

## A TSB success story: Transforming construction with carbon negative cement

**Novacem has developed an innovative carbon negative cement which will offer a scalable and transformational alternative to current carbon intensive cement production. A £1.5m Technology Strategy Board project was key in developing the pilot plant needed to prove the technology. Our partners in this project were Laing O'Rourke, Rio Tinto Minerals and WSP Group.**



### The need

Cement is a vital strategic commodity with 2.9 billion tonnes produced each year. The cement industry is responsible for approximately 5% of global man-made CO<sub>2</sub> emissions and now faces an urgent need to reduce emissions as part of the transition to a low carbon world. However the potential to reduce emissions using existing technology is limited and the industry acknowledges that innovation is needed. Novacem delivers that innovation.

### The project results

Novacem has developed a carbon negative cement which will be direct substitute for ordinary Portland cement, offering performance and cost parity (before the cost of carbon is factored into the comparison).

Cement is the binder which when mixed with water, sand and aggregate (rock or stone) hardens to form concrete. Traditional cement production involves heating limestone (calcium carbonate) which releases significant volumes of CO<sub>2</sub>, with further emissions from fossil fuels required to reach temperatures of 1450°C. On average, 800kg of CO<sub>2</sub> is released to produce 1 tonne of ordinary Portland cement.

Novacem's cement is based on magnesium oxide and a special form of magnesium carbonate. The raw materials used are magnesium silicates, which contain no carbon. Production of Novacem cement involves a net absorption of up to 100kg of CO<sub>2</sub> per tonne of cement. Comparing this to emissions of 800kg per tonne of ordinary Portland cement, a reduction of up to 900kg of CO<sub>2</sub> could be achieved per tonne substituted. Novacem will license carbon negative cement technology on a non-exclusive basis to ensure maximum reduction of emissions across the cement industry.

## The cement industry

With carbon prices of over €50 per tonne forecast, the price of conventional cement production could double in the future. To address this scenario, twenty-three of the world's leading cement companies form the Cement Sustainability Initiative which recently produced an emissions roadmap to 2050. This report, produced in conjunction with the International Energy Agency, confirms that the emissions reduction potential of existing technologies is limited. The roadmap also highlights Novacem as a new technology to watch.

## Innovative partnerships

Novacem recently announced the first closing of its Green Cement Bond, together with the participation of Lafarge, the world leader in building materials, as the first subscriber. The Novacem Green Cement Bond is an innovative commercial and financial approach for engagement with major cement manufacturers to accelerate the development and commercialisation of Novacem's negative carbon cement. The Bond is for a nominal £1 million and it is expected that subscribers will also participate in future Novacem fundraising.

## International recognition

Novacem has been recognised as Technology Pioneer for 2011 by the World Economic Forum. The Forum has extended the honour to thirty one visionary technology start-ups who are poised to have a critical impact on the future of business, industry and society. Additionally, MIT Technology Review featured Novacem among the Top 10 Emerging Technologies for 2010.

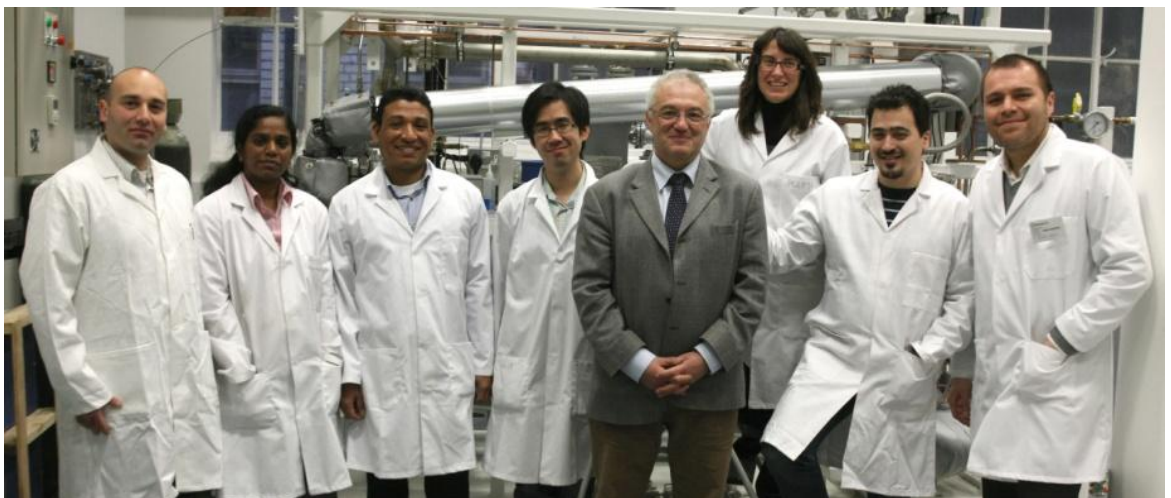
*"The TSB project has been vital in accelerating the progress of Novacem. It supported the development of our pilot plant and early testing of our materials; two key steps in the journey to commercialisation and deployment of our carbon negative cement on a global scale" – Howard Simons, Novacem Vice-President of Engineering*

## TSB project information

Participants: Novacem Limited, Laing O'Rourke, Rio Tinto Minerals, WSP Group, Imperial College

Total TSB Project Investment : £1.5 million  
Total TSB Investment Level : £735k

Novacem contact:  
Howard Simons, Novacem Ltd, The Incubator, Bessemer Building, Imperial College, South Kensington, London SW7 2AZ UK.



*Members of the Novacem TSB team*