Calcium Looping CO_2 Capture

Principle of Calcium Looping (CaL) CO_2 Capture

- CO_2 capture by cyclic calcination and (re)carbonation of CaO containing sorbent
- High energy efficiency due to high temperature level, beneficial heat integration
- Synergies arise from common feedstock of clinker manufacturing and CaL

Main Conclusions

Tail-end CaL

- CO_2 capture of 98 % demonstrated
- High fuel consumptions but net clean electricity export possible with heat recovery steam cycle
- Technology ready to implement
- 3.26 MJ_{LHV}/kg_{CO_2}

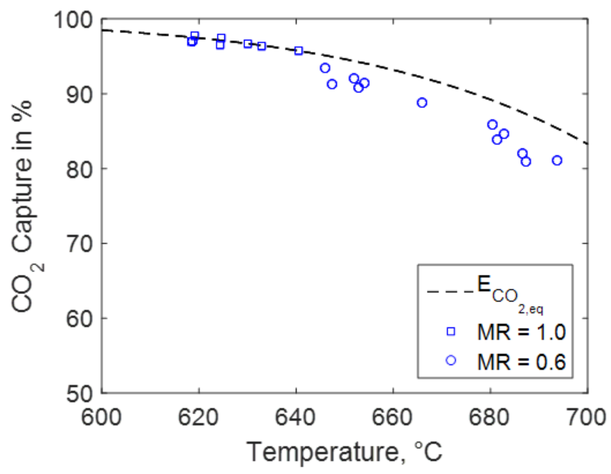
Integrated CaL

- Proof of Concept
- Much lower fuel consumptions. Heat recovery steam cycle compensates consumptions for ASU and CO2 compression
- 2.32 MJ_{LHV}/kg_{CO_2}

Research Statements

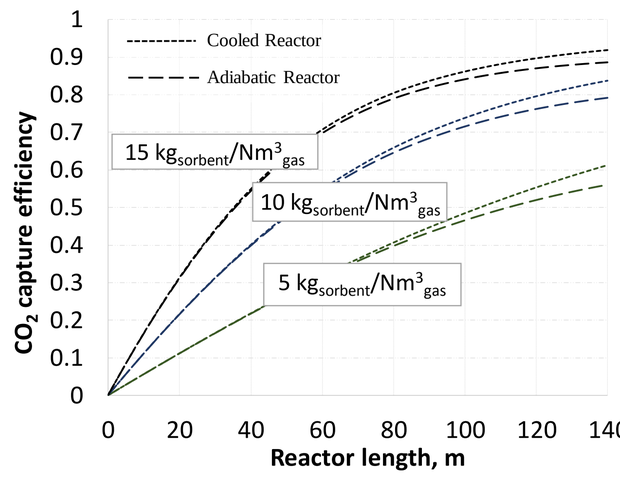
Tail-end CaL:

- High CO_2 capture efficiencies demonstrated at semi industrial scale (up to 98 %)
- Well-known CaL design criteria are applicable for cement flue gases
- Minor uncertainties regarding usability for CO_2 capture in cement plant



Integrated CaL:

- Use of EF reactors beneficial. Additional milling step may be required for FB systems.
- CO_2 capture of CaO in EF environment confirmed
- Simulations of EF carbonator show that high CO_2 capture is achievable with proper solid/gas ratio
- Further investigation during **CLEANKER** project

