

JFE Mechanical Co. Ltd.

Energy, Process & Utilities Case Study





Challenge

JFE Mechanical Co. Ltd. needed to improve the clarity of its installation and maintenance instructions and communicate this information to workers during the construction of its plants and their equipment and machinery.

Solution

The company uses Dassault Systèmes' **3D**EXPERIENCE Platform and the 3DVIA application to create 3D animations of work procedures for facilities and equipment construction and maintenance.

Benefits

Thanks to high-quality construction plans, enhanced design precision and 3D animations of maintenance procedures, workers can better understand how to perform the various procedures, which contribute to their safety and the quality of their work. Construction project times have been reduced as well.

Ensuring maximum safety and quality

Plant inspection and maintenance contributes to a facility's life extension and safe operation. Delays in maintenance work or construction due to unexpected accidents or errors lead to production facility's downtime, and directly impact client's finance. The key objective is to help plant owners and operators minimize downtime and reduce the risks of accidents. To ensure maximum safety, it is crucial for each worker to have an accurate understanding of what needs to be done, to enable employees and their employers to take all necessary safety measures throughout a project.

Facilities and equipment maintenance have become increasingly complex as plants become bigger and security regulations more stringent. It has, therefore, become extremely difficult to gain an accurate understanding of disassembly/assembly procedures using manuals containing only text, images and 2D drawings. Training inexperienced personnel requires many man-hours. Moreover, operations can span several years or several decades depending on the nature of the maintenance operation, making it difficult to pass on the knowledge of how maintenance was carried out the last time. As a result, 3D models are increasingly being used to provide a more realistic view of the plant site and work environment. 3D work instructions are now replacing 2D diagrams and paper documents.

Using digital technology to accelerate project development

Facilities have a lifespan measured in years. Many of them were built using 2D drawings since 3D models did not exist at the time of their construction. It is, therefore, not unusual for these drawings to no longer reflect the current state of a facility with all the maintenance operations performed over the years. Existing drawings may even differ from the design, since adjustments were often made on site during construction or over time. Remodelling work or discrepancies due to aging may not be reflected either. Therefore, to create accurate construction drawings and plans, on-site checks with photographs and measurements of the facility are necessary. This process, though, introduces delays in work schedules and is prone to human recording errors, eventually requiring additional inspections to produce an accurate current status of the facility.

To improve accuracy and eliminate obstacles that can cause project delays JFE Mechanical relies on digital technology to produce an accurate picture of the state of a facility. The company uses a 3D laser scanner with wide-area coverage to generate an accurate picture of a facility's current situation. The scanner is used to rapidly measure the shape and size of the full-scale structures, display the way they are laid out in the plant and to depict the overall state of the buildings. A 3D scanner eliminates human errors such as omitting to take a measurement or recording the wrong information. It is an ideal and safe solution when measuring in high or dangerous places. "With this technology, we have made preliminary studies safer and reduced the average time needed to prepare a construction plan to one week," Mr. Kenji Tsukaoka said.

To design service parts using the previous method of site measurement, it was necessary to include construction positions for on-site adjustments, by taking into consideration construction and measurement discrepancies. When carrying out site operations, it would sometimes take more man-hours than originally planned, but improvements achieved through the use of a scanner capable of high-precision measurement has greatly reduced site operations, while providing significant benefits in terms of safety, quality and project schedules. "One of the benefits with using a 3D scanner is a nearly 50% reduction in the time needed to replace a dust collector's duct from 5 to 2 days," Mr. Tsukaoka said.

Shared understanding of operations

In the past, construction workers had to sift through paper plans to understand construction and maintenance procedures and operations. Whereas experienced workers would have no trouble assimilating the information, less experienced personnel would sometimes find it difficult and time-consuming to reach the same level of understanding.



"With 3DVIA Composer's 3D animation features all workers have the same level of understanding, which reduces construction time while improving safety."

Mr. Kenji Tsukaoka, JFE Mechanical Co. Ltd.





To facilitate this process, JFE Mechanical decided to turn to 3D models and animations to illustrate the installation of complex parts including their assembly and disassembly.

The company chose Dassault Systèmes' (3DS) 3DEXPERIENCE 3D communication application 3DVIA and its 3DVIA Composer product to create its construction plans in 3D. A three-dimensional model of the facilities or equipment, as well as an animated maintenance, assembly or disassembly procedure is created using 3DVIA Composer. The expertise and best practices of experienced personnel are incorporated in the 3D animation and the procedures are created in chronological order. With 3DVIA Composer JFE Mechanical generates clear and safe maintenance work instructions for all construction personnel.

Using animation, workers can easily verify the instructions for a particular task and also change the 3D viewing angle for more clarity. Moreover, with 3DVIA Composer, notes can be added to emphasize important or dangerous points to be aware of. As a result, appropriate safety measures can be taken. "With 3DVIA Composer's 3D animation features, all workers have the same level of understanding, which reduces construction time while improving safety," Mr. Tsukaoka said.

Improving maintenance operations

The point clouds generated by the 3D scanner are used to create 3D models of facilities or equipment along with their site environment. "The 3D models are used to conduct preliminary examinations or verifications even from a remote location. This significantly improves overall maintenance operations," Mr. Tsukaoka said. It also reduces the time wasted on site by personnel discussing problems, and also eliminates the need to conduct detailed checks of a worker's every intervention. In addition, by developing an animated construction workflow with 3DVIA Composer based on these 3D models, workers can visualize each procedure virtually before attempting to perform the task in the real world. "This increases safety and maintenance efficiency," Mr. Tsukaoka said.

In the future, JFE Mechanical plans to develop animations that are even closer to reality by creating 3D models to simulate the disassembly and installation procedures for large-scale facilities. This can be done by incorporating the point clouds generated by the 3D laser scanner into 3DVIA Composer to create the animations.

The company is also considering providing on-site workers with tablets and smartphones so that they can visualize the work they need to do using 3D animations. "Communication between stakeholders during construction projects is streamlined, from initial work enguiry, preliminary investigation, construction, modification, calibration through to delivery. Furthermore, with 3D, instructions are clearer. All these benefits have a positive influence on the quality of the job done and contribute to reducing construction costs and times," Mr. Tsukaoka said.

With the 3DS application 3DVIA JFE Mechanical has improved the safety and quality of its maintenance operations. "As a result, our customers are satisfied and our business continues to grow even amid persistently challenging economic conditions," Mr. Tsukaoka concluded.

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