CEMCAP

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

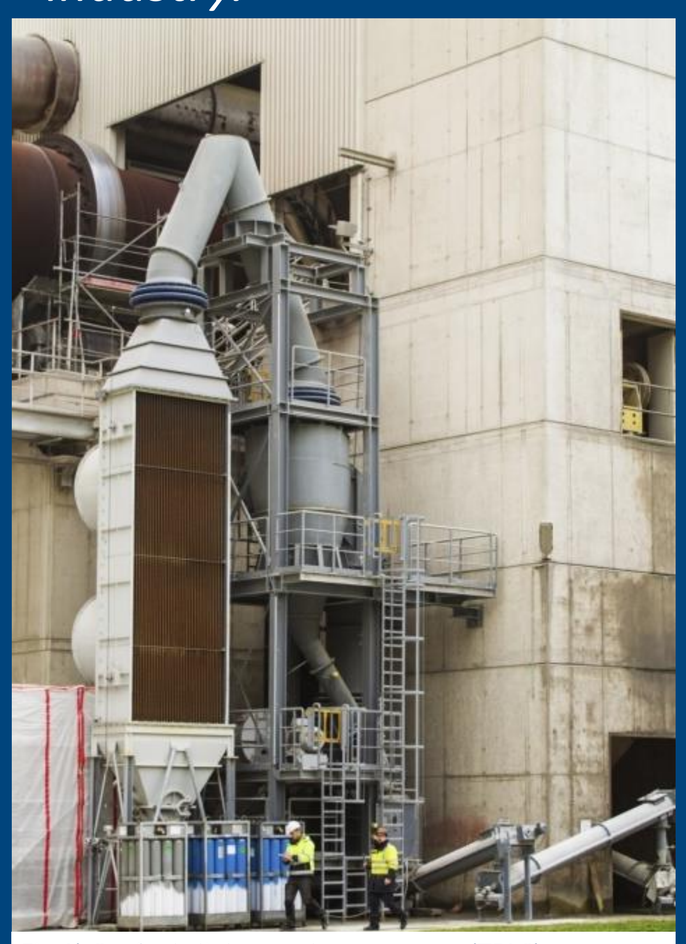

Fig.1) Oxyfuel clinker cooler prototype (TRL6) tested in the HC cement plant in Hanover.

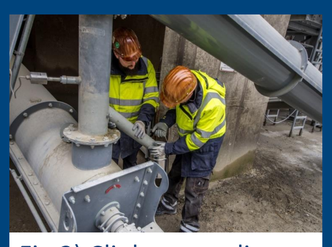

Fig.2) Clinker sampling

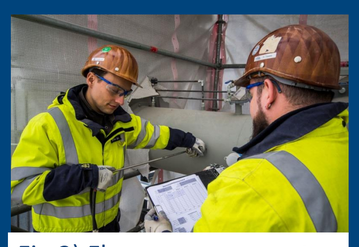

Fig.3) Flow measurement

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This project is funded by the European Union's Horizon 2020 Framework Programme for research and innovation

WP9
Oxyfuel clinker cooler prototype

Key conclusions

- It is possible to cool down clinker in oxyfuel conditions in industrial environment without relevant impacts neither on clinker quality nor on cement compressive strength development.
- The design of the condenser will play a key role in limiting the moisture content of the recirculated gas. Moisture and dust content in the recirculated cooling gas should be minimized and monitored to guarantee a reliable and trouble-free operation of the cooler.
- The seals installed in the pressurized zones of the pilot plant performed well but their reliability over time still needs to prove in industrial scale.
- Sealing the cooler outlet against false air ingress remains a challenge and demands special attention also in industrial scale projects.

Fig.4) Inside view of the oxyfuel clinker cooler prototype during the trials

WP9 research

Activities and methods:

- The first oxyfuel clinker cooler prototype (TRL6) ever constructed was tested in industrial environment (Fig.1 to Fig.4). Clinker samples cooled with CO_2-rich gas were collected (Fig.2) and analysed (Fig.5).

Experimental results:

- Considerably high false air ingress through cold clinker discharge system outlet (about 300 Nm^3/h → up to 23% in some trials).
- No leakages of CO_2–rich gas were detected during the trials.
- Some analysed CO_2-rich gas cooled clinker samples showed unusual layer formations of up to 2 µm thickness around alite crystals in contact with pores (Fig.5).
- Further investigations confirmed that layer formation had its origin on alite decomposition (estimated up to 4 mass% in some trials) and was caused by the presence of a cooling medium rich in CO_2 and moisture.
- Further investigations didn't reveal any negative impact of the detected layers on cement compressive strength development (Fig.6).
- Moisture in combination with dust from the recirculated gas blocked the cooler grate plates (Fig.7).

Fig.5) Layer formation observed under the microscope

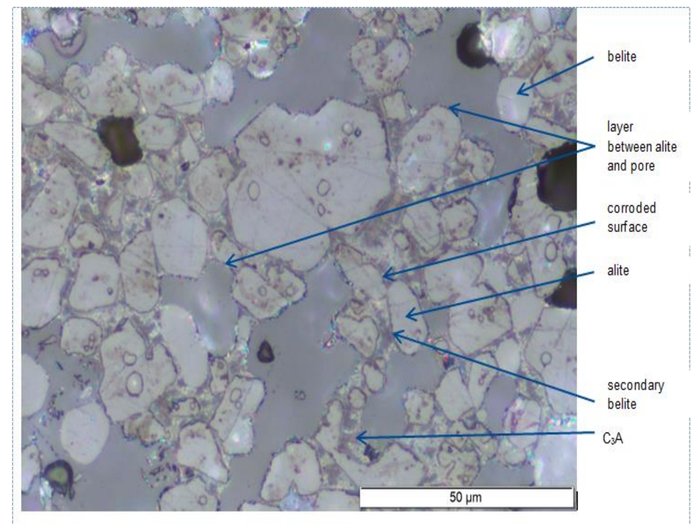

Fig.6) Impacts of layer formation on cement strength

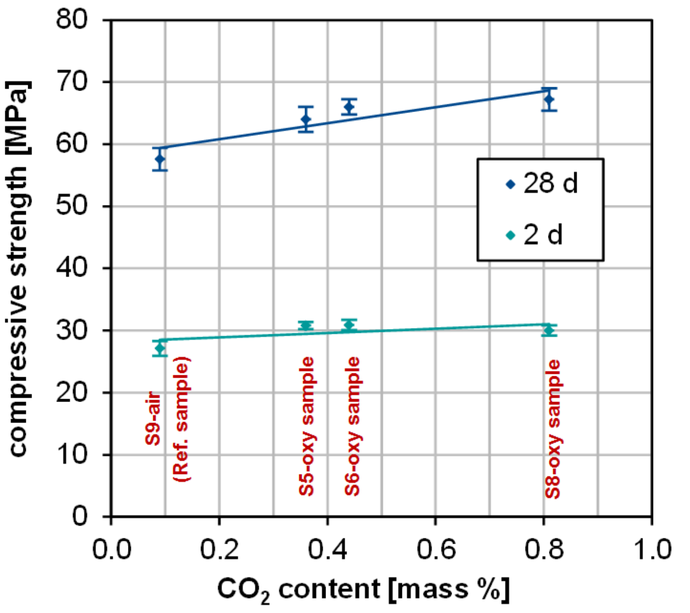

Fig.7) Dust on the cooler grate plates