Optimizing System Design and Performance with OpenFlows Hydraulic and Hydrologic Solutions

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Global Water Issues

Energy-related costs represent up to **40%** of the utilities' operational budgets.

Global water demand is projected to increase **60% by 2030.**

2.3 billion people live in **water-stressed countries**, of which 733 million live in high and critically water-stressed countries.

35+ billion per year are needed to keep water infrastructure assets running in Americas and Europe.

Utilities on average **lose 25–40% of the drinking water** in distribution, and only <15% loss/leakage is considered "world class".

Environmental responsibility is paramount, the transition of water utilities to **net zero** operations is a critical focus.

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Hydraulic and Hydrology Solutions

Solving Today's Water, Sewer, and Stormwater Engineering Challenges

Empowering water, wastewater, and stormwater engineers to address long- and short-term challenges more efficiently

Meet Regulatory Compliance

Ensure Healthy Communities

Achieve Sustainability Goals & Mitigate Climate Risk

Accelerate Digital Innovation

Model & Analyze

Optimize Operations & Network Performance

Mitigate Risk of Catastrophic Events

Reduce Operation & Maintenance Costs

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Imagine the Possibilities

What are your goals for improving operational efficiency and cost reduction?

↓40%

Reduction in design costs and 80% reduction in design time

Creating a hydraulic model and reviewing innumerable scenarios saved DTK Hydronet Solutions 40 percent in design costs and 80 percent in design time at Bankura, West Bengal, India.

↓22.9%

Reduction in Water Supply Interruptions

Forecasts, alerts, and what-if scenario modeling lowered water supply interruptions by 22.9% at Águas do Porto.

↓20%

Reduction in Pumping Energy Costs

American Water, reduced operating costs by 20% primarily through improved energy efficiency.

Source: AWWA Ace Conference Presentation, Jian Yang Ph.D., P.E., and James Chelius P.E. American Water - Corporate Engineering, Jun 11, 2019

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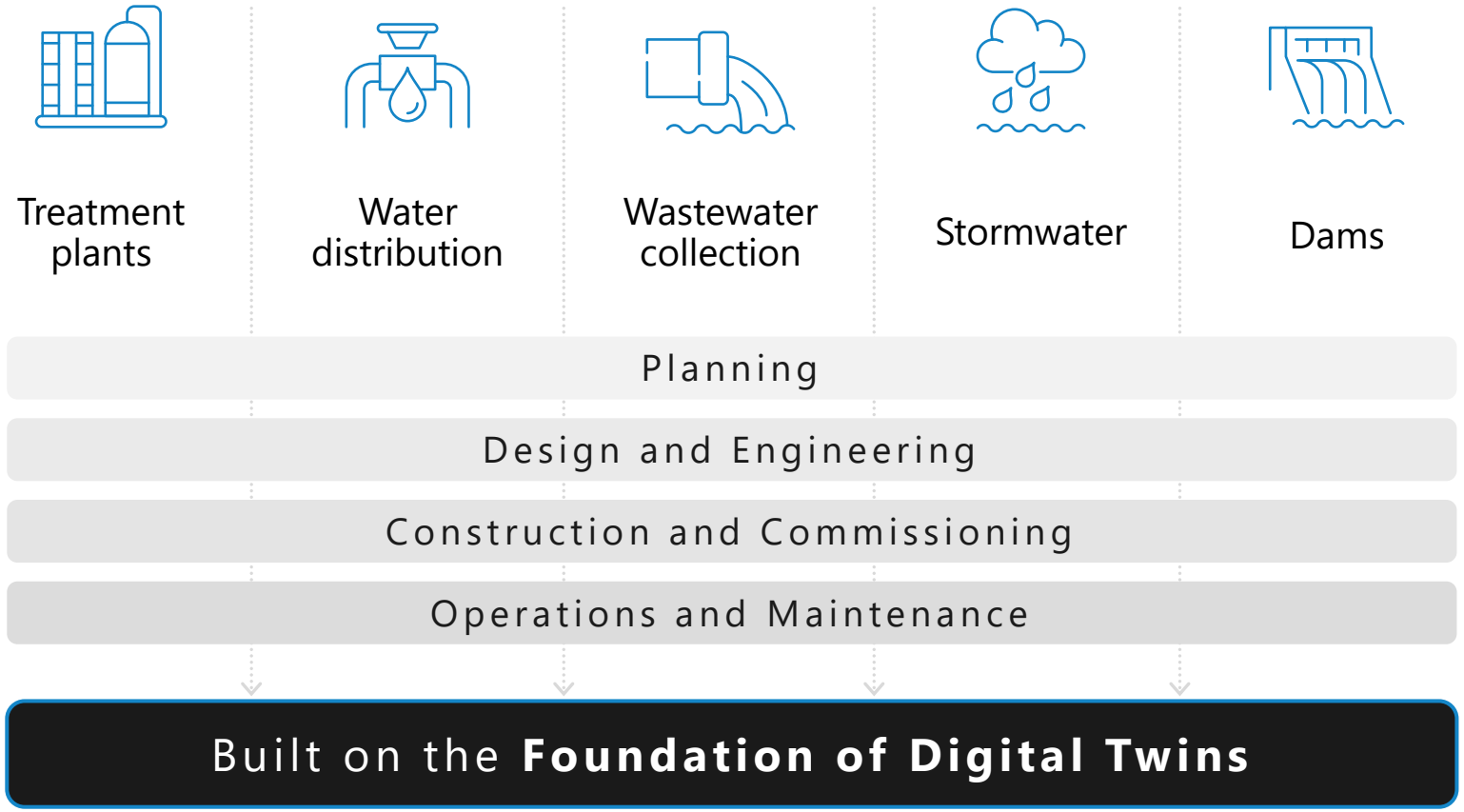
Water Infrastructure Solutions across the Asset and Project Lifecycle



