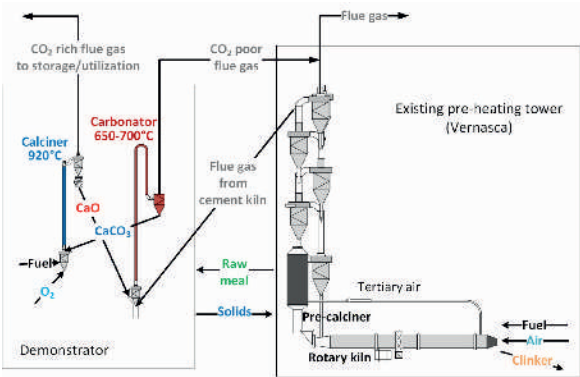


Calcium looping technology and CLEANKER targets

Calcium looping is a regenerative process, which takes advantage of the capacity of calcium oxide-based sorbents to capture CO₂ at high temperatures.

The process is divided in two basic steps: **(1)** the capture of CO₂ by “carbonation” of CaO to form CaCO₃ in a reactor operating around 650°C; and **(2)** oxyfuel calcination in a reactor operating above 900-920°C, which makes the CaO available again and releases a gas stream of nearly pure CO₂.



Integration of the Demonstrator within the kiln of the existing cement plant Vernasca / Italy

Objective	Key indexes	Target
CO ₂ emissions	CO ₂ capture efficiency CO ₂ specific emissions	Cement plant CO ₂ capture efficiency > 90% Negative direct CO ₂ emissions by biomass co-firing (Bio-CCS)
Economics	Cost of cement Cost of CO ₂ avoided	Increase of cement cost < 25 euro/t _{cement} Cost of CO ₂ avoided < 30 euro/t _{CO₂}



Contact

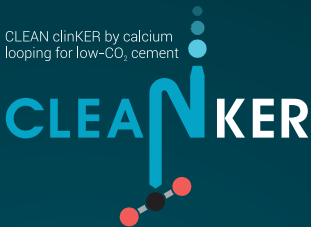
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CLEAN CLINKER PRODUCTION BY CALCIUM LOOPING PROCESS

MAIN FEATURES

EU-funded project within the **Horizon 2020** framework

Starting date:
October 1st 2017. **4 year lifetime**

Consortium: 13 from 5 EU member states + Switzerland and China

Budget: **9.237.851 €**

EC contribution: 8.972.201 €

Chinese government funding: 265.650 €

13 Partners in 5 EU member states
+ Switzerland and China

CLEANKER PROJECT

Quantis

University of Stuttgart
Institute of Combustion and
Power Plant Technology

IKN
Leibniz Institute for
Energy Efficient
Transportation

vdz

LUT
Lappeenranta
University of Technology

TALLINN UNIVERSITY OF
TECHNOLOGY

Buzzi Unicem

POLITECNICO
MILANO 1863

Italcementi
HEIDELBERGCEMENT Group

清华大学
Tsinghua University

CSIC

LEAP
Laboratorio Energia e Ambiente Piacenza

Amici della Terra

RESEARCH CENTRES:

LEAP / Italy
CSIC / Spain
VDZ / Germany

REPRESENTATIVES FROM THE ACADEMIA:

Politecnico di Milano / Italy
Tallinn University of Technology / Estonia
Lappeenranta University of Technology / Finland
University of Stuttgart / Germany and Tsinghua University / China

SMALL AND MEDIUM-SIZED ENTERPRISE (SME):

Quantis / Switzerland

TECHNOLOGY PROVIDER:

IKN / Germany

END USERS:

Buzzi Unicem / Italy

Italcementi Heidelberg Group / Italy

ENVIRONMENTAL ORGANIZATION:

Amici della Terra / Italy

BACKGROUND

The cement industry can play a key role in the reduction of CO₂ emissions. CO₂ generation in the cement production is mainly related to the calcination of limestone (CaCO₃ dissociated to CaO and CO₂), the main raw material used in the production process. Around 60% of CO₂ emissions come from this process reaction.

In addition, fossil fuels combustion emissions are relevant as well; also, on top of direct CO₂ emissions, the generation of electric power required by the process (e.g. grinding) is responsible for indirect CO₂ emissions.

STATE OF THE ART

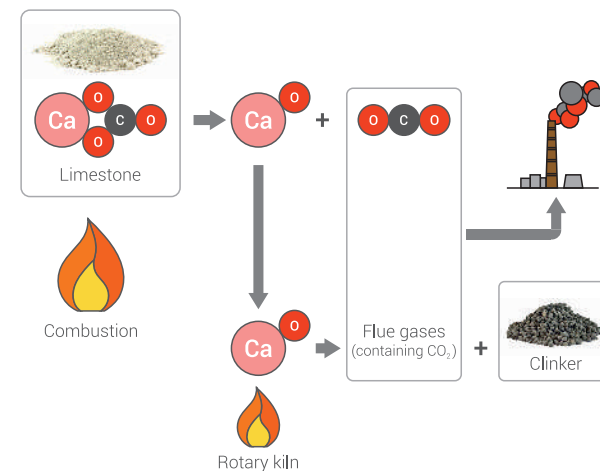
There are currently no feasible methods to produce clinker, and thus cement, without releasing CO₂ from CaCO₃, and, given the lifetime of a cement plant (30-50 years), the technologies to be developed will have to be retrofits.

In addition to **oxyfuel combustion** and **post-combustion solvent-based** capture technologies, which so far attracted most of the research efforts, **Calcium Looping** is recognized as another very promising emerging technology for CO₂ capture.

CLEANKER focus

The ultimate objective of CLEANKER is demonstrating the applicability of the Calcium Looping (CaL) to the cement production process, with the usage of entrained flow reactors. A complete demonstration system will be installed by the 1300kton/year cement plant, operated by Buzzi Unicem, in Vernasca (Piacenza, Italy).

From limestone to clinker - current situation



From limestone to clinker - CaL application

