

CONVERGE CONCRETE MONITORING

Client
Yorkshire Water
Team
Huddersfield ERF

Sector
M3 Water UK

Project start
09/18

Project end
Q1 2021

Value
£41.3m

Date
15/01/20

Author
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Innovation Reference
ID-00203

PROJECT OUTLINE

Murphy are in contract with Yorkshire Water to design, build and commission Huddersfield ERF (Energy Recycling Facility). This is a sludge treatment facility by anaerobic digestion to replace an existing incinerator plant facility which was made inoperable during the Boxing Day Floods in 2015.

The project combines the MEICA and process expertise of Murphy Process Engineering with the design and delivery of the civil infrastructure by M3 Water UK business units.

TESTIMONY

"It has been encouraging to see Murphy use innovative solutions to realise opportunities in the programme on critical structures. The use of the Converge concrete sensors is something Yorkshire Water would welcome their Contractors using in future schemes as it has proven to be of benefit to the project and allows another element of assurance." -

Emma Jose – Yorkshire Water Project Manager

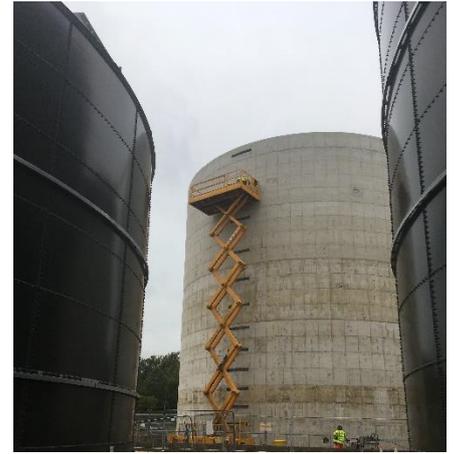
KEY CHALLENGES

Central to the digestion process is the construction of two 20.5m diameter x 21.2m high post-tensioned reinforced concrete tanks undertaken by specialist subcontractor Balmoral Tanks.

Following previous issues Yorkshire Water have encountered on similar post-tensioned tanks, they were keen for Murphy to display attention to detail for the post-tensioning design and implementation whilst meeting the needs of the programme.

The construction programme is extremely tight and any opportunities to accelerate the works using innovative solutions are considered and actively promoted by the project team and the client.

An opportunity was identified in the programme to reduce the curing time of the final Digester wall pour prior to stressing of the post-tensioning strands, also considering the mobilisation of the post-tensioning subcontractor.



SOLUTION / INNOVATION

Converge is a cloud based platform that delivers temperature measurements and in-situ strength estimates in real-time.

The temperature of a calibrated concrete pour is continuously measured by cast-in sensors and delivered, in real-time, to an app on the engineers' devices. Maturity method algorithms built into the software accurately estimate the in-situ strength of the concrete by combining the temperature and the mix calibration data.

The app clearly displays the results in graphical and tabular form and has useful features such as automated strength / temperature alerts, temperature differentials, aggregated concrete stats and .pdf concrete reports.

KEY BENEFITS

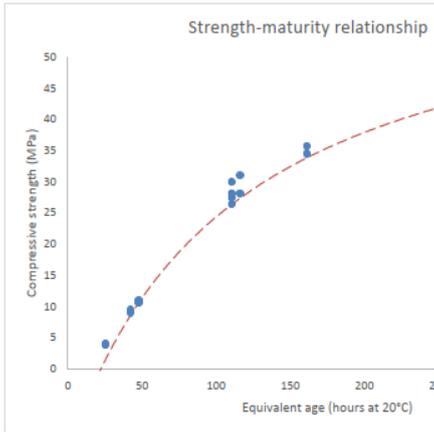
- Activities such as loading, striking formwork and stressing tendons can be conducted based on in-situ, real-time information
- All users can remotely access results in the cloud; speeding up communication and decision making
- Data is available 24/7 meaning activities are never delay due to lack of information
- The calibration results allowed greater confidence of the expected curing duration which allowed the subcontractor to mobilise in advance therefore reducing further time on the programme.
- Strength data is accurate to the in-situ conditions – this will likely improve programme in warmer months as concrete will cure quicker, but also has a safety factor for concrete curing in the winter months ensuring concrete isn't stripped or loaded too early

COSTS / SAVINGS / ROI

Initially the programme indicated a 15d duration from the final pour for a curing period before the post-tensioning subcontractor started on site.

