COMPANY
Water Supplies Department, HKSAR Government
Shenzhen Yuegang Technology Company Limited
The University of Hong Kong (HKU Business School)

PROJECT
Digitalizing Smart Water System: STTSS for Pump Optimization with AI-Driven BIM and GIS Integration

LOCATION
Dongjiang Raw Water Trunk Transfer System

TYPE
Water Works

SCHEDULED TIME OF COMPLETION
June 2023 - May 2025

Optimizing Raw Water Transfer Systems through AI and BIM-GIS Integration

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Water Supplies Department

粵海水务

HKU BUSINESS SCHOOL 港大經管學院

Project Description

The Smart Trunk Transfer Support System (STTSS) by the Water Supplies Department (WSD) of Hong Kong integrates BIM, GIS, AI, and IoT technologies to optimize energy management, reduce carbon footprints, and enhance climate resilience in raw water supply networks. The system features an Integrated System Performance Dashboard, offering real-time and offline monitoring, predictive maintenance, and advanced asset management. This revolutionary approach to water infrastructure management benefits Hong Kong's 7.5 million residents.

Project Challenges

The Water Supplies Department (WSD) of Hong Kong faced significant challenges in ensuring a reliable water supply amidst climate change-induced uncertainties, such as erratic rainfall and prolonged droughts. Traditional supply and control systems limited operational efficiency, energy management, and situational awareness, resulting in labor-intensive processes and difficulties in accessing comprehensive spatial and asset data. Additionally, the need for robust predictive maintenance and optimization to reduce energy consumption due to rising energy costs and enhance service level resilience was a critical challenge that necessitated innovative technological integration.

Solutions for Challenges

The Smart Trunk Transfer Support System (STTSS) effectively addresses these challenges by integrating cutting-edge technologies such as Building Information Modeling (BIM), Geographic Information Systems (GIS), Artificial Intelligence (AI), and the Internet of Things (IoT). The system's Integrated System Performance Dashboard offers real-time monitoring and advanced visualization in both 2D and 3D modes, providing comprehensive situational awareness and proactive asset management. AI algorithms optimize pump and valve scheduling, significantly reducing energy consumption and operational costs. The seamless integration of BIM and GIS data enhances the accuracy and completeness of asset information, streamlining maintenance processes and improving overall system resilience and sustainability.

How does BIM benefit the project?

Building Information Modeling (BIM) significantly enhances the Smart Trunk Transfer Support System (STTSS) by providing a detailed, realistic 3D model that integrates both geospatial and asset data, offering a comprehensive view of the water distribution network. This integration empowers the Water Supplies Department (WSD) to identify assets, monitor asset health, identify potential risks, and enhance decision-making processes for further optimization. BIM's interoperability with Geographic Information Systems (GIS) and Artificial Intelligence (AI) enhances operational efficiency and pump optimization through real-time SCADA data and predictive maintenance analytics. The result is an efficient and reliable AI dashboard platform, characterized by ISO 50001 energy management and reduced energy and operational costs.

Better with BIM

Building Information Modeling (BIM) significantly enhances the Smart Trunk Transfer Support System (STTSS) by providing a comprehensive "one picture overview" of the entire raw water supply network. This integration combines geospatial data, hydraulic models, dynamic 3D GIS visualization, and operational insights into real-world applications. Coupled with our specially designed AI-driven analytics platform, Galaxy, which includes rainfall and reservoir storage level predictive capabilities, this approach enables advanced optimization of pump and valve operations, resulting in substantial energy savings and improved operational efficiency. The seamless integration of BIM with GIS ensures that both vertical and linear asset data are perfectly aligned. This alignment facilitates enhanced collaboration and informed decision-making among project stakeholders.

About Water Supplies Department, HKSAR Government

The Water Supplies Department is responsible for operating and maintaining fresh water and flushing water supplies and distribution systems to ensure reliable water supplies to customers. The fresh water supply system covers 99.99% of Hong Kong's population, while the seawater supply network for flushing covers about 85% of the population.

About Shenzhen Yuegang Technology Company Limited

Shenzhen Yuegang Technology Company Limited has contributed to the Digital Transformation initiative of the Water Supplies Department since 2019 by implementing its suite of smart water technologies and systems to support various smart water projects.

About The University of Hong Kong (HKU Business School)

The University of Hong Kong (HKU Business School) has contributed to data analysis for this project. Their focus is on identifying the optimal pump operation combinations to ensure the supply of drinking water in Hong Kong while considering various constraints. Data will be integrated with the smart water technologies and systems to enable digitalization.

