

Construction

Feb 2022

Improving the Environment

Using advanced materials

A Global Company





Construction

Welcome to
Versarien

Mission ▶

To solve some of the world's biggest
problems using the widest portfolio
of 2d materials inc graphene

Improved
Recyclability

Longer Life

Reduction of
Fossil-Based
Plastics

Reduced
Maintenance

Lightweighting

Reduced Raw
Materials
(cement, metals...)

Enable
Bio-Based
Products



Construction

Welcome to Longhope

Graphene

Longhope Production

3D Printing

Graphene Enhanced Concrete

Brought forward plans for 10,000 sqft Innovation Centre that features a demonstrator floor using graphene enhanced concrete with graphene enhanced polypropylene fibres eliminating the need for steel rebar.

Plus presenting our 3DP Capability for this novel technology and novel material

Low Carbon, Low Cost, High Performance





Mission ▶ **To reduce CO2 used in construction.**

Size of market

24.7m tons
of Ready Mixed Concrete
used in the UK*

250,000
miles of roads**

*<https://www.statista.com/statistics/476772/ready-mixed-concrete-product-on-in-the-united-kingdom-uk/>

**<https://www.gov.uk/government/statistics/road-lengths-in-great-britain-2020/road-lengths-in-great-britain-2020>

Problem being solved

Significant reduction in the amount of CO2 as a result of reducing the amount of cement used in Ready Mix whilst maintaining the strength, reduction in drying and curing time, reduction or elimination of Steel.

Solution being proposed

Graphene reinforced concrete, graphene enhanced polymer fibres, and recycled materials.



Construction

GSCALE

Innovate UK

G SCALE

G

GRAPHENE

Scale up of 2
patented
graphene
processes

S

SEAT

Aerospace
Lightweighting
Carbon Fibre

C

CONCRETE

Construction
Reduce CO2

A

ARCH

Reinforced
Thermoplastic
polymers
3D printing

L

LEISURE

Sport wear
Thermal
performance
Moisture
wicking

E

ELASTOMER

Reinforced
elastomers
Increased
performance

**GSCALE - 18 months
completed**

**Successes in the
research & development
continue**

**Developing real life
products and
technologies**

**Product development
has led to commercial
opportunities**



Construction

Example Sectors

Rail, Road, Water

Tunnel Lining

3DP Permanent Formwork

Enhancing AACM

Water Industries

Slipform Road/Runways

Wind Turbine Bases

Modern Construction

Building House Raft

Very Light Rail (VLR) Structures



Construction

Progress

Achievements



Completed Residential,
Industrial and Retail
applications

Graphene conventional
slab and suspended slab

Casting 1000t of
concrete using HP
Nano- platelets

Recruited 3DP design /
technical support

Next Steps



Commissioning and
installation of 3D
Printer

Pouring the Innovation
Centre fibre reinforced
concrete slab

Demonstration
living lab

Negotiations with supply
chain partners

Opportunities with other concrete providers



Construction

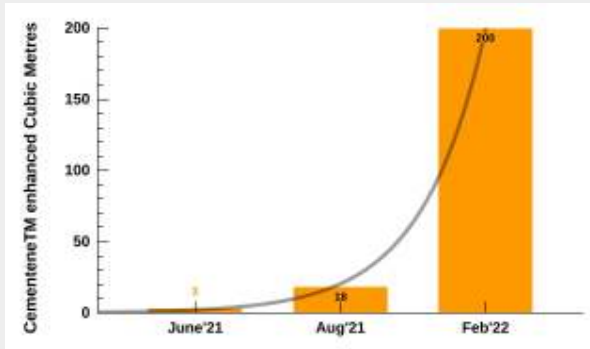
Cementene™
&
Polygrene™

What is Cementene™?

Cementene™ is a range of products that are and will be developed.

This includes
Admixtures for:

- 3D Mortar
- OPC based floor slabs
- AACM enhancers
- Concrete Foams
- Flooring Screeds etc



What is Polygrene™?

Polygrene™ is a range of products that are and will be developed.

This includes:

- Masterbatches to enhance polymer performance and augment recycled polymer properties





