JFE

JFE Group

DX REPORT

2020

Contributing to society with the world's most innovative technology

DX銘柄2020

Digital Transformation

CONTENTS

Dramatically raising competitiveness through DX and establishing a stable, sustainable earnings base

The JFE Group's operating environment, and especially that of the Group's core Steel Business, are undergoing structural transformations. In addition, the effect of the global spread of COVID-19 drastically slowed down economic activity during fiscal 2020 in Japan and overseas, leading to an extremely challenging situation unlike any the JFE Group had ever experienced.

As changes in the business environment accelerate, the JFE Group is proactively using data and digital technologies to rebuild our earnings strength and sustainably enhance our corporate value. With a key strategy of digital transformation (DX), we are currently increasing the value of our products and services for customers, and dramatically increasing productivity in all segments of the value chain. Going forward, we will promote DX as a Groupwide effort to achieve innovation in process technologies and renovate business models.

At the same time, as management becomes increasingly digitalized, information security is becoming increasingly important. Protecting the personal information of customers, vendors, and employees from the risks of increasingly sophisticated and complex cyberattacks and information leaks, and guarding the information assets that are the source of a company's competitiveness, have become major management issues for all companies. The JFE Group is swiftly implementing comprehensive risk countermeasures to make our information security even stronger, including the establishment of JFE-SIRT* for centralized security governance and emergency responses.

To disseminate the broad range of the JFE Group's competitive and defensive activities in the digital field, from fiscal 2020, we have renamed the previous IT Report as the DX Report and expanded its content.

We have already introduced the JFE Group's DX strategy in our Integrated Report, and in this report, we will present the specific content and achievement of leading examples at each operating company using the DX strategy. We hope that readers will find the information in this report useful and that it will help them gain a fuller understanding of our DX initiatives.

*JFE-SIRT: JFE-Security Integration and Response Team

Hiroyuki Fujiwara
Senior Vice President
JFE Holdings, Inc.

Named DX Stock 2020

JFE Holdings, which is proactively pursuing strategic investment in information technology to strengthen the Group's overall competitiveness and increase corporate value over the medium to long term, has been designated for inclusion in the Competitive IT Strategy Company Stock Selection by the Ministry of Economy, Trade and Industry (METI) and the Tokyo Stock Exchange (TSE). In 2020, the Company was selected for the sixth consecutive year, with the designation renamed the Digital Transformation (DX) Stock Selection.

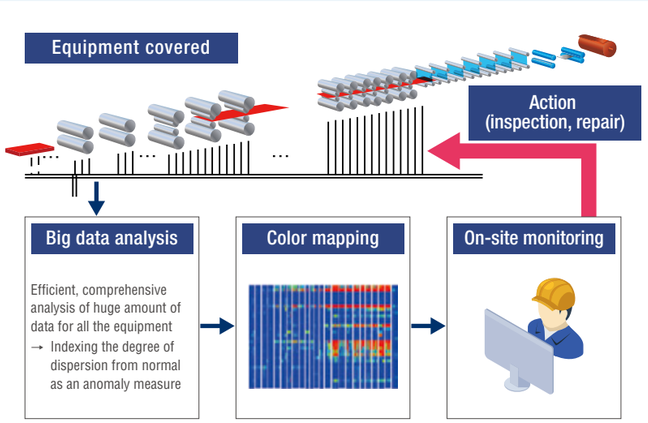
DX Stock Selection indicates a focus on digital transformation to achieve new growth and enhanced competitiveness through drastic reforms of the business model based on digital technologies. JFE Holdings will continue to proactively pursue the digital transformation that has been recognized to date.

DX initiatives

Steel Business **Using big data and AI to monitor signs of equipment anomaly**

Because much of the equipment used by the Steel Business operates for a long time, unanticipated problems not seen in the past are increasingly occurring, raising the issue of building a system to monitor signs of such anomalies.

As this equipment is made up of many diverse pieces of machinery and meters, the number of items to be monitored is huge, totaling more than several hundred, but we have efficiently and comprehensively analyzed the relationships among these items and mapped the degree of anomalies over time to easily monitor equipment at manufacturing sites. By making repairs and taking other appropriate measures for parts that cause heightened concern about becoming an anomaly, we can prevent anomalies from occurring and raise the operational efficiency of our equipment.



Engineering Business ***"Ni-na-u"* in a new age through application of technologies and expertise, data, and the latest IT**

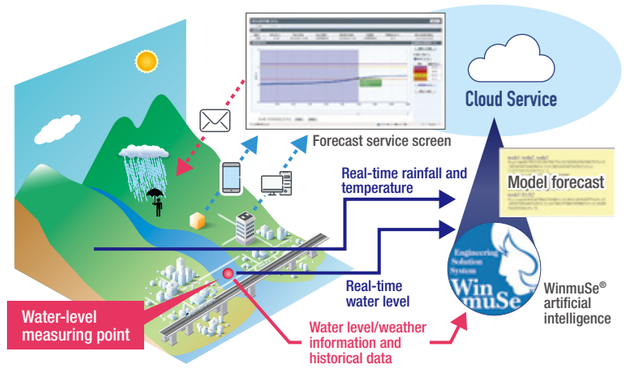
Distribution service for river-level forecast information

Using the WinmuSe artificial intelligence function developed in-house, we have built a cloud service for accurately forecasting future river levels in real time and distributing the forecast information. The system has already been installed in more than 20 locations across Japan, and we aim to expand its use going forward.

Automation of a waste-to-energy plant

JFE's BRA-ING, the world's first automated operating AI system for waste incinerators, which uses AI-based image analysis of the combustion status and systemization of manual operations by skilled operators, has already been implemented, and we plan to install it in 10 facilities in fiscal 2021.

Conceptual diagram of the WinmuSe® Caesar river-level forecasting system



01 Steel Business

The "sophistication of data use" is the essence of JFE Steel's digital transformation (DX).

The IT Innovation Leading Department and the Business Process Innovation Team are integrating IT platforms, including systems upgrades at steelworks. By linking expertise and data accumulated to date (the Integrated DB) with images and sensor data obtained with the latest technologies, we are building a platform that can fully use this data to further increase customer value.

At the same time, we are implementing swift and exhaustive countermeasures in response to the risks of increasingly sophisticated cyberattacks and information leaks. Led by the JFE-Security Integration and Response Team (JFE-SIRT), set up in fiscal 2016, we will continue to improve the level of information security management.

Our DX aims to strategically use the huge wealth of data on a secure IT platform to achieve a preeminent strategic position.

We are working to improve profitability by developing infrastructure that enables the systematic use of our abundant operational data assets, including the JFE Digital Transformation Center (JDXC™), which began operating at the head office last summer, while at the same time accelerating the incorporation of major processes into cyber-physical systems, thereby making process operations more advanced, automated, and efficient. We also aim to significantly improve worker productivity by using AI for human knowledge and know-how and robotics to automate field work. To achieve DX propulsion, we are creating systems to facilitate the use of data science (DS), implementing training for in-house data scientists, and creating structures that further strengthen their activities for DX.

Vision for DX promotion

The main pillars of JFE Steel's digital transformation (DX) are technological innovation and the use of data assets through proactive incorporation of elements like the internet of things (IoT), artificial intelligence (AI), and data science (DS). We have accumulated a large reserve of expertise and data over many years, even compared with those of steel mills in various countries overseas. This wealth of data assets is a source of value creation. The use of this latest DS and AI across the company will innovatively increase productivity and quality, achieve stable operations, and enhance competitiveness.