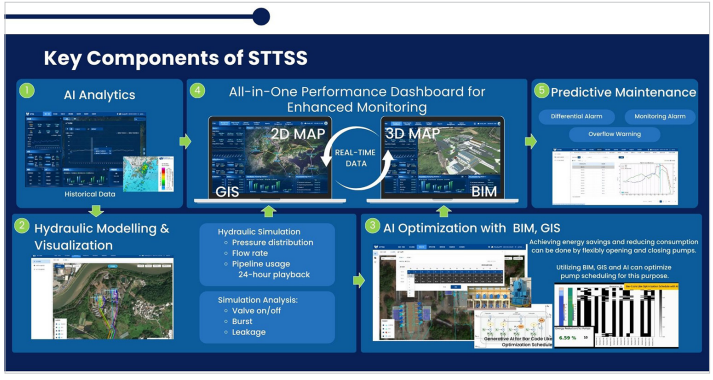
BIM PARTNER
Summit Technology (Hong Kong) Limited

AUTODESK PRODUCTS USED
Autodesk® Civil 3D®
Autodesk® Navisworks®
Autodesk Platform Services
Autodesk® ReCap® Pro
Autodesk® Revit®
Autodesk® Vault
Infowater Pro

Overall View of Muk Wu Pumping Station BIM As-built Model
Image Courtesy of Water Supplies Department, HKSAR Government and Shenzhen Yuegang Technology Company Limited and The University of Hong Kong (HKU Business School)

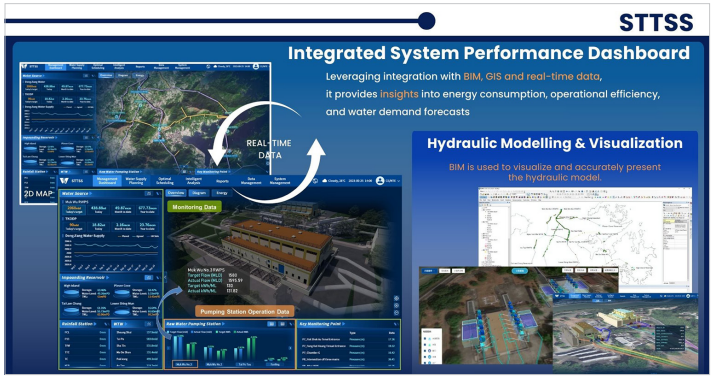
Muk Wu Pumping Station BIM Model at STTSS
Image Courtesy of Water Supplies Department, HKSAR Government and Shenzhen Yuegang Technology Company Limited and The University of Hong Kong (HKU Business School)

Real-Time Monitoring of Dongjiang Water Mains at STTSS
Image Courtesy of Water Supplies Department, HKSAR Government and Shenzhen Yuegang Technology Company Limited and The University of Hong Kong (HKU Business School)

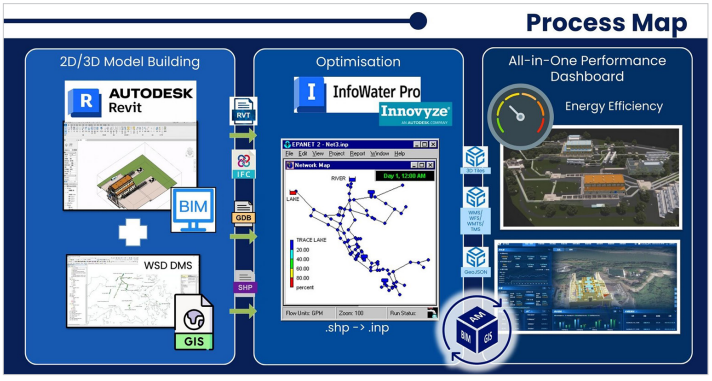


Key Components of STTSS
Image Courtesy of Water Supplies Department, HKSAR Government and Shenzhen Yuegang Technology Company Limited and The University of Hong Kong (HKU Business School)

AI Optimization Strategies Implemented in STTSS
Image Courtesy of Water Supplies Department, HKSAR Government and Shenzhen Yuegang Technology Company Limited and The University of Hong Kong (HKU Business School)



Utilizing BIM and GIS for Hydraulic Visualization of Dongjiang Water Mains in STTSS
Image Courtesy of Water Supplies Department, HKSAR Government and Shenzhen Yuegang Technology Company Limited and The University of Hong Kong (HKU Business School)



Process Map for BIM and GIS Integration in STTSS
Image Courtesy of Water Supplies Department, HKSAR Government and Shenzhen Yuegang Technology Company Limited and The University of Hong Kong (HKU Business School)

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