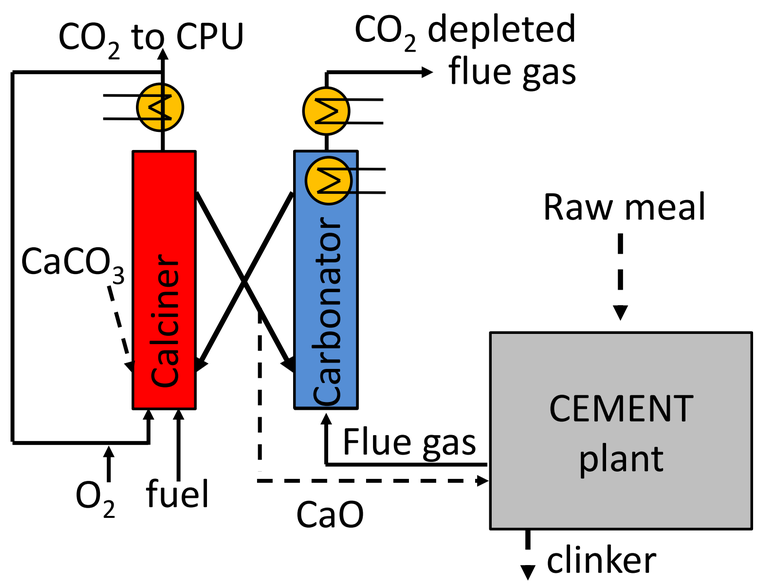


Silicate formation:

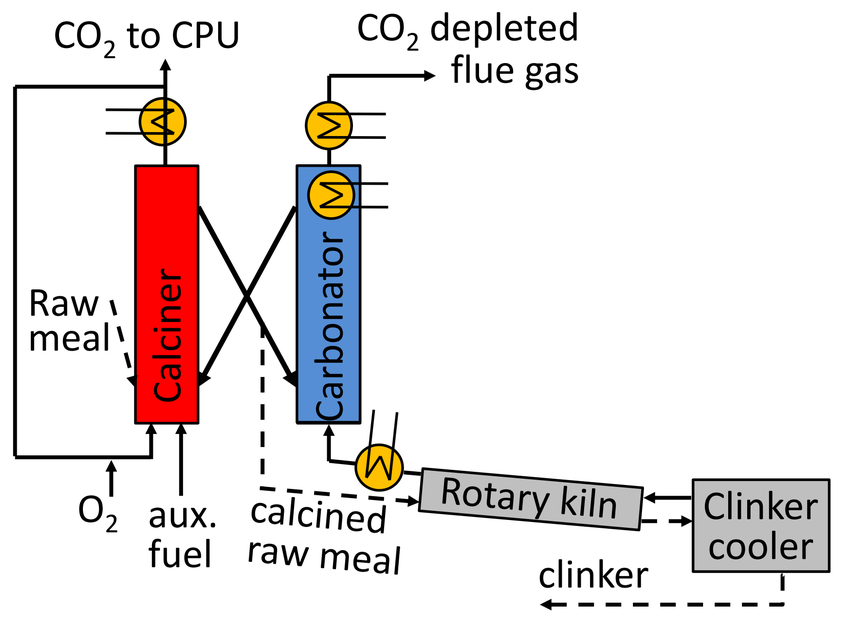
- Partial deactivation of CaO sorbent by fast formation of Belite
- Deactivation is influenced by (i) Ca/Si distribution in solid, (ii) temperature, (iii) residence time, (iv) partial pressures of CO_2 and $H_2O_{(g)}$

$CaL\ CO_2$ capture implementation

Tail-end CaL



Integrated CaL



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

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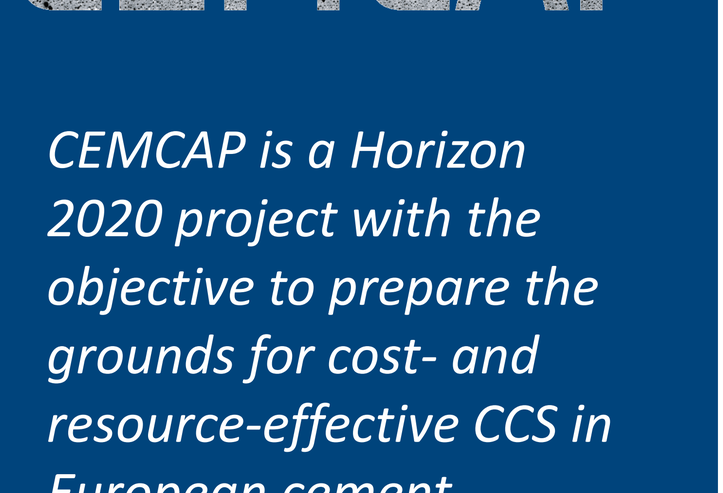

Results & Publications

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

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