



Ryder

# Advanced Materials Sphera Carbon Negative Concrete

Concrete is responsible for eight percent of global carbon emissions, it is the most widely used construction material on the planet.<sup>1</sup> We are partnering with pioneering material innovators on collaborative research to demonstrate the use of carbon negative concrete in practice. Early results from lightweight concrete blockwork are encouraging, having a carbon footprint of -160kg CO<sub>2</sub>eq/tonne.



**Concrete and our environment**  
Concrete is the most widely used man made material on the planet. The production of concrete is responsible for eight percent of global carbon emissions, due to its dependence on cement.<sup>1</sup>

**50bn tonnes of aggregates used globally every year<sup>2</sup>**

Additional aggregates used for concrete, such as sand, are being used at a faster rate than nature can provide — 50bn tonnes a year globally.<sup>2</sup> Fly ash sources, the raw material needed for some lightweight aggregates, are also dwindling. Innovation and the development of new materials can provide the solutions needed to tackle sustainability and supply in construction.

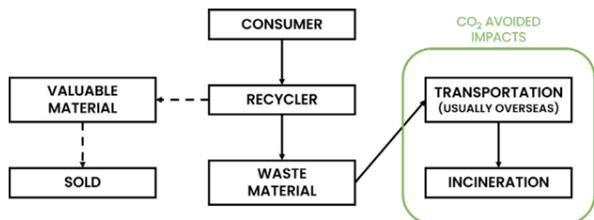
**91% of plastic not recycled globally<sup>3</sup>**

**Waste plastics — an unlikely saviour**  
Sphera uses its patent pending technology to transform waste plastic, that would otherwise be sent to landfill and incineration, into an aggregate for concrete and other construction materials. The technology is a market disruptor, enabling construction companies to partially or fully replace natural and lightweight aggregates in traditional concrete mixes.

With a primary focus on concrete masonry, Sphera is developing carbon negative light and carbon zero dense blocks that exhibit comparable properties to market leading blocks.

**75%** of plastic in the UK is not recycled<sup>4</sup>

**Carbon neutrality and negativity**  
In the UK, approximately 5m tonnes of plastic is consumed each year, 75 percent of which is still not recycled.<sup>4</sup> Instead non recyclable plastic is often transported overseas to be incinerated. The incineration process releases vast amounts of carbon dioxide into the atmosphere. By reusing this material in concrete applications, the carbon contained within the plastic becomes embodied within the concrete rather than emitted — avoiding damaging carbon dioxide impacts.



These avoided impacts are enough to offset the carbon footprint of cement production, transportation, natural aggregate mining as well as Sphera's manufacturing process to create high performance carbon negative blocks. The carbon reduction can be determined by the volume of plastic incorporated into the concrete. For instance, Sphera blockwork has a carbon footprint of negative 160kg CO<sub>2</sub>eq/tonne. The blocks will not only provide reductions in embodied carbon but due to their high insulative value also prove beneficial in reducing operational energy demand, with a thermal conductivity of ~ 0.39 W/mK.

**-160 kg** CO<sub>2</sub>eq/tonne

**Further efficiency benefits**  
As with all innovations, unexpected benefits are often discovered while experimenting. In initial studies, variations of Sphera's products have also been found to accelerate curing — increasing the strength of traditional concrete by 26 percent after one day. Accelerated curing offers wider efficiency benefits, reducing timeframes and the associated costs of pre cast, modular and onsite construction.

**26%** increase in strength of concrete after one day

**Next steps**  
We are excited to be working with the team at Sphera on collaborative research to refine material properties further and begin delivering pilot projects utilising this revolutionary material, while Sphera focus on scaling production to begin testing on some substantial live projects.

**“If just two percent of the sand our industry uses was replaced with waste plastic, we could eliminate plastic waste entirely.”**

Phil Buckley, COO, Sphera

**Our responsibility**  
Collaborative research partnerships focussed on advanced materials, with material innovators like Sphera, are enabling us to move closer to realising a circular economy and meeting our net zero targets. Pioneering projects like this also provide a solution for other significant global challenges, such as the exploitation of our natural resources and reducing plastic waste. Through research and collaboration we are focussed on improving the world around us.



# References

1 Chatham House. (2018) Making Concrete Change: Innovation in Low-carbon Cement and Concrete. Retrieved from <https://www.chathamhouse.org/2018/06/making-concrete-change-innovation-low-carbon-cement-and-concrete>

2 BBC Future. (2019) Why the world is running out of sand. Retrieved from <https://www.bbc.com/future/article/20191108-why-the-world-is-running-out-of-sand>

3 National Geographic. (2018) Planet or Plastic? Retrieved from <https://www.nationalgeographic.com/science/article/plastic-produced-recycling-waste-ocean-trash-debris-environment>

4 Westminster City Council. (2020) Plastic waste - everything you need to know. Retrieved from <https://cleanstreets.westminster.gov.uk/plastic-waste-complete-guide/#:~:text=In%20the%20UK%2C%20for%20example,causing%20damage%20to%20our%20ecosystem.>

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