JFE Steel's Vision

Be a global steel supplier that always creates new value and grows with customers

Three pillars of DX promotion

Companywide policy

Gain competitive advantage through the proactive utilization of data (= data-driven)

With a long history of manufacturing, JFE is a storehouse of data. Our accumulated expertise in high-grade steel manufacturing, responses to aging equipment, and data related to predictive management are the sources of our competitiveness. Advanced use of data is JFE Steel's strategic theme.

Maximize value

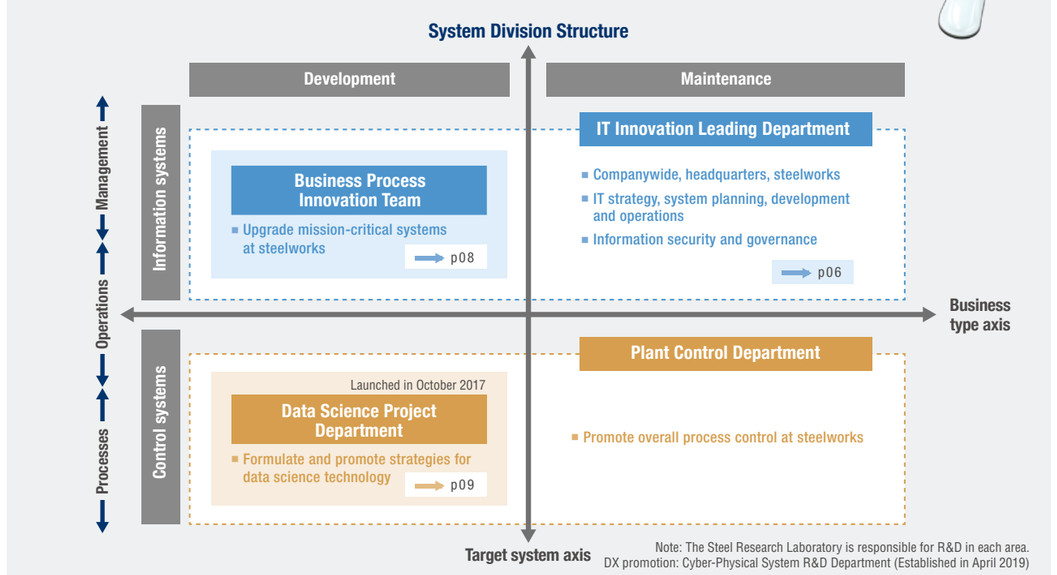
1 Execute IT structural reforms
Upgrade systems at steelworks
Realize a flexible, change-tolerant IT structure

Synergistic effects

2 Raise our level of data use
Promote business reforms and the latest advancements in IT
Actively utilize data science and AI

3 Reinforce our IT risk management
Enhance security and standardized controls
Enhance the security environment for IT

DX promotion structure and transformation

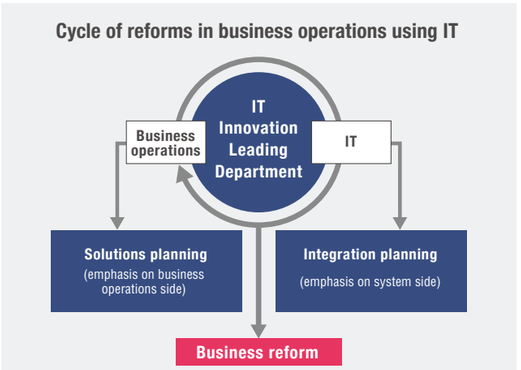


Note: The Steel Research Laboratory is responsible for R&D in each area.
DX promotion: Cyber-Physical System R&D Department (Established in April 2019)

IT Innovation Leading Department

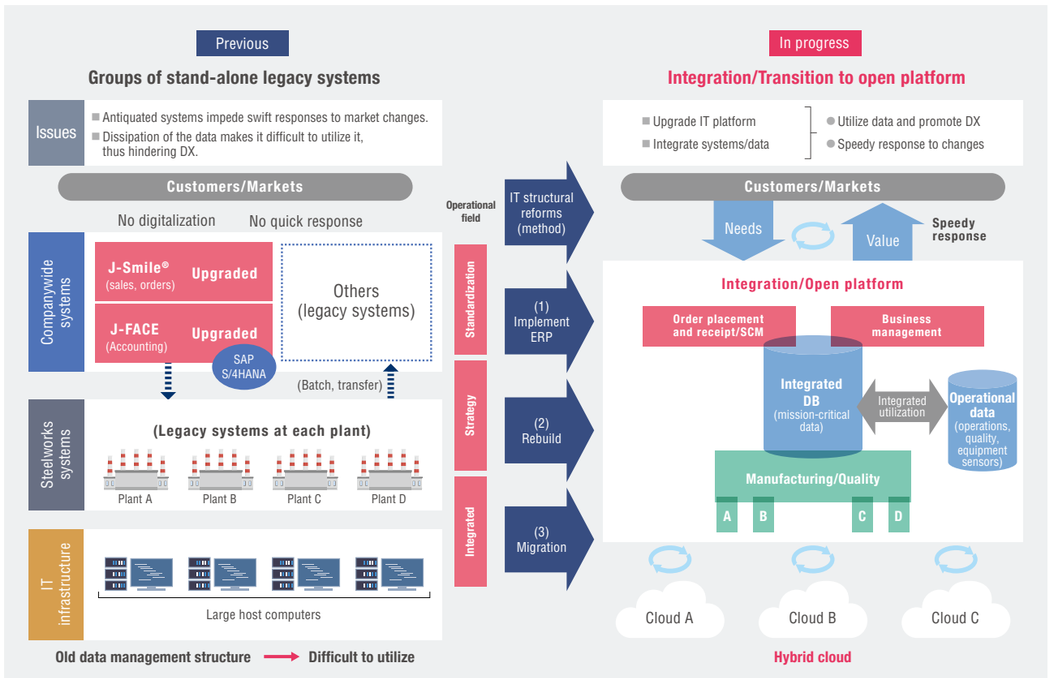
Our mission is to work as one with the administrative and operational divisions to proactively use cloud computing as we create a secure IT platform optimized for the entire company, use the latest technologies to promote business process innovation, transform businesses, and create new value. For important topics in our DX strategy, basic policies are confirmed at the IT Steering Committee, and decisions are made by the management team.

