

Cement sector decarbonisation: the business case

To achieve its 2050 target of net zero cement production, the cement sector will need to apply a range of decarbonisation strategies. However, high capital costs and limited market experience are key barriers to rapid deployment. In the USA, several regulatory incentives are available while the voluntary carbon market offers further opportunities.

■ by *Kayla Carey, Zach Harmer, Braeden Larson and Wilson Fong, ClimeCo, USA*

The cement industry faces increasing pressure to decarbonise from key stakeholders, including buyers, regulators, financial institutions, non-governmental organisations and investors. In response to the proliferating need for climate action, the Global Cement and Concrete Association (GCCA), representing 80 per cent of the industry aside from China, announced a sector-wide net zero goal by mid-century. The US Portland Cement Association established a similar goal to achieve carbon neutrality by 2050. To meet targets, the cement industry must address hard-to-abate process emissions released during clinker calcination, which contributes over half of the emissions from cement production and cannot be reduced through traditional fuel switching or efficiency approaches.

Decarbonisation strategies

To secure the role of cement in the green economy, the sector must significantly reduce the clinker-to-cement ratio, invest in new clinker alternatives, and deploy innovative applications for



Eco Material Technologies turns landfilled coal ash into a reliable product for the concrete industry at its Montour ash harvesting and beneficiation plant in Pennsylvania, USA

carbon capture, utilisation and storage (CCUS). Some companies are already investing in the research and development of breakthrough decarbonisation approaches.

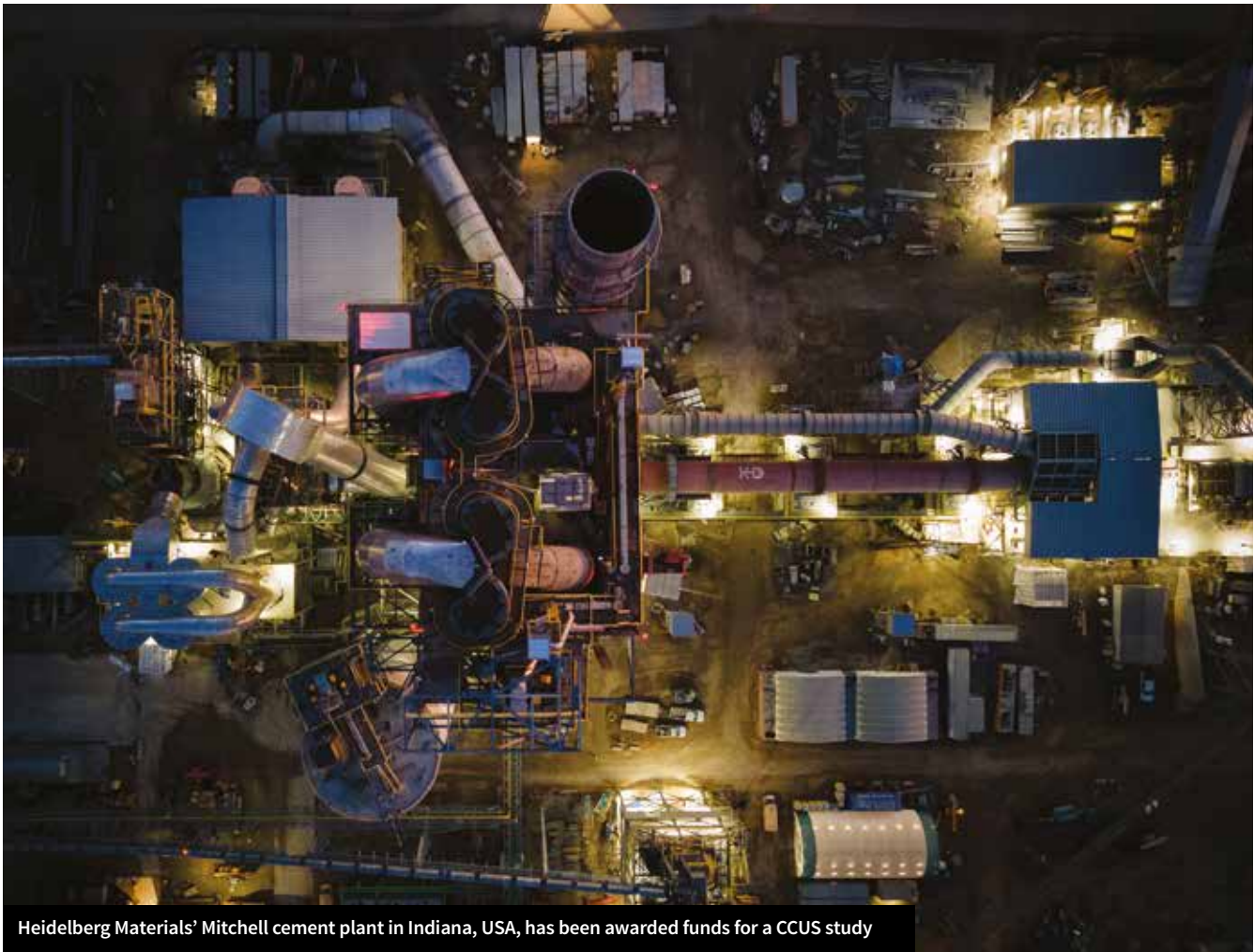
Eco Material Technologies (EMT), a US-based pioneer in building material technologies, brings an alternative cement type to market through the production of harvested fly ash and natural pozzolans. Its first-generation year-round Montour harvesting

