

# CATAGEN's ClimaHtech System Decarbonising Cement and Quarrying

Day after day, our world is witnessing unprecedented climatic shifts. From record-breaking heat waves and devastating wildfires to prolonged droughts and catastrophic floods, the urgency of addressing climate change becomes more pressing each day.

CATAGEN's mission is to clean and decarbonise the air. CATAGEN is a net zero technology company based in Belfast providing unrivalled metrics to optimise catalyst development and reduce harmful tailpipe emissions. Our expertise in global emissions testing and energy efficient chemical reactor technology has led us to develop ClimaHtech – a system of advanced climate technologies.

The cement industry is a significant contributor to carbon dioxide emissions, accounting for around 8% of CO2 emissions globally\*. In the UK alone, cement emissions produced over 4 million metric tonnes of CO2 in 2022, and 2.1 million metric tonnes in 2022 in Ireland\*\*. The most carbon intensive stage of cement manufacturing is clinker production, which emits approximately 60% of the total production emissions, with the remaining 40% produced from the combustion of fossil fuels to provide heat to the process\*\*\*.

Due to its high operating temperatures (up to 1500 °C), large energy demand, and high carbon intensity, the cement industry is an ideal application for CATAGEN's ClimaHtech suite of technologies, particularly BIOHGEN. BIOHGEN uses CATAGEN proprietary technology to produce cost-effective biohydrogen from sustainable organic waste streams and biomass. This energy efficient fuel can accelerate the route to a Net Zero carbon hydrogen economy. Biogenic CO2 is produced as a valuable by-product of the process that can displace fossil CO2 use in the food and drink industry, agriculture, and other industrial applications. BIOHGEN may complement existing alternative fuel use at cement works, enabling production of biohydrogen to facilitate a greater displacement of coal from cement kilns than can be achieved



by alternative fuel usage alone by providing the high temperatures needed for clinker production.

"Cement contributes about 8% of global annual emissions and is a critical material we need to build infrastructure including roads, hospitals, and even wind turbines. CATAGEN's ClimaHtech system can complement existing sustainable changes in the cement sector such as flue stack capture and use of alternative fuels to accelerate the decarbonisation of cement production to help create lower carbon cement products." - Ralph Lavery, Net Zero Applications Engineer at CATAGEN.

ClimaHtech is an acceleration system towards decarbonisation using advanced climate technologies to generate renewable 'green' hydrogen, biohydrogen, and gHreen e-fuels, with complementary systems for hydrogen compression and carbon capture.

CATAGEN have conducted a feasibility study alongside Mannok, the Irish cement and construction products manufacturer, to explore the decarbonisation of their operations

using the ClimaHtech system. Implementation of ClimaHtech technologies could reduce total CO2 emissions from cement production at the Mannok site by at least 18%.

Implementation of solutions at Mannok will displace carbon savings equivalent to removing 49,000 cars from roads on the island of Ireland. The solutions identified in this study could be applied to cement production worldwide where sufficient renewable energy and sustainable biowastes are available.

In addition to the cement industry, CATAGEN has also been working with the quarrying industry, another hard-to-abate sector with significant decarbonization challenges that the ClimaHtech suite of technologies can address.

CATAGEN, Terex, and Wrightbus are working together to decarbonise quarrying through the HyDensity Project. The project was awarded £6.27 million in funding Department for Energy Security & Net Zero (DESNZ) through Phase 2 of the Red Diesel Replacement programme, as part of the £1bn Net Zero Innovation

Portfolio (NZIP) to decarbonise non-road mobile machinery. CATAGEN's ClimaHtech E-FUEL GEN and COMPRESSOR technology will be used to provide e-diesel and hydrogen fuels to Terex's quarrying equipment, supported by Wrightbus mobile hydrogen refueller technology.

The objectives are to develop this complete solution to pre-production readiness level and demonstrate the full systems' approach at two demonstration sites in the UK in early 2025. The benefits of this concept lie in the integration of well-proven equipment with innovative technology that will be capable of delivering a fully decarbonised, robust solution for the industry. By demonstrating both e-diesel and hydrogen fuel use to decarbonise crushing and screening equipment, the project shows how current and future quarrying technology can be operated in a net-zero world.

ClimaHtech's COMPRESSOR technology is a high-pressure hybrid pumping system for hydrogen storage and dispensing. Compression poses a significant challenge in the hydrogen supply chain and current methods in the industry are relatively inefficient, expensive to manufacture, and display various operational issues in use, such as long duty cycles and overheating.

Applications for this technology include transport and mobility, non-road mobile machinery, storage, and integrated hydrogen systems.

ClimaHtech E-FUEL GEN technology produces energy-dense, liquid e-fuels, another essential fuel in a net zero economy. 'Drop in' or blended synthetic fuels can be produced such as e-diesel, e-gasoline, and e-kerosene – the key component in sustainable aviation fuel (SAF). E-FUEL GEN enables the decarbonisation of hard to



decarbonise sectors such as aviation, marine, heavy industry, agriculture, and mobility were other decarbonisation solutions such as electrification are not possible or practical.

E-diesel enables full utilisation of existing assets to end of useful life that is compatible with decarbonisation goals and allows remote and rural activities to be decarbonised with energy dense liquid fuels that can be stored easily where other energy solutions such as hydrogen or electrification may not be readily available.

CATAGEN have hosted many members of Mineral Products Association to our Net Zero Campus in Belfast to showcase our ClimaHtech technologies and how they can accelerate decarbonisation of cement and quarrying activities, most recently the Mineral Products Association Northern Ireland Young Leaders Group.

"It is fantastic to see firsthand the strides that CATAGEN is making to drive the transition toward Net Zero. Heavy industry will need innovative solutions to decarbonise rapidly and CATAGEN are an example of the history of innovation in Northern

Ireland that can tackle these globally significant challenges." - Gordon Best, Regional Director of Mineral Products Association Northern Ireland.

The decarbonisation potential of CATAGEN's ClimaHtech system within the cement and quarrying industries is significant. ClimaHtech also has further capabilities to support the decarbonisation of hard-to-abate industries such as aviation, mobility, heavy machinery, and marine as these industries decarbonise to meet net zero targets.

\*Statista, 2024. Greenhouse gas emissions from cement production in the United Kingdom (UK) from 1990 to 2022.

\*\*Our World in Data, 2023. Annual CO2 Emissions from Cement, 2022.

\*\*\*Nature Sustainability, 2024. Paving the way for sustainable decarbonization of the European cement industry.

**ClimaHtech**  
a CATAGEN formula

