



“LIGHTHOUSE PROJECT”, LAFARGEHOLCIM ESPAÑA

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SEMINAR OFICEMEN - Tecnologías de Captura de CO2
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A short- and medium-term strategy for achieving climate neutrality

We are working on four key levers to accelerate the transition to net zero emissions

GREEN BUILDING SOLUTIONS

We offer the world's broadest range of green solutions, like ECOPact green concrete and ECOPlanet green cement, making low-carbon construction possible at scale.



SMART DESIGN

Using smart design we can significantly reduce the environmental footprint of buildings and infrastructure. 3D printing, for example, can reduce the amount of materials used in construction by up to 70% compared to conventional structures.



CIRCULAR ECONOMY

We are driving the circular economy across everything we do, to keep materials in use for as long as possible, giving them a second life – and a third and a fourth – and using only what is needed to preserve nature.



NEXT-GENERATION TECHNOLOGIES

New technologies will transform the way the world builds. With more than twenty pilots in carbon capture, usage and storage, we're exploring how to decarbonize the way building materials are made.



La **TRANSICIÓN ECOLÓGICA** en LafargeHolcim España



CCUS is a prerequisite for climate neutrality



~ 55% of emissions by 2019 (300 kg/t cem) to be eliminated by CCUS technologies

HOLCIM Group chooses CARBONERAS PLANT in Spain for the first industrial-scale CCU plant: LIGHTHOUSE PROJECT

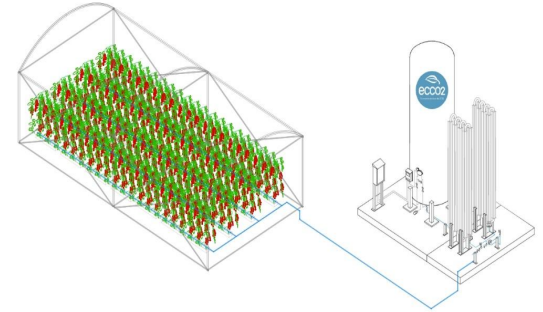
BEYOND 2030...Preparing the future today



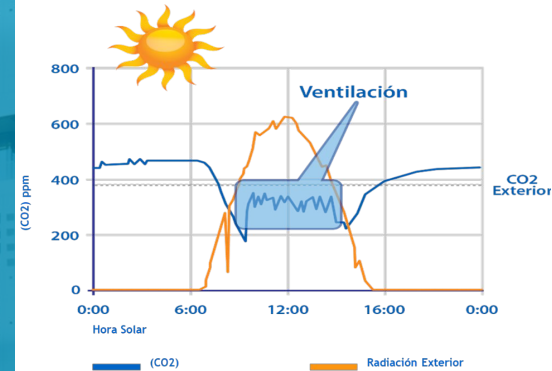
- > 30 CCUS projects in Europe and North America.
- In collaboration with other multinationals and start-ups.
- Technical economic assessment & compatibility with CO₂ alternatives.
- Approx 4 Mtpa CO₂

Destacando Almería como una región agrícola neutra en emisiones de carbono

- CO2 capture plant at LAFARGEHOLCIM ESPAÑA's cement plant in Carboneras.
- Initial capacity of 50 ktpa of CO2.
- Circular economy model: captured and purified CO2 will be used for carbon fertilization in greenhouses in SE Spain.
- JV of LHE, Carbon Clean and STM