Promoting reforms in business operations with IT, transforming businesses, and creating new value



Enhancing an information system platform for DX promotion

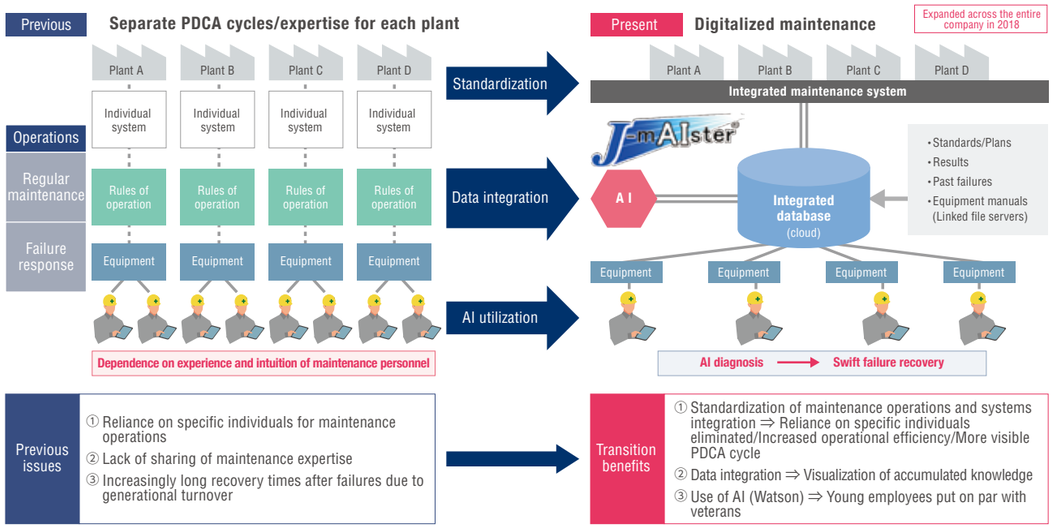
We are engaged in structural reforms of our IT platform to facilitate the use of our wealth of data assets, the core of our DX strategy. By consolidating groups of legacy systems and creating open platforms, we are designing a structure that responds swiftly and flexibly to changes in our operating environment.



System to support recovery from control failures (J-mAIster®)

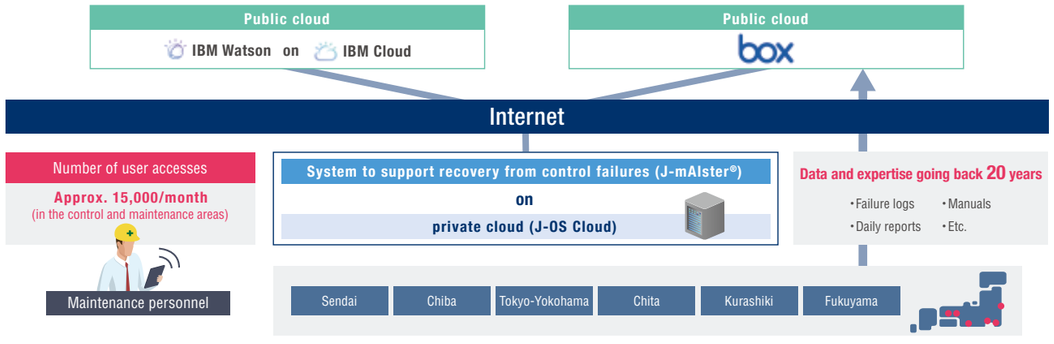
We are integrating our platforms, including the companywide integrated maintenance system that went into operation in 2015 and the installation in all manufacturing lines in fiscal 2018 of the J-mAIster®* system to support recovery from control failures. J-mAIster® draws on IBM Watson to make advanced use of the huge amount of failure data from the past 20 years stored in the maintenance system. With J-mAIster® installed, we have confirmed that recovery times are significantly reduced, and we are rolling out the system for full-scale use including linking it to other internal systems.

*J-mAIster®: JFE Maintenance AI of Smart TPM for Electric Repairs



Building a system that maintains information security while using the latest ICT

By constructing a hybrid cloud environment that links our dedicated J-OS Cloud private cloud with the public IBM Cloud, J-mAIster® has the flexibility to use the latest technologies like IBM Watson while also maintaining the conditions required for information security. In addition, reports, manuals, and other information stored on each regional file server have been consolidated on the companywide box cloud-based shared file server and are centrally managed. Security on this file server is enhanced with encryption functions, while at the same time the sharing of information across regions supports smooth maintenance operations.



JFE VOICE !

Since the installation of J-mAIster®, recovery times have been reduced at many workplaces!

The J-mAIster® system allows efficient searching for examples of problems that have occurred at all manufacturing lines of all steelworks and for information needed for recovery. When I have trouble determining the cause of a problem at my workplace, I use J-mAIster®. I input key words describing the situation into a mobile terminal by voice or keyboard, and artificial intelligence searches huge amounts of data and selects reports on similar problems that other people have experienced, simple procedure manuals, and other information, showing me the next step in determining the cause. In the future, I hope to use J-mAIster® to pass on the knowledge of my predecessors to the employees who will come after me.

Since J-mAIster® was installed, recovery times have been reduced at many workplaces. Going forward, by continuing to accumulate data and learn, I expect the system itself to become able to analyze failures and propose responses.

Masaki Matsushita, Leader, Plant Maintenance & Control Section, Planning Department, Chita Works

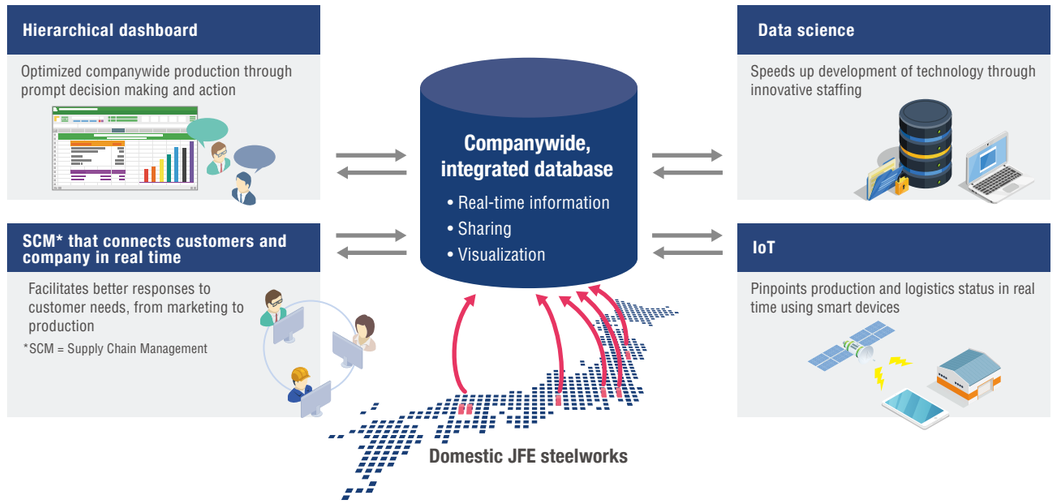
Business Process Innovation Team

Reform mission-critical systems at steelworks using the latest ICT
Create new value through reforms in business operations

We are reforming mission-critical systems at steelworks under the following policy: (1) Rebuilt a system platform using the latest ICT; (2) Redefine operational processes to pass on manufacturing expertise and introduce standardized operations; and (3) Create an integrated database with a standardized data structure.

Through this system upgrade, we aim to create an operating platform that shares and uses all companies' data with all employees, and to transform work styles to create new value.

New work styles realized through system upgrades

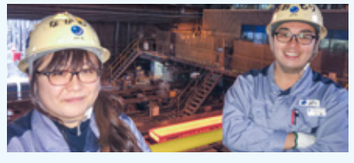


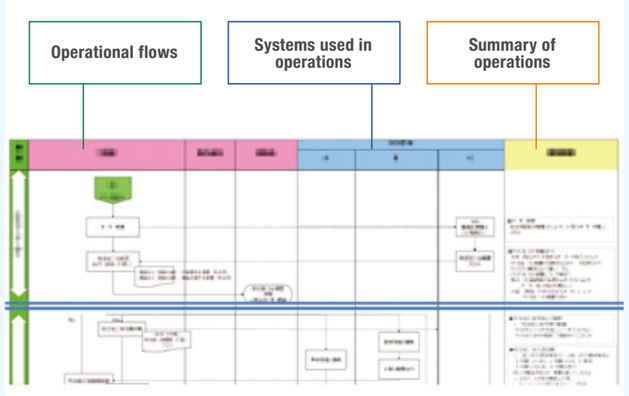
JFE VOICE !

