



Reconstructing a Water Treatment Centre with Shared VR

Wessex Water and AECOM use Shared VR to improve teamwork and save costs

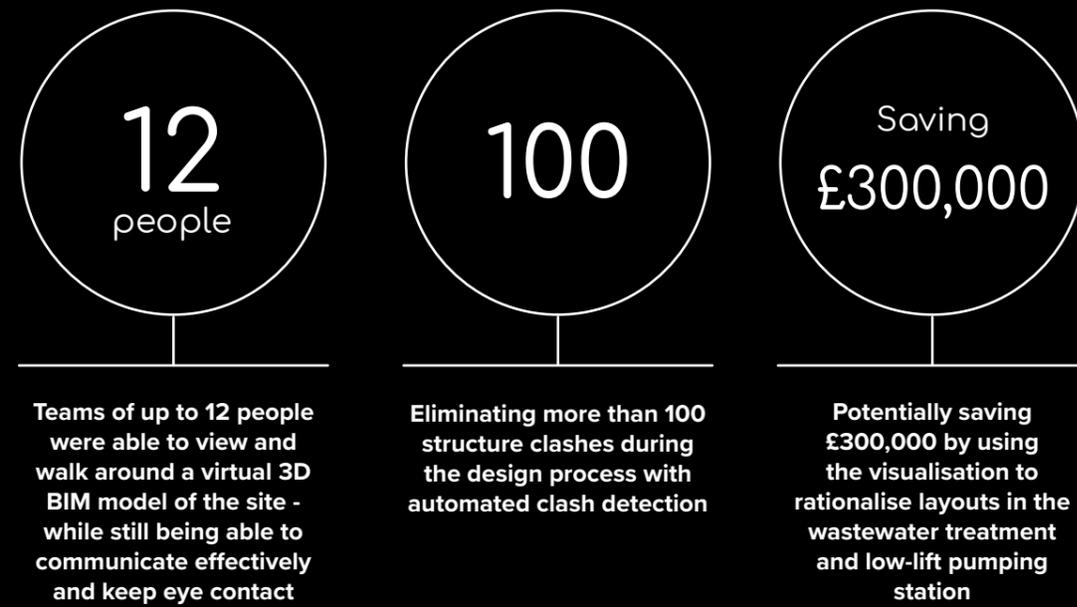


Highlights

Wessex Water was working with AECOM on a £50m project to reconstruct the Durlough Water Treatment Centre in the UK. The scheme would be Wessex Water's first delivered to BIM Level 2, with the aim to use digital technology to work faster, safer and more efficiently.

Realising the potential of an immersive collaborative environment, AECOM suggested the use of an Igloo Shared VR cylinder.

Among many benefits, this meant:



Also, with the use of an Igloo Shared VR cylinder, AECOM noted:



About Wessex Water and AECOM

Wessex Water provides water and/or sewerage services to more than 2.8 million customers in the south west of England.

Its purpose is to:

- Provide its customers and communities with excellent service and value for money
- Protect and improve the environment
- Provide its employees with the opportunity for personal development and a satisfying career

It supplies 275 million litres of water a day, maintains and renews 7,442 miles of water mains, and fixes more than 1,000 leaks every month. It also takes away and treats 863 million litres of sewage a day and looks after 21,637 miles of sewers. Wessex Water is recognised by its regulator as one of the leading water and sewerage companies in England and Wales.

AECOM is the world's premier infrastructure firm. It designs, builds, finances and operates infrastructure assets for governments, businesses and organisations. It connects knowledge and experience across its global network of experts to help clients solve their most complex challenges.

From high-performance buildings and infrastructure, to resilient communities and environments, to stable and secure nations, AECOM's work is transformative, differentiated and vital. In 2019, AECOM was ranked #1 in Transportation and General Building in Engineering News-Record Top 500 Design Firms.

AECOM was also named one of Fortune magazine's World's Most Admired Companies for the sixth consecutive year.



The situation

The need to fulfill challenging targets + design of a major refurbishment needing new skills

As its flagship scheme (and an important part of its current asset management plan), Wessex Water had planned a major upgrade of the Durlough Water Treatment Centre.

This would see significant benefits by:

- Enabling it to consistently and safely deliver 30 million litres a day
- Upgrading the condition and design of the aging plant
- Addressing concerns over deteriorating raw water quality and the presence of pesticides and manganese

The plan entailed demolishing all the existing structures at the north end of the site. This would remove an admin building, a dissolved air flotation (DAF) plant and sand filters.

This would be replaced with:

- A brand-new main treatment building with processes for DAF and Rapid Gravity Filters
- Manganese filters
- A brand-new low-lift pumping station

The project was highly complex and technically challenging.

