



Corbion
Keep creating

Self-healing concrete

Exploring new
applications
through
co-creation.



Self-healing concrete: exploring new applications through co-creation.

The capabilities we deliver to biochemical customers are always set in the context of application functionality. How do we make our customers' products better? We do this across five key fields of expertise: controlled release technology, adhesion, solvency, emulsification and antimicrobial protection. Functionality represents our meeting ground for doing business with customers, and is the engine room for innovation and growth. Our customers are experts in applications, like pharmaceuticals, agrochemicals, electronics and biochemicals, while we provide cutting-edge technological expertise in lactic acid technology. Together we find breakthrough opportunities, as well as concrete solutions that meet their industry requirements.

This is exactly what happened when we were approached by the Technical University (TU) Delft to progress its exciting innovation – self-healing concrete.

Why self-healing concrete?

It is generally accepted across the construction industry that concrete will crack. However, even small, hairline cracks can cause serious problems. For this reason, the importance of good design and application cannot be underestimated – especially when it comes to reducing the extent of cracking. Cracks that measure up to 0.2 millimeters are widely admissible, but to prevent them from becoming larger, substantial amounts of steel reinforcement are required. Or alternatively, self-healing agents in virgin concrete can be applied. By sealing cracks and therefore protecting steel frameworks from external forces, corrosion is avoided, and the life of concrete structures can be extended. An essential consideration in times of rapid urbanization.

The start of a co-creation journey

The TU Delft had been working on a self-healing concrete project. During ongoing research, scientists found an innovative way to manufacture limestone-producing bacteria. This involves exposing bacteria to oxygen and water to convert substrates into calcium carbonate (i.e. limestone). In doing so, cracks can be effectively sealed – this is known as self-healing concrete.

The university, however, experienced some technical challenges when using the self-healing concrete in application. During the making, pouring and curing of the concrete, it found that the substrate being used did not survive the process. TU Delft was therefore looking for a partner with in-house product development experience and knowledge of lactic acid-based controlled release mechanisms to support its ongoing research. Specifically, it was looking to develop technology that releases the substrate at the moment the crack occurs in the concrete. As such, their partner would be required to meet a range of specific needs for the substrate. These included not impeding the setting time or the strength of the concrete.



Corbion proved to be the right partner for TU Delft and saw great potential in this collaboration. With extensive expertise in lactic acid, derivatives and polymer production, we used our knowledge to implement a solution that could deliver long-term results.

Challenging the norm

We began our co-creation journey with a thorough review of the first self-healing agent prototypes. This involved technical workshops, including both Corbion and TU Delft experts. While Corbion focused on product development, TU Delft explored the application – in doing so, both entities were able to play to their strengths to further progress.

We jointly discovered it was possible to create a new self-healing agent that was capable of overcoming the technical hurdles of the first prototypes. This resulted in a more stable product that can survive the concrete making process and perform well in application.



Futureproofing for success

Crucial to the future commercialization of the project was the establishment of a robust business development plan. Through commercial meetings – not only between Corbion and TU Delft, but also external parties, including concrete material manufacturers – together, we sought the best approach to successfully bring the product to market.

Here, the first phase of Corbion's collaboration with TU Delft came to an end. A new company – Green-Basilisk – was established in 2014, and self-healing concrete became available to the construction industry for the very first time in 2017. Now, with a product range containing three variants, Green-Basilisk's self-healing concrete has been recognized as a true innovation across the industry not only in Europe but also Asia, Middle East and Africa.

Continuing the co-creation journey

Our self-healing concrete co-creation journey with Green-Basilisk continues today. A key hurdle to overcome now is price. Challenging the status quo and constantly looking for ways to optimize production, a cost reduction project is currently underway to determine new and innovative ways to lower the cost to a level far closer to that of regular concrete additives. If our co-creators succeed, self-healing concrete is likely to become a viable and sustainable product that can protect bridges, marine structures (waterdams), tunnels and other concrete structures over a 100-year lifespan.

We can't co-create alone

Recognizing opportunities and sharing our ideas to improve our partners' processes and products makes us the co-creators we are. But we can't co-create alone – we need partners from all sectors to identify novel applications for biomarkets. By combining our knowledge, we can create ground-breaking new products that can solve seemingly impossible challenges – like autonomous healing cracks in concrete.

About us

About Corbion

Corbion is the global market leader in lactic acid, lactic acid derivatives, and a leading company in emulsifiers, functional enzyme blends, minerals, vitamins and algae ingredients. We develop sustainable ingredient solutions to improve the quality of life for people today and for future generations. For over 100 years, we have been uncompromising in our commitment to safety, quality, innovation and performance. Drawing on our deep application and product knowledge, we work side-by-side with customers to make our cutting-edge technologies work for them. Our solutions help differentiate products in markets such as food, home & personal care, animal nutrition, pharmaceuticals, medical devices and bioplastics. In 2017, Corbion generated annual sales of € 891.7 million and had a workforce of 1,794 FTE. Corbion is listed on Euronext Amsterdam.

For more information: www.corbion.com

About Green-Basilisk

Green-Basilisk is the Delft University of Technology spin-out offering self-healing concrete solutions. The company has developed a self-healing agent that can be added to repair products or virgin concrete and that closes cracks in the concrete. Green-Basilisk's solutions increase the durability and service lifetime of concrete structures, whilst decreasing maintenance and repair costs as well as related downtime. A patented technique was developed in cooperation with Henk Jonkers, Erik Schlangen and Sybrand van der Zwaag. Green-Basilisk was founded by its CEO Bart van der Woerd. In 2017 Green-Basilisk was financed by Shift Invest and has sufficient resources to take the next steps towards sustainable construction.

For more information: www.basiliskconcrete.com



Interested in our solutions? [Contact us biobased@corbion.com](mailto:biobased@corbion.com)

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