Digital Twins – Bentley Solutions for Rail and Transit

Case Studies

Integrated High Speed Rail & Station Jakarta – Bandung

PT Wijaya Karya (Persero) Tbk | *Jakarta - Bandung, Indonesia*

The integrated high-speed rail between Jakarta and Bandung will reduce congestion between the two cities and foster a culture of public transportation in Indonesia. Spanning 143 kilometers in length and featuring various structures, the project presented geological and coordination challenges, compounded by an accelerated project schedule amid a global pandemic. Having used 2D design and conventional survey methods on past projects, resulting in delays, additional cost, and inefficient construction, lead contractor PT Wijaya Karya (WIKA) realized that they needed an integrated BIM and digital twin solution.

Leveraging Bentley's open civil design and reality modeling applications, and digital twin technology, WIKA developed a connected digital ecosystem and single source of truth, facilitating dynamic modeling and the generation of an intelligent digital twin. The integrated solution streamlined workflows, improving efficiency, design quality and calculation, saving USD 185 million in construction costs and shortening the construction schedule by six months. The project sets a benchmark to develop open digital building blocks for integrated public transportation in Indonesia.

Project Playbook: iTwin®, MicroStation®, OpenBridge®, OpenBuildings®, OpenRail™, OpenRoads™, PLAXIS®, SYNCHRO™

Metro Manila Subway Project (MMSP) – Phase 1

Oriental Consultants Global | *National Capital Region, Philippines*

The Philippines Department of Transportation initiated the Metro Manila Subway Project (MMSP) to ease traffic congestion and provide safe, reliable transportation for the National Capital Region, also known as Metropolitan Manila. Phase 1 of the MMSP traverses six cities and includes 13 underground stations and a train depot covering 28.8 hectares aboveground. The scale of the project presented communication and coordination challenges that current applications failed to address. Therefore, the project team realized that implementing collaborative BIM workflows, proactive risk management and cost monitoring would require that a connected data environment be established.

Leveraging ProjectWise® and ComplyPro®, the project team developed a common digital engineering system and a single source of truth, enabling real-time data sharing that optimized collaboration to save 5,000 resource hours within the project's first six months. Combined with SYNCHRO for construction simulation, Bentley's integrated technology solution identified and resolved 50 clashes, eliminating rework, shortening the project schedule, and saving costs. The successful BIM implementation has already achieved an ROI of over USD 600,000.