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Hydraulic Modeling and Analysis Engineering Solutions

Thousands of Engineers Use OpenFlows Everyday

OpenFlows™ Water

Water Distribution
Network
Modeling and Analysis

OpenFlows™ Sewer

Wastewater Collection
Network
Modeling and Analysis

OpenFlows™ Storm

Stormwater
System
Modeling and Analysis

OpenFlows™ Hydraulic Toolset

Solving individual hydraulic components
and hydraulic elements calculations

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Water Distribution Network Modeling and Analysis

Empowering water infrastructure engineers
to solve challenges more efficiently

Effectively plan, design and optimize water distribution systems

Plan, Design & Optimize Systems

Understand System Hydraulic Behavior & Performance

Predict and Solve Network Problems

Ensure Safe & Reliable Water Supply

Mitigate Transient Risk of Catastrophic Water Failures

Reduce Nonrevenue Water and Energy Costs

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Water Network Engineering Solution

Swift Planning
Superior Insights
Better Decisions

OpenFlows™ Water

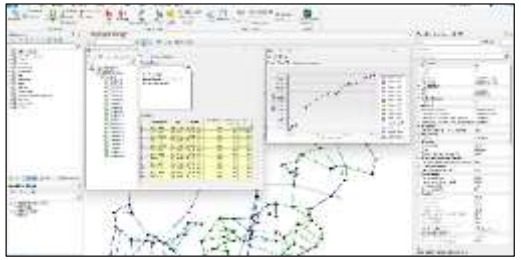
Hydraulic Modeling and Analysis Software

Open Interoperability
- Stand-alone interface
- MicroStation®
- ArcGIS Pro
- AutoCAD

Seamless Integration with GIS/SCADA

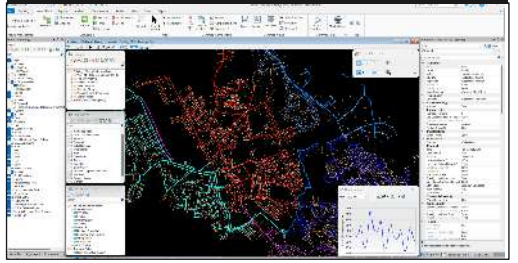
Why Bentley's Water Network Engineering Solution?

