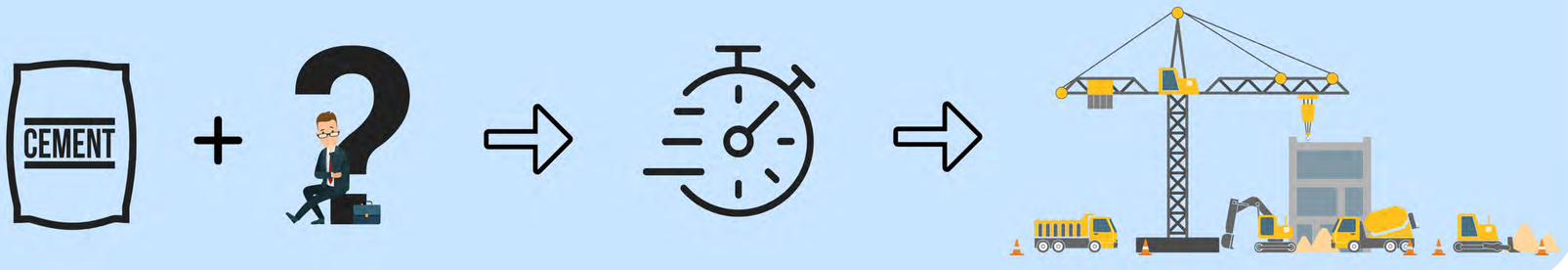
Low Carbon Concrete:
Future Assessment Technology for Service Life and Fire Resistance

Maciej Jozwik / MPA & BRMCA / Prof Rod Jones, Dr Moray Newlands, Prof Donald MacPhee, Prof Luke Bisby

This project explores the use of low carbon cement to replace Portland cement in concretes currently used in the Industry. The work shows that both elevated temperature curing and chemical/mechanical activation of such cements allow to achieve more rapid comparable performance against traditional concretes.

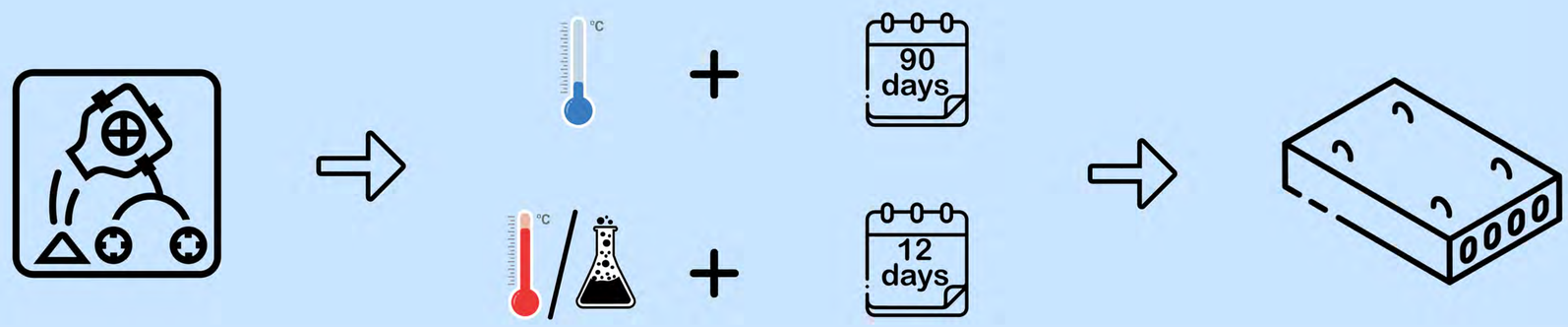
What is the aim of this project?

Nearly 90 million tonnes of concrete are produced every year in the UK. Portland cement (PC) clinker production is a major source of CO_2 emissions, therefore, replacing PC with low carbon alternatives and/or the use of renewable energy during clinker production is the most promising path to reach the Government's net zero by 2050 target [1].



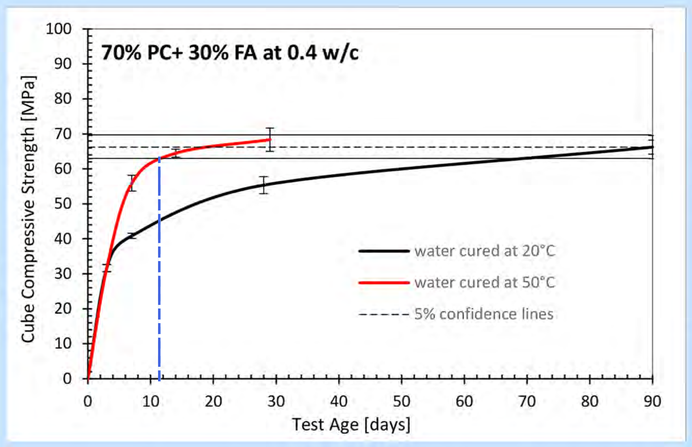
How do we plan to achieve it?

