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New PureGRAPH-CEM[®] product to be trialled at UK's largest cement plant with Breedon Group

Highlights

- **Third trial scheduled with United Kingdom's largest cement producer, Breedon Group plc**
- **Trial will use new, specialised graphene formulation developed specifically for cement dispersion**
- **Next phase of testing with Breedon Group was developed under a Joint Development and Commercialisation Agreement to deliver graphene enhanced cement**
- **Potential improvements achieved using new formulation validated by an industrially recognised third party**

First Graphene Limited (ASX:FGR; "First Graphene" or "the Company") is pleased to announce a third trial with one of the United Kingdom's largest cement producers, Breedon Group plc ("Breedon"), will test an optimised formulation of the Company's PureGRAPH-CEM[®] product under full-scale production conditions.

This trial builds on the pioneering work recently conducted in exclusive collaboration with Breedon at its Hope Plant, which confirmed the Company's ability to produce graphene enhanced cement at an industrial scale.

The third trial incorporates the technical and practical experiences obtained in the first two trials to further optimise the performance of First Graphene's leading graphene nanoplatelets.

New graphene product to be trialled at UK's largest cement plant

The trial will primarily focus on testing a new grade of graphene, PureGRAPH-CEM[®], under full-scale cement production conditions at Breedon's Hope Cement Works facility in Derbyshire, United Kingdom.

The new product from First Graphene is based on a PureGRAPH[®] grade with a particle size distribution and morphology optimised for use in cement grinding mills, enabling the graphene to be added directly to the mill without any additional processing equipment.

Scheduled to start in Q1 of the 2024/25 financial year, the trial will use just over two tonnes of the specialised aqua-dispersed product, which could produce up to 1,000 tonnes of cement.

The new graphene product will be used as an additive in the cement production process, complementing traditional cement grinding aids throughout the trial.

The trial will last eight hours and involves close monitoring of cement fineness before and during the addition of the PureGRAPH[®] grade product.

The trial has two objectives:

1. Validate the mechanical improvements demonstrated at the pilot scale
2. Confirm whether milling throughput can be improved using the new product, reducing energy consumption

This third trial will be planned and executed collaboratively with the Breedon site team, under the terms of the Joint Development and Commercialisation Agreement signed in 2023.



Image 1: Breedon Group's Hope Cement Works facility in the United Kingdom

Results from this trial are expected in the second half of 2024.

New and improved PureGRAPH[®] designed for cement

There have been multiple improvements made to the PureGRAPH[®] product chosen for use in this trial, which will simplify the addition process and minimise disruption to the cement plant.

This formulation can be readily dosed using standard processing equipment, whilst avoiding the sedimentation issues associated with graphene dispersions.

Special treatment of the graphene also removes the need for additional or customised dispersion equipment in the cement plant, as the solution can be loaded directly into the mill.

The PureGRAPH-CEM[®] product also has an optimised manufacturing process to ensure it meets cost structure requirements for the broader cement and concrete industry.

As a result of process optimisations, this new grade of graphene has up to 50% less embodied CO₂ than grades used in previous trials.

The development of the PureGRAPH-CEM[®] product is also set to be trialled with cement producers in other global markets including Europe, South East Asia, Australia and New Zealand.

Cement strength performance reinforced by lab-scale milling

Results from laboratory-scale milling shows the PureGRAPH-CEM[®] product can improve cement strength and support this next stage of trials.

The milling was conducted by First Graphene with industry trusted Kirton Concrete Services (“Kirton”) in the United Kingdom, utilising Breedon’s raw materials.