Wessex Water appointed AECOM as one of the six Tier 1 Design Capital Delivery partners to undertake the detailed design of the civil engineering and mechanical and industrial engineering (M&I) works. This would be together with integrating the design elements undertaken by others.

This scheme presented new challenges:

1. Wessex Water's project to reconstruct Durlough was their first scheme to be delivered to BIM Level 2.

That means the use of collaborative 3D models with embedded digital versions of all project and asset information, documentation and data. This was necessary due to the complexity of the site, where there were numerous existing underground services to be modelled. Furthermore, with the plant providing drinking water for 40,000 people in Somerset, it was crucial it be of the highest quality possible.

2. As a private industry, the water industry had not needed to comply with the Government's April 2016 mandate that all public projects be procured and delivered using BIM Level 2 as a minimum requirement. There is a cultural change needed in the industry as a whole, where traditionally many engineers want to use and mark-up paper drawings.



The solution

Pursuing a digital strategy - including committing to Shared VR

Wessex Water worked with AECOM to introduce a digital strategy to bring a range of technologies and innovations to form a comprehensive digital engineering approach to the scheme and wider business. These included:

- **Creating a single source of information.**
A Common Data Environment stored all design information in the cloud, instead of a local server. This enabled high levels of collaboration across the supply chain, from project management to engineering, procurement to operations.
- **A digital model that fully integrates all civil, mechanical, electrical and process design.**
Ground penetrating data, laser scan data, and drone surveys were used to create a highly accurate model of the new plant design. The use of drones also eliminated hazards associated with working on a fragile roof.

- **Digital design reviews.**
Visualising the scheme in 3D allowed the delivery team to quickly understand the look and function of the proposed construction works, which would enable prompt on-site decision making.
- **Design for Manufacturer and Assembly (DFMA).**
By maximising opportunities for off-site prefabrication of components, efficiency could be increased. This reduced risks and helped deliver the scheme to deadline targets.

As part of this strategy, AECOM saw the potential for the use of an immersive, collaborative environment. AECOM suggested the use of an Igloo Shared VR system to Wessex Water, and a 6.5-metre cylinder was purchased. This would come to fulfill a crucial role in the design of the refurbishment.



"We use the Igloo to go through design models with the operations team to make sure they're happy with all access and maintenance for their bits of kit."

James Leverton, Digital Solutions Lead, AECOM

Why Wessex Water and AECOM were attracted to Shared VR

Taking the benefits of VR + sharing it among entire teams
= Best of both world

Wessex Water had initially suggested implementing some form of AR or VR to aid design. AECOM trialled mixed-reality smartglasses, but struggled from a logistical perspective in visualising models. Wessex Water was also concerned that headsets would not be well received by stakeholders.

An Igloo Shared VR system looked an ideal solution:

Sharing the experience

Wessex Water wanted the benefits of VR such as being able to visualise a model instead of having to pore over detailed 2D drawings, while retaining the benefits of the team dynamic.

With an Igloo Shared VR system, this allowed them to:

- Work collaboratively - everyone could see what everyone else was looking at
- Brief team members - people could easily talk through what immersive content was being displayed
- Communicate effectively - team members could gauge reactions by being able to make eye contact, read facial expressions and body language
- Facilitate group discussions and arrive at a consensus opinion
- It also saw appliance in engaging sub-contractors

Promoting understanding

In the past, the only way to share the plans for a new model was by looking over the complicated 2D drawings. With Shared VR, you can showcase and visualise a 3D model in an immersive environment where people can even walk around the virtual model. This can also identify DfMA opportunities by providing equipment suppliers an immediate understanding of the project.

Facilitating sessions for large numbers of participants

AECOM and Wessex Water wanted to cater for a group size of 12 people. It was able to specify a 6.5-metre diameter Shared VR cylinder with 360° projection and surround sound.

Future applications

Wessex Water could see an easy opportunity to utilise Shared VR beyond the project. For example:

- Demonstrating the project for stakeholder buy-in
- Possibilities for training
- Uses on future projects needing to produce BIM models

The Igloo system being adaptable with many forms of content made all this possible, and more.

How Shared VR was integrated into the Durlough Water Treatment Centre Reconstruction

AECOM and Wessex Water held a joint proposal, discussion and decision on Igloo Shared VR Systems which were well received. It was felt being able to gauge reactions and keep eye contact while having a discussion was so crucial to how a team worked effectively.

AECOM created a 3D BIM model with data from ground-penetrating radar, laser scans and drone surveys. This 3D Model was then combined with Revizto software to create a VR model.

An Igloo Shared VR system (a 6.5-metre diameter cylinder) was assembled inside a disused building on the site. The size enabled up to 12 team members at any time to walk around the VR model of the site and carry out design reviews.