CO2 is critical for optimal crop growth and yields



CARBON CAPTURE PLANT -

TECHNICAL DESCRIPTION

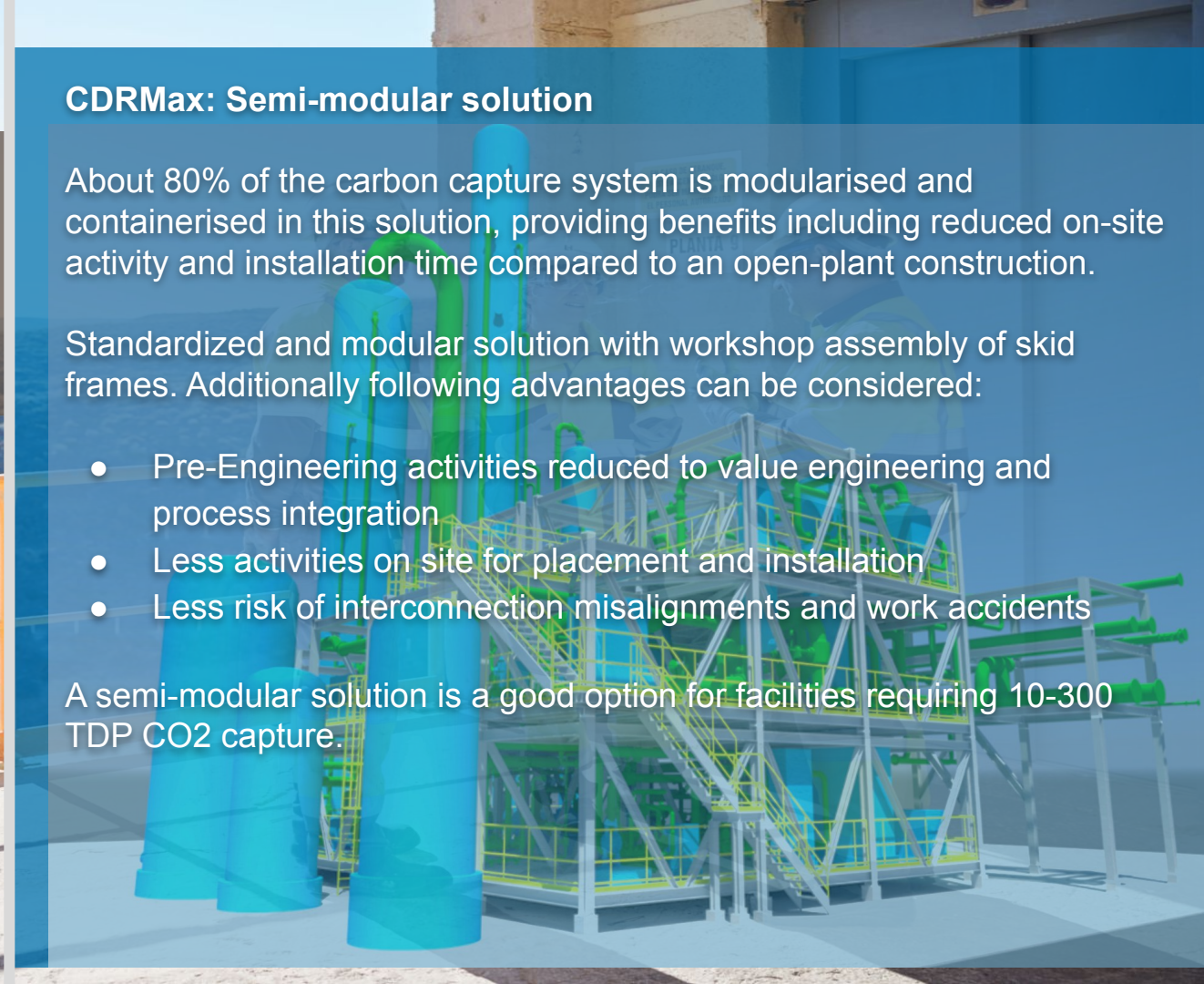
CDRMax: Semi-modular solution

About 80% of the carbon capture system is modularised and containerised in this solution, providing benefits including reduced on-site activity and installation time compared to an open-plant construction.

Standardized and modular solution with workshop assembly of skid frames. Additionally following advantages can be considered:

- Pre-Engineering activities reduced to value engineering and process integration
- Less activities on site for placement and installation
- Less risk of interconnection misalignments and work accidents

A semi-modular solution is a good option for facilities requiring 10-300 TDP CO₂ capture.



CARBON CAPTURE PLANT -

CDRMax® CO2 Process

1

APBS-CDRMax® process exhibits inherent capability to limit aerosols solvent losses & meet stringent emission limits

2

Optimal material of construction due to APBS solvent chemistry: Less corrosion from APBS-CDRMax® solvents allow for lower material construction, ultimately reducing capital expenditures for customers

