

COMPANY

Water Supplies Department, HKSAR Government
Shenzhen Yuegang Technology Company Limited
ACCIONA

PROJECT

Innovative Asset Management for Building
Resilient Water Supply: BIM & AMIS at Tseung
Kwan O Desalination Plant

LOCATION

Tseung Kwan O

TYPE

Water Works

SCHEDULED TIME OF COMPLETION

December, 2023

Innovative Asset Management: BIM, GIS, and IoT Integration for Water Supply Resilience in Hong Kong



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 a total of 99.99% of Hong Kong's population, while the seawater supply network for flushing covers about 85% of Hong Kong's 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 of WSD.

About ACCIONA

ACCIONA is a leading Spanish company known for innovative infrastructure solutions in water and energy. ACCIONA has applied its expertise to design, build, and operate Hong Kong's first reverse osmosis (RO) desalination plant, the Tseung Kwan O Desalination Plant.

BIM PARTNER

Summit Technology (Hong Kong) Limited

AUTODESK PRODUCTS USED

Autodesk® AutoCAD® Plant 3D

Autodesk® Civil 3D®

Autodesk® Navisworks®

Autodesk® ReCap® Pro

Autodesk® Revit®

COBie (Autodesk® Revit® Add-ins)

Project Description

Commissioned in December 2023, the Tseung Kwan O Desalination Plant (TKODP) utilizes state-of-the-art reverse osmosis technology to convert seawater into potable water. With an initial production capacity of 135,000 m³/day, expandable to 270,000 m³/day, this project is pivotal in enhancing water supply resilience amid climate change challenges. The ultimate design will provide approximately 10% of Hong Kong's fresh water needs. The integration of BIM within the Asset Management Information System (AMIS) ensures efficient asset management throughout the plant's lifecycle.

Project Challenges

The TKODP project marks Hong Kong's inaugural large-scale desalination plant utilizing reverse osmosis to convert seawater into potable water. The project encountered numerous challenges during both the construction and operation phases. To address these, advanced tools such as BIM, GIS, IoT, and SCADA were employed to digitize the entire infrastructure assets. Industry-standard systems like AMIS were integrated to ensure seamless interoperability among these tools. Moreover, aligning with WSD's BIM standards and ensuring timely access to accurate information was essential to prevent risks and enhance asset management. Robust systems were required to manage data, thereby preventing risks and minimizing rework.