operation, located in the northeastern US, reclaims and beneficiates landfilled coal ash into a reliable and high-quality product for the concrete industry. EMT also partnered with the Arizona-based Kirkland Mining Co to develop natural pozzolans into high-quality supplementary cementitious materials (SCMs) that enhance concrete strength, durability and corrosion resistance while significantly reducing emissions.

Heidelberg Materials is building the world's first industrial-scale CCUS cement project in Norway and recently announced the start of a CCUS study for its Mitchell plant in Indiana. Following last year's US\$3.7m grant for a front end engineering and design (FEED) study for CCUS, the US Department of Energy (DOE) most recently awarded US\$8.9m in partnership with the

Eco Material Technologies Kirkland natural pozzolan plant in Arizona, USA





Heidelberg Materials' Mitchell cement plant in Indiana, USA, has been awarded funds for a CCUS study

Illinois State Geological Survey to evaluate subsurface storage at this state-of-the-art facility. With a new line that will triple production, the study will evaluate the potential to store over 50Mt of CO₂ over three decades. Through CCUS, energy efficiency and alternative fuel measures, Heidelberg Materials seeks to lead the US in achieving net zero.

EMT, Heidelberg Materials and others are laying the foundation for a low-carbon building materials industry. However, the scalability of these cutting-edge technologies is hindered by high capital costs and limited market experience. For these products to reach their full potential, the industry needs collective action and a balance of regulatory and market-based financial incentives.

Regulatory incentives in the US

US federal and state governments have recently increased incentive-based programming for hard-to-abate sectors. The cement sector can leverage available and emerging incentives to fund decarbonisation efforts. The following sections review some regulatory incentives

the US cement and concrete industry can use to fund low-carbon products and technologies.

Low-carbon procurement

Low-carbon procurement policies incentivise building material manufacturers to reduce a product's embodied carbon emissions by making this shift economically feasible. Jurisdictions can leverage their purchasing power to restrict market access for products that do not meet embodied carbon content requirements (eg, Federal Buy Clean Initiative). Alternatively, regulators can provide preferential bids for low-carbon products during public procurement. For example, in New York, the Low Embodied Carbon Concrete Leadership Act (LECCLA) offers a five per cent artificial price discount for low-carbon concrete in public bids. This supply-based incentive encourages the adoption of low-carbon concrete by making their respective bids more competitive against traditional carbon-intensive products.

CCUS incentives

As interest in CCUS accelerates, federal

regulators increasingly offer various funding and incentives across the development value chain. The Internal Revenue Service, Section 45Q Credit for Carbon Oxide Sequestration, provides a production-based tax credit per metric tonne of CO₂ sequestered for up to 12 years. Recent amendments increased the tax credit amount and introduced a direct-pay option for the project's first five years, where recipients can opt for a cash payment rather than tax credits. The Infrastructure Investment and Jobs Act provides US\$2.5bn through DOE grants to advance large-scale CCUS projects between 2022-26.