Optimize System Design & Performance



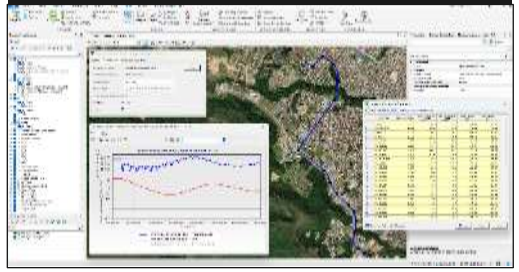
- Understand system hydraulic behavior and performance
- Build, calibrate, and manage models quickly and easily
- Simulate, predict and solve network system problems
- Perform and track multiple what-if scenarios

Make Intelligent Decisions



- Analyze and improve network reliability and improve water quality
- Identify water loss locations and reduce non-revenue water
- Optimize pumping to reduce energy expenses
- Improve emergency response

Mitigate Risk, Ensure Compliance



- Mitigate risk of transients and prevent catastrophic water events
- Assess and meet fire flow requirements
- Predict and meet population demands
- Design cost-effective system expansions and rehabilitation strategies

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GeoInfo Services Designs 24/7 Pressurized Water Network to Provide Clean Reliable Drinking Water

Challenge

- Ayodhya Authority commissioned Geoinfo Services to engineer an urban pressurized water supply system for uninterrupted access to clean water, eliminating Ayodhya's existing gravity-fed distribution network.
- Objective to convert Ayodhya's existing water supply system into a 24/7 pressurized, piped network.

Solution

- Needed to generate a hydraulic model and digital twin of the city's water infrastructure.
- Using OpenFlows helped evaluate design scenarios with innovative pumping technology to equalize pressure and reduce energy costs.
- Developing a digital twin powered by the hydraulic model facilitating real-time monitoring and predictive analysis to optimize operations and mitigate emergency situations.

Benefits

- OpenFlows™ helped save USD 1.5 Million in annual operating costs and eliminate 347 tons of carbon emissions
- The 24-hour water supply network reduces waterborne illnesses, saving 50% in associated family medical expenses.
- Saved 1,000 hours planning, designing, and implementing a cost-efficient water supply solution

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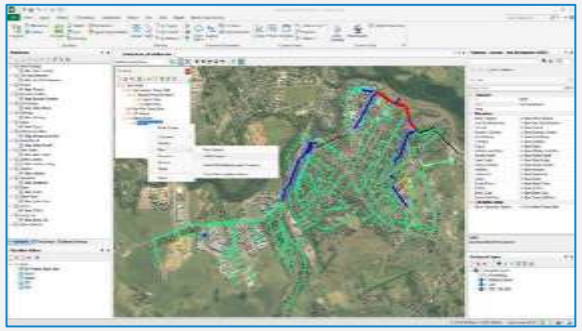
Wastewater Collection Network Modeling and Analysis

Empowering wastewater infrastructure engineers
to solve challenges more efficiently

Effectively plan, design and analyze wastewater systems



Ensure Reliable Wastewater Collection

Improve Network Reliability & Reduce Sewer Overflows

Predict and Meet Population Demands

Plan, Design and Analyze Sanitary and Combined Sewer Systems

Estimate Infiltration and Stormwater Inflows

Predict and Manage Peak Flows and Surface Flooding

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Sewer Network Engineering Solution

Sustainable Wastewater Management and Healthy Communities

OpenFlows™ Sewer

Hydraulic Modeling and Analysis Software

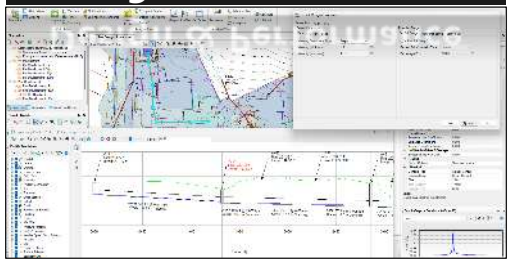
Open Interoperability

- Stand-alone interface
- MicroStation®
- OpenRoads™ Designer
- OpenSite® Designer
- OpenRail™ Designer
- ArcGIS Pro
- AutoCAD

Seamless Integration with GIS/SCADA

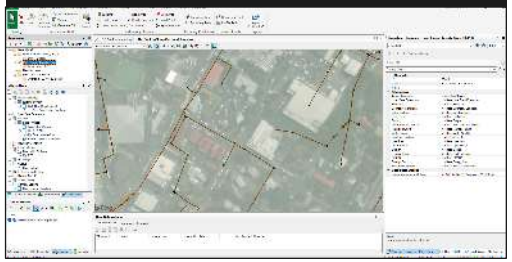
Why Bentley's Sewer Network Engineering Solution?

