

RETHINKING PLANT DESIGNS

In water and wastewater infrastructure, engineering has a new paradigm to deal with, says Aidan Mercer, industry marketing director, Utilities and Government, Bentley Systems

Engineering is a marvel. It has produced some of the most breathtaking and iconic sights that continue to amaze with the ability to last the test of time. The sheer ability to design and operate the world's infrastructure has primarily been down to engineering excellence. In the water and wastewater industry, there has been a significant drive to adopt new technology, new ways of working and engineers are being challenged to deliver like never before.

With a dramatic rising global population, reduced budgets and ageing infrastructure, engineering is being realized as one of the key components to delivering better projects and managing assets over their lifecycle -- and it all starts at the design phase of a project.

In water and wastewater infrastructure, engineering has a new paradigm to deal with. Developments of 3D technology permit infrastructure engineers to think and work differently. The process of multi-discipline plant design for example, offers a new potential of convergence between the "reality" of what we recognize in the physical state and the "virtuality" of the 3D environments of how engineers conceive and conceptioner designs.

All the information captured in the design stage becomes fundamental to the success of any project; and it's all captured in 3D. This means the 3D model becomes all-encompassing -- inclusive of the 2D designs, detailed design, conceptual design as well as all the relevant information such as the P&ID's, electrical, HVAC and piping information. All this detailed information can be instantly queried and referenced against the visual nature of the 3D model; making it highly intelligent and engineeringly accurate. This 3D digital engineering model can span the life of assets, meaning the design stage is now pivotal for the success and longevity of a treatment plant.

These digital engineering models created in the early stages of the designs are now being required to deliver better information and accu-

racy in operational stages due to improving the levels of collaboration and speed of reviews and approvals with better access to information based on open data policies. This is perfectly showcased by MWH Global with their \$17.4mn project entitled 'Seafeld Wastewater Treatment Works Thermal Hydrolysis Plant'.

MWH used 3D digital engineering models to enhance collaboration and to bring the operational teams in on the design phase. This level of excellence in collaboration was achieved due to their broad use of Bentley's products. In fact, this project was so significant and innovative, it won them the Be Inspired Award 2014 for Innovation in Water or Wastewater Treatment Plants.

Products such as OpenPlant, AECOSim Building Designer, AutoPLANT, MicroStation, Bentley Navigator, and ProjectWise not only enhanced their visualisation potential, but also their unique ability to share information with the whole supply chain - and the digital engineering models were the fulcrum.

Another significant project to highlight in this area is one of the finalists in the same category. CH2M submitted for the award with their project entitled 'Skyway Wastewater Treatment Plant Phase II Expansion' and were also users of various applications from Bentley such as AECOSim Building Designer, Bentley Raceway and Cable Management and OpenPlant PID.

This level of software commitment enabled a 3D design of a new plant to be carried out, while the existing plant was still in operation. Some excellent results were quickly realised, and in particular Bentley Navigator, saving the client an estimated \$748mn by allowing the existing plant to remain partially in service. Both of these projects demonstrate the potential of what can be achieved in the design phase, and the emphasis is clearly on the data and information collected in these stages that will be used to streamline and improve operations in a visual format.



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This augmented level of focus placed on the 3D model is indeed changing the way engineers approach projects. It will become a prerequisite of any bid to secure a contract that an engineer is fully vested in the operations and maintenance phase, and perhaps one day will even be compensated for the quality of their models when used in operations.

In fact GWI consider this one of the biggest factors in treatment plant design, stating "The real opportunities to make a margin are in ownership and operations, where, if a design is truly innovative and does deliver lower lifecycle costs, the engineer can reap the benefits".

New found levels of collaboration have significantly furthered the potential opportunities in 3D and advanced the levels of integration. Open data standards (ISO 15926 for example) drive standard data formats and integration so that these digital engineering models keep integrity through to handover. For a treatment plant, this is critical in its nature as the handover process require engineering accuracy. This emphasis on the design element of treatment plant will be the foundation for an integrated plant lifecycle, shifting the intelligence of that phase into operations. As Steve Jobs once said "Design is not just that it looks and feels like. Design is how it works". [Utilities](#)