Concrene Limited licenses Concrene® - a revolutionary concrete nanotechnology which is reinforced with novel nanomaterials. Headquartered in London, UK, the company is growing and working with construction stakeholders worldwide.

Thomas Swan & Co. Ltd. is one of the UK’s leading independent chemical manufacturers and a global leader in graphene production.
We are proud to introduce the world’s first nanotechnology innovation for concrete and construction.

Our Concrene® technology uses graphene to reinforce standard industry concrete.

Graphene is the strongest material ever discovered with a tensile strength of 130 GPa and Young’s modulus close to 1 TPa. This inherent strength, coupled with the material’s ability to regain original shape after 25% strain and dimensions smaller than 1 micron, makes it perfect for mixing with cementitious binders, admixtures and various aggregates to create a new, better performing concrete products.

CONCRENE® ADVANTAGES

STRONGER
The Concrene® technology increases the compressive strength of industry standard concrete by 40% and flexural strength by 70%.

LIGHTER
As a direct consequence of increased strength, 1 m³ of normal concrete would equate to c. 0.85m³ of Concrene®. Manufacturers will cut costs from using less cement, aggregate, additives and steel reinforcement.

GREENER
Using less volume of concrete on site has twofold environmental benefit:
• Reduced carbon emissions from cement manufacturing.
• Less heat in the air due to the exothermic nature of concrete hardening.

WATERPROOF
The addition of graphene decreases the porosity, consequently, a Concrene® product is less water permeable than standard concrete which has long term cost advantage.

PRECAST
Concrene® allows concrete products to meet the design criteria with smaller volumes, which reduces the quantity of steel reinforcement required, increases the volume of products sold and transported every day.

SCALABLE
The Concrene® technology can be applied to any type of industry concrete and will suit the needs both for large- and small-scale manufacturers. The graphene product which supports the technology comes at an industry competitive bulk cost from our trusted graphene supplier.

To ensure that our clients receive a graphene product with the highest quality and consistency, we have partnered up with Thomas Swan UK.

They are a global leader in graphene with decades of experience in chemicals manufacturing, ISO approved processes and highly experienced R&D team to assist customer enquiries.
**SOLUTIONS**

Nanomaterials have a significant positive impact on the entire concrete volume - the graphene particles are so small, that they act as a filler and reduce the porosity of the concrete matrix.

**PROBLEM 1**

Decreasing the amount of cement – The race to find a low carbon embodied substitute for cement does not reduce the overall volume of concrete.

**SOLUTION 1**

Concrene® improves the chemistry of concrete making it stronger and more durable. This reduces the overall volume of concrete by 15% and decreases the heat emitted in the air due to concrete hardening.

**PROBLEM 2**

Reducing the steel reinforcement – Existing technologies on the market do not allow precast concrete products to reduce the amount of steel reinforcement.

**SOLUTION 2**

Concrene® increases the flexural strength by 70% which will reduce the volume of steel rebars required. This introduces a significant cost saving per product and opens up more storage space in the manufacturing plant.

**PROBLEM 3**

Waterproofing concrete – Water penetration degrades any concrete product, especially in areas with high temperature amplitudes.

**SOLUTION 3**

Using Concrene® increases water resistance by 300%, which extends product service life and saves costs from maintenance.

<table>
<thead>
<tr>
<th>USE</th>
<th>SAVE</th>
<th>IMPROVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5L Concrene® per m³</td>
<td>↓25kg cement</td>
<td>↑40% compressive strength</td>
</tr>
<tr>
<td>↓10% steel reinforcement</td>
<td>↑70% flexural strength</td>
<td>↑100% slump</td>
</tr>
<tr>
<td>↓50kg of CO₂/m³</td>
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</table>
The cost of the graphene product required for Concrene® is priced at the range of standard industry admixtures and the cost model of our technology is perfectly suitable for any construction project.

The main advantage of adding graphene is that due to its exceptional mechanical strength and nano-size, it bonds well with the binders’ crystals to create a much denser and more durable concrete matrix. We have conducted a series of industry-accepted tests and proof of concept trials, strictly following the standards for concrete mixing and testing.

**PERFORMANCE CHARACTERISTICS**

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>INDUSTRY AVERAGE</th>
<th>CONCRENE®</th>
<th>TEST METHOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cement reduction</td>
<td>50%</td>
<td>65%</td>
<td>In House</td>
</tr>
<tr>
<td>Slump</td>
<td>50mm</td>
<td>100mm</td>
<td>BS EN 12390-3:2009</td>
</tr>
<tr>
<td>Compressive Strength</td>
<td>35 MPa (5000 Psi)</td>
<td>49 MPa (6100 Psi)</td>
<td>BS EN 12390-3:2009</td>
</tr>
<tr>
<td>Water penetration depth</td>
<td>&lt;30mm</td>
<td>&lt;10mm</td>
<td>In House</td>
</tr>
<tr>
<td>Flexural Strength</td>
<td>3.5 Mpa (500 Psi)</td>
<td>6.1 Mpa (880 Psi)</td>
<td>BS EN 12390-5:2009</td>
</tr>
<tr>
<td>Bond Strength</td>
<td>56.5 kN</td>
<td>78 kN</td>
<td>BRE In House</td>
</tr>
</tbody>
</table>

Concrene Limited is a spin-off from the University of Exeter. Proof of concept was obtained from the BRE Group in 2018 to replicate the lab tests and the suitability of the materials for industry use.

**EMBODIED CARBON OF CONCRETE**

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15% less volume of materials