

Corporate Knights



Class of 2013

Inaugural Global Green MBA:
Business School Report Card



SAVE TO WIN **p20**

An emerging financial product called prize-linked savings accounts entice people to put money away for rainy days. But does it really work?

NEW ENVIRONMENTALIST **p22**

Having battled corporations for decades, more environmental groups see collaboration with big business as the quicker path to positive change.

THE LESS GREAT LAKES **p38**

Low water levels are just one sign of how climate change is hurting the world's fourth-largest economy. How bad is it? What can we do?



In Focus: CarbonCure Technologies

Injecting CO₂ into concrete as it hardens is helping slash its towering toll on the climate

ADAM ASTON



Robert Niven, CEO of CarbonCure, sees "carbon-neutral" concrete in our future.

Concrete is a conundrum. It's the world's most heavily consumed manmade material, with nearly three tonnes used per person, every year. Yet for the climate, baking limestone into cement does more harm than practically any other industrial process.

To help cut cement's supersized carbon footprint, Halifax, Nova Scotia-based startup CarbonCure Technologies is tinkering with the age-old recipe for how cement cures into concrete, its final rock-like form. The company's answer: carbonated cement.

"Every day millions of tonnes of concrete is produced globally," says Robert Niven, chief executive and founder. "Every tonne is a lost opportunity to sequester carbon dioxide."

Devising greener concrete is no easy task, in part because the recipe is deceptively simple and has proven to be such a remarkably good building material for so long.

It is, quite literally, the stuff from which civilization has been built. Today's cement traces back to formulations first used 7,000 years ago. Some Roman-era structures, such as the domed Pantheon, are as sturdy today as when they were erected two millennia ago.

Today's megastructures are likewise possible only because of concrete's peculiar mix of performance and affordability, from the biggest dams to our tallest towers.

The problem? The manufacturing of cement emits 5 per cent of the world's greenhouse gases, on par with about half of all emissions from car, truck and other road transport. Among industrial sources of CO₂, the industry trails only the much larger petrochemicals sector.

Making cement emits roughly equal shares of CO₂ at two stages: first, from the fuel used to heat a mix of limestone and traces of other minerals to 1,450 degrees Celsius; and second, from the resulting chemical reaction, where limestone breaks down into lime, giving up nearly half its mass as CO₂.

Unless better recipes are devised, emissions will keep growing. A building binge across the developing world is expected to more than double global cement production this decade, according to the Carbon War Room, a London-based think tank.

CarbonCure is tackling that problem by focusing on how cement cures into concrete. The company's proprietary process injects anthropogenic CO₂ – captured from big industrial sources such as natural gas reformers – into the mix as concrete is being formed into an array of masonry products, including blocks and pavers.

As the CO₂ percolates through the mix, it triggers a chemical reaction, remak-

ing microscopic bits of limestone in the concrete matrix, permanently locking the gas into a rock-like structure. The resulting concrete block is not only greener; it turns out stronger than the standard stuff.

The carbon savings can stack up quickly. As a rule of thumb, every standard concrete block made using CarbonCure's recipe sequesters around 30 grams of CO₂. Thus, some 3,000 of them can lock up as much CO₂ as a mature tree does in a single year.

The first U.S. structure to be built with CarbonCure's green blocks was completed at the University of California, Davis in the spring. Exterior walls of the Jess S. Jackson Sustainable Winery Building, a one-storey, 8,500-square-foot research facility, were built with more than 2,500 specially manufactured blocks made by Basalite Concrete Products, based in Dixon, California. The result, says Niven, is the lowest-carbon concrete-block wall ever built in the U.S.

CarbonCure is currently working with four partners in North America that are producing its low-carbon blocks, pavers and other masonry products. Atlas Block, a major Canadian concrete manufacturer, is in negotiation to supply the low-carbon blocks for several sports complexes being built for the 2015 Pan Am Games in Toronto. "This is easily the most exciting technological improvement I've seen in years," says Atlas chief executive Don Gordon.

Another dozen partners are in the pipeline, says Niven. In time, he hopes to expand the company's reach to China – where more than half of the world's concrete is currently being produced – and other global markets.

He also hopes to see CarbonCure move beyond masonry to apply its process to larger precast structures and ready-mix, the wet slurry of concrete and aggregate delivered in big mixing trucks.

Given that roughly 12 billion tonnes of concrete is produced every year around the world, if CarbonCure can adapt its technology to all concrete types, "the potential to reduce carbon is huge," Niven says.

Indeed, green efforts are advancing in other aspects of concrete production. Industrial waste, such as fly ash or slag, offers a low-carbon alternative to cement. And major manufacturers such as Lafarge and Holcim are using more low-carbon or carbon-neutral fuels, such as biomass, to replace fossil fuels used in cement kilns.

Taken together, these green steps suggest that concrete could someday be "carbon neutral, or even carbon negative," says Niven. 🌱