Organizational knowledge by visualizing operation and data flow

We are working on the project of reforming mission-critical systems at steelworks. As part of the project's task, we produced "manufacturing operation- and data-related flow diagrams" (shown in the illustration), which visualize all the systems' work flow. The diagrams make it possible to broadly share a common understanding of the relation between operation and data, which had been known to a few specific people. With this task, we contribute to business process reengineering.

Haruka Nakamura, Takahiro Omori, Business Process Innovation Team





Contribute to developing a new system platform for the future

After joining JFE, we were responsible for manufacturing and operating technology at steelworks. Now we are working on a project to reform mission-critical systems, which are aimed at designing manufacturing recipes. The new systems steadily have been going live in stages. We will proceed to implement a new system platform that will create new value in the future.

Yoshiki Watanabe, Yu Hashimoto, Narihiko Ai, Business Process Innovation Team

Data Science Project Department

To maintain a competitive advantage using our wealth of operational data assets, we are aiming to strengthen our infrastructure for collecting process data from all steelworks and use data-science technologies to “integratedly and comprehensively automate” every process.

Establishing the JFE Digital Transformation Center, a base for DX promotion

We have established the JFE Digital Transformation Center (JDXC™) at the head office as a base for companywide DX promotion using data science and the latest information and communication technology. JDXC™ represents the Japanese steel industry’s first environment that can comprehensively use operational data accumulated at all steelworks and manufacturing sites, further raising our global competitiveness.

JDXC™ functions and objectives

1. Promote higher productivity and cost reductions through the comprehensive use of data by linking data from upstream processes to downstream processes, sharing data across regions, and other measures.
2. Raise the overall level of operational technology by pursuing cohesion and standardization of the cyber-physical system (CPS)* for manufacturing processes.
3. Raise the individual skill level and expand the number of data scientists by sharing knowledge, experience, and the resolution of issues among data scientists companywide.

* Cyber-physical system: A system that creates value by collecting information from physical space (actual equipment and products) with huge sensors (big data), consolidating this information in cyberspace and applying various analytical methods to make feedback to physical space in real time.

JDXC™ entrance and interior

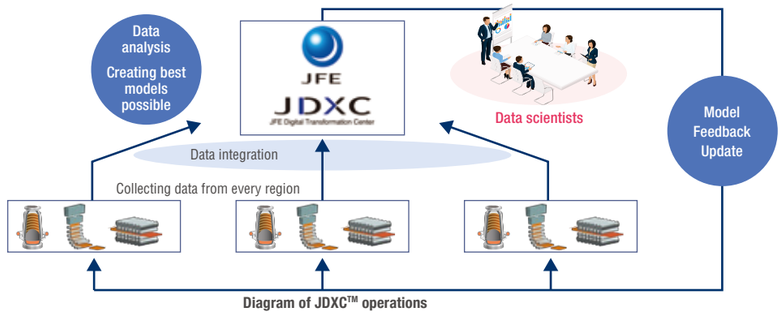


Diagram of JDXC™ operations

Introducing data science technologies at all blast furnaces—raising productivity with “blast furnace CPS”

JFE Steel is promoting technological innovation by proactively introducing the internet of things, artificial intelligence, and data science. CPS is being introduced at all our operating blast furnaces in Japan. This has made it possible to address the difficult issue of detecting anomalies in the airflow inside a furnace, which can cause major problems, and make important predictions about the temperature inside an operating furnace, contributing to both higher blast furnace productivity and stable operations.

Objectives

- Stable and highly efficient operations
- Uniform level of operations in all regions
- System standardization

Predictive model

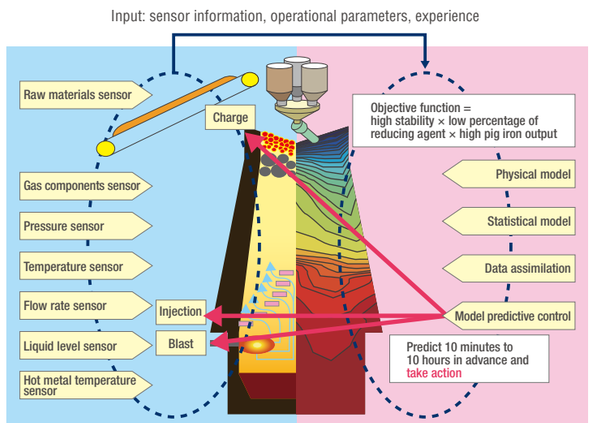
- Detect anomalies in airflow in the furnace from pressure sensors (several dozen minutes in advance)
  ⇒ Avoid gas channeling trouble(1)
- Predict the furnace temperature up to 10 hours in advance(2)
  ⇒ Take appropriate action to maintain the target temperature

(1) Gas channeling: Occurs when hot air being injected through the tuyere flows in separate channels when viewed from the circumference of the furnace interior. This causes the furnace temperature to fall and the layers of raw fuel inside the furnace become uneven, leading to poor airflow.

(2) Importance of predicting furnace temperature: If the furnace temperature falls, items being smelted can harden and become difficult to extract, in some cases halting production for an extended time. Maintaining a high temperature means that fuel (reduced material) is wasted.

Going forward, we will introduce CPS in manufacturing processes other than those used in blast furnaces. Our objectives are as follows:

- Feed results of anomaly prediction back into actual processes as operational action
  ⇒ Achieve stable operations
- Visualize process bottlenecks
  ⇒ Raise productivity
- Innovate processes through virtual testing. Pass on technologies and reform work styles by AI for knowledge and expertise



Introduction of training simulator using MR technology—passing on technical skills to young employees

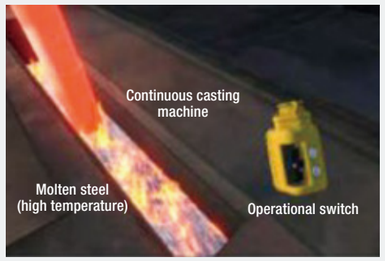
JFE Steel has installed a training simulator that uses the latest mixed reality (MR) technology* at its West Japan Works. This is the Japanese steel industry’s first system that uses the latest virtual technology to conduct training identical to actual operations at steelworks.

Some on-site operations at JFE Steel, including the handling of materials melted at high temperatures, involve high degrees of operational or safety risk. These technical skills need to be developed, however, and we have had no choice but to use on-the-job training to pass on those skills, which created issues in terms of doing so safely and reliably. To resolve these issues, we are using MR technology in the belief that a virtual environment is effective for training. With MR technology, we can create a training environment that integrates a virtual plant realistically recreated on a computer with human actions in the real world, making it possible to recreate both stable operational status and abnormal situations.

* Mixed reality (MR) and related technologies
• Virtual reality (VR): Technology that uses a computer to create a virtual space • Augmented reality (AR): Technology that expands the actual world by adding information to actual space
• Mixed reality (MR): Technology that creates a new space combining real space and virtual space that coexist in real time

Actual training allows staff to move equipment, operate switches, and experience the real status of equipment operations in a 3D virtual space. Training on this system before on-the-job training reduces operational and safety risks, allowing decisions and responses to be made quickly in abnormal situations. Going forward, we will roll out this training simulator to all steelworks and other works to pass on technical skills to young employees.