Optimize System Design & Performance



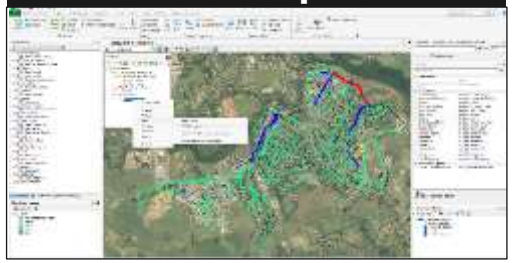
- Utilize interoperable hydraulic modeling
- Perform 1D/2D hydraulic modeling, simulation, and analysis
- Manage and analyze models with multiple what-if scenarios
- Understand surface flooding depth and velocity, and flood hazards

Make Intelligent Decisions



- Complete comprehensive analysis of sewer and storm systems
- Implement strategies for design, operations, sanitary loading, and network topology
- Create steady-state simulations and extended period simulations
- Integrate data across multiple platforms

Mitigate Risk, Ensure Compliance



- Predict and meet population demands
- Perform overflow remediation analysis and design
- Perform critical storm analysis
- Design cost-effective system expansions and rehabilitation strategies

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TSA Designs a Modern Sewage Network To Help Address Water Quality Issues for Vulnerable Communities in Brazil

Challenge

- Vulnerable communities in Brazil face water quality issues due to raw sewage being dumped into rivers and intermittent water services that fail to meet potability standards.
- TSA, a family-owned company in Porto Alegre, Brazil, is dedicated to designing efficient water and wastewater networks to improve access to water and sanitation services.
- TSA's projects have a significant impact, such as a new sewage system serving 300,000 people, reducing water treatment costs, and addressing water scarcity through improved infrastructure.

Solution

- The company utilizes OpenFlows Sewer to design modern sewage systems, reducing environmental degradation and enhancing the quality of life for underserved communities.
- The software gives the team better visibility into all parts of the project as a connected system instead of a spreadsheet.
- The software helps TSA analyze the best alternatives for a particular system and come up with the best option, both for the public and for the client and complete projects much faster.

Benefits

- OpenFlows Sewer helps TSA identify the best alternatives to optimize each system, thereby reducing the pumping, implementation, and operation costs.
- By designing reliable, effective, and efficient sustainable sewage networks, TSA can help reduce environmental degradation and provide a more dignified and healthier existence for vulnerable communities in Brazil.

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Stormwater System Modeling and Analysis

Empowering stormwater infrastructure engineers
to solve challenges more efficiently

Effectively plan, design and analyze stormwater systems

Manage Stormwater Effectively

Limit Stormwater Flood Risk

Ensure Regulatory Compliance and Healthy Communities

Plan, Design, Analyze Cost-effective Stormwater Systems

Implement Low Impact Development (LID) Controls

Predict and Solve System Capacity Problems

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Storm Network Engineering Solution

Sustainable Stormwater Management Solutions

OpenFlows™ Storm

Hydraulic Modeling and Analysis Software

Open Interoperability

- Stand-alone interface
- MicroStation®
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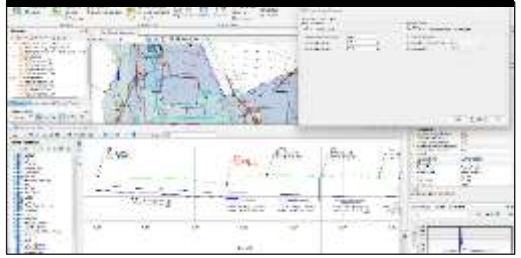
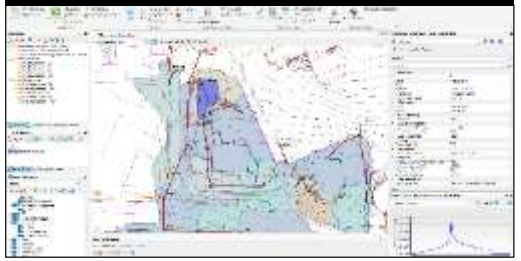
Why Bentley's Storm Network Engineering Solution?