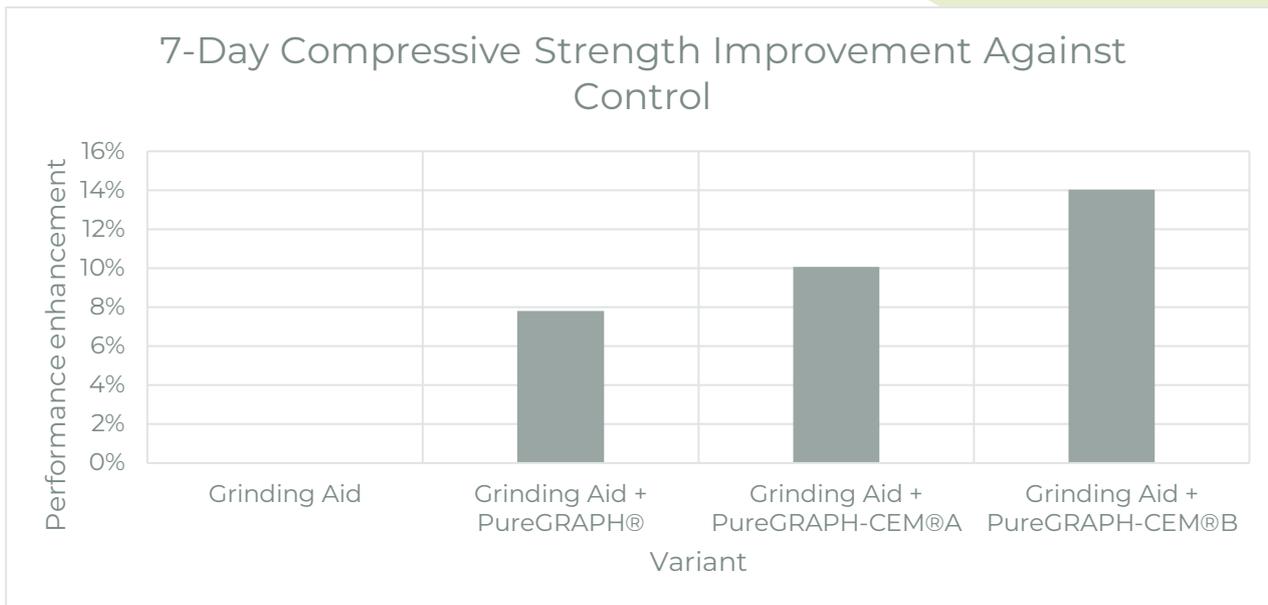
The research defined the size, chemical composition, form and loading level required to maximise the chances of success.

Results showed an increase in compressive strength of graphene enhanced cement of between 9% and 16% on Day 1 and between 8% and 13% at Day 7, when compared with a control containing a standard grinding aid (see Graph 1).

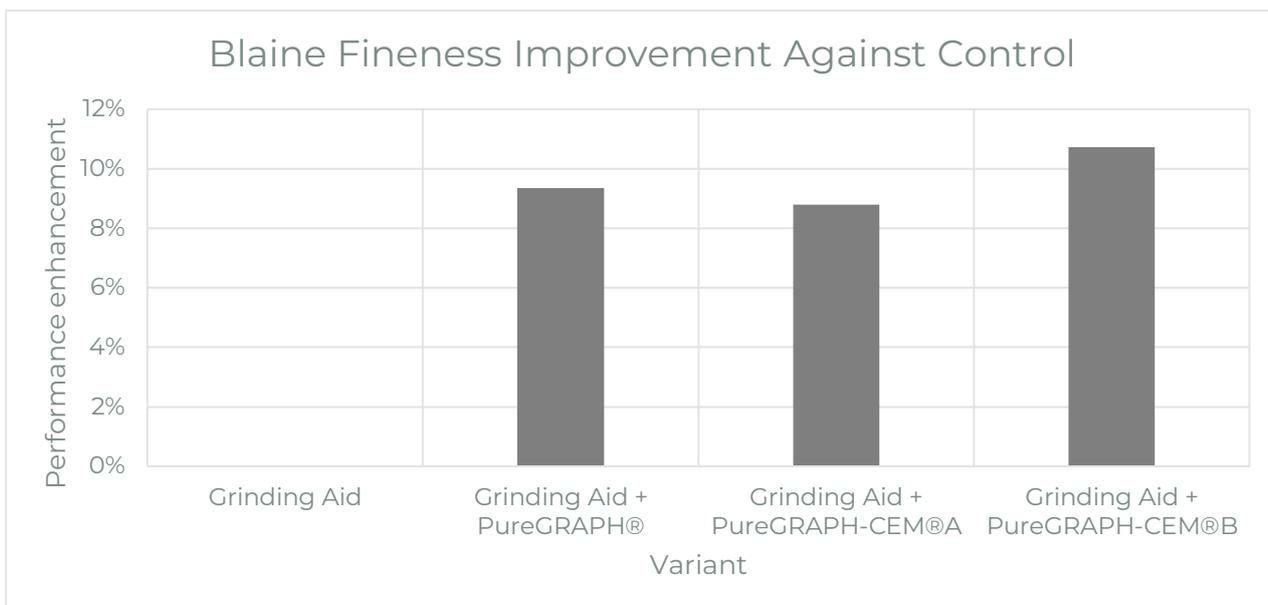
This indicates First Graphene’s product is compatible and complementary with existing grinding aids, which could reduce the need for alternative additives and improve overall cement production processes.

