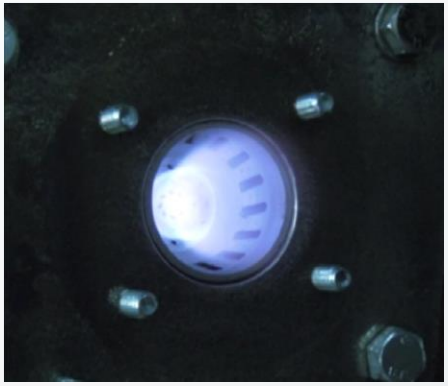
Rapid Prototyping

- Application
  - Support technology for fast building of prototypes in the field of energy conversion systems
- Features
  - wide range of usable materials (metal and plastic)
  - reduced production time via PLA-, Resin- or SLM-printing
  - cost savings due to more efficient manufacturing processes
  - creation of complex geometries
  - independence of external manufacturer
- Future
  - establishment of new materials in the field of high temperature applications
  - improvement of process safety
- Status
  - in use



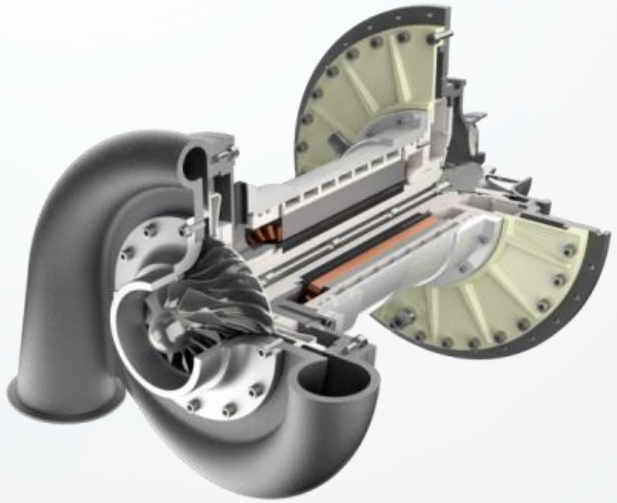
Multi Fuel Burner

- Application
  - previous fuels: Natural Gas – Diesel – Propane / Butane – Biogas – Mixed Gas up to 30 % hydrogen - Lean Gas – Ethanol / Fusel Oil / Liquid Oil Gases (LOG)
  - Manufacturing via SLM
- Features
  - much compact execution
  - pretty mixture
  - adaptable to existing systems (changeover)
  - fuel flexibility
- Future
  - further optimization of the combustion process (NOx-generation)
  - chemical and thermal hydrogen combustion (cooling methods / impact on the material)
- Status
  - in use (series manufacturing



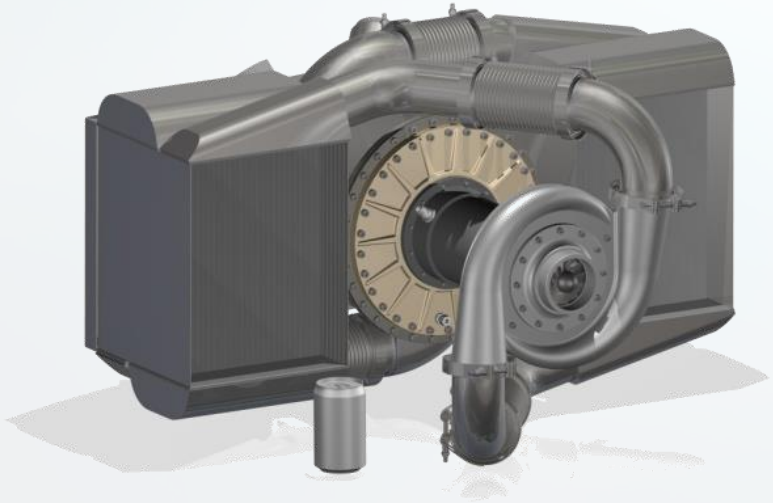
Micro Gas Turbine

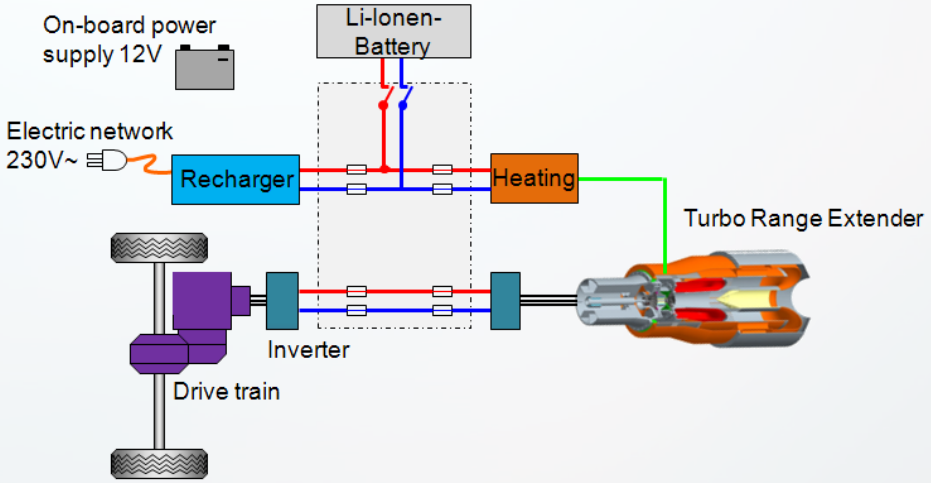
- Application
  - turbo machine based range extender for hybrid vehicles
  - stationary and grid-depending power supply
  - power aggregate for power supply of battery packs
- Features
  - Exhaust emissions better than Euro VI
  - No operating fluids (oil) → use of air bearings
  - High life time (> 40.000 h)
  - Eta_{el} ~ 30 %
  - Easy maintenance
  - Fuel flexibility
- Future
  - scale to different power ranges
  - combination with solid oxide fuel cells (SOFC) for increased efficiencies
- Status
  - Development phase



