



Development of “CUCO - Precast Concrete for Construction” that reduces, fixes, and absorbs CO₂, and reduces emissions in the production process by more than 80 percent

—First application as a foundation material for the event hall building at Osaka-Kansai Expo to be held in 2025—

As part of the NEDO*¹ Green Innovation Fund Project titled "Development of Concrete and Other Manufacturing Technologies Using CO₂" (hereinafter referred to as the "Project"), Takenaka Corporation (President: Masato Sasaki), in collaboration with Kajima Corporation (President: Hiromasa Amano) and DENKA Corporation (President: Toshio Imai), is managing the CUCO consortium to implement this project. The consortium is developing carbon-negative concrete*² that emits virtually zero or less CO₂ during the production process.

Through this project, we have now developed "CUCO - Precast Materials for Construction" (hereinafter referred to as "developed materials"), which is a type of concrete that reduces, fixes, and absorbs CO₂. Compared to conventional concrete, these developed materials can reduce CO₂ emissions by over 80 percent during the production stage.

There are four variations of the developed materials, each featuring different combinations of the technologies that reduce, fix, and absorb CO₂. All of these materials will be applied as foundation components for the Pavilion World Messe Event Hall Building (a temporary structure*³) at the 2025 Japan International Exposition (Osaka-Kansai Expo). This marks the first time these materials will be utilized in an actual building. After the Expo, the Event Hall Building will be dismantled, but the developed materials will remain in use as a foundation to test the resource recycling technology. Additionally, we will investigate how the properties of the concrete, such as strength and durability, change over the long term when used in a real-world environment.

*1 NEDO: New Energy and Industrial Technology Development Organization

*2 Carbon-negative concrete: Concrete that reduces, fixes, or absorbs more CO₂ than the amount of CO₂ emitted during manufacture.

*3 Temporary buildings: Buildings constructed to last only for a short period, such as for an exposition. Structural performance is equivalent to that of a permanent structure.



Foundation members of the Event Hall Building of Osaka-Kansai Expo where the developed materials were applied

■ Outline of the Developed Materials

The concrete we developed incorporates various technologies designed to reduce, fix, and absorb CO₂. The three main technologies implemented are:

1. Technology to Reduce CO₂ Emissions

This technology cuts CO₂ emissions by approximately 60 percent by utilizing ECM*⁴ cement, which incorporates blast furnace slag fine powder known for its low CO₂ emissions, in place of conventional cement.

2. Technology to Fix CO₂

This technology stores CO₂ by fixing it into the calcium content of concrete demolition debris, which is then used as aggregate or filler in the new concrete (referred to as CCU material*⁵).

3. Technology to Absorb CO₂

This technology enables the absorption and fixation of CO₂ after concrete hardening. It involves mixing cement with LEAF, a special admixture that enhances the capacity to absorb CO₂ and effectively densify the hardened body.

In this application, four types of developed concrete are utilized, which include combinations of technologies (1 and 2 with different CCU materials), (1 and 3), and (1, 2, and 3).

※⁴ ECM: Abbreviation for Energy and CO₂ Minimum, a cement in which about 60 percent of conventional cement is replaced by blast furnace slag fine powder, an industrial by-product, to reduce energy consumption and CO₂ emissions during cement production.

※⁵ CCU materials: CCU stands for carbon capture and utilization, which in this technology refers to materials for concrete produced by utilizing (fixing) CO₂ as a resource.

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Takenaka Corporation



Reference URL : <https://www.takenaka.co.jp/news/2022/01/04/>

Reference URL : CUCO website <https://www.cuco-2030.jp/english/>

■ Future Development

CUCO will work with NEDO to develop and improve CO₂ reduction, fixation, and absorption technologies to achieve carbon negativity, thereby contributing to the transition to a decarbonized society.