More recently, there has been a surge in interest in CCUS hubs as a solution to lower costs and improve efficiencies. The government has created programmes such as the DOE's "Technical Assistance for Large-Scale Storage Facilities and Regional Carbon Management Hubs" fund to support CCUS deployment. Private sector hub programmes like the Great Plains Institute can use this funding to expand their regional captured carbon sequestration goals.

Other tax incentives

Current green tax incentives to decarbonise exist beyond 45Q and CCUS deployment. At the state level, governments provide industry tax credits for research and development, economic opportunity exploration, and new, large-scale construction. Kansas regulators created a Research & Development Credit to “eliminate uncertainty concerning the development or improvement of a product.” Tax incentives can provide a business case for industry to manufacture low-carbon cement and concrete products.

Opportunities in the voluntary carbon market

Despite recent growth, regulatory incentives alone are insufficient to fund decarbonisation in the cement sector. Where regulatory incentives are lacking, the voluntary carbon market (VCM) can be an effective lever.

Carbon markets are structured mechanisms that allow companies to invest in GHG reduction projects to offset their unavoidable emissions by purchasing certified carbon credits. Unlike compliance-based programmes that are created and regulated by governments (eg, California Cap-and-Trade Program), the VCM is driven by corporate sustainability commitments. A voluntary carbon credit (also known as a carbon offset) represents one metric tonne of CO₂ equivalent that was either prevented from entering or removed from the atmosphere.

Non-profit organisations, called registries, set and manage integrity standards for the VCM. They also host quantitative methodologies (or protocols) which outline the essential parameters to develop a carbon credit project. A high-quality credit abides by core market principles: the emission reductions or removals are permanent, the activity is additional, or beyond business as usual, the quantification uses verified and conservative accounting standards, and the claims are only counted once.

Currently, multiple existing and emerging pathways allow entities throughout the cement value chain to generate credits that could be sold or retired. These opportunities range from new SCM production to the deployment of CCUS and hydrogen.

Low-carbon products

There are a few VCM methodologies that the cement and concrete sector may be

able to use to generate credits for various activities, including the use of CO₂ or sulphur in concrete manufacturing and the production of some blended cements. Most recently, the Climate Action Reserve, one of the most trusted carbon credit registries, announced the development of a protocol for the production of alternative cementitious materials, such as harvested fly ash and natural pozzolans, to fill the existing SCM supply gap and reduce emissions from clinker production. ClimeCo spearheaded this multi-stakeholder effort, which is anticipated to be available for use in mid-2023.

CCUS and hydrogen

Emerging pathways for CCUS projects could also supplement government funds with financing from carbon credits. The American Carbon Registry and Verra’s Verified Carbon Standard are developing methodologies for an array of carbon capture, transport and storage activities. The foremost opportunities, which are expected to be available in mid-2023, will likely credit for the permanent storage of CO₂ in deep-saline aquifers. Some other initiatives include opportunities for accelerated carbonation of demolished concrete and are exploring the potential to

develop credits for CO₂ mineralisation in concrete production.

Similar emerging pathways exist to develop credits for industrial applications of green hydrogen. The GCCA identified green hydrogen as another lever to meet net zero targets. As a major carbon source and large energy consumer, cement producers may be well-poised to take advantage of these upcoming opportunities.

How industry can support incentives

The cement sector has access to several near-and long-term financing pathways for decarbonisation. However, these government and market-based programmes require industry expertise to ensure they are effectively designed. Entities throughout the production chain should monitor and participate in regulatory decarbonisation plans to help policymakers understand and implement the appropriate funding programmes. Similarly, industry should utilise existing carbon credit methodologies to fund decarbonisation, engage in new methodology development and explore the VCM to support new solutions. ■



Government and market-based decarbonisation programmes require industry expertise to ensure they are effectively designed (Pictured: Heidelberg Materials’ plant in Mitchell, Indiana, USA)

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