Leilac 2





# **LEILAC 2 – Scaling Up Low-Carbon Solutions**

October 2021

These projects have received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 654465 and No 884170

### **Cement's unavoidable CO2 emissions**



#### The situation

- Cement and lime are responsible for around 8% of global CO<sub>2</sub> emissions
- Majority of the CO<sub>2</sub> emissions are unavoidable
- CCS will need to be applied to most cement and lime plant to meet global emission reduction target
- The cement and lime industries are under intense competitive and cost pressures



The current collective objective facing industry and government is threefold:

- to maintain economic prosperity,
- meet cement and lime market demand,
- dramatically lowering CO<sub>2</sub> emissions.

The vision

The LEILAC Projects' Vision is to meet that great challenge as quickly as possible: providing a solution without significant impact on operability, capital intensity or efficiency





## The CO<sub>2</sub> Solution CALIX'S CORE TECHNOLOGY



Using Calix's LEILAC technology the released process CO<sub>2</sub> is not contaminated.

This carbon separation process does not require additional energy or chemicals

**CO<sub>2</sub> Capture** When processing limestone, cement meal, or magnesite, gas exhaust is high quality CO<sub>2</sub>

"LEILAC" (Low Emissions Intensity Lime and Cement)

No theoretical energy penalty
High Purity CO<sub>2</sub>

( Target lower operating costs

S Comparable capital costs – existing plants

Heat / fuel agnostic

### A New Type of Kiln



10 patent families covering core technology and applications in CO<sub>2</sub> mitigation



>€44m has been invested to date in developing the technology, with a further €16m already committed





Technology – Simply replaces part of the existing cement production process – no additional chemicals or processes or energy required to separate unavoidable CO2



### Impact

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### **LEILAC1** Pilot plant

- Calcine cement meal and capture the  $CO_2$  created from around 5% of a full plant's throughput.
- Confirm that there would be a similar or better product quality
- Efficiently capture over 95% of CO<sub>2</sub> process emissions.
- Evaluation and mitigation of the major scale-up technical risks.

### LEILAC2 Demonstration plant

- Develop a module (similar footprint to the Pilot) that can calcine cement meal – and capture the CO<sub>2</sub> created - from around 20% of a full plant's throughput.
- Prove low-impact retrofit approach
- Develop the use of variety of energy sources, including electricity.

## Commercial roll-out

- Use of modules of this new calciner design to separate unavoidable CO<sub>2</sub> emissions at low cost for 100% of a full plant's throughput.
- A good quality CO<sub>2</sub> stream and product.
- Flexible options for a low-impact retrofit or newbuild.
- Complements other CO<sub>2</sub> abatement technologies (any other capture system for fuel emissions - or using renewable energy such hydrogen, biomass or electricity
- Blue-print design for local engineering firms to implement globally



€12m H2020 grant plus € 9m in-kind in 2016

- 5-year project, start in 2016
- Direct capture of process-related CO<sub>2</sub>
- 95% capture rate CO<sub>2</sub>

Pilot plant in HeidelbergCement's plant at Lixhe, Belgium

Pilot operations have been very successful and proven the core technology:

- Built on time and on budget
- Successfully operating
- 95+% CO<sub>2</sub> purity
- No impact on host plant's operations or emissions levels
- Core technology reliability and consistency proven











€16m H2020 grant plus €17m in-kind in 2020, and industrial funding

Focused on proving ability to retrofit, integration, a x4 scale up and enhanced performance.

Capacity to capture 100kpa of  $CO_2$  - 25% of a typical cement plant's process emissions - in a replicable module



tower (it will undertake 20 % of the duty of the current tower).

Initial concept for sizing/comparison with the host plant – if it sat alongside the existing calciner







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Global Cement and Concrete Association









# • The team matters.

- A large scale problem will need a large team how do you keep a large team focussed?
- Everyone at all levels needs to be engaged.
- Communication is critical R&D produces learnings that force change can be disruptive unless everyone is on board.
- Defining the problem is step 1 scale up isn't just increasing the size of the equipment.
- Work to maximise the up-front development as much as possible.



www.project-leilac.eu - now in German, Spanish, French, Dutch and English



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