Project Playbook: ComplyPro, iTwin, PLAXIS, ProjectWise, SYNCHRO

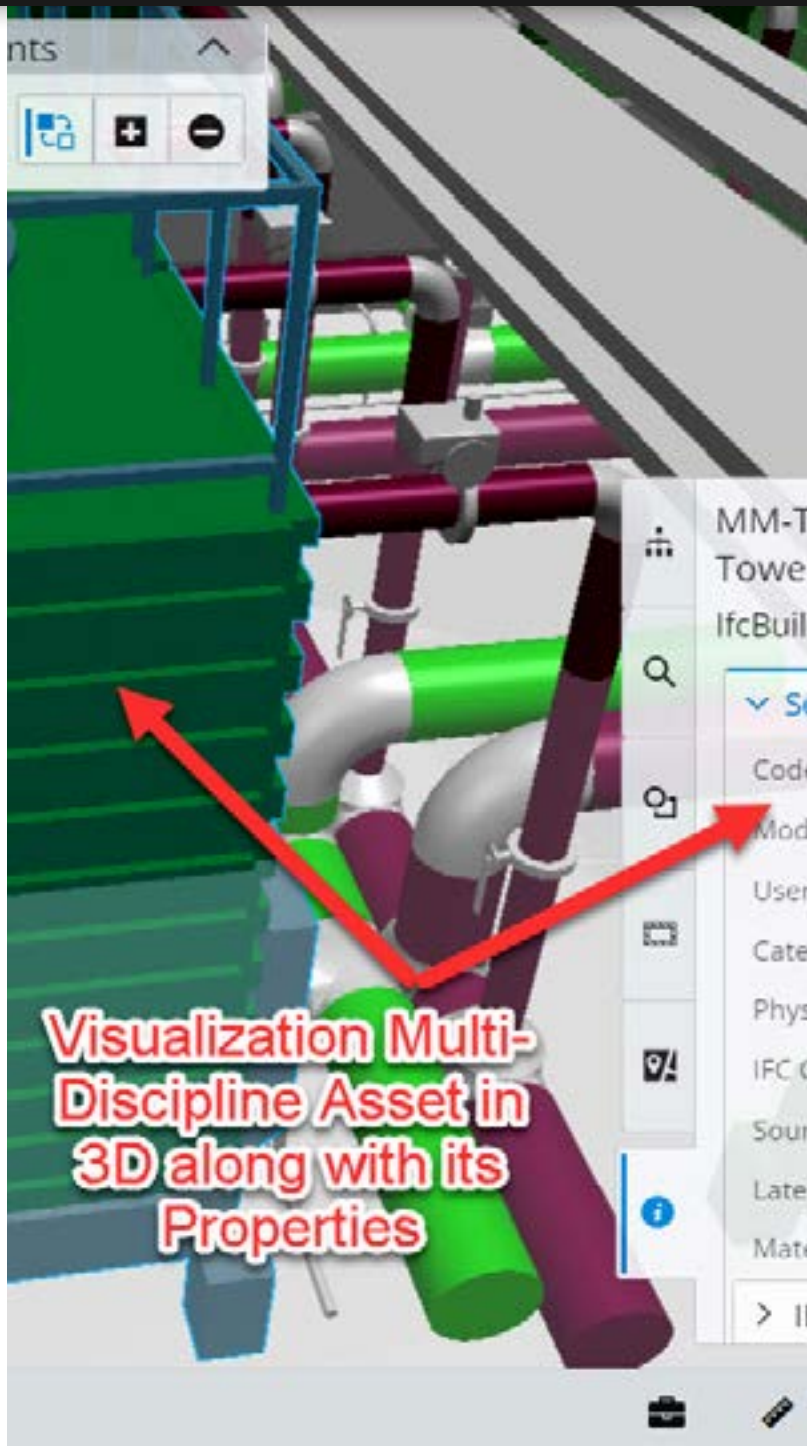
MRT Jakarta Phase II

PT MRT Jakarta (Perseroda) | *Jakarta, DKI Jakarta, Indonesia*

MRT Jakarta Phase II is an 11.8-kilometer urban railway development project to increase mobility and reduce congestion by providing safe, reliable public transportation. PT MRT Jakarta (Perseroda) is responsible for construction, operations, and maintenance amid a complex urban environment, challenging topography, and tight project schedule. Previously restricted by inefficient document management systems and time-consuming manual methods with information silos, PT MRT Jakarta (Perseroda) needed improved project information management to streamline design development and review.

PT MRT Jakarta (Perseroda) selected ProjectWise and the iTwin Platform to streamline collaboration. The solution provided real-time access to trusted project information, enabled digital reviews that saved at least 10% in time, and reduced hardcopy paper submissions by 90%. Integrating AssetWise®, they expect to minimize construction costs and schedule overruns. By handing over 3D models and as-built data to operations and maintenance, they will improve asset performance and reliability throughout the railway's operational life.

