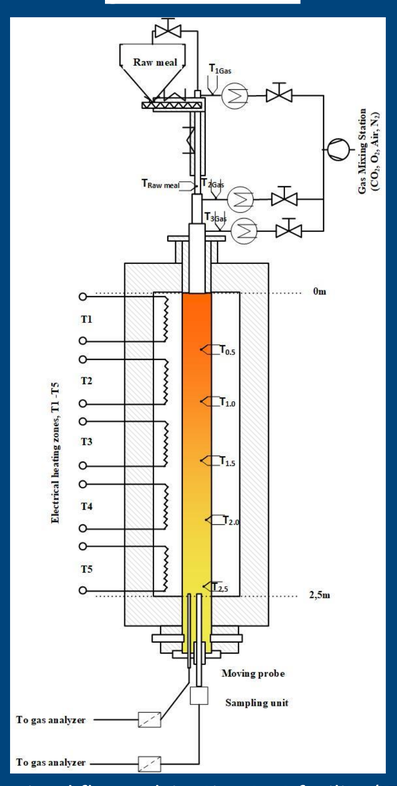
CEMCAP

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 8: Calciner technology for oxyfuel process



Entrained flow calcination test facility (IFK)

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Results & Publications

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

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Calciner technology for oxyfuel process

- Objective: Experimental investigation of entrained flow calcination under industrial relevant oxyfuel conditions
- Calcination: Chemical decomposition of limestone by heat supply at certain temperature, reversible reaction $CaCO_3 \leftrightarrow CaO+CO_2$
- Equilibrium temperature depends on partial pressure of CO_2 in calciner atmosphere

Main Conclusions

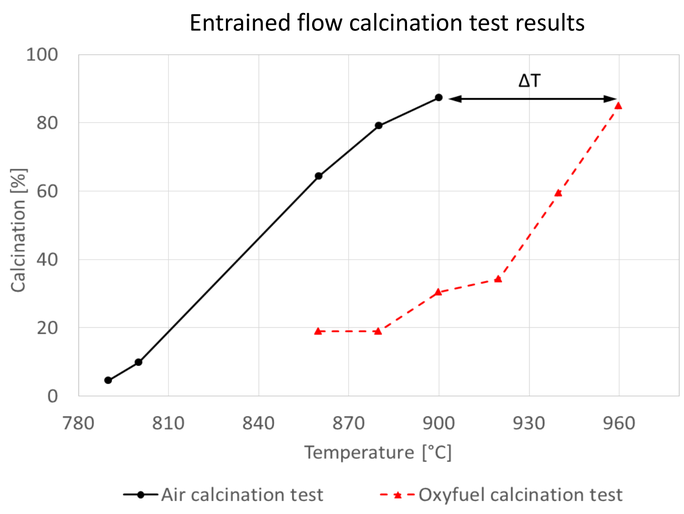
- In case of oxy firing (80 vol.% CO_2) required calcination temperature is 60-70 K higher in comparison to air firing (20 vol.% CO_2)
- The temperature shift is comparable among different test set-ups and conditions
- Temperature requirement for entrained flow calcination is higher than theoretical equilibrium temperature (air firing: 800 °C, oxy firing 880°C)
- Provided the higher temperature, calcination degrees above 90% could be achieved within existing calciner residence times
  - retrofitting is likely to be possible

Research Statements

Tests performed

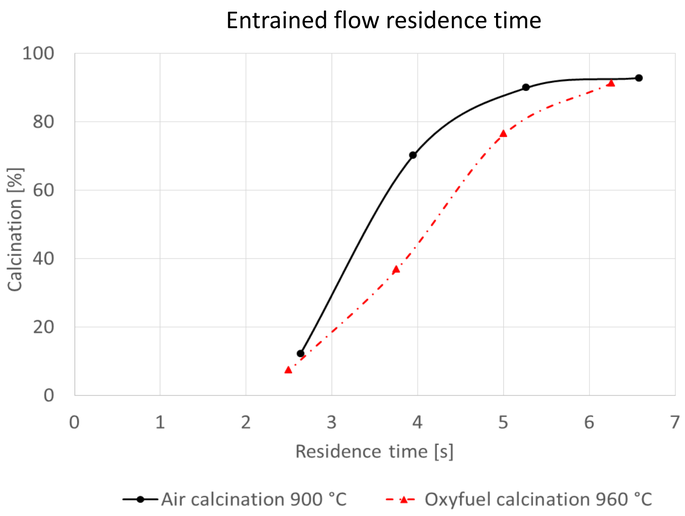
Calcination scenario	Air firing	Oxy firing
Calciner temperature [°C]	790 – 900	860 – 960
Residence time [s]	6 – 13	

- With variation of preheating temperatures



Oxyfuel calcination process

- Entrained temperature higher than equilibrium temperature, influenced by:
  - heat transfer characteristics of test facility
  - raw meal preheating
  - actual pCO_2
  - raw meal; physical and chemical properties
- Increase of residence time alone could not improve calcination
  - higher temperature is mandatory.
- The measured temperatures (gas) are higher than the actual particle temperature
- At the higher temperature in oxyfuel calcination the raw meal particles do not show increased tendency of sintering



Industrial oxyfuel calciner operation

- Increasing the preheating temperature levels of raw meal before entering the calciner has potential to keep the required calcination temperature within calciner operation boundaries
- The ash derived from calciner fuel might be the reason for increased deposits, in the performed oxyfuel calcination experiments the raw meal particles itself did not show higher tendency of sintering and therefore stickiness