3

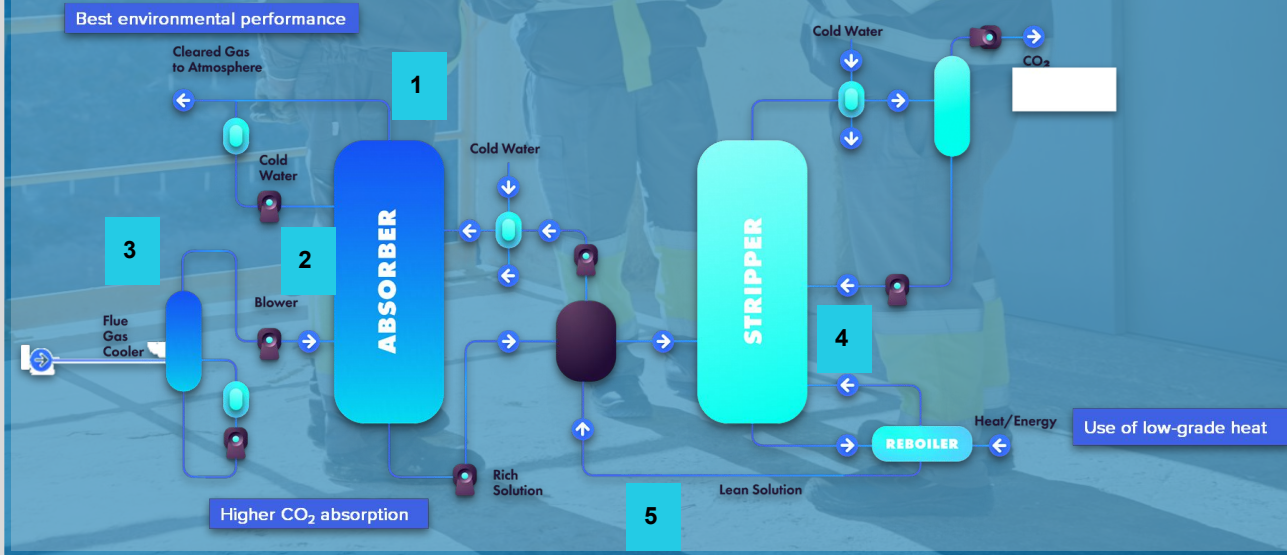
Flue gas pre-treatment IP: Unique process to minimize solvent loss and reduce solvent make-up; 5% operating expense reduction

4

Low grade heat process IP: Innovative process to use low-grade heat use in the process; Up to 80% retention in the steam requirement

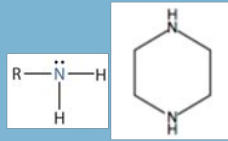
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Solvent treatment IP: Technology help in removing degraded solvent & improve operational efficiency
Reduce solvent loss & MUST run system in CO₂ capture



Carbon Clean

IP and Innovation



Solvent IP

Solvent Chemistry

RPB specific solvent chemistry

Process IP

Process Design

Flue gas pre-treatment

Solvent Purification

Low grade heat process

Heat integrated process

RPB IP

2 Stage RPB's

RPB Deaerator

Modular Process

Know-how

Accumulation of pilot & simulation data

RPB scale-up sizing rules

Solvent (Kinetics) + RPB (mass transfer) integration

Advanced packing

Products

CDRMax[®] - Conventional

CDRMax[®] - Semi-modular

CycloneCCTM - Fully Modular

70

Exiting active patents (33 granted and 37 active patents)

12

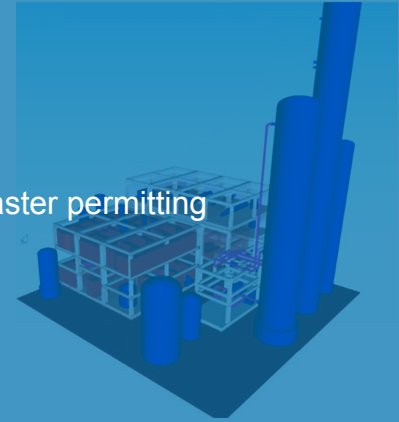
Patent families in 21 countries around the world

ECCO2 Project Carboneras - TECHNOLOGY HIGHLIGHTS

CDRMax: Semi-modular solution

The benefits of the CDRMax semi-modular solution include:

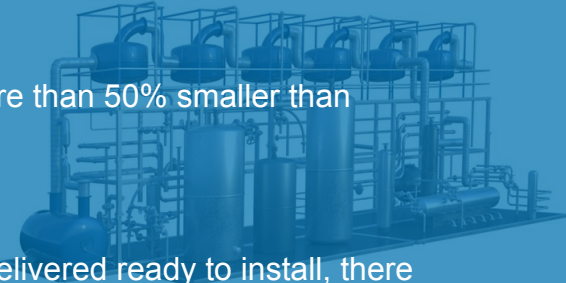
- Simpler and safer installation as the semi-modular systems are prefabricated
- Less installation and on-site activities resulting in minimal site disruption and faster permitting
- Reduced project timeline



CycloneCC: Modular solution

The benefits of CycloneCC include:

- CapEx and OpEx are reduced by up to 50%
- Mass transfer equipment is 10 times smaller and its overall footprint is more than 50% smaller than conventional carbon capture units
- Modular and scalable so units can be added over time
- Simpler and safer installation as the pre-fabricated, skid-mounted unit is delivered ready to install, there is minimal site disruption and faster permitting





HOLCIM