Solutions for Challenges

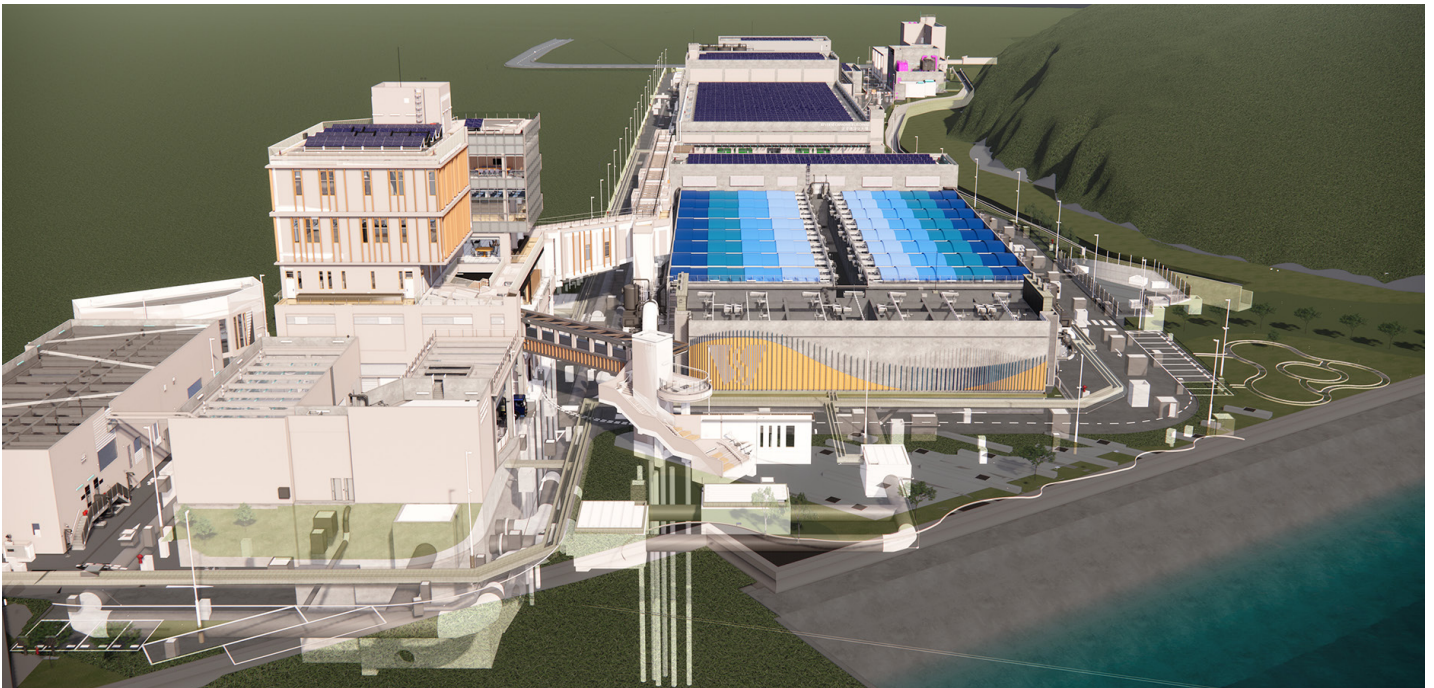
To address these challenges, the project analyzed business processes and implemented a streamlined BIM-AM workflow, enhancing data interoperability with openBIM formats such as IDS, IFC, BSDD, and COBie. A comprehensive and systematic asset register was developed to transfer useful asset data into the Asset Management Information System (AMIS) according to WSD's well-predefined Asset Hierarchy Structure, ensuring seamless data exchange. The adoption of a centralized asset repository within AMIS enabled timely access to accurate information, supporting the implementation of the Reliability Centered Maintenance (RCM) strategy. The application of mobile devices for real-time data capture further streamlined the maintenance processes, ensuring accurate and up-to-date information sharing across all stakeholders.

How does BIM benefit the project?

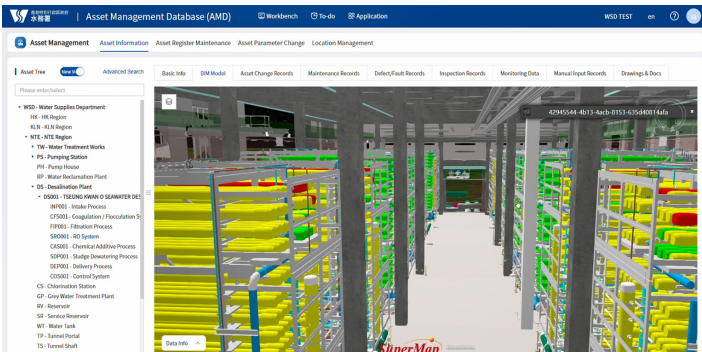
Integrating BIM with AMIS has provided the TKODP project with a robust platform for managing complex asset data throughout the asset lifecycle. This synergy ensures seamless data transfer and interoperability, enhancing real-time visualization and monitoring of assets. The integration facilitates a 'cradle-to-grave' approach to asset management, thereby reducing downtime and optimizing asset performance. Furthermore, BIM supports informed decision-making by linking real-time sensor data to asset management processes, significantly improving the efficiency and reliability of water supply operations.

