RECYCLED CONCRETE

Vivian Tam

ABOVE: Vivian Tam, Western Sydney University. OPPOSITE: Tam's CO_2 Concrete.

WHERE ONCE concrete structures might have been expected to stand for 100 years or more, the typical lifetime is now 50 years or less as a result of regular updates and design changes, says Professor Vivian Tam, Associate Dean Research and Discipline Leader Construction Management at Western Sydney University's School of Engineering, Design and Built Environment.

Often, once a concrete structure reaches the end of its life, the only option for most concrete waste is landfill. Only about five per cent is recycled into aggregate for low-grade pavement.

"My research looks into how waste concrete can be recycled into high-grade aggregate and made as strong as virgin concrete," Tam says.

Tam has developed a method to create such density and strength using recycled aggregate. It involves treating the aggregate in a pressurised chamber and injecting carbon dioxide. This increases strength and reduces water absorption, bringing the "CO_2 Concrete", as Tam calls it, up to the level of structural concrete.

At current Australian levels of production, CO_2 Concrete could provide a net lifecycle benefit of $16 billion and save 2.68 billion kg of carbon dioxide emissions, she says, compared to a cost of $22 billion for using virgin concrete.

So what's the problem?

"Engineers are reluctant to be the first to use the CO_2 Concrete," Tam says.

But things are slowly coming together, as smaller projects such as a drinking station for cows at Western Sydney University use the recycled product.

"I still don't have an industry case study," Tam says.

"Part of the problem is perceived risk, and part is the government not pushing projects to use it. In Japan, for example, the government says industry has to use more recycled materials on projects of certain sizes. That drives innovation." ➤

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MAKING IT REAL

DESIGNING AND DEVELOPING A NEW PRODUCT OR PROCESS THAT REDUCES EMISSIONS IS ONE THING BUT SELLING IT TO INDUSTRY IS ANOTHER.

ABOVE: Lucia Cade FIEAust CPEng, Non-Executive Director, Engineers Australia.

The best technology in the sector will go unnoticed and unappreciated if it doesn't meet a client's current need, or help achieve their stated purpose, says engineer and non-executive director Lucia Cade FIEAust CPEng, Chair of South East Water and Non-Executive Director of Engineers Australia, Carbon Revolution, Urban Utilities, and Paintback.

"I think the most important thing, if you want to work with a particular client, is to understand what their purpose is," she says.

"Have they done the work of developing a business climate target and putting a framework in place? Because if they haven't, your solution is only ever going to be measured on the standard net present value on whatever time frame they look at."

Many of the advanced case studies outlined in this article – Professor Veena Sahajwalla's proof of concept work with Molycop, Dr Stuart Bell's research into improvements in concentrated solar thermal, Professor Vivian Tam's search for an industry partner to prove her CO_2 Concrete capability – illustrate how engineers recognise the essential nature of solving a real and current problem.

The next step, Cade says, is to understand on a company-specific basis how an innovation might fit into their unique climate target framework.

"The most important thing about the businesses whose boards I sit on is that we have, in our purpose and our strategy, a climate change target, goal and commitment. We've had discussions about what kind of business we want to be, and a discussion about our role not just in the economy and for our employees, but also in society. So we've then got strategies in place to achieve that, with targets and time frames.

"That leads to a gateway process or a framework for how we're going to transition or invest, meaning every business decision is aligned to that."

When working with a business that does not have such a framework, it's difficult for a climate-informed solution to succeed, because it can only be evaluated in a financial way, rather than more holistically.

What does this mean for engineers working on innovative, climate-related offerings?

It means they must be aware of the inner workings of the businesses they would like to work with or sell to. It also means they should target potential clients that have climate frameworks in place.