

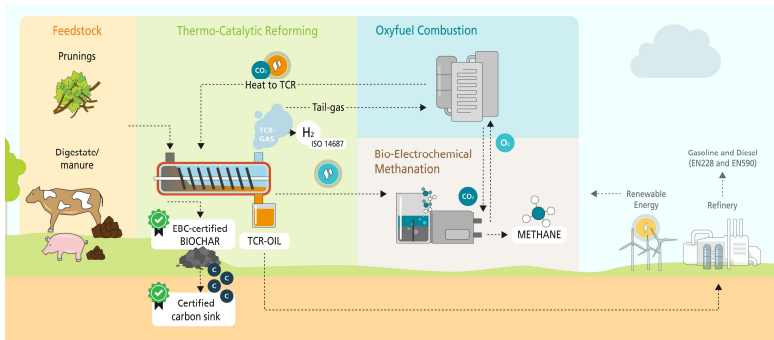
The NET-Fuels Project Integrating Oxyfuel Combustion for Climate-Positive Hydrogen and Syngas

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1. The NET-Fuels Approach

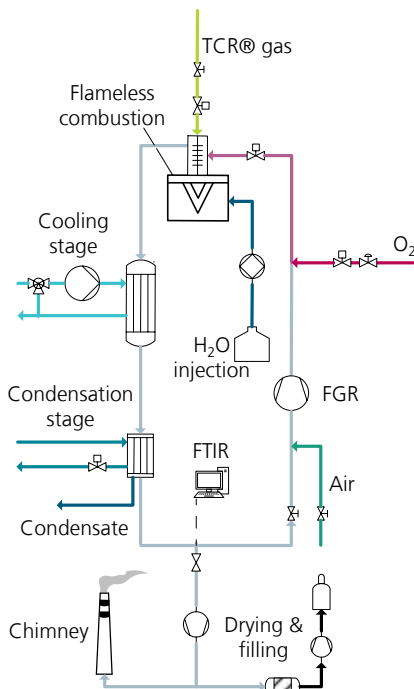


- Conversion of biogenic residues via pyrolysis (TCR®)
- Production of biochar, liquid oil and H₂-rich pyrolysis gas
- Biochar acts as a carbon sink, oil is used in refineries
- H₂ extraction from pyrolysis gas and combustion of tail gas in oxyfuel system to provide heat and CO₂
- Utilization of CO₂ in Bio-Electrochemical Methanation

Objective:
What flue gas composition can be expected from coupling pyrolysis unit with oxyfuel combustion?

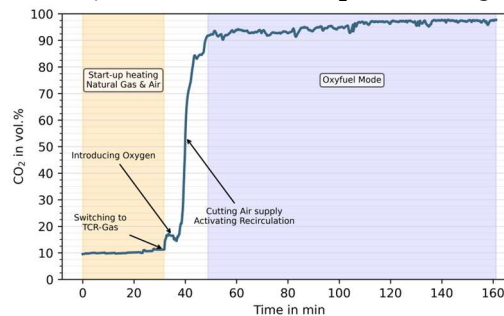
2. Methods

- Coupling of a TCR® pyrolysis unit with an oxyfuel combustion system
- Heating up the combustion chamber with natural gas and air
- Transition to flameless combustion of TCR® gas with pure oxygen and recycled flue gas
- Water injection for temperature control
- Downstream flue gas cooling, condensation, adsorption drying and filling
- FTIR & GC measurement of flue gas composition



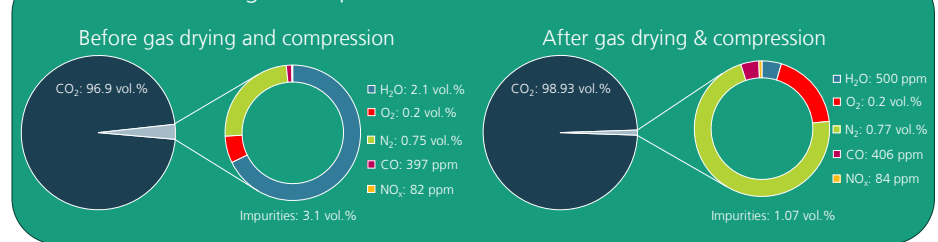
3. Results

Temporal evolution of CO₂ in the flue gas

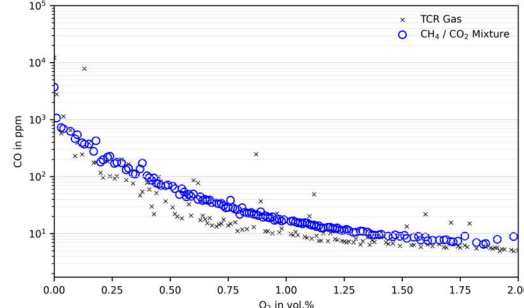


- CO₂ content > 95 vol.% after condensation
- CO₂ content rises sharply when switching from air to oxyfuel
- Stable process conditions in the near-stoichiometric combustion regime

Flue gas composition in vol.% measured with GC



CO emissions over residual O₂ in flue gas



- CO increases with decreasing O₂ content in the flue gas
- Lower CO emissions compared to trials with biogas (CH₄ / CO₂ mixture) as a fuel
- CO emissions with TCR® gas showing a larger spread