The research also found the Company’s new graphene improved Blaine fineness – a particle size measurement used in cement testing – by between 9% and 12% when milling time was fixed (see Graph 2).

Blaine fineness is used to define the target particle size and surface area of a cement, and by increasing the Blaine fineness with graphene, this would allow for increased cement throughput at the mill.



Graph 1: Results show an increase in compressive strength of graphene enhanced cement by Day 7.



Graph 2: Results show graphene enhanced cement improved Blaine fineness.

The Company continues to update and improve its PureGRAPH® product range, working collaboratively with downstream partners to develop optimised products for key markets.

With global cement producers committed to reducing carbon emissions by 25% by 2030, the Company will be well placed to deliver a valuable solution for industry.

First Graphene Managing Director and CEO Michael Bell said:

“This is an exciting development in our Joint Development and Commercialisation Agreement with one of the UK’s largest cement producers, Breedon Group.

“The creation of a devoted PureGRAPH® grade for use in cement production reinforces First Graphene’s commitment to delivering ‘green’ cement solutions for the global construction market.

“The adoption of this new and improved graphene product by Breedon shows we are both on the same journey towards decarbonisation of the cement and concrete sector.

“I look forward to providing further updates, including results from this trial in the second half of 2024.”

This release has been approved for release by the Chairman.

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About First Graphene Ltd (ASX: FGR)

First Graphene Limited is focused on the development of advanced materials to help industry improve. The Company is a leading supplier of graphitic materials and product formulations with a specific commercial focus on large, high-growth global markets including cement and concrete; composites and plastics; coatings, adhesives, sealants and elastomers (CASE); and energy storage applications.

One of the key outcomes that these advanced materials offer is the reduction of carbon dioxide emissions, whether directly through a reduction in output of these harmful greenhouse gases or lower energy usage requirements in manufacturing, or indirectly due to enhanced performance characteristics and extending the usable life of products.

First Graphene has a robust manufacturing platform based on captive and abundant supply of high-purity raw materials, and readily scalable technologies to meet growing market demand. As well as being the world’s leading supplier of its own high performance PureGRAPH® graphene product range, the Company works with multiple industry partners around the world as a supplier of graphitic materials and partner to research, develop, test and facilitate the commercial marketing of a wide range of sector-specific chemical solutions.

First Graphene Ltd is publicly listed in Australia (ASX:FGR) and has a primary manufacturing base in Henderson, near Perth, WA. The Company is incorporated in the UK as First Graphene (UK) Ltd and is a member of the Graphene Engineering Innovation Centre (GEIC), Manchester, UK, where it has a strong marketing and R&D capability.