Project Playbook: AssetWise, iTwin, ProjectWise, SYNCHRO



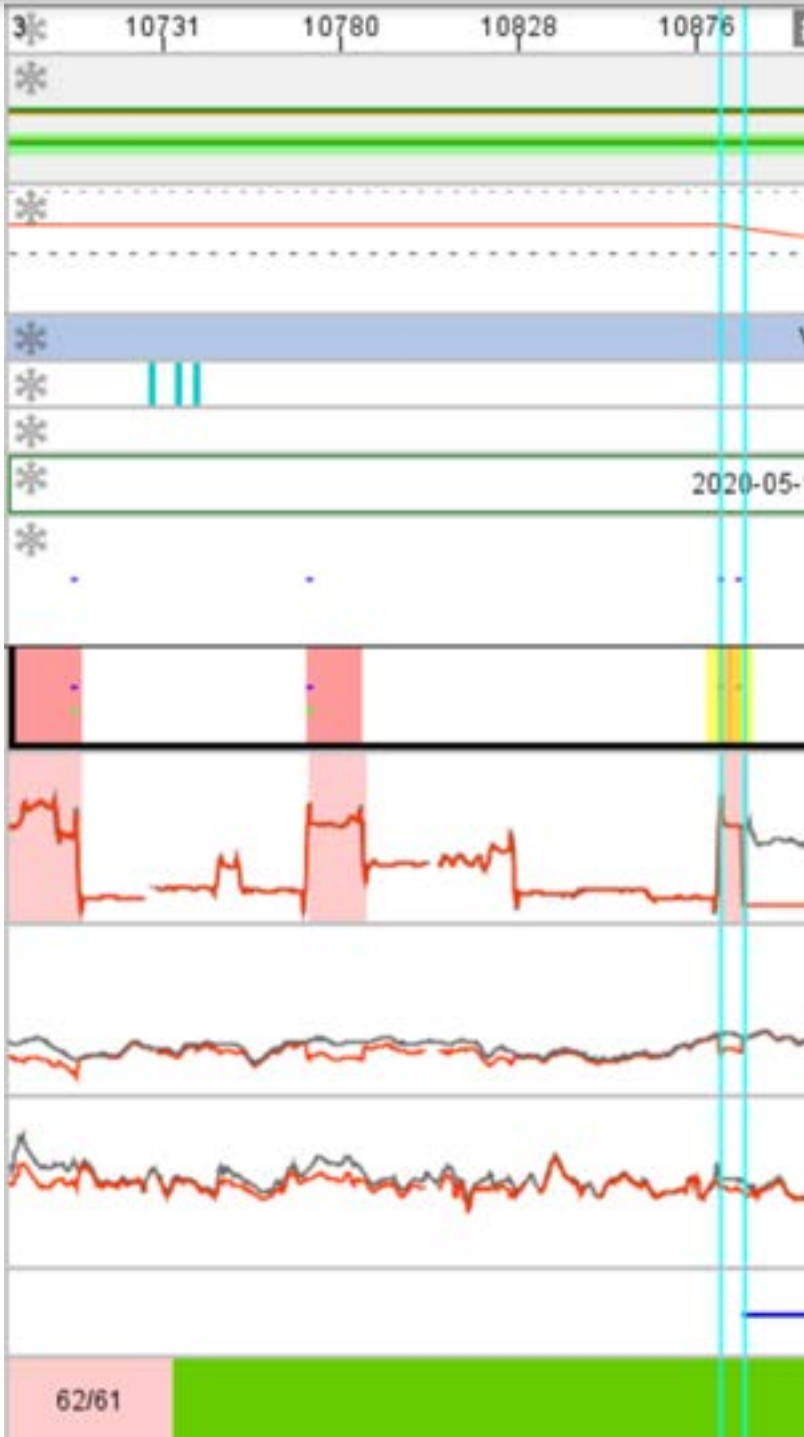
Predictive Decision Support System (PDSS)

SMRT Trains Ltd | *Singapore*

SMRT Trains operates and maintains over 140 kilometers of rail track in Singapore. With an average daily ridership of over 2 million people in 2019, SMRT needs to keep the tracks in good condition to avoid delays. Previously, however, they had used intensive, time-consuming, and manual maintenance planning using multiple systems' tens of millions of data points per year across separate data silos. SMRT realized that they needed to upgrade their inefficient processes.

To enable engineers to make optimized decisions using all relevant data, SMRT used AssetWise as the basis of their predictive decision support system (PDSS). The PDSS enables them to overlay multiple data sources within seconds rather than hours. The design allows for easy access to data, significantly streamlining multiple analyses. Now, SMRT can optimize efficiency of a work crew's maximum work capacity during one shift, ensuring the reliability of the rail network.

Project Playbook: AssetWise



Digital Twins for Rail and Transit

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About Bentley Systems

Bentley Systems (Nasdaq: BSY) is the *infrastructure engineering software* company. We provide innovative software to advance the world's infrastructure – sustaining both the global economy and environment. Our industry-leading software solutions are used by professionals, and organizations of every size, for the design, construction, and operations of roads and bridges, rail and transit, water and wastewater, public works and utilities, buildings and campuses, mining, and industrial facilities. Our offerings, powered by the *iTwin* Platform for infrastructure digital twins, include *MicroStation* and *Bentley Open* applications for modeling and simulation, *Seequent*'s software for geoprofessionals, and *Bentley Infrastructure Cloud* encompassing *ProjectWise* for project delivery, *SYNCHRO* for construction management, and *AssetWise* for asset operations. Bentley Systems' 5,000 colleagues generate annual revenues of more than $1 billion in 194 countries.

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