Scene of actual training



Trainee’s field of vision

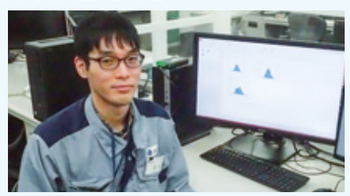
JFE VOICE !

Opening the JFE Digital Transformation Center as a base for DX promotion

As the person in charge of investment, research and development, and infrastructure development, I established the JFE Digital Transformation Center (JDXC™) and am currently working on utilizing it. JDXC™ is a base for data collaboration and utilization, as well as a base for training data scientists. Going forward, we will continue to build and expand an environment where we make proactive and broad-based use of accumulated data and expertise for stronger and faster DX, with the aims of contributing to operational efficiency and cost reduction.

Go Yokokura, Data Science Project Department

Introducing data science technology at all blast furnaces—increasing productivity with CPS for blast furnaces



Since joining JFE Steel, I have been involved in developing models to introduce cyber-physical systems (CPS) for ironmaking and steelmaking processes. Given the difficulty of grasping the overall process in a high-temperature environment, I am using data science technology to visualize these processes. I frequently visit plants as part of my model development and actual equipment installation, and I always try to raise my level by learning new things from the experience and expertise of the operators. I plan to continue these activities, with the aim of creating an automated control system.

Ryosuke Masuda, Cyber-Physical System R&D Department, Steel Research Laboratory

02 **Engineering Business**

For achieving SDGs, create and *"Ni-na-u"** the foundation for life by promoting digital transformation (DX)

* *"Ni-na-u"* is a Japanese word meaning supporting and remaining responsible.

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 proactively promote digital transformation to enhance corporate value by addressing environmental, social, and governance (ESG) issues. We are seeking fundamental reforms in business processes, additional value in products and services, and new business by using data on top of operational efficiency.

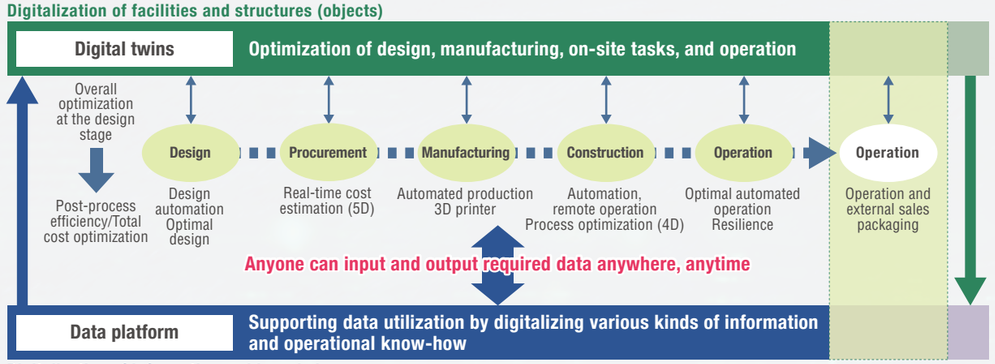
Atsushi Okamoto
Senior Managing Director

Overall optimization of operations by digital twins and data platforms

Looking to the future, JFE Engineering is seeking to enhance corporate value by promoting DX. We will take up the challenge of optimizing overall operations by using both "digital twins*" and "data platforms" in our Seventh Medium-term Business Plan. We are promoting operational innovation in various areas such as optimal design by advanced simulations in virtual spaces, automated on-site operations using 3D data, and optimal automated plant operations.

* Digital twins: Technology that simulates real-world phenomena in cyber space as if they were twins

Digitalization of facilities and structures (objects)



Digitalization of information and knowledge

Received IT Excellence Award in FY2020 for DX promotion activities

IT Excellence Award

We received the IT Excellence Award in FY2020 from the Japan Institute of Information Technology. We received the IT Excellence Award (one of two recipients), following three companies selected for the IT Supreme Excellence Award.

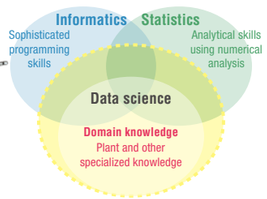
For this award, we were highly evaluated for many achievements such as construction and utilization of data analysis platforms and automatic operation of plants along with promoting DX with a comprehensive and sustainable framework at each level of security/IT infrastructure modernization/digital transformation.

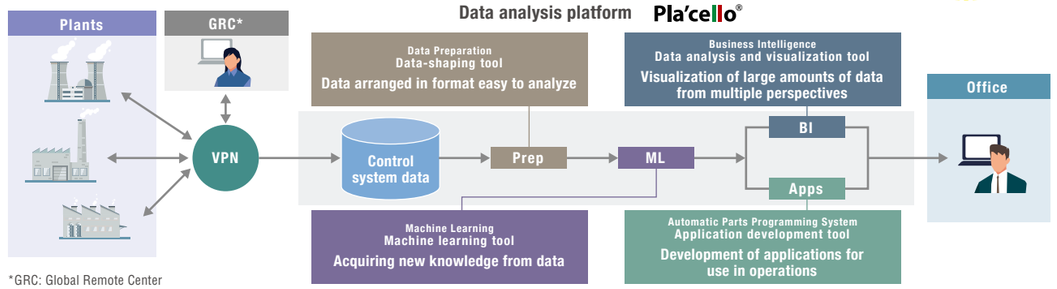
Front row: Executive Vice President Hata, Senior Managing Director Okamoto
Back row: General Manager Kobayashi, General Manager Kasuya, Manager Ueda

Internal data analysis platform "Pla'cello," which does not require specialized IT knowledge
—For more advanced and efficient operation by using accumulated plant data

The Pla'cello data analysis platform, which started operating in November 2018, can intuitively handle data processing, visualization and AI engine development, etc., with a graphical user face (GUI).

Pla'cello makes it possible to analyze data to detect signs of abnormalities, predict demand, and develop applications without advanced knowledge in informatics or statistics. More than 600 people are currently using the platform in a variety of locations. We will continue to enhance its functions and promote its use within our company.





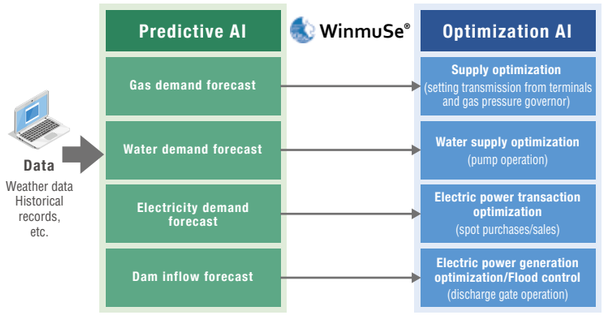
*GRC: Global Remote Center

Solution service "WinmuSe," based on proprietary AI engine developed in-house
—Using internal know-how to resolve issues for social infrastructure businesses

Our proprietary WinmuSe AI engine is an AI solution service that enables optimal operation of facilities, a high priority for social infrastructure companies.

"Predictive AI" to forecast demand using weather data and historical records and "Optimization AI" based on forecast results make it possible to provide the optimal operation plan in a timely manner.

The system already has a successful track record, such as demand forecasting of electric power and gas/supply optimization and water level prediction of a river. Most recently, we are promoting the development of the "Dam Optimal Operation System" with Hokuriku Electric Power Company.



