

Low carbon future for concrete

UK engineers are developing carbon-efficient concrete that could be used soon in construction and industry, thanks to an innovative project funded by the Technology Strategy Board.

The need

From roof tiles and patio slabs to structural beams and columns, concrete is the basis for many construction applications and its use is growing. According to the International Energy Agency, global cement demand by 2050 will be between 3.69-4.4 billion tonnes.

Cement manufacture is also responsible for around 5% of CO₂ emissions. Increased pressure on manufacturers from government and consumers to reduce carbon emissions across all industrial sectors means there is a drive towards finding sustainable alternatives to current processes.

The results

With funding from the Technology Strategy Board, a British consortium led by sustainable buildings consultancy BRE, has developed new materials, based on 'Alkali activated ash' (AAA) binders that set and bind concrete together. These 'low carbon binders' can be used in concrete products such as tiles and pavers and offer significant benefits, including 70% fewer carbon emissions compared with traditional cement. As well as improved durability and strength, AAA is produced from readily available waste or by-products such as ash materials, which would otherwise end up in landfill.

The new binders are unlikely to fully replace traditional Portland cement but they will provide a cost-effective and alternative choice in concrete products where low environmental

impact gives the concrete producer a competitive advantage. If widely adopted, the new binders offer the public benefits of reduced CO₂ emissions, diversion of industrial waste from landfill to beneficial re-use, and the creation of a new low carbon concrete industry for the UK.

The project has produced reliable data on how to produce the binders on an industrial scale; has created prototype concrete products with 30% less CO₂ impact, and has sufficient critical mass to move the new technology towards commercialisation. Similar products are being developed in Australia but the UK is at the forefront of the new technology in Europe. Those behind the project estimate that these new concrete products could be on the market by 2015.

Potential applications

Trial industrial products produced under the project included roof tiles and pavers. Other potential products made with alkaline ash binders include concrete blocks, kerbs and bollards. The global sustainability drive encourages both private and public purchasing

decisions toward products and materials with low CO₂ emissions. The project leaders believe that the new product could take between 10% and 20% of the traditional Portland cement market and compete favourably against imported products.



Next steps

A new research project, which started in 2009 with support from the Technology Strategy Board, aims to improve cost and performance and to extend applications into

ready-mixed and re-inforced concretes, for example, foundations for buildings. Barriers to the uptake of AAA technology and the requirements of consumers are also being explored.



Technology Strategy Board Driving Innovation

Collaborative research and development projects are one of the tools that the Technology Strategy Board uses to drive innovation in the UK. The Technology Strategy Board is a business-led executive non-departmental public

body, established by the Government. Its role is to promote and support research into, and development and exploitation of, technology and innovation for the benefit of UK business, in order to increase economic growth and improve the quality of life. It is sponsored by the Department for Business, Innovation and Skills (BIS).

Tel: 01793 442700 www.innovateuk.org

'Thanks to funding from the Technology Strategy Board the project has stimulated much interest within our business and has allowed us to find alternative binder solutions for concrete products over traditional Portland cement.'

IAN FERGUSON, FORMERLY GROUP
CONCRETE TECHNOLOGIST, MARSHALLS

Alkaline Ash Binders for Durable & Resource Efficient Construction Materials

Project No: K1068H

Total project investment:
£288,441

TSB investment:
£144,221

Project duration:
April 2007 - September 2009

Contacts:

Dr Andrew Dunster, BRE
T 01923 664365
E dunstera@bre.co.uk
W www.bre.co.uk

Mr Roy Lewis, Marshalls Mono
T 01422 434196
E Roy.Lewis@marshalls.co.uk
W www.marshalls.com

Mr John Fifield, CRH
T 01525 244924
E john_fifield@compuserve.com
W www.fortcrete.co.uk