

Engineering Business

(JFE Engineering Corporation)



Atsushi Okamoto
Senior Managing Director

For achieving SDGs, “*Tsu-ku-ru*,” “*Ni-na-u*,” and “*Tsu-na-gu*” the foundations of life by promoting digital transformation (DX)

JFE Engineering has taken up the challenge of achieving SDGs (Sustainable Development Goals) through planning, designing, building, and operating infrastructure supporting people’s daily lives and industry.

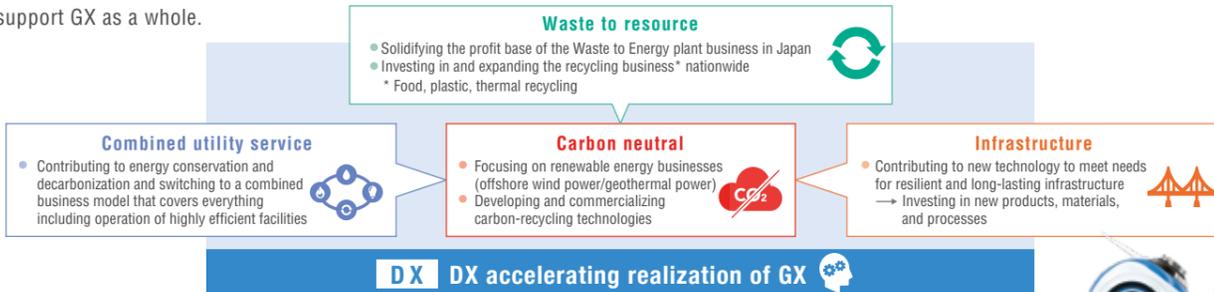
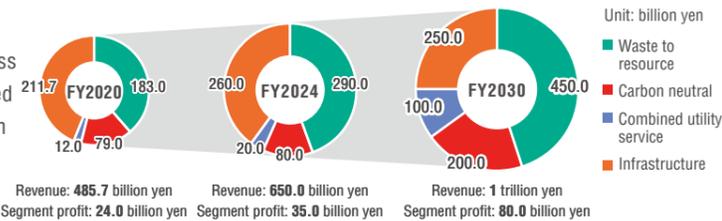
DX is necessary for our company to continue to be a front-runner in the engineering industry while further accelerating those initiatives.

We will go beyond simply increasing operational efficiency by proactively promoting digital transformation to achieve a green society and increase corporate value with initiatives including thoroughly reforming operational processes, adding new value to products and services, and taking up the challenge of using data for new businesses.

* “*Tsu-ku-ru*,” “*Ni-na-u*,” and “*Tsu-na-gu*” are Japanese words whose meanings for us are the following:
Tsu-ku-ru: Construction of plants.
Ni-na-u: Operating, maintaining, and managing business.
Tsu-na-gu: Handing over a beautiful planet to the next generations, good communication between our customers and us, throughout JFE, and construction of data networks, three elements essential for achieving SDGs.

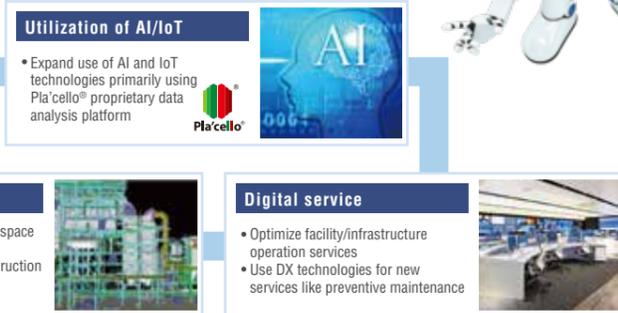
JFE Engineering’s Medium-term Business Plan

Aiming for fiscal 2030 revenue of 1 trillion yen, JFE Engineering has formulated a Seventh Medium-term Business Plan that focuses on four areas: waste to resource; combined utility service; infrastructure; and carbon neutral. Working in these four areas, we aim to create environmentally friendly social infrastructure and innovation that can be seen as a “green transformation (GX).” As we move forward, we are positioning “digital transformation (DX)” as the initiative to support GX as a whole.



JFE Engineering’s DX strategy

In addition to actively using the AI and IoT technologies pursued under the Sixth Medium-term Business Plan, under the Seventh Medium-term Business Plan we have added two core areas to our pursuit of DX: “digital twin” that reproduces the real world in a virtual space to visualize processes and costs and optimize operations; and “digital services” to transform businesses by providing optimal operation services for facilities and infrastructure and preventive maintenance services that use digital technologies.



