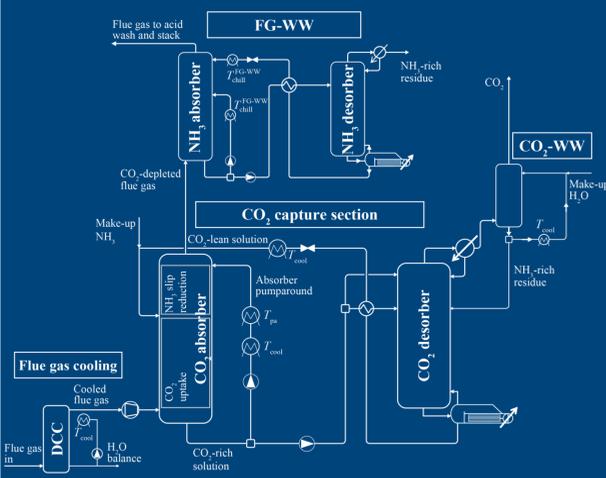


CEMCAP

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



The Chilled Ammonia Process (CAP)

- low-cost, chemically stable solvent
- competitive energy penalty
- demonstrated for various applications from NG power plants (4%vol CO₂) to coal-fired power plants (~15%vol CO₂) at different scales

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WP10: Chilled Ammonia Process

Scope of work

- In pilot scale investigate process differences between cement and power
- Thermodynamic and kinetic model extensions and development
- Process optimization for cement application

Conclusions

- Applicability of the CAP to cement plant flue gas proven
 - high CO₂ concentrations can be exploited for highly efficient CO₂ capture
 - tail-end application, i.e. retrofit possible, cement quality not affected
 - robust process performance even at high levels of SO₂ in flue gas
- Vast industrial experience from CAP application to coal/gas power plants and refineries (TRL 7)
- Required adaptations for cement application mastered within CEMCAP using GE's 1 t/day pilot plant and extensive process simulations

Results and discussion

Pre-CEMCAP (2006-2015)

CAP development for the power application (TRL 7)

- from lab pilot to 50MW_{th} with full integration incl. transport and storage
- CO₂ concentrations of 3-15%-vol.



Product Validation Facility at the Mountaineer power plant, WV (50 MW_{th}): 8000 h in 2009-2011



Working principle of the CAP

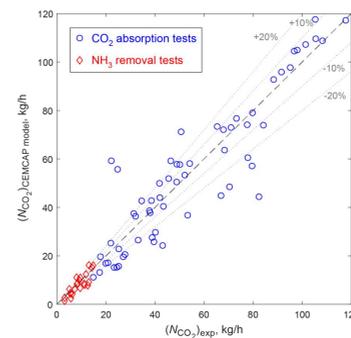
CEMCAP (2015-2018)

CAP development for the cement application (TRL 6)

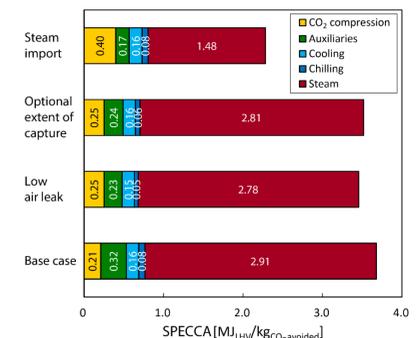
- Extensive experimental tests of all process units affected by the new flue gas composition
- Model development and verification
- Detailed design and energetic process optimization applying rate-based and equilibrium-based process simulations



Pilot at GE's technical centre Växjö, Sweden



Parity plot of pilot test results and model predictions showing the high accuracy of the newly developed model.



Resulting process performance showing the positive effect of high CO₂ concentrations on energy penalty for CO₂ capture.

Future vision

Further CAP development for the cement application (TRL 7 and 8)

- Demonstration plant of 100,000 tCO₂/year in cement environment
- GE has full EPC capability (investments of >100 M€ in CAP development). Market framework that incentivizes investments is currently lacking.
- Negative CO₂ emissions possible, if steam for CO₂ capture is provided through biomass plant