



Pan-United Corporation & CarbonCure: A Success Story

Pioneering greener concrete in Singapore and beyond



Introduction

Pan-United Corporation Ltd. (Pan-United) is Singapore's largest supplier of ready mix concrete and cement, with a six decade history of supporting the country's construction industry. Pan-United also has a strong track record for sustainability, having been the first company to attain the [Singapore Green Building Council's \(SGBC\) "Leader"](#) certification, which is its highest level of sustainability certification, in February 2017.

The team takes a holistic approach to sustainability, incorporating digital technologies and integrated management systems, as well as water and waste management, and an innovation-led eco department. The result of this is more than 150 specialised green-certified concrete products that comply with Singapore's SS EN 206: 2014 concrete standards for specification, performance, production and conformity (very similar to the EN 206: 2013 standard in Europe). Pan-United's concrete products also meet the evolving environmental, design, and product quality needs of an industry increasing its demands for sustainable solutions.

CarbonCure is one such innovation pioneered by Pan-United's ready mix branch, Pan-United Concrete. The team saw CarbonCure's proven technology, which introduces recycled carbon dioxide (CO₂) into fresh concrete to reduce its carbon footprint without compromising performance, as a way to support its mission to become a global leader for sustainability in the ready mix concrete space.

Pan-United became [the first CarbonCure concrete producer in Asia](#), initiating an industry-wide movement to adopt more environmentally friendly practices in the region.



Customer Profile

Pan-United's ready mix concrete business began in 1999 and has grown to become Singapore's largest supplier, with more than 25 batching plants. The company also has a growing footprint in Malaysia and Vietnam. Pan-United has a vertically integrated value chain, from its raw materials to ready mix concrete production.

Pan-United's mission is to shape smarter cities. The team of more than 1,000 employees delivers on this with its wide range of safe, sustainable, and environmentally-friendly concrete solutions. The company's impressive leadership in this area made it the first and only concrete firm to win the prestigious 'SGBC-BCA Sustainability Leadership Award,' which was jointly presented by the SGBC and the Building Construction Authority (BCA) in 2019.

"We are excited about our pioneering collaboration with Canadian-based cleantech company, CarbonCure. We estimate that our implementation of CarbonCure's technology can reduce over 4,000 tonnes of carbon emissions annually at each of our concrete plants."

Chairman's Statement, Pan-United Corporation Ltd. Sustainability Report 2018



Motivations for Evaluating CarbonCure

The construction landscape in Singapore is changing, with an increased focus on sustainability that Pan-United Corporation is well-placed to support. The company began its own sustainability journey in 2001, which has included the adoption of recycled raw materials as substitutes for natural resources and pioneering sustainable business practices like paperless concrete deliveries.

Always on the look-out for new and innovative environmental solutions, Pan-United Corporation followed the development of CarbonCure with interest, before being formally introduced via SGBC. In particular, the team appreciated the low capital expenditure involved in adopting CarbonCure, and how simple it was to implement the technology to reduce concrete's carbon content.

The evaluation of CarbonCure wasn't without hesitation. While Singapore and the surrounding region was starting to prioritize sustainable business operations, the transition was slow. The concept of introducing CO₂ into concrete was a foreign concept to many and Pan-United was concerned about lack of adoption.

This challenge is common among early adopters of any technology, when the need to engage and inform new audiences is key. CarbonCure works alongside its producer partners on educational offerings, and provides a wide range of technical and marketing literature ready for its partners to use.



Implementing CarbonCure

CarbonCure's Installation team supported Pan-United through the implementation process, which included retrofitting the technology onto existing batching plant setups and finding a location to accommodate the CO₂ storage tanks. This was done without difficulty and, critically, did not interrupt any ongoing production operations. CarbonCure's team then helped to integrate the technology with Pan-United's existing batching systems.

When it came time for Pan-United's quality control team to carry out plant trial mixes, CarbonCure's Technical Services and Support (TSS) team supported Pan-United's team through conducting testing, data analysis, mix optimization processes and dosage ramp trials.

These internal tests validated that CarbonCure concrete and conventional concrete have identical fresh and hardened properties, including strength and durability. They also proved that CarbonCure concrete meets the requirements set by Singapore's SS EN 206: 2014 concrete standards for specification, performance, production and conformity (very similar to EN 206: 2013 in Europe).

With CarbonCure, not only does the injection of CO₂ in the mix permanently embed it into the concrete, but the mineralization process improves compressive strength, enabling the reduction of cement while maintaining the expected performance. The majority of the carbon reduction is achieved by reducing the amount of cement in the mixes. Pan-United's testing found the same workability and desired strength in CarbonCure concrete using 5% less cement—and no change to pumping, placing, or finishing.



Results

Using the test results and subsequent optimised mix designs, Pan-United has been able to show customers that the performance of CarbonCure-based mixes matches that of conventional concrete. The majority of customers that have used, or are using, CarbonCure-based mixes with 5% cement reductions have adapted to it without any complications.

