Highly Efficient, Fuel Flexible CHP Technology based on Fixed-bed Updraft Biomass Gasification and SOFC

Department Pyrolysis and Gas treatment
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Scope:
- Demonstration of 1-10 MW fuel-flexible biomass CHP technology with 40 % electrical efficiency
- Technology and process development: KIT ➔ Integrated high temperature gas cleaning
- Techno-economical, environmental and impact assessment


Helmholtz-Classification:
Programm Energy efficiency, Materials and Resources
Topic 4 Efficient Use of Fuel Resources
Subtopic 4.3 Gas Cleaning and Aerosol Technology

Objectives:
- Fuel-flexible biomass CHP technology load range 1-10 MW
- Electric efficiency 40%
- Overall efficiency 90 %
- Technology and process development ➔ Updraft gasification technology ➔ Integrated high temperature gas cleaning ➔ Solid oxide fuel cell technology (SOFC)
- Techno-economic assessment
- Environmental assessment
- Impact assessment
- Market potential studies

Process Development ITC:

raw syngas after POX / reheating → Catalystic ceramic filter elements → SOFC

Particulates ➔ Hot gas filtration with ceramic fibrous filter
Tar conversion ➔ Catalytic coated filter
Trace contaminants
(S-, Cl-species) ➔ Mineral sorbents

Ceramic filter system with proprietary recleaning technology (600 – 700 °C, syngas)
- Horizontal arrangement of the filter elements
- Rigid ceramic fibrous material
- Catalytic coating of the filter elements
- Pt based catalyst
- Transfer pellet technology
- Entrained flow sorption process upstream of the filter system
- Dry mineral sorbents (mixtures)
- Flexible adjustment to syngas load

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