Case 1: Reform business operations at construction and work sites by data linkage

Electronic tags/3D data linkage

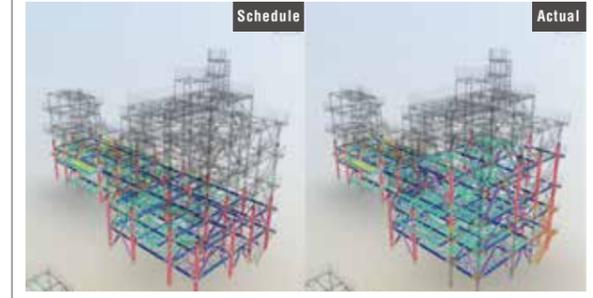


Electronic tags are attached to shipped items, and the electronic tag information is linked to 3D design data. The records of parts arrival management and construction progress are automatically obtained and used to track progress.

Actual construction date



Schedule/actual comparison



At construction sites, it is important to manage the arrival of parts and the progress of construction, but having on-site workers constantly inputting data creates a significant burden. JFE Engineering is therefore using electronic tags (RFID) to make on-site operations and management more efficient. Electronic tags are attached to parts shipped from steelworks and linked to 3D design data. An electronic tag reader is used on-site to manage the arrival of parts. As construction progresses, the electronic tag is removed when the part is attached, then simply put into a trash container equipped with a reader function. This process makes it possible to manage parts, construction, and progress without placing a burden on on-site workers.

JFE VOICE !



Front row, from left: Yamanaka, Hosoya, Yamamoto, Plant Construction Sector
 Back row, from left: Sugito, Horikawa, Imamoto, Horibe, ICT Center, Technology Headquarters

Significantly reducing work time by introducing electronic tags

By introducing electronic tags, we have made it possible to avoid parts sitting idle at manufacturing plants and manage deliveries at work sites by simply scanning while walking around the items placed at the work site. In addition, linkage with 3D data makes it possible to see the construction progress in real time from the head office. Some improvements are still needed, but we expect to make construction more efficient going forward.

Kei Yamanaka, Plant Construction Sector

Initiatives going forward: Business reform and operational optimization by using digital twin

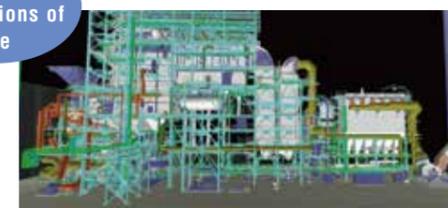
Engineering, Procurement, and Construction (EPC)

- Process optimization
- Cost visualization

Operation and Management (O&M)