Where design consultants require additional durability results before specifying CarbonCure concrete, Pan-United has conducted these tests with the support of CarbonCure's TSS team. The results—including accelerated carbonation and pore solution pH value—have been successful, further increasing the adoption of CarbonCure concrete among Pan-United's customer base.

Today, CarbonCure-based concrete mixes are being used in a wide variety of buildings in Singapore, from corporate headquarters, to residential buildings and infrastructure projects.

As of March 2021, Pan-United has saved over 425,000 kilograms (940,000 pounds) of CO₂ with CarbonCure, which is more than 211 hectares (522 acres) of U.S. forest absorbing carbon for a year.

Reference Projects



Surbana Jurong Campus (Part of Temasek) Cleantech Loop, Singapore (Jurong Innovation District)

Building description: Corporate Headquarters
Cement reduction: 5%
Completion date: Estimated 2021



Linde Integrated Manufacturing Complex with ExxonMobil Asia Pacific Pte. Ltd

Building description: Gasification Plant
Cement reduction: 5%
Completion date: Estimated 2023



Avenue South Residences Silat Avenue, Singapore (Bukit Merah)

Building description: Condominiums
Cement reduction: 5%
Completion date: Estimated 2023



JTC Infrastructure Works at Lor Halus Tampines Road, Singapore

Building description: Infrastructure
Cement reduction: 5%
Completion date: Estimated 2021

A Sustainable Commitment

As CarbonCure's first partner in Asia, Pan-United Corporation is playing an important role in expanding the availability of sustainable concrete in the region. Acknowledging the growing awareness and demand for greener products in the construction industry, the team recommends that other producers adopt CarbonCure as an effective way to make concrete production sustainable:

"We view CarbonCure's clean technology as very useful in addressing the urgent climatic need to reduce the global carbon footprint. Pan-United intends to expand the use of the technology by introducing it to other ready mix concrete producers in Singapore and the region.

"While reducing the overall carbon footprint, we believe this special process has multiple benefits to enable sustainability gains not only for concrete producers and the construction industry but also for developers in their building projects."

*Ken Loh,
Chief Operating Officer, Pan-United Corporation*



Learn More About CarbonCure

CarbonCure's solution enables the production of the same reliable concrete but with a reduced carbon footprint. The technology injects a precise dosage of CO₂ into concrete during mixing where it mineralizes.

The mineralized CO₂ improves the concrete's compressive strength, enabling producers to safely reduce cement content in their mixes and achieve further carbon reductions without compromising quality.

CarbonCure's Technology: A Closer Look

CarbonCure offers a concrete solution to reducing embodied carbon. CarbonCure's technology works by injecting recycled carbon dioxide (CO₂) into fresh concrete during mixing.

Once injected, the CO₂ undergoes a chemical reaction known as CO₂ mineralization, where the CO₂ converts into a nano-sized mineral. What was once CO₂ is now eliminated, never to be re-released into the atmosphere.

Mineralized CO₂ improves the concrete's compressive strength, which then enables the reduction of cement content in mix designs without impacting strength or performance.

Every cubic metre of concrete produced with CarbonCure's technology saves an average of 15 kilograms (25 pounds) of CO₂ emissions from entering the atmosphere, and provides a 4-6% reduction to Global Warming Potential.

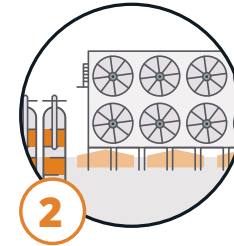
An average building built with CO₂ mineralized concrete would save over 680,000 kilograms (1.5 million pounds) of embodied carbon, which is **equivalent to** the carbon emitted by an average gas powered passenger vehicle drive for 2.7 million kilometres (1.7 million miles).

How it Works



1

CarbonCure's technology is retrofitted to an existing concrete plant in one visit.



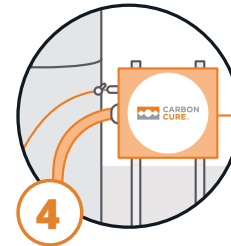
2

Carbon dioxide (CO₂) gas is sourced as a by-product from industrial processes.



3

The purified CO₂ gas is delivered in pressurized vessels by commercial gas suppliers.



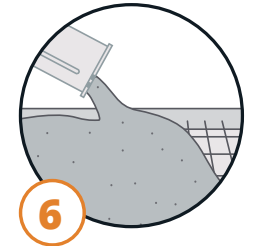
4

CarbonCure's proprietary delivery system precisely injects the CO₂ into the concrete mix.



5

Batching is controlled by a simple interface integrated with the batch computer.



6

Once injected, the CO₂ converts into a nano-sized mineral that becomes permanently embedded in the concrete.



Build for the Future. Build with CarbonCure.

CarbonCure has been used on thousands of projects ranging from healthcare to higher education, residential developments, and corporate campuses.

For more information about building with CarbonCure concrete, visit carboncure.com. To get in touch with a CarbonCure representative, send us an email at info@carboncure.com or give us a call at **+1 (902) 448-4100** (Worldwide) or **+1 (844) 407-0032** (North America).