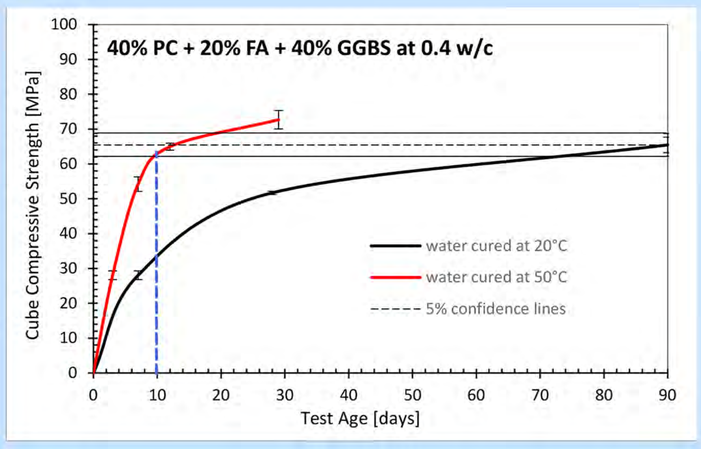
A number of concretes were cast (one reference; three low carbon cements), and water cured at 20°C and 50°C to establish an equivalent '90-day maturity' age. Series of durability testing are to be performed, with emphasis on carbonation and chloride resistivity. Additional microstructural analysis will provide an informed view on whether accelerating maturity of concrete alters the underlaying physical microstructure.

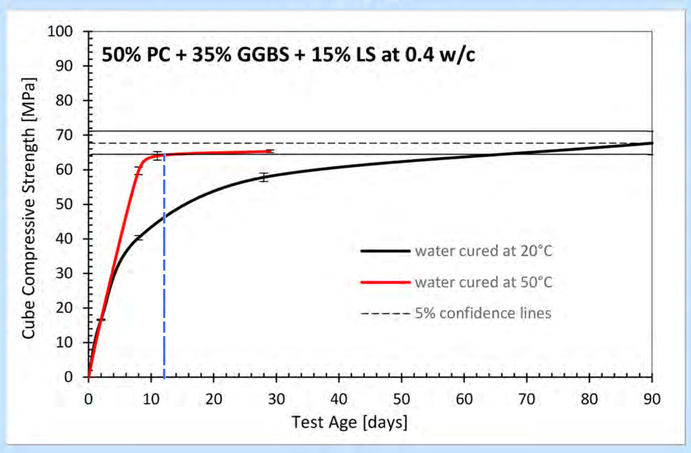


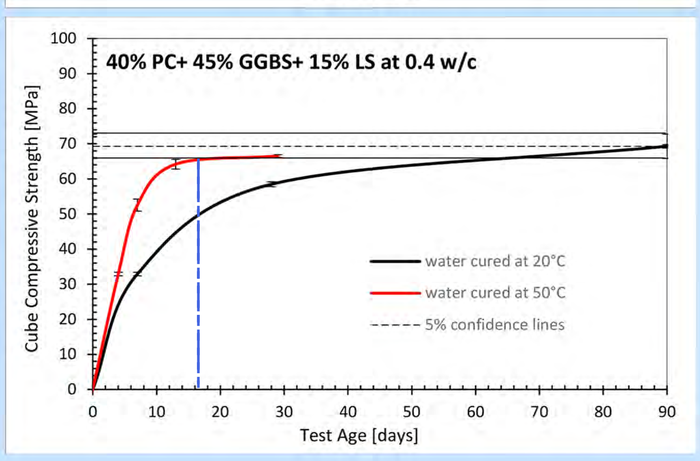
What did we find?

Initial results concluded that approximately 12 days of elevated temperature curing returns the 90-day strength-based maturity equivalency to 90-day traditionally cured concrete (at 20°C). This means that potentially, the timescales for durability performance testing of low carbon concretes can be significantly reduced making them more attractive to designers and specifiers.









What did we find?

References

[1] Mineral Products Association, "UK Concrete and Cement Industry Roadmap to Beyond Net Zero," 2020.

Scottish Funding Council
Promoting further and higher education