To make changes, laptops installed with Autodesk Revit and AutoCAD Plant 3D software would update the BIM models. Changes were pushed via the cloud to Revizto visual collaboration software. This could then be synced to the local Igloo server for viewing in a complete 360° immersive environment.

To navigate the VR environment, team members could use a simple Xbox controller.

The VR model also enabled the production of off-site components by providing information for equipment suppliers. 3D supplier fabrication details were inputted into the model. This would ensure the integration of the components into the site construction when delivered ready-made.

“We can all come into the Igloo space, and also join by Revizto’s camera share, and have an informed review session and ensure that the decisions that are being made are the right ones by the right people, and Igloo allows you to do that.”

Rhys Lewis, Business Development Director, Revizto

“With Igloo you can look someone in the eye when you’re talking to them and quickly understand that you’re talking about the same thing, you can gauge their interest and see if they understand what you’re saying.”

James Leverton, Digital Solutions Lead, AECOM



“We had early conversations with the client about using the HoloLens, but some of its delivery managers were not comfortable with wearing goggles that can restrict eye contact.”

James Leverton, Digital Solutions Lead, AECOM

Evaluating the impact

The initiatives had considerable success and impact. The cylinder was used for design coordination including clash detection, and for testing and reviewing plant operability.

The Igloo Shared VR cylinder also helped identify opportunities for value engineering. This included rationalisation of the wastewater area, increasing efficiency. Having the cylinder located on-site was also beneficial to design coordination. When designers spotted a problem, they could return to their desks, update the model and place it back into the cylinder.

The Igloo significantly boosted levels of engagement among both team members and stakeholders.

Audiences were extremely enthusiastic. Few if any people were distracted by or checking their phones during review meetings. The Igloo worked well to facilitate team conversations and discussions.

Despite the cultural changes needed in the water industry, AECOM only needed to produce a single set of piping and instrumentation diagram (P&ID) drawings. All other reviews were from the BIM model.

AECOM has spoken to Wessex Water about the possibility of developing BIM for use post-handover. Shared VR has made a strong contribution to how Wessex Water works. It may be crucial in meeting challenging efficiency targets from the regulator.

“

Impressions of the Igloo:

“It was really useful to be able to walk around a one-to-one model of the main treatment building with operations and review the exact layouts and locations of maintainable kit.”

Success of the Igloo:

“Stakeholder engagement – unbelievable improvements.”

“Everyone who entered the Igloo left their phone at the door (apart from taking photos).”

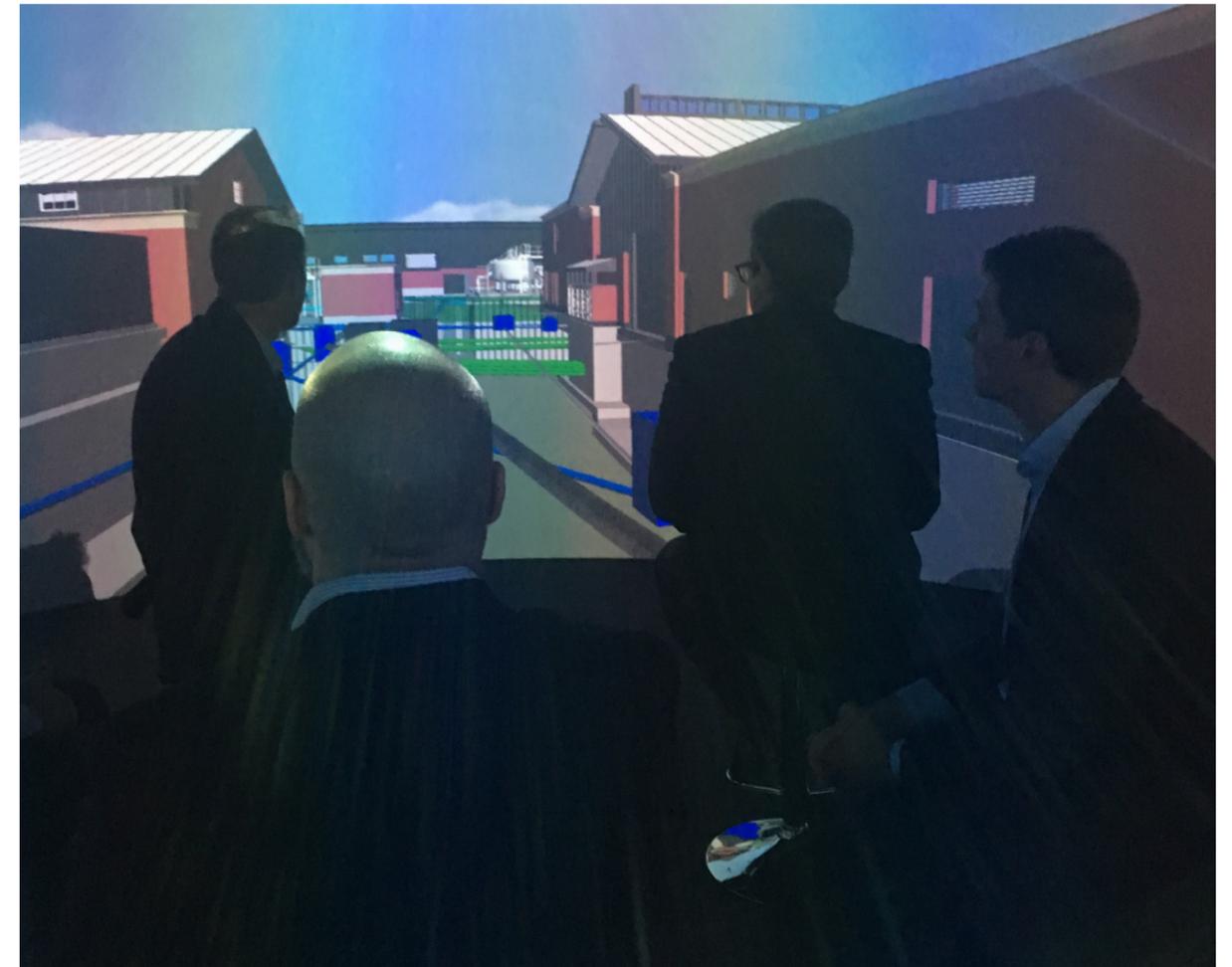
“People’s engagement is sustained for longer periods.”