- Plant visualization
- Optimal operation

“*Tsu-ku-ru*” foundations of life



To 4D (+ time) → Process optimization
 To 5D (+ expense) → Cost optimization

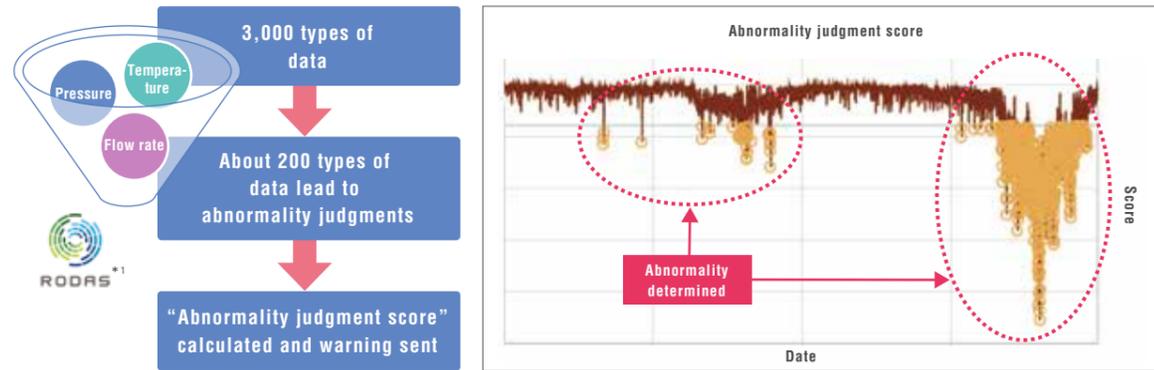
“*Ni-na-u*” foundations of life



Actual plant operations reproduced in virtual space

“Business reform using a digital twin” is at the core of JFE Engineering’s DX strategy. A digital twin is a “twin” of the real world constructed in a virtual space. A model of the real world is built using 3D data, IoT data, and other data from the plant and social infrastructure in the real world, and simulation analysis is carried out. Those results are fed back to the real world and used to optimize operations and make them more efficient. The development and implementation are being carried out in two parts: “digital twin (‘*Tsu-ku-ru*’)” that aims to make operations more efficient and visualize projects in the engineering, procurement, and construction (EPC) process, and “digital twin (‘*Ni-na-u*’)” that aims for optimal automated operation and plant visualization in the operation and management (O&M) process.

Case 2: Detecting signs of operational failure at biomass energy plants



Biomass power generation seeks to achieve high output with stable, efficient power generation regardless of fuel quality. Early detection of potential failures is important for stable operation, but to date this has relied on operators' skill and experience. The AI-based operation support system is able to extract, from a huge amount of operational data that humans cannot process unaided, information that could indicate imminent operational failures and reduced power generation efficiency. The system analyzes data in real time and visualizes it as an "abnormality judgment score," which reduces monitoring work and detects abnormality in advance. We continue to collect more operational data and expand functions with the aim of superior plant operation with even greater stability and efficiency.

JFE VOICE !



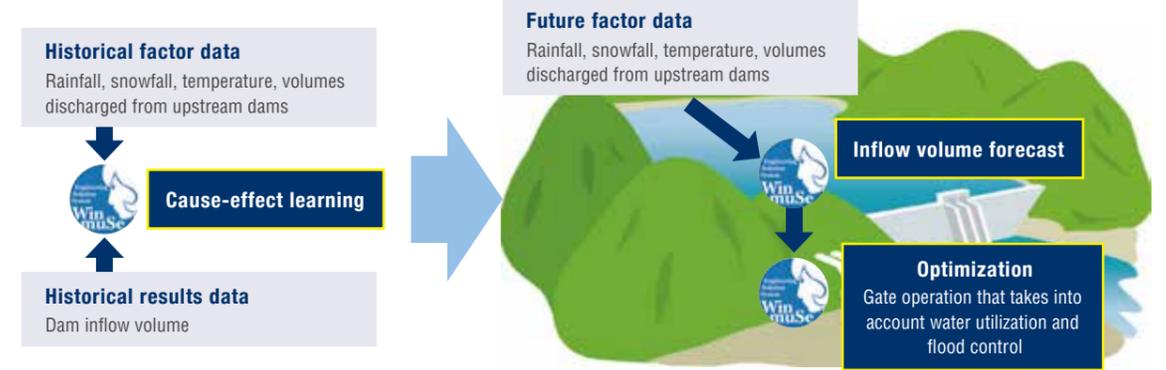
From left: Habiro, Electrical & Control System Center, and Yoshioka, ICT Center, Technology Headquarters

Using Pla'cello® for advance detection of operational failure

The Pla'cello® abnormality warning detection system and visualization and analytical tools make possible the early detection of signs of abnormalities, the swift assessment of the situation, and the timely investigation of the cause. The capability to detect early any critical abnormalities that could lead to an emergency plant shutdown is useful for stable operation.

Yoshiaki Habiro, Power Plant Engineering Department, Electrical & Control System Center

Case 3: Dam Optimal Operation System



JFE Engineering and Hokuriku Electric Power Company are jointly developing the Dam Optimal Operation System with the aim of increasing the amount of hydroelectric power generated. A verification test conducted at a dam in fiscal 2020 confirmed the system's ability to predict with high accuracy the amount of water that will flow into the dam. The test also confirmed that reflecting and optimizing the predictive data in the dam's operation could be expected to increase the amount of hydroelectric energy generated (approximately 5,000 MWh annually). In addition to increasing the number of dams where this system is used, the two companies are working to improve and develop the system further by incorporating the latest AI technologies to increase significantly the amount of CO₂ emission-free hydroelectric power.

JFE VOICE !



