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Insights on Design Automation for Water Treatment Facilities

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Learning Objectives

- Evaluate options for increasing design automation in your firm
- Explain the benefits of implementing different types of design automation in facility design
- Identify opportunities for automation improvements in your firm
- Integrate existing design standards with automation tools

Description

Resource constraints, cost concerns, and a desire to better leverage emerging AI and ML technologies have caused design teams in the water industry to adopt automation tools to accelerate their work. These tools allow designers to leverage standardized processes and design content to efficiently generate high quality documentation with 3D visualization, while still providing a customized solution to meet a client's specific needs. These tools can allow multiple designs using alternative treatment technologies to be efficiently generated and evaluated as part of design optimization efforts. This presentation includes a discussion of current trends in design automation, with a focus on water and wastewater treatment facilities. This includes the use of bots, BIM/CAD automations, and specialized rules-based design automation tools. A case study of a project using the Transcend rules-based automation package will be discussed to show the value that can be achieved with these tools.

Speaker(s)

Mike Etheridge

Mike Etheridge joined Black & Veatch in 1990 as a instrumentation & control systems engineer in the Water business unit. He has worked his entire 32 year career at B&V working on water projects and project execution. His career includes time as a designer, control system programmer, startup specialist, engineering manager, and project manager.

In addition, since 2000, Mike has been involved with integration and development of technology solutions with design and project execution processes. This includes development of project execution tools that integrate deliverables and data from the

project lifecycle with design tools that are used to model and produce project deliverables. Most recently he has helped lead a development initiative that integrates a comprehensive cloud-based project database with project Revit models, using Forge and custom APIs to synchronize the data with project design models. He has also been involved with implementation of both task based automations and rules based design automations through partnerships with Transcend.

Adam Tank

Adam has 12 years of experience in the water industry with a focus on innovation, software, and business development.

As the Chief Customer Officer at Transcend he has responsibility for client success related to Transcend Design Generator (www.transcendh2o.com) and the automation of preliminary engineering activities.

Most recently he served as the North America Smart Cities Director at Suez. He previously founded, and sold, a robotics spin-out of the General Electric corporation which focused on cutting edge potable water pipe rehabilitation techniques. Prior to that he serves as GE Water's Digital Water Leader, managing venture investments and creating software solutions for water distribution challenges.

Earlier in his career Adam serves as an engineer in the CPG industry where he both lived and worked in Brazil, and led sanitation programs for General Mills' largest yogurt plant in North America.

Adam received his undergraduate degree in microbiology from Kansas State University and his M.B.A. from the University of Arizona. He is a water blogger and podcaster, foster dad, long form author, and supporter of volunteer organizations like Big Brothers Big Sisters of America.

Options For Increasing Design Automation

While design tools used in designing water facilities have evolved over the past 30 years, the design processes and deliverables have remained fairly stable – construction drawings and specifications custom designed to fit the facility scope. Often automation efforts in the industry have been limited to automation of repetitive production or administrative tasks that don't typically involve much engineering. This includes tasks like automating title block entries from deliverables lists or generation of basic equipment lists from CAD drawings or models. These types of automations are still valuable and will undoubtedly continue to be implemented.

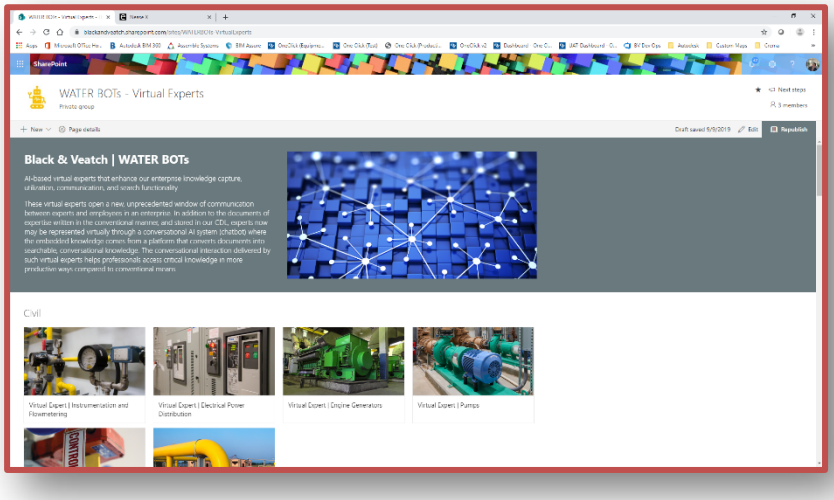
However, greater automation value exists in integration of the underlying engineering analysis and decisions with relevant project data and standard design rules that can be applied to project specific criteria to produce an automated design that is still customized for the project.

BOTs & Task Automation

Direct automation of drafting and design tasks in design tools has existed since the earliest days of CAD software. Event and user driven automations developed with LISP, VBA, Dynamo or other code has been used to improve productivity, enhance quality, and to extract information. Opportunities for this type of automation will continue to provide value going forward.

BOTs are a more recent automation tool that can be used to improve productivity and quality on design projects, both within design tools and in other aspects of design outside the core design tools. Robotic Process Automation (RPA) BOTs can be leveraged to automatic specific repetitive tasks, provided the tasks are well defined and repeatable from project to project. RPA BOTs can be leveraged using a variety of software tools, from generic spreadsheet tools to more complex analysis tools – though more complex tools will likely require more complex efforts in programming the RPA BOTs.

While not generally thought of as a design support tool, Chat BOTs can also provide value in automating (or at least enhancing) delivery of information to designers. Most design firms have copious amounts of standards and process related content to guide design decisions and finding the right, context specific, guidance documents can take a considerable amount of a designer's time. Chat BOT advances include the ability to consume and 'learn' from the source content to provide context specific assistance to users looking for reference material needed for design.



Rules Based/Generative Design Automation

While BOTs and basic task automation can provide measurable benefits to design project efficiency, greater benefits can be achieved from tools that leverage design rules to be used to produce a more comprehensive automation of design. These tools consume user input design criteria and apply design rules with standardized content/data to produce preliminary design outputs. Outputs can include design basis documentation, P&IDs, BIM models, general arrangements/layout drawings, equipment lists – along with a variety of evaluation metrics (CAPEX, OPEX, carbon footprint, etc.).

Benefits of Implementing Various Design Automation Tools

All forms of automation generally provide some value. For BOT and task based automation, the value is generally derived from productivity gains and error reduction.

For rules based design automation tools, there is still value gained from productivity improvements, reducing model and drawing production efforts by allowing the tool to create preliminary versions of key deliverables. However, the value extends beyond productivity gains to allow for enhanced decision making that can impact not just value and the design stage, but through the life of the project. By allowing quick production of multiple options for a treatment facility and delivering decision metrics like CAPEX for each option, the client and designer can collaborate to produce a better facility without having the cost or schedule burden of producing multiple preliminary designs using more typical manual methods.