Responding to increasingly advanced cyberattacks
—Developing a comprehensive security program that includes physical countermeasures and training, in addition to system countermeasures

The JFE Group is implementing Groupwide security measures to ensure a safe business environment that prevents virus infections, information leakage, and other problems. These measures include strengthening physical security to prevent unauthorized entry into offices and server rooms, e-learning, training for the detection of targeted cyberattack emails, and other periodic security training.

Our Global Remote Center (GRC) has obtained CSMS certification*1 and operates to counter the risk of cyberattacks targeting plant and infrastructure control systems at locations like factories or power stations. We will continue to provide safe services by implementing appropriate security measures.

Global Remote Center (GRC)

*1 CSMS: Cyber Security Management System for IACS (Industrial Automation and Control System)
*2 ISMS: Information Security Management System

The GRC has obtained CSMS certification.*1

The ICT Center's ICT Solutions Support Department has obtained ISMS certification.*2

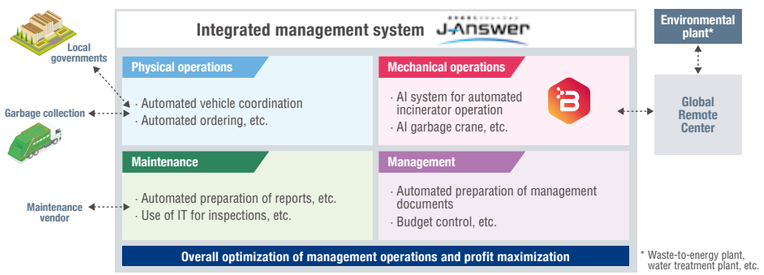
Case 1

For unmanned operation of environmental plants

—Developing world's first AI system for automated incinerator operation (BRA-ING) and integrated management system (J-Answer)

Because the combustion state at waste-to-energy plants changes depending on the type of waste, manual operation by a skilled operator was needed for stable operation. BRA-ING, which uses an AI image analysis of the combustion condition and the systematization of manual operations, is the world's first automated incinerator operating system. The system is already in the implementation stage and we plan to expand its use to 10 facilities in fiscal 2021.

We also started to offer the J-Answer integrated management system in November 2020. We are installing it in stages at waste-to-energy plants commencing operations from March 2021, to make using data more convenient and to optimize overall operations with various types of data linkage and analysis.



On-site comment

Environmental Solutions Sector
Front row: Ito, Shirai, Kojima
Back row: Kawano (ICT Center), Tabe

We started using the IoT (internet of things) to collect data in fiscal 2014, and with the cooperation of many people, we have achieved major successes not seen at other companies. We are accelerating our development toward unmanned operation.

Hiroshi Kojima
PPP Promotion Dept., Environmental Solutions Sector

Case 2

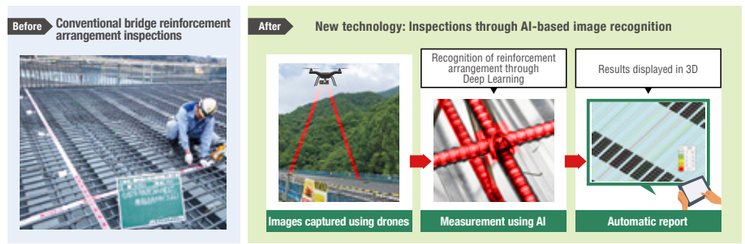
World's first automatic AI-based bridge reinforcement arrangement inspection system

In bridge construction, placement inspection to confirm that the steel bars have been installed as designed is very labor intensive. Working with ACES, Inc., we developed an automated AI inspection system for bridge steel bar placement and began using the system on actual worksites in July 2020.

Using drones, we can capture images of the construction site from above and measure the number of steel bars and their spacing using AI-based image analysis. The results of the measurements are automatically recorded and displayed as a BIM/CIM model.

We expect the system to reduce labor up to 75% as well as improve reliability compared to conventional sampling inspections* that measure the entire construction area.

* Sampling inspections refer to techniques where only certain sections are checked.



On-site comment

Bridge Structure Division, Infrastructure Engineering Sector
Kakiichi, Arai, Nakano, Maeda

We are proactively developing and introducing ICT and AI technologies at construction sites. We are currently using trial installations at selected construction sites for verification testing of increased efficiency and labor saving.

Takumi Kakiichi
Bridge Structure Division, Infrastructure Engineering Sector

JFE VOICE !

Achieve smooth communication even while working remotely during the COVID-19 pandemic by using IT tools

JFE Engineering is proactively promoting the use of cloud services and smart devices. Using a file-sharing system (Box) and a communication tool (Microsoft 365), we have created an environment where required information can be accessed "anytime, anywhere," achieving a remote work ratio above 80%. The use of information technology has enabled us to maintain smooth communication even while working remotely.

On-site comment

April 2020—immediately before the declaration of the state of emergency! Tension was increasing at the Working from Home Promotion Team, COVID-19 Task Force, which was busy every minute installing remote access infrastructure and tools and bringing employees up to speed. Collaborating with members who joined from other departments, the team succeeded in having all our Group companies working from home without any problems.

Masaya Hirotsune, Smart-Work Promotion Sec., Human Resources Dept.

Smart-Work Promotion Sec.
Front row: Furubayashi, Ikeda, Hakamata
Back row: Manager Hirotsune, Uetake, Tanaka

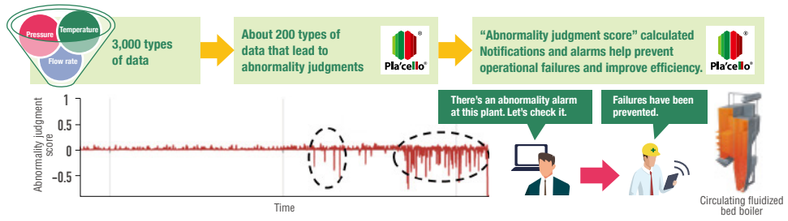
Case 3

Aiming to stabilize operations at biomass energy plants

—Early detection of potential operational failure by using AI

One requirement is to achieve high output with stable, efficient power generation regardless of the quality of the fuel in biomass energy plants. Early detection of potential failures is important to maintain stable operation, which is currently dependent on operators' skill and experience. The AI-based operation support system is able to extract information that might result in operational failures and reduced power generation efficiency from a huge amount of operational data that humans cannot process unaided. The system analyzes data in real time and visualizes it as an "abnormality judgment score," which achieves reduction of monitoring work and abnormality detection in advance.

We aim to establish the AI-based operation support system by continuing to collect more operational data and to expand functions to realize more stable and efficient plant operation than ever before.



On-site comment

Biomass Power Plant Design Dept., Engineering Design Center, Energy Industries Engineering Sector
Nakagawa, Enomoto, Muneoka

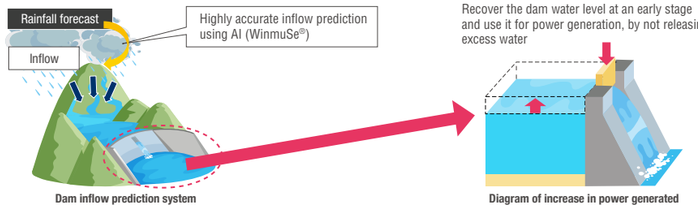
When an abnormality occurs, the operation support system sends a notification, and visualization tools help us check the operational data instantly. It is extremely helpful for understanding the situation and identifying the cause quickly.

