

## Scale-up of Calcium Carbonate Looping Technology for Efficient CO<sub>2</sub> Capture from Power and Industrial Plants

The SCARLET project aims to obtain reliable information and tools for the scale-up of the Calcium Carbonate Looping (CCL) process and pre-engineering of a 20 MW<sub>th</sub> CCL plant by continuous self-sustaining pilot plant operation. SCARLET is a collaborative research project funded by the European Commission within the 7<sup>th</sup> Framework Programme under the grant agreement no. 608578 in the theme “scale-up of advanced high efficiency capture processes”. The project is coordinated by the Institute for Energy Systems and Technology (EST) of Technische Universität Darmstadt and runs from April 2014 to March 2017.

### OBJECTIVES

- Long-term pilot testing of the CCL process in 1 MW<sub>th</sub> scale at TU Darmstadt
- Development and validation of scale-up tools and guidelines
- Design, cost estimation and risk assessment study for a 20 MW<sub>th</sub> CCL pilot plant
- Techno-economic and environmental impact of commercial full scale CCL application



### PROGRESS

#### Long-term pilot testing with hard coal and lignite

The 1 MW<sub>th</sub> pilot plant was modified for improving and extending operability to reach the determined objectives. The pilot plant has recently been equipped with a 60 m<sup>3</sup> silo (see on the right) and a pneumatic conveying system for testing the CCL with lignite as fuel. Two test campaigns, one with hard coal and one with lignite as fuel, were carried out.

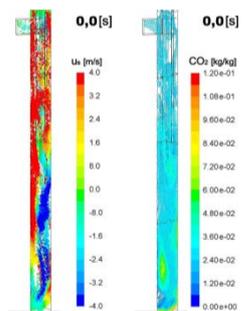


The first test campaign was performed using coarse as well as pulverized hard coal in the calciner. For more than 400 hours, CO<sub>2</sub> from the coal fired furnace of the pilot plant was captured under stable conditions of the CCL process. High capture rates up to 93% in the carbonator and 96% for the whole process were achieved.

The second test campaign was conducted fueling lignite. Stable operation in various operating points for more than 300 hours of capture operation. Capture rates up to 94% in the carbonator and up to 97% for the whole process were achieved.

#### Validation of process and CFD models

Based on the experimental data of the CCL testing with hard coal and lignite, the ASPEN PLUS<sup>TM</sup> process model, the Discrete Element Model (DEM) for the carbonator and the energy-minimization multi-scale (EMMS) method integrated in a two-fluid model (TFM) for carbonator as well as the calciner are being validated. On this basis, simulations of reactor optimizations are being performed.



#### Scale-up and engineering of 20 MW<sub>th</sub> pilot plant

The CCL process is being scaled up to a 20 MW<sub>th</sub> pilot plant. Boundary conditions, basis of design and draft process configuration for the pilot plant integrated to UNIPER's Emile Huchet (France) host site have been defined.



#### SAVE THE DATE!

The 1<sup>st</sup> public SCARLET workshop will take place on 20<sup>th</sup> April 2016 at Technische Universität Darmstadt including a tour to the pilot plant.

### CONTACT

Institute for Energy Systems and Technology (EST)  
 Dr.-Ing. Jochen Ströhle / M. Sc. Jochen Hilz  
[info@project-scarlet.eu](mailto:info@project-scarlet.eu)



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Further information about the project is available online and updated regularly. Publications and reports will also become available.

[www.project-scarlet.eu](http://www.project-scarlet.eu)