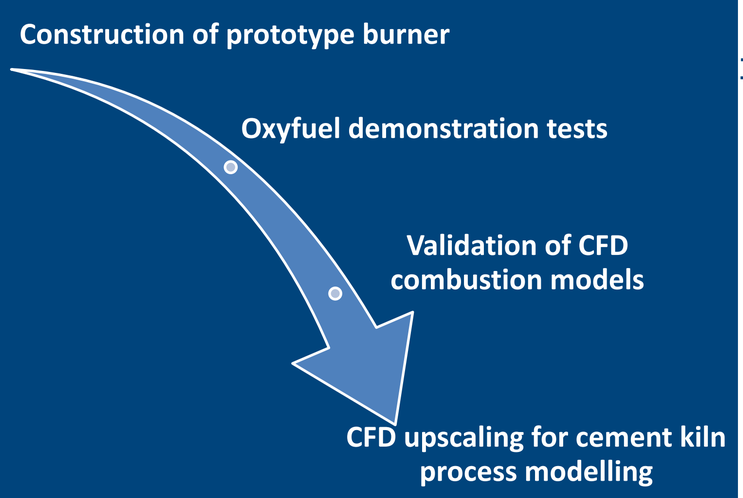
Oxyfuel Burner Technology

CEMCAP is a Horizon 2020 project with the objective to prepare the grounds for cost- and resource-effective CCS in European cement industry.

Work package 7 methodology



Francisco Carrasco[1], Jörg Maier[1], Mario Ditaranto[2], Eike Willms[3], Johannes Ruppert[4]

[1]Institute of Combustion and Power Plant Technology (IFK), University of Stuttgart, Stuttgart, Germany
[2]SINTEF, Trondheim, Norway
[3]Thyssenkrupp Industrial Solutions AG, Beckum, Germany
[4]Department of Environment and Plant Technology, VDZ gGmbH, Düsseldorf, Germany

Contact: Francisco Carrasco
Francisco.carrasco@ifk.uni-stuttgart.de

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Twitter: @CEMCAP_CO2

Deliverable 7.2: Oxyfuel burner performance tests
Deliverable 7.3: Oxyfuel CFD burner and large kiln simulations

Results & Publications

https://www.sintef.no/projectweb/ cemcap/results/

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Conclusions

- Conventional high momentum jet burners, which are currently used in cement kilns, can also be used for oxyfuel operation without need for modifications. However, limitations in max. O_2 concentration apply.
- Oxygen enrichment in inlet gases, oxygen concentration in primary gas and swirl adjustment are key parameters in order to shape flame formation.
- CFD simulation of a large scale burner in oxyfuel mode demonstrate that the flame delivers a kiln radiation heat profile to the material similar to that in the reference air case.

Work Package 7 Research Activities

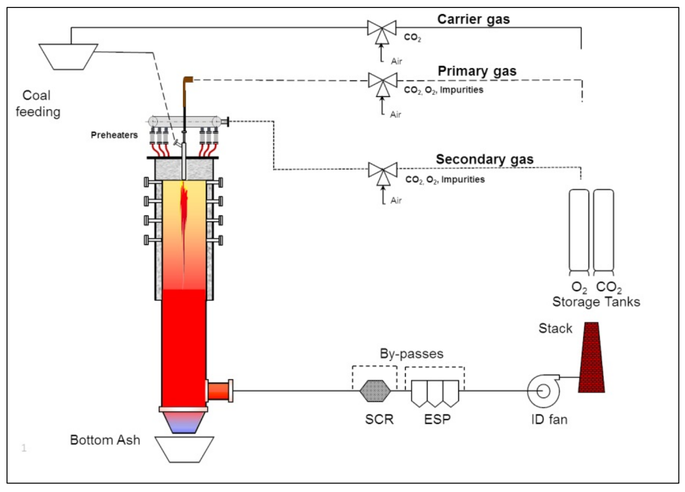


Fig 1. Schematic of the 500 kW_{th} pilot test facility at IFK, University of Stuttgart.

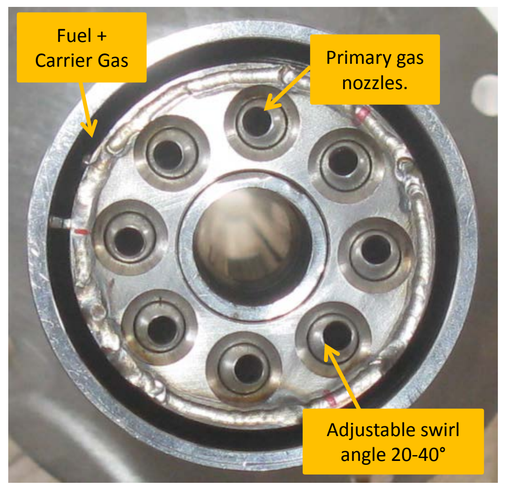


Fig 2. Burner tip of downscaled burner, design based on ThyssenKrupp´s POLFLAME® burner.