Turbo Range Extender - TRE

- MTiG – Microgas Turbine with integrated Generator
  - Application: serial plug-in hybrid electric vehicle (PHEV)
  - Recuperated 35 kW micro gas turbine with integrated generator



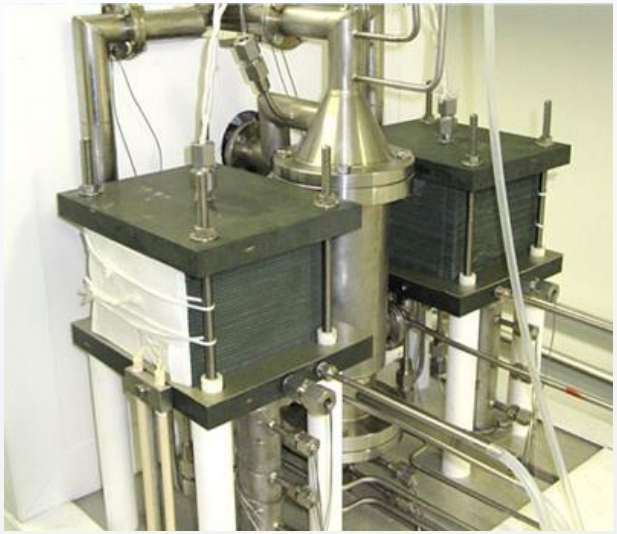


External Combustion

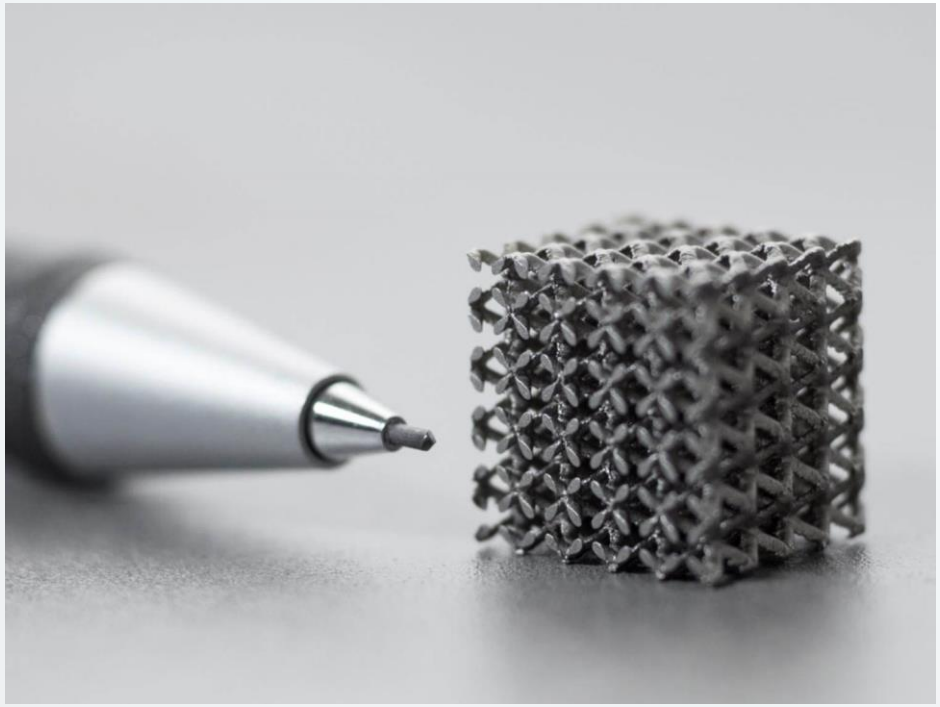
- Application
  - stationary sites for exploitation of coating residual products or particulate biogenic fuels
  - Power range max. 100 kW_{el}
- Feature
  - simple combustion principle
  - robust site design
  - optimal fuel utilization
  - secondary stream process for energy conversion (electricity)
  - exploitation of materials previously disposal obligated
- Future
  - expansion to smaller power ranges
  - isolated operation for emergency power supply
- Status
  - Development phase

MGT-SOFC

- Application
  - Coupling of a micro gas turbine with a solid oxide fuel cell (SOFC)
  - Stationary and mobile energy conversion
  - Primary fuel: methane (other fuels possible)
- Feature
  - Efficiency of the system > 60 $\%_{el}$
  - Operating temperature up to 1000 °C
  - Turbine provides expansion of SOFC gases with simultaneously charging the SOFC stacks by the compressor (efficiency increase compared to stand alone SOFC system up to 15 %
- Future
  - Usage in mobile systems
  - Expansion of usable fuels
  - Process optimization
- Status
  - Preparation of development



Thank you for your attention!



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