Better with BIM

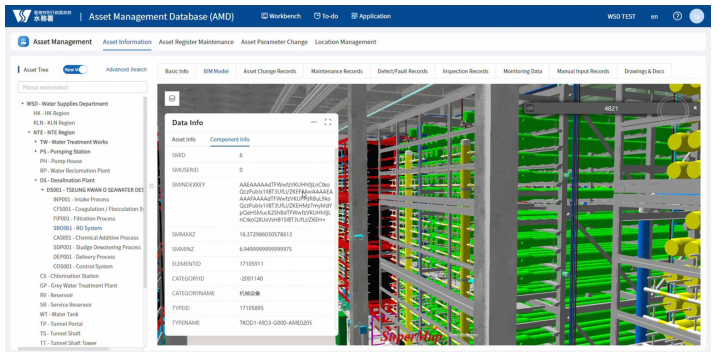
The integration of BIM within AMIS has revolutionized asset management at TKODP, establishing a comprehensive digital platform for real-time data capture and lifecycle management. The SCADA system, combined with real-time sensor data, facilitates the formulation of maintenance strategies. This integration fosters collaboration among stakeholders by providing a single source of truth for asset information, minimizing risks and streamlining operations throughout the asset lifecycle. The result is not only substantial cost savings but also a marked improvement in operational efficiency. By leveraging mobile devices for real-time data capture synchronized with BIM models, AMIS ensures proactive asset maintenance, thereby reducing errors and enhancing overall performance.



Overall View of the Tseung Kwan O Desalination Plant BIM Model
Image Courtesy of Water Supplies Department, HKSAR Government and Shenzhen Yuegang Technology Company Limited and ACCIONA



Visualization of the Reverse Osmosis (RO) Building in AMIS
Image Courtesy of Water Supplies Department, HKSAR Government and Shenzhen Yuegang Technology Company Limited and ACCIONA



Utilizing BIM in AMIS for Asset Management
Image Courtesy of Water Supplies Department, HKSAR Government and Shenzhen Yuegang Technology Company Limited and ACCIONA

Innovation of the BIM project

IoT : ONLINE ANALYSERS AND DASHBOARD

The image shows a complex dashboard for 'TKODP online analysers' with various data points, charts, and status indicators. Below the dashboard are several 3D models of industrial equipment, labeled as 'online analysers', showing their integration with the BIM model.

IoT Online Analyzers and Dashboard at TKODP
Image Courtesy of Water Supplies Department, HKSAR Government and Shenzhen Yuegang Technology Company Limited and ACCIONA

INNOVATIONS : AMIS

INSPECTION :Routine Inspection with BIM

The diagram illustrates the process of routine inspections using BIM. It shows an 'Inspection route' overlaid on a 3D model of the facility. The process is supported by mobile devices (smartphones and tablets) that record inspection data. Text boxes explain that inspection data is recorded via mobile devices, synchronized with BIM components, and that equipment inspection records are directly linked to the BIM model for seamless integration and management.

Routine Inspections with BIM in AMIS
Image Courtesy of Water Supplies Department, HKSAR Government and Shenzhen Yuegang Technology Company Limited and ACCIONA

openBIM Application : AMIS

Geospatial GIS and BIM Plug-in

The diagram illustrates the integration of various Autodesk software products into the AMIS system. On the left, a list of software includes Autodesk Revit, AutoCAD Plant 3D, AutoCAD Civil 3D, Autodesk Recap Pro, and Autodesk Navisworks. These are connected via 'API and conversion tools' to the 'TKODP BIM Model in AMIS' shown on the right. The model displays a 3D view of the facility with geospatial data overlaid.

Geospatial GIS and BIM Plug-in in AMIS
Image Courtesy of Water Supplies Department, HKSAR Government and Shenzhen Yuegang Technology Company Limited and ACCIONA

Asset Life Cycle Management

A comprehensive diagram of the Asset Life Cycle Management (ALCM) workflow. It starts with the 'Tseung Kwan O Desalination Plant' and 'Develop BIM Model', leading to a 'BIM Information System'. The workflow includes 'Work Request', 'Task Scheduling', 'Job Dispatching', 'Site Work', 'Maintenance Management Cycle', 'Maintenance Strategy', 'Maintenance Records', 'Maintenance History', and 'Maintenance Optimisation'. It also shows 'Water Installations Asset Register' and 'AMIS with BIM/GIS functions' integrated into the system.

Comprehensive BIM Workflow from BIM to RCM
Image Courtesy of Water Supplies Department, HKSAR Government and Shenzhen Yuegang Technology Company Limited and ACCIONA