Further to a review of the calibration results, it was identified that the curing duration was expected to be 7d, however, this was in ideal conditions of a 20°C cube tank. Therefore a 10d period was considered. Further to this it was identified that the subcontractor could mobilise 5d earlier and install the wire strands so they would be in a position to start stressing upon confirmation of the concrete reaching its required compressive strength.

A 10d saving on the programme equates to £50k of potential delay damages should the project overrun. The trial ran on the Huddersfield Project cost circa £1.6k, however, this was a discounted price from Converge as it was a trial.



equal 25N/mm²



J.Murphy at Huddersfield ERF

Digester2 B
compressive strength
reached 25N/mm²

09.08 on 17th Oct 2019 (BST)



IDEA ORIGINATOR

Sinan Unlu proposed this project. Sinan is an Assistant Design Coordinator in the Construction and Property sector.

The idea was originally suggested to support Murphy's Construction and Property team, however the opportunity to work within the Water sector was more feasible and timely.

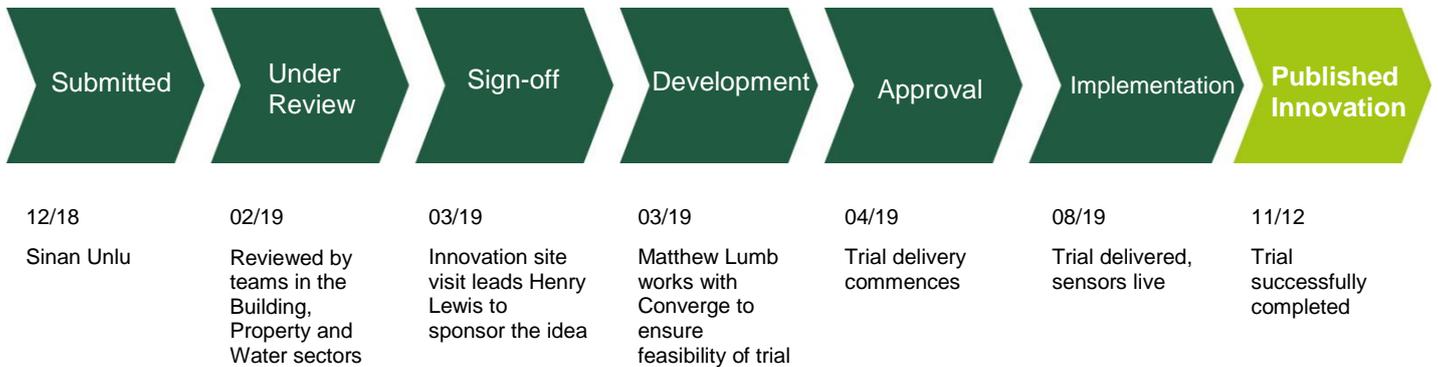
CHAMPIONS

The idea was taken on by the Huddersfield ERF team.

Henry Lewis, Senior Engineer sponsored the initiative and liaised with the client to enable further work. **Matthew Lumb**, Senior Engineer, coordinated the implementation phase of the trial along with supplier Converge.

This included calibration, installation, monitoring and assessment.

INNOVATION JOURNEY



FEEDBACK

The Converge system worked well at Huddersfield ERF as there was a requirement to mitigate potential programme slippages and this use of the system provided some tangible benefits. Once the equipment had been delivered, Converge organised a free training session for the engineers installing the hardware on site and using the app / online portal. They also had online live chat support, all of which was extremely useful.

By calibrating the concrete mix gives some initial confidence of expected curing times to allow programme adjustments to be considered. Real-time results and notifications gave the project team the information required to review the progress the post-tensioning activities in line with the programme.

FUTURE OPPORTUNITY

The Converge System has been implemented by a number of Tier One contractors and this was the first use of the system on Murphy projects. The use of the system needs to be considered at an early stage of the project to see whether the cost of the equipment will ensure sufficient project savings.

The system is ideal for use on projects where accelerating the stripping and / or loading of recently poured concrete will offer significant programme benefits, such a multi-level concrete portal frame structures. There needs to be sufficient time in the programme to ensure the concrete mix design is in place and a calibration period (28d) of the mix can be conducted in order to develop the maturity formula.

