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ISDIP

ISDIP052	Opportunities exist with Firth to save water by increasing recycled water in concrete mixes	
Date	March 2024	
Business Unit	Brian Perry Civil	
Project & Region	Auckland Airport – Northern Region	
ISC Themes	Innovation Innovation Emissions, Pollution and Waster Water	õ

1 What Happened?

Brian Perry Civil (BPC) is providing main contractor services for the Air New Zealand Hangar 4 Foam Tank at Auckland Airport. This building project has a Green Star requirement that encourages sustainable thinking with our supply chain. As a large portion of our carbon footprint is linked to concrete usage, we are looking for ways to reduce the Global Warming Potential (GWP) of the concrete that we use.

2 What Are We Doing Differently?

BPC and Firth began workshopping how we could further reduce the GWP of the concrete. The workshopping identified emissions could be reduced using recycled water instead of potable water for most of the available mixes. The amount of recycled water used in the concrete mix can be adjusted to suit. Firth's 'Green Star' low carbon rules require that a minimum of 50% recycled water is used for the mix to qualify as a low carbon concrete mix.



Recycled water low carbon concrete mix.

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The Firth team began producing concrete using recycled water for BPC to trial. This was sourced by Firth from washing of the batching machines, delivery trucks and equipment at the plant and rainwater that is collected on these areas. The collected water is filtered at the plant, but still has a high PH and is considered hazardous if it was disposed of inappropriately. The recycling is therefore saving potable water as well as finding a destination for contaminated water.

The performance results from the concrete are not affected by using recycled water, however the additional suspended solids in the water act as nucleation points for the crystal to grow. This means the concrete sets faster than it normally would, depending on the percentage of recycled water used. The construction team therefore needs to factor this workability change into their construction approach.

An initial trial programme was established, with a focus on how fast the concrete would cure. These were conducted in areas where the concrete finish wasn't critical. With initial results being successful, the BPC team is now using it for most of our pours on the Foam Tank project.

Savings to date: Firth estimate they have saved 20m3 to 25m3 of potable water to date, and the project has further potential to save another 10 - 15 m3. (Generally 1m3 of concrete uses 120 - 140 litres of water. When ordering 50% recycled water there is a saving of 60-70 litres of potable water per m3 of concrete).

As noted above – as well as offsetting the use of potable water, the contaminated water is not required to be treated or disposed of.

This change is a great example of how collaboration and aligned sustainability targets can create a mindset of seeking and driving change. The reduction in potable water use is an important carbon reducing strategy, and with the supplier and contractor working together, these types of opportunities can be introduced.





Firth and BPC Trialing Low Carbon Concrete

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When a large enough volume of concrete is used, Firth can provide a specific Global Warming Potential (GWP) value for the concrete mix being used. This allows the impact this change has had on our emissions profile to be calculated.

An important tool in our sustainability decision making are Environmental Product Declarations (EPDs). These documents quantify the environmental impact of the products we purchase, and the majority of Fletcher Building products have invested in EPD's to assist their customers. Firth's EPD covers their full national production capability, and ranges from mixes from 17.5MPa, right up to 50MPa. The EPDs also contain step-by-step guides that assist selection of to achieve the most eco-friendly mix to suit the required application.

https://www.firth.co.nz/concrete/low-carbon-concrete/epd-ecomix-concrete/

Going forward, the BPC Airport team is continuing with further trials and a mindset to reduce carbon, achieve great results for our client and share these learnings for the benefit of the wider industry.

3 More Information





KO TE WAI TE ORA NGĀ MEA KATOA WATER IS THE LIFE GIVER OF ALL THINGS

Water is a taonga of huge importance to lwi and Aotearoa, as the basis for all life, it is to be cherished and looked after. Essential for our lives, water sustains, cleanses, and refreshes us, as well as providing support for how we live.

It's fundamental for our economy including growth of pasture, crops, forestry, and electricity generation.

Further to this, for Maori, water holds a spiritual life force, that we need to preserve. Firth understands the importance of water to not only Maori culture, but also our economy and the biodiversity of Aotearoa. Which is why recycling concrete wastewater is an integral part of Firth's sustainability goals. All water that has the potential to be contaminated with cement is contained and collected at Firth plants.

Contaminated water sources are generated from the washing of trucks and yard spaces that cement dust may fall on. Rainwater falling on these areas is also channelled to collection and harvesting points.

Cement contamination raises the pH of the water significantly and it is hazardous to flora and fauna if it is discharged to ground, or if it makes its way into stormwater systems or natural waterways.

Firth has, for many years, recycled this water back into concrete manufacture as a substitution for fresh water supply. This allows us to reduce our draw on fresh water sources as well as reducing the risk and impact of contaminated water discharge.

The water we use has been settled to minimise the quantity of solids suspended within the water reducing the impact the recycled water may have on the concrete. Particularly high pH or high solid waters will often lead to accelerated set times in the concrete, an issue that can be exacerbated in higher strength concrete that tends to already have shorter set times.

The amount of recycled water generated varies across each of Firth's plants and is dependent on numerous factors such as the numbers of trucks at a plant washing out and the frequency they require washing, as well as the size of the operational areas and the amount of rainfall falling on the plant.

Each plant will have a variable quantity of recycled water available against the amount of concrete production, it means the mixes utilising recycled water and the percentage of water used varies. Some plants utilise 100% recycled water and others will vary generally by mix design or grade of concrete.

Most Auckland plants utilise 100% recycled water in lower strength concrete but utilise a variable scale across higher strength mixes.

Customer requests will also influence the recycled water use with Greenstar designed projects utilising more and projects more sensitive to potential set time variation (such as finished slabs) utilising fresh water.

There are normally opportunities available to increase the use of recycled water, especially in higher rainfall periods and Firth welcome the opportunity to discuss further via operational or technical staff how we can help support sustainability initiatives in your project.

