

**Project title:** Low carbon multi-component cements for UK concrete applications

**Main applicant:** Mineral Products Association (MPA)

**Technology developer:** N/A

**Industry partners:** Hanson Cement, Forterra Building Products Ltd., Building Research Establishment Ltd. (BRE)

**Demonstration capital cost:** £485,000

**Funding awarded:** £327,000

**Project timeline:** July 2018 – March 2021

**Project description:** In today's cement and concrete industry, the carbon impact of cement is commonly reduced by substituting the primary component – Portland cement clinker – with lower carbon secondary components such as fly ash (a waste from coal fired power stations), GGBS<sup>1</sup> (a by-product from iron and steel manufacture) and ground limestone. While such practices are already popular in the UK, the National Application standards (e.g. BS 8500 for concrete) permit only the use of single components, to produce either clinker-fly ash, clinker-GGBS or clinker-limestone cements.

The Mineral Products Association (MPA) has identified that limestone remains underutilised in the UK and could be optimised in new low carbon multi-component 'clinker-fly ash-limestone' or 'clinker-GGBS-limestone' cements. International research has shown that the use of ground limestone in these cements is known to improve inter-component synergy, potentially leading to higher rates of clinker substitution.

By demonstrating that low carbon multi-component cements are suitable for the UK construction market, the MPA hopes to liberalise the relevant National Application standards. This would be achieved by (1) designing and optimising multi-component cements; (2) engaging with the Building Research Establishment to carry out rigorous validation testing of the new cements in a range of concrete applications; (3) demonstrating that the multi-component cements are suitable for full-scale production through the successful design and manufacture of precast retaining wall structures.

**Barriers to market:** The UK construction industry relies on tried and tested materials with a long history of good performance. This is important for maintaining standards and producing structures that are fit for purpose. However, this cautious approach presents a barrier for new and innovative materials, which means that their uptake can be hampered. In order to increase confidence in the use of non-traditional materials, rigorous validation testing (medium-term) or field data (long-term) needs to be produced to influence the relevant standards and guidance.

**Size of target market:** UK cement production is approximately 10.2 Mt per year. The new multi-component cements should quickly replace Portland-fly ash cement, which currently represents around 14 per cent of the market. Over time, it is conceivable that low carbon multi-component cements could represent 30-40 per cent of sales. Recognition of multi-component cements by the National Application standards would immediately allow manufacturers to produce, market and sell these cements.

**Initial TRL:** The project will cover multiple TRL's between 5-8

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<sup>1</sup> GGBS refers to ground granulated blastfurnace slag

**Targeted final TRL: TRL 9**

**Energy and carbon savings:** It is estimated that there could be potential carbon emission savings of eight per cent across the UK's cement sector, which currently emits around 7.8MtCO<sub>2</sub> annually. Additionally, some of these new cements have carbon emission profiles 40 per cent lower than conventional alternatives.

**Why IEEA funding was important to this project:**

*"The Industrial Energy Efficiency Accelerator is doing exactly what is intended in this project. It has led to early engagement with industry and BSI and will accelerate the route to market of low carbon multi-component cements that are new to the UK. The research, testing and demonstration will provide crucial evidence and assurance for architects, specifiers and engineers to confidently use these new low carbon cements to deliver the Government's plans for low carbon schools, housing and infrastructure"* - **Dr Richard Leese, Director, MPA Cement**