HEIDELBERGCEMENT

Groundbreaking Technologies: CCU/S – Carbon Capture, Utilisation and Storage

CO_2 CARBON NEUTRAL

We are working on all levels to minimise carbon emissions as far as possible. However, a considerable proportion of carbon emissions generated in the process of cement manufacturing is unavoidable and cannot be tackled using established techniques (i.e. use of alternative fuels, clinker substitution). We must therefore develop new technologies that prevent CO_2 from reaching the atmosphere on a large scale.
By investing in different **carbon capture technologies,** we aim to trap CO_2 in its purest form to either utilise or safely store it until it can be used in large quantities.

What is CCU/S?

CO_2 from clinker production is captured for the purpose of Utilisation or Storage in order to prevent it from reaching the atmosphere.

What we do

1. Carbon Capture

HeidelbergCement focuses on 3 technologies for CO_2 capture:

- **Post-Combustion Capture:** At the end of the conventional combustion process, sulphur and nitrogen oxides are filtered out of the flue gas. The CO_2 is then separated from the remaining exhaust gas via a washing system using liquid amine. After separation, the CO_2 with a purity of about 99% percent can be used as a raw material or stored (first full-scale project: CCS in Brevik, Norway).
- **Oxyfuel:** The oxyfuel method is a clinker burning technique in which pure oxygen is introduced into the kiln instead of air. This leads to a CO_2 content of up to 90% in the exhaust gases, which can be further upgraded to 99%. The aim is to capture the CO_2 in a more energy-efficient way than by post-combustion capture, as no additional heat is required. The **Catch4Climate** pilot project in Mergelstetten, Germany, is intended to lay the foundations for the large-scale use of Oxyfuel technology in cement plants, thus enabling the later use of CO_2 as a raw material in other processes.
- **Direct Separation:** A special reactor replaces the conventional calciner of the kiln system to separate the CO_2 already during calcination. Pilot projects are LEILAC 1 in Lixhe, Belgium, and LEILAC 2 in Germany. Direct separation technology is supposed to enable the capture of process-related CO_2 without additional use of heat or any other commodity.

2. Utilisation

Carbon Capture and use refers to the utilisation of CO_2 that has been captured directly from the kiln or separated from the flue gas.

- One option is the usage for **re-carbonation,** so, the deliberate facilitation of CO_2 re-absorption into concrete under controlled conditions.
- We also use captured CO_2 for **algae cultivation:** CO_2 and sunlight are converted by photosynthesis into microalgae, which are then processed into high-quality animal feed (e.g. in Safi, Morocco).

3. Storage

While we prioritise the use of captured CO_2, excess quantities can be safely stored in suitable geological formations in order to fully achieve the decarbonisation target of the cement industry.

- **Off-Shore Storage:** In the CCS project at our plant in Brevik, Norway, 400,000 tonnes of CO_2 are to be captured annually and transported for storage under the North Sea. In Slite, Sweden, we intend to run the world's first carbon-neutral cement plant and capture up to 1.8 million tonnes of CO_2 annually.
- **On-Shore Storage:** In another project in Alberta, Canada, captured CO_2 will be stored onshore in depleted oil and gas reservoirs that the local government has designated for this purpose.

MATERIAL
TO BUILD OUR FUTURE