Optimize System Design & Performance



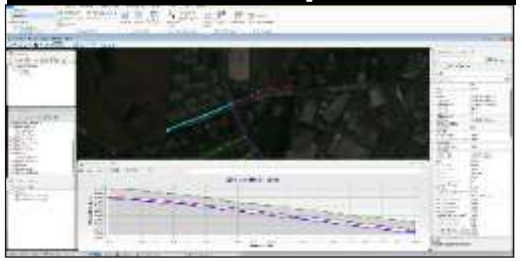
- Conduct 1D/2D hydraulic analysis for surface flood modeling
- Design the most cost-effective pipe sizes and invert elevations
- Model complex pond outlets for a variety of tailwater conditions
- Import rainfall data and distributions

Make Intelligent Decisions



- Detect system bottlenecks, improve capacity, and limit stormwater flooding
- Automatically determine cost-effective pipe sizes and invert elevations
- Manage models with scenario management and 1D solver options
- Integrate data across multiple platforms

Mitigate Risk, Ensure Compliance



- Limit stormwater flooding and comply with regulations
- Design high-quality stormwater systems with minimal capital investments
- Perform critical storm analysis
- Perform remediation analysis for a variety of system conditions

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Quattrone Develops Cost-efficient Stormwater Network Solution for New Housing Complex in Florida

Challenge

- The Mallory Townhomes was designed to offer an affordable rental housing complex in the city of Fort Myers, Florida.
- Mid-construction, a conflict with the stormwater outfall structure was identified, which could have led to costly and time-consuming modifications.
- Quattrone & Associates were brought on site to evaluate and find a cost-efficient stormwater network solution and keep the construction on schedule.

Solution

- OpenFlows™ Storm was used to redesign the stormwater system
- The software's flexibility allowed the team to consider and incorporate local storm events to run the model specifically for this project site while generating detailed reports.
- Bentley's digital environment provided a visual and analytical model to help redesign the stormwater layout, determining an optimal design solution

Benefits

- The advanced hydraulic modeling and analysis allowed for an efficient redesign of the stormwater network.
- The design incorporated reusing all the existing RCP materials to keep construction moving forward.
- Bentley's application saved the owner and contractor USD 10,000 and avoided a six-month potential construction delay.

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ArcGIS Pro

- Leverage ArcGIS native functionality
  - Map water, sewer and storm systems
  - Edit network data
  - Utilize geospatial capabilities
- Create informative layouts
- View system maps in the field and the office

Hydraulic Modeling

- Understand how water, sewer and storm systems operate and respond to network and environmental changes

Plan, design & analyze water networks

Plan, design & analyze sewer networks

Design & analyze pond and outlets

Model surcharge and flood protection, emergency planning

Identify Areas of Water Loss

Optimize network operations

Identify areas of inflow & infiltration

Determine overflow risk and flood extent

Seamless integration means you always have a direct link to your master GIS record - even in a changing environment.

Note: ESRI integration is available for the OpenFlows Water and OpenFlows Sewer (Advanced and Ultimate tiers only)

OpenFlows Key Features

- ✓ **Interoperability –** OpenFlows supports standalone use or integration with industry-standard GIS and CAD platforms. The result is a significant reduction in project time and costs, improved productivity, and minimized risk.

- ✓ **Scenario and Model Management –** Conduct simulations of various what-if scenarios, leading to more robust system analyses, enhanced productivity and proactive problem-solving.

- ✓ **Digital Twin Readiness –** Model information that can be directly accessed by Bentley's digital twin platforms to create a digital twin, providing organizational visibility to critical system data on performance along with risk information. Enhance operations, maintenance, and capital planning decisions.

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Thank You!

www.Bentley.com

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