

# The future is low carbon

Limestone calcined clay cement is expected to play a key role in the decarbonisation of the cement industry. Cementir explains the part played by its FUTURECEM® technology in supporting the drive for low-carbon solutions in the cement industry.

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**A**s part of efforts to achieve ambitious sustainability targets in the cement industry, the development of low-carbon solutions is key. Limestone calcined clay cement technology represents one of the main drivers to transform and further decarbonise cement manufacturers' current product ranges, taking advantage of the availability of clay as an alternative raw material, the increasing focus on supporting changes in cement and concrete standards, and the growing interest in the global building material ecosystem for solutions based on limestone calcined clay.

From CEMBUREAU to the GCCA, including several research centres and national industry associations, many are promoting and highlighting limestone calcined clay technology as one of the much-needed ways to decarbonise the cement industry and the construction value chain.

## FUTURECEM® – limestone calcined clay technology

With its FUTURECEM® patented product based on limestone calcined clay technology, Cementir Group has been the first mover and is playing a leading role in this product transition. FUTURECEM has been on the market in Denmark since 2021, and more recently, was launched in Benelux and France. It is the first limestone calcined clay cement to be industrialised and fully commercialised on a large scale, therefore becoming a reference and a bestseller in the targeted markets to date.

The product is a strategic pillar of Cementir Group's circular economy programme, intended to reduce the environmental impact of its operations by developing less CO<sub>2</sub>-intensive products. It is the result of extensive applied research by Cementir Group's Research and Quality Center in Aalborg, Denmark. It considers the entire value chain – from raw material assessment through to manufacturing and up to concrete technology.



The construction of UN 17 Village in Ørestad, Copenhagen, Denmark, uses FUTURECEM limestone calcined clay cement

The technology allows more than 35 per cent of clinker substitution in cement with limestone and calcined clay, resulting in a more sustainable and better performing cement with up to a 30 per cent smaller carbon footprint when compared with ordinary Portland cement. Moreover, the low-carbon benefits are achieved while at the same time preserving strength and quality.

FUTURECEM technology is fully recognised as a solution for clinker ratio reduction in the roadmap for "Low Carbon transition in the cement industry" by the International Energy Agency (2018) and as "low clinker cements" in Cembureau's roadmap "Cementing the European Green Deal" (2020). Even higher clinker substitution rates are also formally recognised in the EN 197-5 European standard for Type II/C-M cements (up to 50 per cent). Cementir is actively pursuing higher substitution rates as a key partner in the Calcined Clay-Limestone Technology Extension (CALLISTE) project (see further).

A milestone within the development of FUTURECEM technology was the Danish "Green Concrete II" (Green Transformation

of Cement and Concrete Production) project, concluded in 2019, which actively involved the entire value chain of construction and building materials, as well as universities and research institutes. Cements based on FUTURECEM technology as well as concrete recipes were developed and tested at full-scale construction projects: infrastructure elements (two bridges) and an indoor floor and wall in the new concrete laboratory at the Danish Technological Institute.

## Green transition

FUTURECEM is a key contributor to the green transition for the concrete, construction and cement-based industries in general. This was a clear outcome from a survey conducted in the market by Cementir Group to explore and assess the status of the 'green transition' in northern Europe (Scandinavia, France, Belgium, The Netherlands), and how cement players would support this transition.

This journey started in Denmark, where FUTURECEM became the reference cement following its launch in 2021, with all supply volumes almost fully booked for 2022.

The four main pillars of this sustainable transition are:

1. product suitability for intended application
2. targeted communication
3. close dialogue throughout all the building value chain
4. strategic partnerships with leading construction players.

Thorough information about new products and their industrialisation are key drivers to support a transition towards more sustainable products.

FUTURECEM has been primarily focussed on the ready-mix concrete (RMC) segment which exploits the distinct FUTURECEM properties that make concrete more stable against variations in consistency and better to pump – usually a challenge with the rather cement-poor concrete used in Denmark. According to customers, Cementir Group's RAPID cement (CEM I 52.5N) can be easily replaced by FUTURECEM, reaching not only the target performance but also delivering a beautiful finish and perfect surfaces.

Within this segment, Unicon has fully embraced FUTURECEM, embedding it into a complete green product programme under the name of "UniGreen" to promote the use of CO<sub>2</sub>-reduced ready-mixed concrete in all buildings across the country. The company plans to convert the entire production to FUTURECEM in 2022.

Moving to other market applications, several Danish concrete precast producers have been implementing FUTURECEM in their process through pilot production. The main difference perceived is the light-brown colour of the concrete that is considered a seal of quality and visible proof for builders to show their sustainable building credentials. In addition to RMC and precast producers, premix producers are also evaluating and testing FUTURECEM to support their transition. Indeed, a few FUTURECEM-based precast and premix products have been launched on the market for acoustic panels and tile adhesives, respectively.

Since March 2022 the FUTURECEM range has been extended with 25kg bags, big bags and bulk consignments. Getting as many people on board as possible is crucial in the transition to a more sustainable construction industry.

FUTURECEM is particularly suitable for foundations, floors and walls but can also be used in, eg, building mortars. If FUTURECEM is used for a typical concrete floor, a saving of 7.8kg of CO<sub>2</sub>/m<sup>2</sup> can

be achieved compared to the use of conventional grey cement.