Construction

Cementene™

Why? To reduce the amount of cement, concrete & carbon in construction

Problem being solved

Reduce reliance on high CO2 cements

Problem being solved

Slow strength gain and poor porosity in alkali activated cementitious materials

Solution being proposed

Graphene enhanced concrete and construction composites



Construction

Cementene™

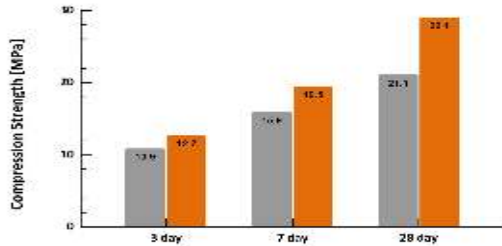
CEM I Results



Cementene

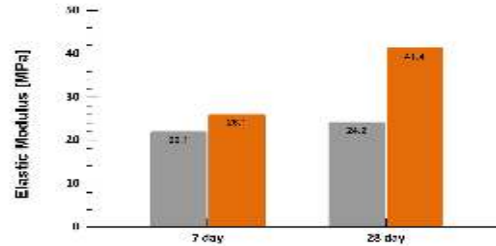
COMPRESSION STRENGTH

+38% improvement at 28 days



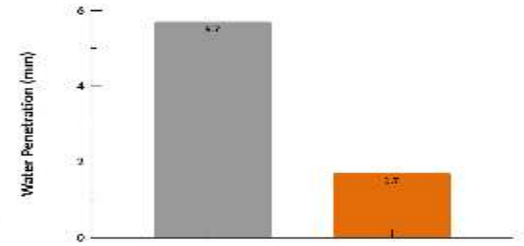
ELASTIC MODULUS

+71% improvement at 28 days



WATER PERMEABILITY

70% reduction in water penetration depth



■ CEM I Control mix ■ CEM I Cementene™ mix

Independently tested by SOCOTEC UK Limited



Construction

Polygrene™

Why? To reduce the amount of fossil fuel based plastics used

Problem being solved

Graphene can lead the way towards polymer recycling and a circular economy.

Problem being solved

Reduction in the use and improvement in the recyclability of plastics (including in the construction industry)

Solution being proposed

Graphene enhanced plastics and graphene reinforced bio based plastics



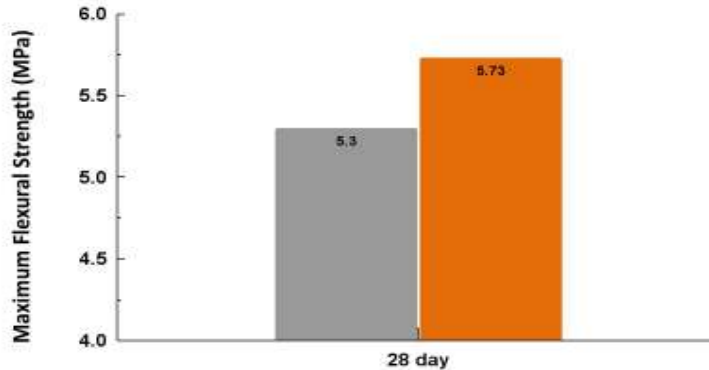
Construction

Polygrene™

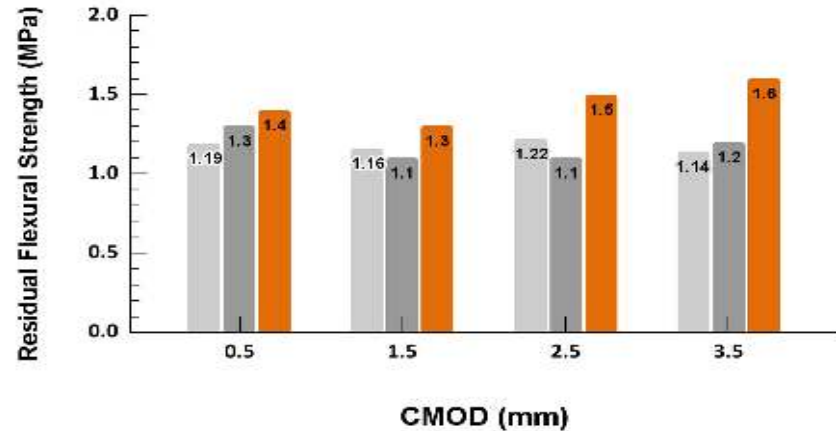
Reinforced CEM I Results



Limit Of Proportionality (LOP) (with crack induced test piece)



Crack Mouth Opening Displacement (CMOD) Polygrene™ PP macrofibres outperforms by +30% industry standard PP macrofibre reinforced concretes at the same dosage



■ Industry Standard PP Macrofibre Control Concrete

■ Polygrene™ PP Macrofibre Concrete

Independently tested by SOCOTEC UK Limited



Construction

Cementene™

&

Polygrene™



Cementene



Polygrene

Benefits of Cementene™

Greater Performance

Reduced CO₂

Reduced Cost (thinner slab, less cover etc)

Reduced Site Costs (less time to build, additional early strength)

Longer Asset Life (low permeability/porosity leading to longer predicted life)

Highly workable concrete

Benefits of Polygrene™ PP macrofibres

Greater Performance

Reduced CO₂

Reduced Cost (remove steel reinforcement)

Reduced Site Costs (less time to build prepare)

Increased flexural strengths (lighter structures)



Construction

Longhope
Case Study

The 'REAL' Benefits of Cementene™ & Polygrene™ PP fibres

Cementene™ Admixture offers;

>10% concrete saving

>10% 'cart away' saving

>10% less reinforcement

?? Quicker delivery / site setup saving

??? kg CO2 saved

Polygrene™ PP chopped macrofibres offers;

??? kg steel reinforcement saved

?? hrs less steel preparation time saved (Quicker delivery)

??? kg CO2 saved

When complete the Case Study will quantify
real and justifiable savings in areas such as...



Construction

Low Carbon
Performance

Construction Industry Challenges

The construction looks to maximise....

Low Carbon

Low Cost

High
Performance

This can be achieved with Versarien's....



Cementene™ Admixture



Polygrene™ PP macrofibres



Thank you

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