



Trio Ready-Mix & CarbonCure: A Success Story

How a ready mix producer uses CarbonCure to transform its reclaimer water into profitable virgin material replacement

Introduction

Trio Ready-Mix has been providing concrete to Southern Vancouver Island contractors, developers, landscapers, and homeowners for over 50 years. Part of the Ralmax Group of Companies, Trio is renowned for its unwavering commitment to customer satisfaction.

In addition to ensuring quality concrete, Trio is committed to its workers' safety and protecting the beautiful natural environment in which it operates. That's why sustainability was top of mind when Trio was building its new concrete plant in downtown Victoria, British Columbia, Canada.

Around the same time, an opportunity arose to become the first concrete plant to adopt CarbonCure's **XPRIZE-winning** reclaimed water technology—Trio jumped onboard.





Trio and CarbonCure

In 2018, Trio designed a new concrete plant in Victoria, British Columbia. As an environmentally conscious company, Trio began exploring ways to reduce the environmental footprint of its new facility.

"It's very rare that you get to build a brand new concrete plant. Our original plant was built in the 1960s. Even though concrete production hasn't changed much since then, we wanted to take this opportunity to evaluate the innovative new technologies available to us," said Stephen Hay, General Manager at Trio Ready-Mix.

With sustainability in mind, Trio added reclaimers and other equipment to manage mixer washing water and returned concrete at the new site. The team also adopted <u>CarbonCure</u> <u>for Ready Mix</u> to reduce the use of carbon-intensive cement in its concrete mixes. Today the ready mix solution reduces cement requirements by up to 4% across Trio's mixes, resulting in the removal of over 80 tonnes (89.3 US tons) of carbon dioxide from Trio's operations in just 21 months.

Trio's new equipment for managing water produced from truck washouts, returned concrete, and other onsite activities made it a great candidate to trial CarbonCure's latest technology— CarbonCure for Reclaimed Water—in a commercial setting.

CarbonCure for Reclaimed Water can help producers replace virgin cement requirements further, while reusing water from the plant by stabilizing and preserving the reactivity of the cement solids present in the reclaimed water.

The technology was developed as CarbonCure's submission and eventual grand prize winner—in the final round of <u>the</u> <u>NRG COSIA Carbon XPRIZE</u>.



How CarbonCure for Reclaimed Water Works

- **1.** Ultrafine suspended solids are created in reclaimed water through a reaction with CO₂. The presence of these solids enhances concrete strength when present in new mixes.
- **2.** The existing cement fines are CO₂-stabilized and can be recycled for equal use as a binder material in new concrete mixes, replacing the need for virgin cement.
- **3.** CarbonCure for Reclaimed Water reduces the unpredictable variability in fresh concrete properties that occurs when using untreated reclaimed water slurry in new concrete production.



Evaluating and Implementing CarbonCure

Before Trio's trial, CarbonCure for Reclaimed Water had been through over 1,500 hours of industrial testing and data-gathering as part of the final round of the Carbon XPRIZE. However, Trio was the first commercial setting to implement the solution.

"There was some initial apprehension because we were the first to roll out a technology that had previously only operated in a lab setting. We didn't know what to expect when we rolled it out in a large-scale production plant," said Stephen.

The team started slowly, introducing the technology in a few mixes and testing and monitoring performance in the field. Once the production team was comfortable with the results, usage increased and the team eventually began replacing cement content in their mix designs.

In the past, Trio's reclaimed water management philosophy was to intentionally keep the solids in suspension until they stopped being reactive, because they couldn't control or predict the reactivity of the cementitious fines effectively.

"For over 30 years, the concrete industry has been challenged to find an effective solution for reclaimed water. Because CarbonCure standardizes and stabilizes the cementitious fines in the reclaimed water, we get repeatable, consistent results that allow us to gain maximum value from the cementitious fines in terms of strength. It almost acts as a supplementary cementitious material."

> Stephen Hay General Manager, Trio Ready-Mix





Hands-On Support from CarbonCure's TSS Team

The CarbonCure Technical Services and Support (TSS) Team was on the ground with Trio for the entire implementation and testing period. The team set up a small lab at Trio's plant to run tests on the concrete, slurry, and water.

