

AAEngineering Industrializes Delivery of Kazakhstan Gold Ore Processing Plant Amid COVID-19 Quarantine

Bentley's Cloud-based Technology Saves 30% in Design Time and Digitalizes the Mining Industry

CAPITALIZING ON GOLD ORE RESERVES

As a driver in the Asian mining industry with vast amounts of available natural minerals, Kazakhstan is developing its mining infrastructure to explore and capitalize on these reserves. When drilling and geological studies revealed the presence of gold ores in the surrounding Akmola region, gold producer Altyntalmas invested in expanding resource extraction operations. With already three existing nearby factories, the organization announced a tender to increase their annual ore processing production up to 5 million tons. The USD 230 million project included construction of a new gold processing plant, a dam, accommodation camp for 600 people, water pipelines, and a 220-kilovolt electrical substation.

AAEngineering Group was tasked with overall design, procurement, and construction works that required upgrading existing energy and mining infrastructure, ensuring environmental protection and occupational safety, and determining an optimal construction site that mandated a 1,000-meter sanitary protection zone from adjacent pits and uranium dams. The new plant also needed to be interoperable with the existing processing facilities in terms of equipment



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and materials, as well as seamlessly integrate with the operating systems. Additionally, AAEngineering faced challenges meeting the technology demands to comply with the client's Digital Mine initiative on a tight timeline, compounded by coordinating a remote team during the COVID-19 pandemic.

CONCEPTUALIZING OPTIONS, STREAMLINING EXECUTION

AAEngineering wanted to offer several conceptual models to the client so that they could visualize the infrastructure design options and make the best decision for implementing the project. "We needed to issue several versions of the project according to their technical inquiry," commented Andrey Aksyonov, director of information modeling department at AAEngineering. This situation required updating the existing plant information model, creating a digital terrain model, and incorporating components from the database of equipment and materials to provide accurate visual options for the client.

Once the client decided on the optimal design concept and selected the location for the new plant, AAEngineering moved to the detailed design stage and proposed simultaneously executing design and construction works to reduce construction time and meet the short, 22-month deadline. They also sought to demonstrate their commitment to the client's digitalization efforts, providing seamless integration with existing facility assets and operations using digital twins. To develop their conceptual solutions, concurrently perform design and construction, and achieve digital deliverables aligned with the client's smart mining initiatives, AAEngineering needed integrated BIM and digital twin technology. Furthermore, given the COVID-19 global pandemic quarantine, they needed to establish a connected data environment to remotely coordinate design and construction.

PROJECT SUMMARY

ORGANIZATION

AAEngineering Group

SOLUTION

Mining and Offshore Engineering

LOCATION

Aksu, Akmola Region, Kazakhstan

PROJECT OBJECTIVES

- ◆ To deliver visual conceptual design options.
- ◆ To generate a digital twin to meet smart mining initiatives during COVID-19.

PROJECT PLAYBOOK

AutoPIPE[®], Bentley Raceway and Cable Management, ContextCapture, glINT[®], iModel.js[™], iTwin[®] Services, LumenRT, MicroStation[®], OpenBuildings[®] Designer, OpenPlant[®], OpenRoads[™], OpenSite[®], PLAXIS[®], ProjectWise[®], Promis.e[®], ProStructures, SITEOPS[®], SYNCHRO[™] 4D

FAST FACTS

- ◆ One of Kazakhstan's gold producers is expanding their gold processing production up to 5 million tons annually.
- ◆ The project required integrating existing factories, digital deliverables, and remote coordination amid COVID-19.
- ◆ AAEngineering relied on Bentley's technology from conceptual design through construction.

ROI

- ◆ Using ProjectWise and Bentley's modeling applications to establish a digital twin reduced design time by 30%.
- ◆ ContextCapture and SYNCHRO 4D helped reduce the construction period, enabling plant commissioning ahead of schedule.
- ◆ Generating a digital twin improved quality control and decision-making, supporting intelligent digital mine initiatives set to transform the mining industry.

To sum it all up, Bentley Systems enabled us to improve our own design, construction, and operations solutions.

-Andrey Aksyonov, Director of Information Modeling Department, AAEngineering Group

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LEVERAGING BENTLEY'S OPEN APPLICATIONS

Beginning early in the conceptual modeling stage, AAEngineering established a collaborative design platform using ProjectWise to provide a connected data exchange system for all contractors and the client. They used laser scanning and unmanned aerial vehicles (UAVs) to survey the existing facilities and the new construction site, processing the captured images with ContextCapture. From the survey data, they assessed earthworks and generated a digital terrain model in OpenRoads. Then, using OpenPlant, they digitized existing and new pipeline layouts and equipment connections to develop several conceptual 3D models for the client. "Using the survey data in ContextCapture, we built a digital terrain model, and all this was transferred to the site layout plant to generate preliminary specifications with an assessment of earthworks," stated Aksyonov. The client used the models to determine the optimal design concept and approve the plant location, equipment, and piping scheme.

Based on the client's specifications, AAEngineering used various software applications to assemble the pipeline and structural models, along with the accommodation camp. They then integrated these models with the general plant model in OpenBuildings Designer. Aligned with their proposal to perform design and construction simultaneously, AAEngineering used ContextCapture to process weekly UAV-captured images into reality meshes and synchronized the models with SYNCHRO 4D for construction simulation and scheduling. Incorporating LumenRT and iTwin Services facilitated visual clash detection and provided the cloud-based platform to establish a digital twin. According to Aksyonov, "Using Bentley's innovative digital twin technology, we synced the model with iTwin for the best understanding, for visualization of changes, and for making the right decisions on the project." By leveraging Bentley's open applications, AAEngineering was able to maintain project control and stay on schedule throughout quarantine.



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DIGITAL TWIN DRIVES INDUSTRY TRANSFORMATION

Using Bentley technology during the conceptual phase resulted in a well-developed visual bid for the project, providing the client with a full understanding of the design right from the start and winning AAEngineering the contract. Throughout project execution, the integrated modeling applications and digital twin solution streamlined workflows and facilitated concurrent design and construction that reduced construction costs and allowed plant commissioning to be ahead of schedule. Working in a collaborative digital environment and updating the development model with UAV surveys saved 30% in design time and cut travel expenses by 75%, optimizing remote coordination and construction management during the COVID-19 quarantine. Through accurate modeling and visualization, they reduced material quantities by 15% and eliminated clashes during construction.

Lastly, using the digital twin, the client was able to train operations staff prior to plant commissioning. In addition, the digital twin enabled seamless integration with the client's operating system in accordance with their digital mine initiative to support intelligent mining processes and management, promoting automation and digitalization that are transforming the mining industry. For AAEngineering, implementing the use of digital twin technology on this project provided economic efficiencies and has instilled new corporate processes, making advanced digital practices a company standard. Their advanced technological approach offers a competitive advantage that has made them a regional leader with a signed portfolio of engineering, procurement, and construction contracts for the next five years. "To sum it all up, Bentley Systems enabled us to improve our own design, construction, and operations solutions," concluded Aksyonov.



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