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Singapore's innovation turns concrete into carbon storage solution

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Technology

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Singpaore scientists develop method to 3D-print concrete that captures carbon. (Photo: NTU Singapore)

Singapore has developed a 3D printing technology that not only produces concrete with better carbon sequestration capabilities but is also stronger and more durable than traditional materials. The key to this innovation lies in the combination of steam and carbon dioxide.

Steam boosts concrete's carbon absorption

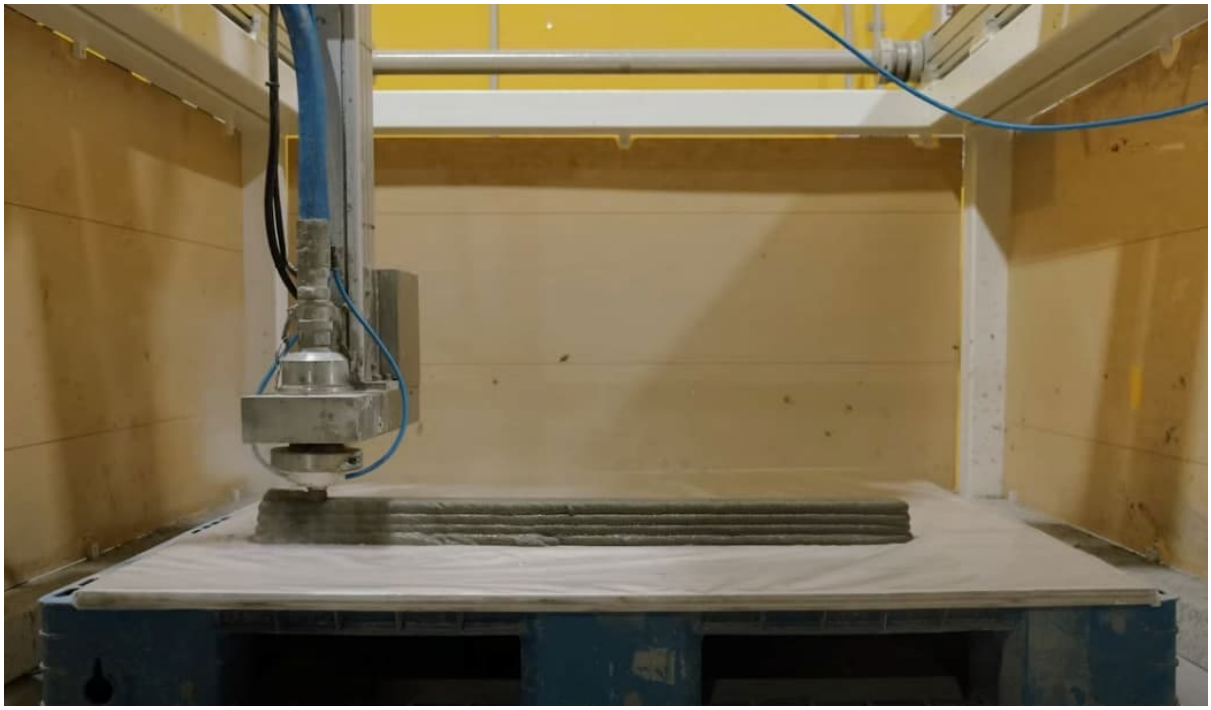
This technology was developed by the Department of Mechanical and Aerospace Engineering at Nanyang Technological University (NTU Singapore) and the Singapore Centre for 3D Printing (SC3DP).

During the printing process, steam and carbon dioxide are injected into the concrete mixture. The carbon dioxide reacts chemically with the components in the concrete to mineralize and

form a solid that is permanently sequestered, while steam enhances the carbon absorption capacity.

Tests conducted by scientists have shown that, compared to traditional 3D concrete, the new method increases carbon sequestration by 38%, the weight-bearing capacity by 36.8%, and improves bending strength.

Additionally, the new concrete can be shaped more effectively and precisely, enhancing its printability by 50%. Unlike traditional concrete, which takes 1 to 3 months to harden, the carbon-infused concrete hardens much more rapidly.



The research team at NTU Singapore injects steam and carbon dioxide into the concrete mixture, allowing the carbon dioxide to solidify and be permanently sequestered. (Photo: NTU Singapore)

Commercialization timeline still unknown

Professor Tan Ming Jen, who leads the research team at NTU, stated that the steam and carbon dioxide combination technology is patented by Saudi Arabian oil company Aramco. His team applied it to 3D printing.

"We believe that because of the greater surface of the area and the more control small chambers that we have, we can infuse a lot more carbon dioxide into the concrete. Those are the advantages of marrying the two technologies," he explained.

The research conducted by Professor Tan's team was published in the Carbon Capture Science & Technology journal. In a recent interview with Channel NewsAsia, he mentioned that the team is in the process of applying for a U.S. patent but did not disclose a commercialization timeline.

The construction industry accounts for 40% of global carbon emissions, with cement production alone contributing 8%, making it a significant carbon-emitting sector.

Professor Tan believes that with the rise of carbon pricing, particularly as Singapore increases its carbon tax, there is an excellent opportunity for the development of building materials that permanently sequester carbon dioxide. He called on more researchers and businesses to join efforts to accelerate the development of this technology.

Source: Carbon Herald, Open Gov, CNA