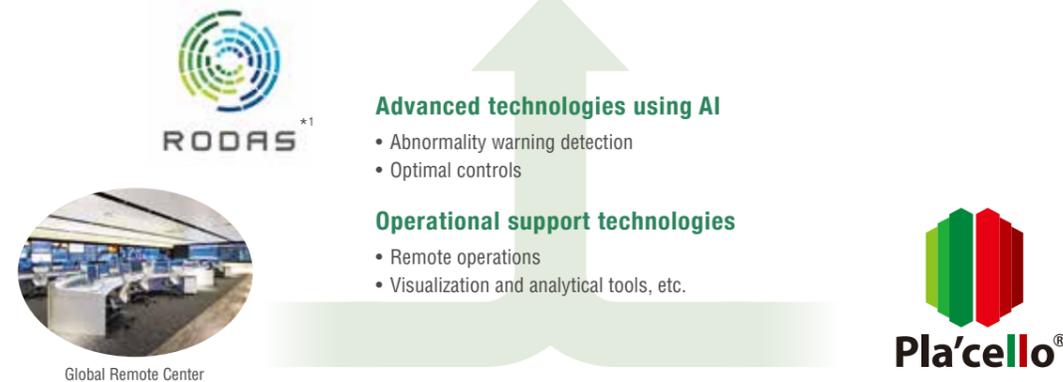
From right: Takago, Hokuriku Electric Power Company, and Hadama, ICT Center, Technology Headquarters

Meeting customers' requirements with reliable AI solutions

Hydroelectric power is one of our company's main power sources. Increasing the accuracy of dam inflow volume predictions is crucial to increasing the amount of hydroelectric power generated. Through this joint development, our two companies are working to make the system more robust and increase the possibilities for hydroelectric power generation.

Ryuei Takago, Civil Engineering Management Team, Renewable Power Department, Hokuriku Electric Power Company

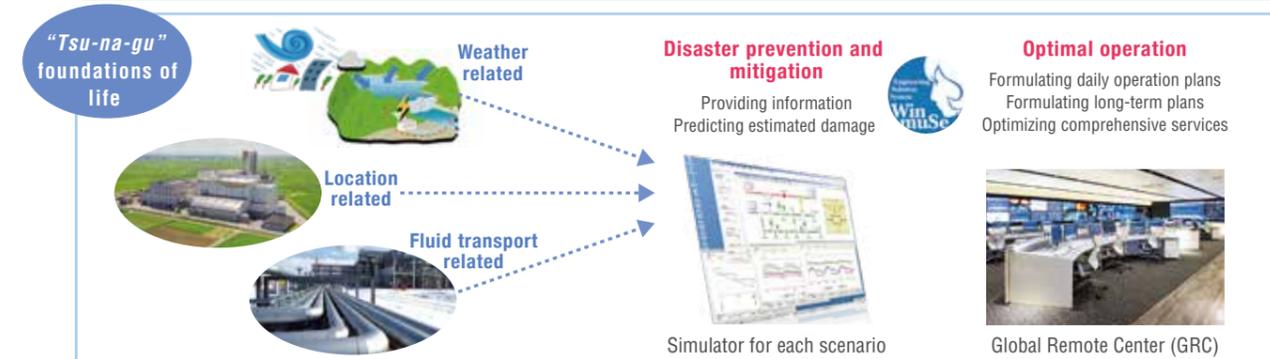
Initiatives going forward: Providing preventive maintenance management services for boiler power plants



We have begun offering RODAS, a package of technologies using big data that we developed for biomass energy plants and other boiler power plants. This is one of the first initiatives in the plant industry globally to provide comprehensive DX-related services for boiler power plants using artificial intelligence and cloud technologies. RODAS, which was realized through the accumulation of big data, features an abnormality warning detection function and optimal control technologies using artificial intelligence. Efficient operation with artificial intelligence makes it possible to maintain stable operations despite a shortage of skilled engineers, thereby increasing customers' profits as well. Going forward, we will pursue even more advanced plant operation technologies based on Pla'cello® to contribute to promoting DX in the plant industry and increase the use of renewable energy.

*1 RODAS: A service package of technologies that uses big data for boiler power plants. Trademark registration pending.

Initiatives going forward: Service of providing information about disaster prevention and mitigation to social infrastructure operators



JFE Engineering is using our proprietary WinmuSe® AI engine, with strengths in predictive AI based on various weather-related data (to forecast demand, water levels, etc.), and optimization AI using information collected from plants to supply various services to local governments and social infrastructure operators. Important social infrastructure facilities for water supply, sewerage, and city gas, which are indispensable for people's daily lives, must provide stable, uninterrupted service. In addition to normal times, providing service when disasters strike requires the preparation of appropriate facility operation plans that anticipate disasters and regular drills.

Going forward, we will construct a high-speed simulator that accurately reproduces operation processes to provide service to support disaster responses at important facilities.