Comparison with traditional design review methods:

“In the past, we have had real difficulties presenting operations teams with detailed 2D drawings that they couldn’t really understand. Inside the Igloo they got it straight away, it stimulated lots of good conversations.”

“The problem that we have is that sometimes operations don’t fully understand our 2D drawings - with a 3D model they can look around as if they’re there, check they’re happy with what they’ve got, so they can sign it off before they get to the site.”

The project featured as a case study in the New Civil Engineer magazine in November 2019. The article looked at the water industry’s need to adopt new technologies to meet the regulator’s ever-challenging targets, with Wessex Water praised for demonstrating how the water industry is harnessing the use of digital technology to deliver projects faster, smarter and safer.



“We are seeing a number of benefits such as improved engagement and project buy in from our operations colleagues, and more efficient, effective design reviews with significant time and cost savings.”

Simon Osborne, Delivery Manager at Wessex Water

Keys to success: The Igloo perspective

At Igloo we have worked on many deployments of Shared VR technology. And we are always keen to advise customers, and also to learn from customers, about the factors that enable an Igloo to become an effective enterprise tool.



From our perspective, the AECOM and Wessex Water deployment has five main keys to success:

- ### 1 A solution to an existing problem

How to deliver a flagship scheme to BIM Level 2 for the first time presented new challenges. It was crucial to resolve them ahead of future projects. The Igloo cylinder proved an intrinsic part of how Wessex Water used BIM models and was essential in providing a way for teams to make the transition from 2D to 3D to VR.

By solving this problem, Shared VR has delivered tangible value that will impact how Wessex Water delivers future schemes.
- ### 2 Working with high-quality software and content

Wessex Water worked with AECOM who used high-accuracy scanning technologies in conjunction with software Revizto to create a detailed VR model.

It was able to free BIM models from the confines of 2D screens and the isolation of VR headsets, by producing excellent, understandable content that anyone could grasp.
- ### 3 A commitment to training

It was understood how important being able to use the Igloo Shared VR cylinder to its full capacity was. As part of our service, Igloo delivered a comprehensive training programme. This allowed team members to fully utilise the Igloo, and re-train future employees in its use.

With a cadre of power users, Wessex Water has an on-site team of Igloo experts, who act as rainmakers and trouble-shooters for the wider team.
- ### 4 Senior-level evangelists

From the outset, a member of the AECOM team and a member of the Wessex Water executive team have been strong advocates of the Igloo. They have been keen to talk publicly and passionately about the benefits BIM and Shared VR can bring.

Senior-level support secured plenty of visibility for the Igloo via social media, traditional media, and internal communications channels.
- ### 5 Formal integration into workflows

AECOM ensured its commitment to digital engineering by only producing a single set of drawings. Subsequently, all further design reviews were from the VR model.

Shared VR was not an add-on. It was an intrinsic part of the way the project team functioned.

For more information

Igloo Vision is the Shared VR company.

From bases in the UK, USA, Canada and Australia, we work with clients worldwide. Increasingly, companies and institutions are turning to Igloo Shared VR for engineering, construction and infrastructure applications, including:

- Dwr Cymru Welsh Water
- National Grid
- Skanska
- Atkins
- BAM Nutall
- KIER
- Lendlease
- United Utilities

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