Daiki Muneoka
Biomass Power Plant Design Dept., Engineering Design Center, Energy Industries Engineering Sector

Case 4

Aiming for maximized dam power generation by using AI

Aiming to further increase the amount of hydroelectric power generation, JFE Engineering and Hokuriku Electric Power Company have jointly developed the Dam Optimal Operation System. The highly accurate prediction of the amount of water that will flow into the dam, or inflow, was confirmed with an experiment that we did at a dam last year. We were able to confirm that the electric energy of hydroelectric energy generation would further increase (by approximately 5,000 MWh annually) by using and optimizing the prediction data in the dam's operation. In addition to steadily increasing the number of dams where this system is applied, we, along with Hokuriku Electric Power Company, aim to improve and develop this system through a combination of the latest AI technology and dam operation expertise, and promote more effective utilization of CO_2 emission-free hydroelectric power.



On-site comment

ICT Center, Technology Headquarters
Watanabe, Suzuki, Hadama

The development of this system has entered the implementation verification phase. We are speeding up development to contribute to the activities of hydroelectric power facility owners.

Soichiro Yamane
ICT Center, Technology Headquarters

JFE VOICE !

Having various types of training and events to improve and promote the skill level of ICT technology companywide

We hold hands-on training like "ideathon" and "hackathon" events to help employees who are not IT engineers learn how to use Pla'cello for analyzing actual operational data. In fiscal 2020, we also established the companywide AI/IoT Subcommittee for proactively acquiring cutting-edge technologies through education and hands-on training.

Through these activities, we will accelerate our DX promotion such as innovation of on-site operation and operational efficiency improvement using AI and IoT (internet of things).

On-site comment

The activities of the AI/IoT Subcommittee are carefully planned to make participation easy for people with little opportunity to use information technology in their regular work. The members are now very active. I have high hopes that their ICT skills will be improved dramatically over the next few years.

Yoshitaka Kobayashi, ICT Center, Technology Headquarters

03

Trading Business

JFE Shoji is working daily toward the IT Vision outlined below, according to the medium-term business plan covering fiscal 2018 through fiscal 2020. Along with operational issues at JFE Shoji, we are taking a perspective of consolidated management and have begun working on issues at Group companies for the overall achievement of the JFE Shoji's vision.

With regard to DX promotion, we have begun introducing Robotics Process Automation (RPA), whereby we use data to become more efficient internally and to respond better to customers.

We are introducing RPA at Group companies, and together with systems upgrades at each company, will build a DX platform for JFE Shoji and Group companies, working as one to provide high-quality services to our customers.

Tatsuya Sakamoto
Managing Executive Officer

JFE Shoji's Vision

Trading and operating activities to build a stable profit base and to expand profitability

Shift to marketing strategy operations | **Strengthen on-site capabilities** | **Demonstrate group synergies**

JFE Shoji's IT Vision

Themes of advanced IT to support growth

Improve office productivity

Use RPA and AI to automate and elevate business operations
(Shift to operations directly linked to marketing strategy)

Improve coil center productivity

Use IoT technology to integrate sensor data
(Various improvements through visualization of operating status)

Demonstrate group synergies

Strengthen connections with JFE Holdings, JFE Steel, and JFE Engineering
(including SCM, shared security platform and joint procurement)

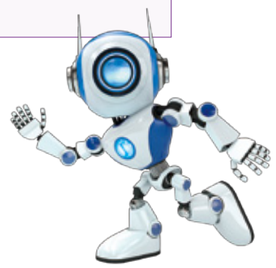
Enhance efficiency of consolidated management

Expand applications and upgrade standard systems
Enhance domestic and international communication environment

Platform to support advanced IT

Enhanced information security | **Stable systems operations** | **Retain and train IT staff**

Companywide RPA expansion

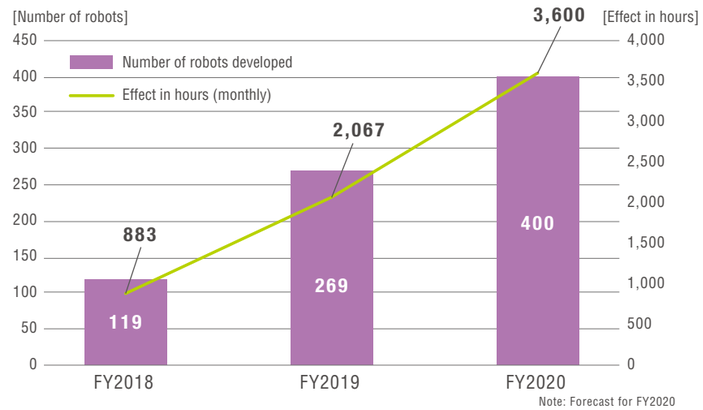


Under our medium-term business plan covering fiscal 2018 through fiscal 2020, JFE Shoji is introducing RPA companywide. Our current forecast is to achieve 43,000 hours of labor savings annually (3,600 hours monthly), surpassing our medium-term target of 40,000 hours (3,300 hours monthly), by the end of fiscal 2020.

Individual operational organizations are not simply adding RPA to operations but are creating an opportunity to review operations and identify additional operations where RPA can be applied. There are many cases where this has eliminated gaps in operational processes by staff members and led to standardization. Some head office organizations also began standardizing internal operations in fiscal 2019, enabling more employees to use robots and leading to an upward trend in the reduction of work hours per robot (a positive effect).

There have also been cases in which contact with customers has become faster, more regular, and more standardized than in the past, contributing to better service.

	FY 2018	FY 2019	FY 2020
Number of robots developed	119	269	400
Effect in hours (monthly)	883	2,067	3,600



Note: Forecast for FY2020

JFE VOICE !

JFE Shoji has been carrying out J-SLIM operational improvement for more than 10 years and holds a briefing to announce successes annually. More than half of JFE Shoji's sections have made announcements at these briefings with RPA as a theme.

- By introducing RPA, we began to think critically about existing ways of doing things
- Now, in addition to internal efficiency, we work to make improvements with vendors as a matter of course
- Branching out with RPA, we plan to launch a project to build a new system by working with other divisions

Ms. Hojo, making an announcement for the Automotive Steel Overseas Sec. No. 1

- Standardizing the project management sheets prepared by individual staff members has been an issue for our section for some time but had been difficult to do because of the many systems involved
- Having introduced RPA, we now expect to be able to do this
- Going forward, as the data stored since RPA was introduced grows, we hope to use it to create new services

Mr. Hashimoto, making an announcement for the Machinery & Materials Overseas Sec.

Information security governance to support DX promotion

Information Security Management

To prevent cyberattacks and unauthorized use of systems and thus confidently engage in business activities, the JFE Group is constantly working to improve its level of information security management through the following measures.

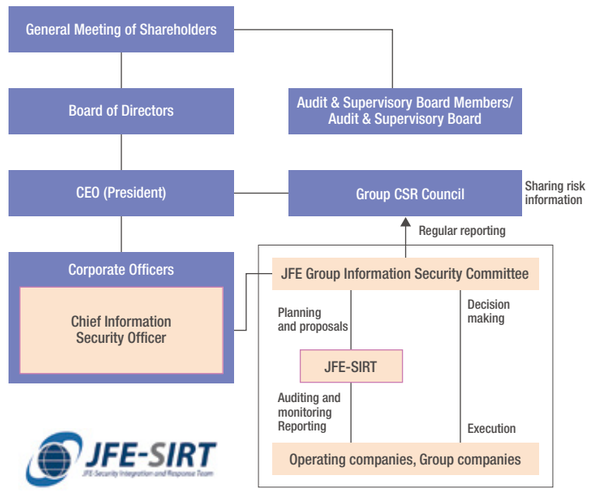
JFE Group information security management structure

After the release of the Ministry of Economy, Trade and Industry's Cybersecurity Management Guidelines in 2015, JFE Holdings established the JFE Group Information Security Committee in April 2016 for the ongoing maintenance and strengthening of IT risk management functions Groupwide. Led by the JFE Group Chief Information Security Officer*1 at JFE Holdings, officers responsible for IT divisions at each operating company discuss important issues related to information technology and set Groupwide policies focusing on information security. In addition, JFE-SIRT, made up of IT division managers at all operating companies, was established and is working to strengthen security countermeasures and governance at operating companies and their group companies, on the basis of decisions made by the JFE Group Information Security Committee.

