FLOW WITH THE KNOW:
DIGITALLY DECODING FLUID CONCRETE

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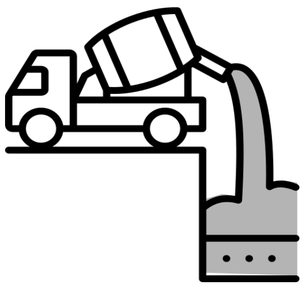
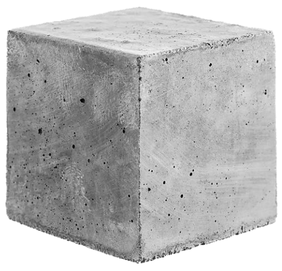
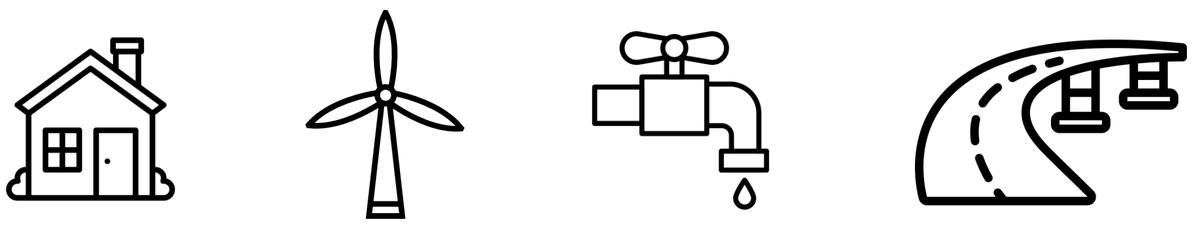
Concrete and the UK construction challenge



Concrete is a **fluid** which after setting produces a **high strength** material



Plans to develop **homes**, **energy networks**, **infrastructure** and **communities** all depend on concrete



Concrete contributes to circa **7% of global carbon emissions**

Understanding **fluid concrete** allows for early detection of **quality issues** but current testing is a **wasted opportunity**:

2 million on-site concrete quality tests are conducted yearly in the UK

20% of total UK construction costs are spent fixing errors [1]

£10 billion is the estimated yearly cost of concrete quality issues [2,3]

On-site **slump** testing

The slump test is conducted on almost every UK construction site. Currently, a ruler crudely measures how much the concrete falls when a mould is removed.

The test is **quick**, **simple**, and **low-tech** but offers **limited insight**, and **poor quality may not be detected.**

Quick and simple but lacking the insights we need

T E C H N O L O G Y G A P

Laboratory **rheometer** testing

Advanced laboratory instruments can measure **highly accurate fundamental fluid properties** (rheology), allowing for **better quality control.**

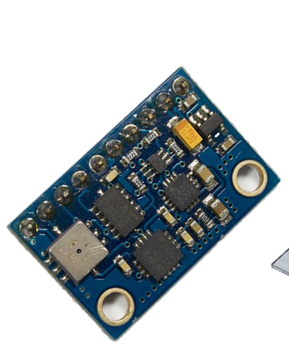
However, the equipment is **expensive** (>£30k), **highly technical** and **cumbersome.**

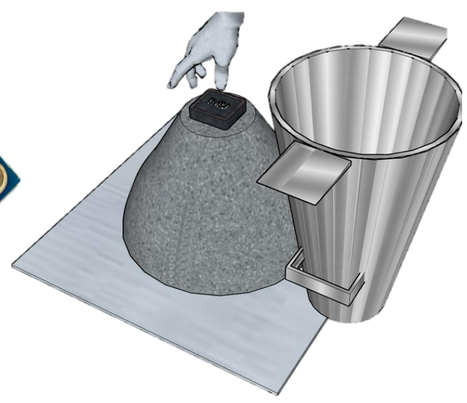
Provides the insights we need but costly and complex

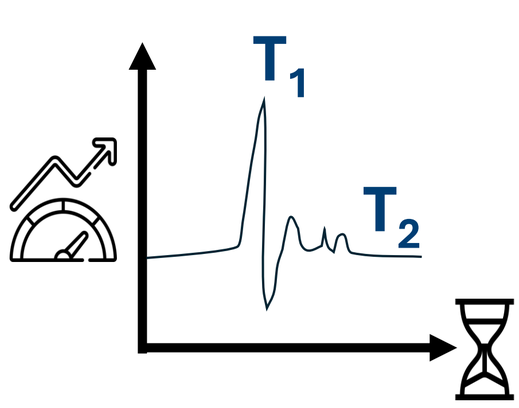
THE SLUMP-RHEOMETER

Keep the on-site test, but deliver the insights of laboratory instruments via digital transformation

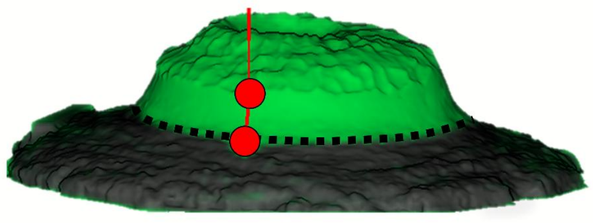
1 Perform the standard slump test with a **wireless sensor system** to capture the acceleration profile

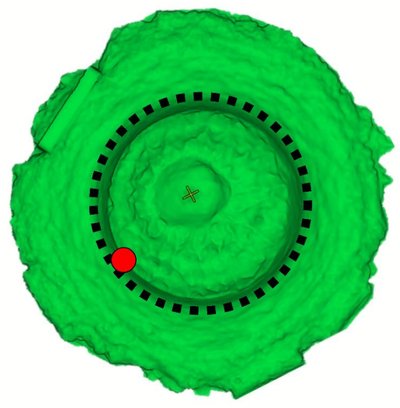






2 After test completion, perform **3D scanning** for accurate geometric measurements





90% accuracy of rheological measurement compared to lab instruments

Potentially **ten times lower cost** compared to lab instruments

Enhanced quality control through issue detection, **reducing waste + carbon emissions**

References:

[1] CIRIA. 2024. Cast In-situ concrete: A model for error reduction.
[2] King, 1993. Efficient concreting practice: A review of current procedures.
[3] Podges, 2017. A decision model for the investment in technology to reduce concrete rework.
calmetrix, Pheso Rheometer 2024. Artec, Leo 3D scanner 2024.

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