

COMPANY

Novacem
novacem.com

LOCATION

London, United Kingdom

SOFTWARE

AutoCAD® Plant 3D

Being able to develop this process – using state of the art layout design tools – allows Novacem to effectively and efficiently scale up the technology. This approach enabled us to explore different concepts by giving our design team more freedom to be creative, while pioneering new and innovative production techniques.

—The Novacem technical team

Green cement

How Autodesk helps Novacem create carbon negative cement

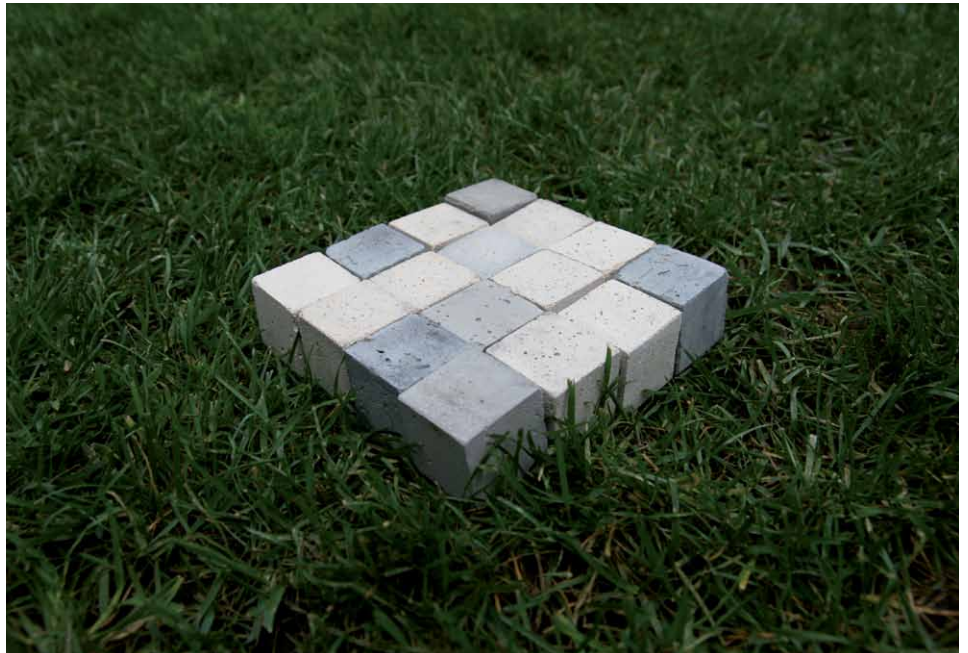


Image courtesy of Novacem.

Cement forms the ‘glue’ that holds the building and construction industry together. Globally, the cement industry is worth around £100bn; the industry supplies 2.9bn tons of cement to support global economic development every year, and this is set to grow to 5bn tons a year by 2030, mainly due to rapidly increasing development needs in India and China. However, the environmental impact of this huge industry is equally significant. Figures show that the cement industry contributes 5 percent of the world’s CO₂ emissions, making it one of the largest polluters globally. Mitigating emissions across the cement industry, therefore, needs to form an important part of any overall strategy to meet global emission reduction targets.

The production of 1,000 kg of cement emits approximately 800kg of CO₂. Fifty percent of this comes from the release of CO₂ bound to the main raw material limestone, while 40 percent is generated by the combustion of fossil fuels needed for the main chemical reaction, and the remainder from electricity use and transport.

In an effort to reduce emissions, the cement industry is working to adapt its processes through a combination of techniques which

include: reduction of clinker (by partially replacing it with materials such as slag, limestone and fly ashes); the partial use of alternative fuels; and energy efficiency techniques. However, even a combination of these steps will only have an incremental impact on the cement industry’s environmental impact.

Novacem’s solution

With this in mind, Novacem is developing a new solution which has the potential to significantly reduce the cement industry’s CO₂ output. To help it achieve its goals, the company is currently using Digital Prototyping software from leading vendor Autodesk®, including, most prominently, the AutoCAD® Plant 3D solution.

The Novacem process, which aims to deliver a carbon negative cement and related manufacturing process, has the potential to revolutionize the industry. Launched in 2007 as a spin-off from Imperial College, London, the firm was recently listed on Global Cleantech 100, drawn up by the Cleantech Group in conjunction with a 60-person international panel of experts, to highlight the most promising private, clean technology companies from around the world.

The Autodesk Clean Tech Partner Program supports early-stage clean technology companies with design and engineering software they can use to accelerate their development of solutions to the world’s most pressing environmental challenges. For more information visit [autodesk.com/cleantech](https://www.autodesk.com/cleantech)



Image courtesy of Novacem.

Meeting the challenge

Current cement industry emissions, based on the production of Portland Cement, arise from two principal sources. Firstly, calcination of the raw material, limestone (calcium carbonate), releases carbon; secondly, the high levels of energy needed to achieve the necessary temperature – in the region of 1,400°C – and to grind the clinker produced by calcination, require significant amounts of fossil fuel.

Instead of using limestone as a foundation, Novacem's cement is sourced from magnesium oxides and carbonates, which are produced from naturally occurring magnesium silicates. As a result, there is no stored carbon in the raw material to be released during processing, and magnesium silicate is plentiful, with reserves of more than 20 trillion tons. The Novacem process also requires relatively modest temperatures of around 700° C, which means

that low carbon or carbon neutral fuel can be utilized. Finally, the Novacem process produces a magnesium carbonate compound which absorbs CO₂ during production, and which is included in the final cement composition; this means that an already low-carbon production process can become carbon negative. Overall, the Novacem process could reduce emissions by 850kg per ton compared with traditional cement.

Pilot plant

Novacem already operates a laboratory pilot plant, and uses Autodesk design software provided through Autodesk's Clean Tech Partner Program to support development and upgrades. Additionally, it's providing a template design which will be used to develop engineering drawings, and Novacem is also making use of the tool for digital design, supporting fine tuning and cost control.

An important element of using the Autodesk design software is to visualize the systems before they are physically built and installed. Virtual realizations of the plant, with walk-throughs and three dimensional representations, can be developed. These representations not only help design work but also provide images to third parties such as investors, partners, and planning, environmental and safety agencies. AutoCAD Plant 3D brings modern 3D design to plant designers and engineers to help streamline the placement of piping, equipment, and support structures, reducing complexity and evaluating different designs quickly and easily. As part of the program, Novacem has been working with recognized AutoCAD Plant 3D consultants who are supporting the firm in training its engineers to use the program efficiently.



Image courtesy of Novacem.

This software has given us important design capability and allowed us to help our investors visualise the technology. We value the opportunity to be part of the Autodesk Clean Tech Partner Program.

—The Novacem technical team

Future development

With the help of Autodesk software, Novacem will continue to upgrade its existing production capacity and further mature towards commercial production. Throughout this process, Digital Prototyping technology will be key in enabling Novacem to digitally design, visualize and simulate how the planned automated control systems will work under real-world conditions before they are built and installed. This approach allows for the exploration of a range of different concepts. Novacem's design team will have the freedom to be creative and to pioneer new ideas in pursuit of new solutions that improve its production process, with the aim of making it the standard for the construction industry.

For more information

To learn more about the Autodesk Clean Tech Partner Program, visit

autodesk.com/cleantech.

Learn More about Autodesk Products

- Autodesk Inventor software: autodesk.com/products/autodesk-autocad-plant-3d