FUTURECEM has recently won the Construction Industry Climate Awards 2022, which is given to a climate solution or technology with documented significant reduction of CO<sub>2</sub> emissions when using the solution or in the manufacture of the nominated product.

FUTURECEM is used in RMC and concrete elements for the ambitious sustainable building UN17 Village in Ørestad, Copenhagen, Denmark, with more than 500 apartments. When completed in 2024, it will be known as the world's first housing project integrating all 17 UN world goals in the same building.

Starting this year, a new project with 97 eco-labelled apartments will be built by AP Ejendomme, one of Denmark's largest private builders, who will include FUTURECEM in the foundation works of the project. Moreover, the company's ambition is to use FUTURECEM in all future projects.

### **Further roll-out in 2022**

After the commercialisation in Denmark in 2021, FUTURECEM's roll-out is accelerating in Cementir Group's European markets. CCB, Cementir Group's subsidiary in Belgium, has commercialised FUTURECEM since early 2022 in the French and Benelux markets. In line with Cementir Group's customer centric approach, commercial teams, working together with the R&D centre, have been interacting with key customers to develop a customised value proposition for the identified application segments: RMC, precast, dry mix and general contractors. Customers are fully

supported in the implementation phase of FUTURECEM in their production process.

A testing phase at the customer site has confirmed the general suitability of FUTURECEM across the different applications, with minor adjustments needed to fine-tune mixes.

In this transition process within the C-Green range, CCB Beton has taken the lead with an extensive programme of pilot testing with on-site pouring for several building elements. Compared to CEM II/A-LL 42.5R with fly ashes, relevant savings in terms of CO<sub>2</sub> emissions and cement dosage per cubic metre have been achieved. Selected plants will be dedicated to the FUTURECEM roll-out in the coming months.

Local practices and regulations could limit innovative and low carbon cements and require additional local certification. In Belgium FUTURECEM is undergoing extra durability testing in accordance with local norms to get national technical approval (ATTG), needed to gain full approval for utilisation in RMC. This extra certification is scheduled by the end of 2022.

### **Accelerating implementation**

Sustainability has been prioritised as the key driver in FUTURECEM's overall value proposition. The accelerated action plan is based on rethinking solutions portfolios rather than just products, both in cement and concrete towards a low-carbon footprint, and any opportunities to improve the overall impact of CO<sub>2</sub> in their lifecycle.

As part of a global strategic programme, Cementir Group has been implementing initiatives to incorporate FUTURECEM

First delivery of FUTURECEM® by CCB, Belgium



technology in its global offer: grey and white cement and white cement-based solutions (ultra-high-performance concrete).

Within InWhite®, following Aalborg Extreme® and Aalborg Excel®, Cementir Group has launched a new solution called Aalborg INBIND® – a highly-customised binder solution for UHPC applications.

### **Looking towards 50 per cent CO<sub>2</sub> reduction**

To achieve even higher substitution rates, Cementir, with the Danish Technological Institute, has launched the CALLISTE applied research initiative, built on FUTURECEM technology, which is financed by Innovation Funds.

The main goal of CALLISTE is to reach a CO<sub>2</sub> reduction as high as 50 per cent when compared with conventional Portland cement by 2024, through the development of FUTURECEM with up to 50 per cent clinker substitution, as allowed in the new EN 197-5. The consortium behind CALLISTE comprises all the actors representing the entire value chain from academia to industry and final users, including ready-

mix concrete, precast concrete elements, and dry-cast concrete products.

The cooperation within the entire value chain will offer the opportunity for full-scale demonstrations that are planned in the coming months.

Within the objectives of the project, there is also the development of best practice guidelines for mix design and production of concrete using FUTURECEM with very low clinker content – a critical factor for the full implementation within the building sector.

According to the project activity plan, a wide selection of industrial superplasticisers has been successfully investigated and validated, confirming

Cementir is looking to extend the use of FUTURECEM



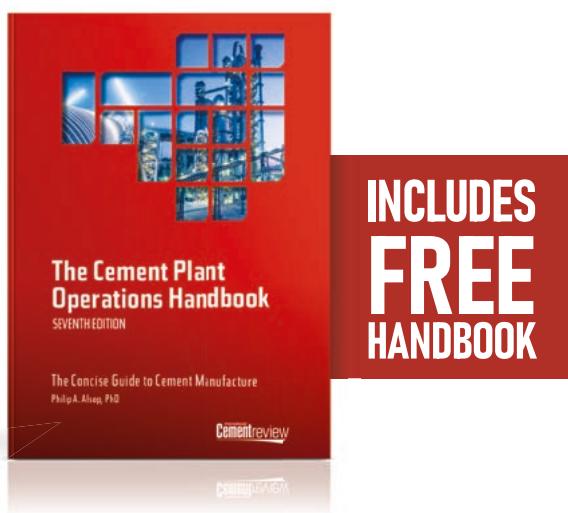
that industrial products are available that enable the production of concrete of high quality with high clinker substitution in calcined clay-limestone cement. A number of concrete blocks intended for long-term durability studies have been produced and placed at field exposure sites and the results from test programme have shown promising concrete properties. ■

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