Trio also conducted internal testing and hired a third-party testing company, EXL Engineering, to verify all slump, air, and strength tests.

Results

Today, Trio is replacing cement content by 3% with CarbonCure for Reclaimed Water—and gaining up to an additional 4% reduction with CarbonCure for Ready Mix.

The team initially implemented the solution in residential and low specification mixes. Today, CarbonCure for Reclaimed Water is used in 70% of Trio's mix designs, and over 75% of Trio's produced concrete. The team intends to add it to its high-performance 45, 50, and 60 MPa (6,527, 7,252, and 8,702 psi) concrete as it completes its optimization process before the end of the year.

There are many misconceptions about reclaimed water in the industry, so it can be challenging to promote the benefits to the end customer.

However, when reclaimed water is properly treated with CO_2 and the solids present in the reclaimed water are accounted for in the batching process, producers can reduce the environmental footprint of concrete while still ensuring end users have good control of set time, workability, and other critical fresh properties.

The stabilized and enhanced cement fines created by using CarbonCure for Reclaimed Water enables concrete producers to reduce the amount of fresh water content in their mixes by 17-20%.

"Recently, we had a concrete finisher on a site who expressed concern that Trio was planning to use reclaimed water in its mixes. He was amazed when I informed him that we had been using it in our mixes for over a year—and he hadn't noticed a difference."

> Stephen Hay General Manager, Trio Ready-Mix

Results Spotlight



No change in the set time between mixes using city water versus reclaimed water.



No change in slump and air between CarbonCure mixes and control mixes.



3% cement replacement with CarbonCure for Reclaimed Water.





Up to **7% virgin cement reduction** when combined with CarbonCure for Ready Mix.



Return on Investment

When CarbonCure-treated reclaimed water is used in Trio's concrete mix, the savings average CAD \$0.90 per cubic meter of concrete.

"Our initial motivator was environmental, not monetary. However, we have seen a great return on investment. The virgin cement replacement is where the true environmental and cost savings are, but the water treatment and savings on the cost of safe fines disposal are also significant," said Stephen.

Additionally, because of the high consumption rate of CO_2 in CarbonCure for Reclaimed Water, CO_2 costs are significantly lower.

"Not only do I save money on CO_2 costs, but also provide an excellent opportunity to permanently sequester large volumes of CO_2 every year," said Stephen.

"A lot of it comes down to volume, so the key is adding CarbonCure into as many mixes as possible. There is a minimum amount of concrete production to make it all viable, but it's not an extraordinarily high number by any means."

> Stephen Hay General Manager, Trio Ready-Mix

CarbonCure's Carbon Removal Program

Thanks to the use of CarbonCure's technologies, Trio has a great opportunity to sequester carbon and participate in CarbonCure's Carbon Removal Program.

For every cubic meter (1.3 cubic yards) of concrete produced with reclaimed water, approximately 1.1 kilograms (2.4 pounds) of CO_2 is permanently sequestered and an additional 8 kilograms (17.6 pounds) of CO_2 is avoided due to the replacement of virgin cement with upcycled cementitious solids in the reclaimed water.





What's Next for Trio and CarbonCure?

Trio Ready-Mix is an early adopter of CarbonCure for Reclaimed Water, but the team has no regrets about taking the plunge.

In the future, Trio intends to use CarbonCure in every mix design to gain virgin cement replacement benefits and to reuse all of its water in concrete production.

"We endeavor to have no stormwater discharge from our site, and being able to use CarbonCure for Reclaimed Water in as many mixes as possible is the key to that."

> Stephen Hay General Manager, Trio Ready-Mix

The team also intends to work with CarbonCure's Market Development Team to showcase its environmental efforts and educate its market about the benefits of using reclaimed water when properly treated—in all concrete mixes.

To learn more about CarbonCure for Reclaimed Water, please <u>contact us</u>.







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 <u>carbonVcure.com</u>. To get in touch with a CarbonCure representative, send us an email at <u>info@carboncure.com</u> or give us a call at +1 (902) 448-4100 (Worldwide) or +1 (844) 407-0032 (North America).