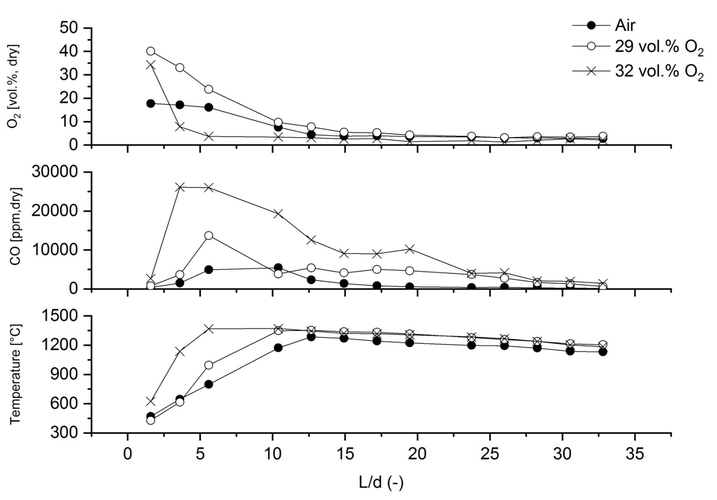


Fig 3. Results of O_2, CO and Temperature profile measured at centerline during burner demonstration tests firing pre-dried lignite under Air and two Oxyfuel configurations with different overall oxygen levels.

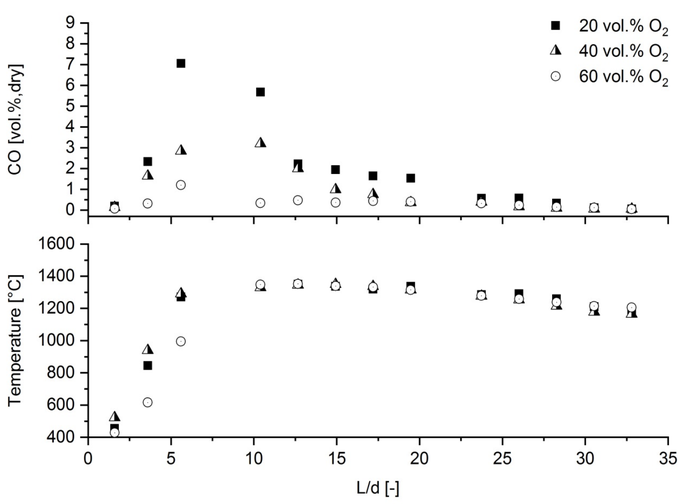
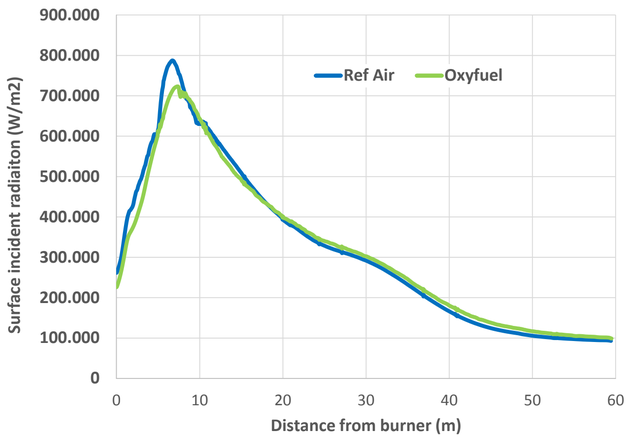


Fig 4. Effect on CO and Temperature during oxyfuel tests (29 vol.% O_2) when variating oxygen enrichment in primary gas.

a)



b)

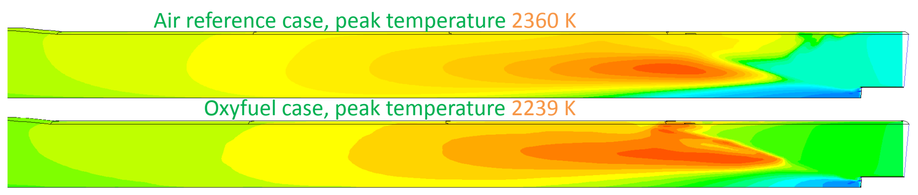


Fig 5. Results of CFD simulation of large scale kiln burner in air and oxyfuel mode. a) Comparison of the surface incident heat radiation profile at the kiln wall. b) Contour maps of gas temperature in the plane crossing the nozzle centerline.