*1. Chief Information Security Officer (CISO): The officer in charge of information security, who is responsible for information management and use within companies and organizations

*2. Computer Security Incident Response Team (CSIRT): A general term for a group that responds to internal computer security-related incidents when they occur

JFE Group information security management structure



The JFE Security Integration and Response Team (JFE-SIRT) is a CSIRT*2 responsible for planning, proposing, and promoting Groupwide measures, auditing Group companies, reviewing security policy, and responding to information security incidents.

Message from JFE-SIRT

Digital transformation (DX) initiatives are becoming increasingly active. The JFE Group has designated working together to promote DX as an important Group strategy. Through DX, we are proactively incorporating new technologies and using information assets to increase productivity, transform businesses, and create new value, although use of DX also invites new cybersecurity risks. We need to appropriately protect these information assets from such risks to ensure that we provide our customers with high-quality and secure goods and services and meet our responsibilities as part of supply chains.

The JFE Group launched the Information Security Committee and JFE-SIRT framework in 2016, as we strive to raise the level of cybersecurity countermeasures across the entire Group, including in the areas of information technology and operational technology, in Japan and overseas. We will steadily continue to build on this framework and further develop it to contribute to promoting the DX strategy.

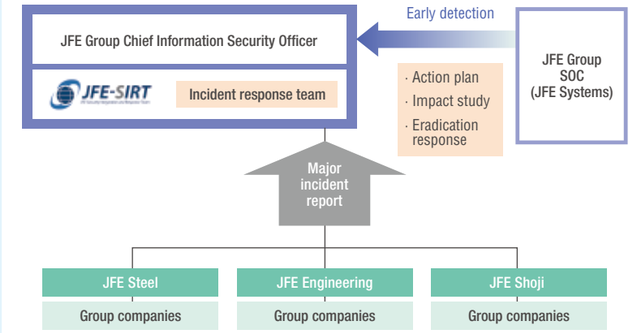
Ken Sakata
Team Leader, JFE-SIRT

Integrated security monitoring network

Targeted cyberattacks against companies are becoming more ingenious every day, including many cases in which significant time passes before a company learns it has been attacked, by which time information assets have already been stolen. To detect these threats at an early stage and prevent damage as much as possible, a framework for integrated security monitoring is required at multiple levels, from personal computers to networks. Our Groupwide SOC*3 structure was established to facilitate constant monitoring across the entire JFE Group. When a security incident does occur at a company, JFE-SIRT is the structure for swift reporting, responding, recovering, and proposing measures to prevent a reoccurrence, under the guidance of the JFE Group Chief Information Security Officer.

*3. Security Operation Center (SOC): The organization that monitors networks and devices by detecting, analyzing, and giving advice on responding to cyberattacks

Integrated security monitoring network



Integrating the Group's security platform

We are promoting a common information security platform covering networks, IT equipment, and security-related software, to raise the level of information security across the entire Group and protect the Group's information assets from increasingly sophisticated cyberattacks. Even if an information security incident were to occur, a common platform makes possible an accurate assessment of the threat and a rapid response.

We are also introducing a common information communication platform for cloud computing, which we recently began using, to promote the safe sharing of information within the Group and contribute to business creation across the Group in the area of DX.

Group security platform integration

Disclosure of cybersecurity information

JFE Holdings releases information about our information security initiatives to shareholders, customers, suppliers, and other stakeholders. In addition, the Company is working to increase security awareness and raise the security level within every Group company through various opportunities for communication within the Group to help promote every Group company's digital transformation (DX).

Target	Purposes of information disclosure
Customers	To provide a sense of security when they use our products and services
Suppliers	To build relationships of trust in supply chains and as business partners
Shareholders, institutional investors	To demonstrate that we are a corporate group with appropriate risk management functions in place
	To facilitate an understanding of our corporate value with non-financial information
Employees	To instill a sense of individual pride and responsibility as a member of the JFE Group
Media	To raise awareness of the JFE brand in society

Information disclosure media

- Annual securities report (in Japanese)
- CSR Report
- Integrated Report (JFE Group Report)
- DX Report (this report)
- JFE Holdings and Group company websites, etc.

JFE Group Declaration of Cybersecurity Management

1 Recognize cybersecurity as a management issue

The JFE Group recognizes cyber-related risk as a key management priority. We shall enhance our own understanding of the latest cybersecurity developments and actively engage in management by positioning cybersecurity spending as an investment.

Management shall enhance their cybersecurity measures with responsibility while confronting realities, addressing risks, and exercising leadership. Members of management shall chair cybersecurity-related committees at JFE Holdings and its three operating companies, promote constructive discussions, validate various measures, and allocate appropriate resources to whatever measures deemed necessary.

2 Determine management policies and declare intentions

The JFE Group shall determine management policies and draft a business continuity plan (BCP) aimed at quick recovery in the event of a cybersecurity incident, emphasizing not only identification and defense, but also detection, response, and recovery.

Every year, the JFE Group shall lay out a cybersecurity action plan for the Group, reflecting a review of risk identification, defense mechanisms, and guidelines for responding to an information security incident. Also, the JFE Group shall strengthen incident response capabilities through regular drills and prepare the BCP. Furthermore, the JFE Group shall periodically conduct cybersecurity audits on JFE Group companies. Through these efforts, the JFE Group aims to steadily raise the level of the overall Group.

Management shall take the lead in declaring companies' intentions to internal and external stakeholders, and make every effort to voluntarily disclose recognized risks and measures to deal with them, in corporate reporting.

3 Build internal and external systems and implement security measures

The JFE Group shall establish internal systems mainly through JFE-SIRT, ensure sufficient resources including budgets and personnel, and take necessary human, technical, and physical measures.

Using various internal and external human resources development programs, the JFE Group shall cultivate the skills of high-level, professional staff with detailed knowledge of cybersecurity and shall work with external specialists to leverage the benefits of sharing know-how. The JFE Group shall strive to educate and motivate employees at every level in all divisions at each company under the JFE Group umbrella through in-house training and drills, as well as participation in cross-industry exercises.

The JFE Group shall manage cybersecurity throughout domestic and international supply chains by monitoring security measures at outsourcing contractors and others on the supply chain.

4 Encourage widespread use of cybersafe products, systems, and services

The JFE Group shall manage cybersecurity across the full spectrum of corporate activity, including development, design, production, and supply of products, systems, and services.

5 Help build safe and secure ecosystems

The JFE Group shall collaborate with relevant government agencies, organizations, industry associations, and other bodies to actively share information, engage in dialogue, and build human networks, both in Japan and internationally. The JFE Group shall contribute to reinforcement of cybersecurity throughout global society by raising awareness of measures taken on the basis of such information.

JFE

JFE Group

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