

Environmental Management

JX Metals Group Basic Environmental Policy

As a comprehensive manufacturer of nonferrous metals and advanced materials, the JX Metals Group is rising to the challenge of innovation in the productivity of resources and materials. Committed to compliance with environmental regulations, we carry out the following initiatives in order to proactively strive for environmental conservation on a global scale, including measures against global warming, and contribute to building a sustainable society.

1. We will contribute to achieving a decarbonized society by promoting technological innovation and energy transition and aiming for zero greenhouse gas emissions.
2. We will supply environmentally-friendly advanced materials to support the growth and advancement of society.
3. We will promote resource recycling and aim for zero emissions in all our business activities.
4. We will thoroughly raise each employee's awareness of environmental conservation through environmental education, leading to business activities with less environmental impact.
5. We will share information on environmental conservation activities with stakeholders and seek to operate in harmony with society.

Compliance With Environmental Laws and Regulations

Through steady operation of environmental management systems, the Group works to ensure compliance with environmental laws and regulations. The Environment & Safety Department at the Head Office monitors and supervises the state of compliance and reports to the ESG Committee through the Safety and Environment Committee. At their annual meeting, environmental management supervisors work to strengthen our compliance system by providing information on legal and regulatory trends and reporting on the status of compliance at each operating site. We additionally reinforce employees' knowledge of laws and regulations by holding rank-specific education and training regularly at the Head Office and operating sites.

In fiscal 2022, there were no adverse dispositions from regulatory authorities (including license revocation, orders to cease operations, orders to cease use of facilities, orders for improvement, fines, etc.) for violations of environmental laws and regulations.

Establishing an Environmental Management System

The JX Metals Group has established environmental management systems in line with ISO 14001 standards for ensuring achievement of the Action Plan for Environmental Protection, which was drawn up to reflect the Basic Environmental Policy. A multilevel organizational structure has been created, including various committees and subcommittees, in which everyone, from senior management headed by the president to employees at operating sites and affiliated companies, works together to promote environmental conservation and mitigate environmental risk. No environmental accidents occurred in the Group in fiscal 2022.

Operating Sites That Have Obtained ISO 14001 Certification (as of March 31, 2023)

43 Operating sites (Japan: 27, overseas: 16)

Environmental and Safety Auditing

Individual operating sites implement internal environmental audits at least once a year. In addition, they periodically undergo environmental and safety audits by the Environment & Safety Department of the Head Office. Audits were conducted at 19 business sites in fiscal 2022.

Activities in the areas of health and safety and environmental conservation are planned, promoted, and reviewed by the Safety and Environment Committee, an organization under the ESG Committee. The Safety and Environment Committee meets once every six months.



An environmental & safety audit at Isohara Works

Promoting CSR Purchasing

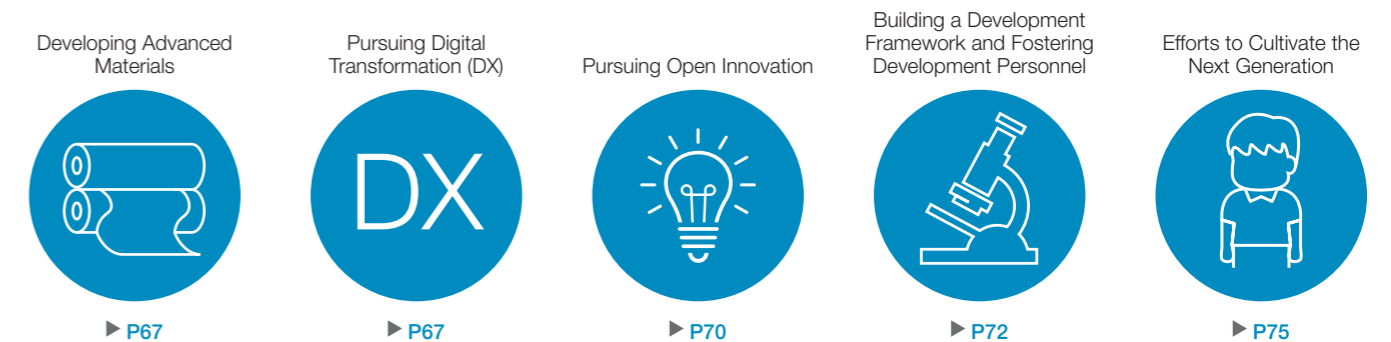
The Group has set a Green Purchasing Policy, aimed at reducing environmental and other social impacts when procuring materials and equipment. Based on this policy, we have drawn up Green Purchasing Guidelines setting out specific requirements for choosing suppliers. These guidelines contain requirements with which we ask our business partners to comply. These conditions apply to all suppliers.

We confirm supplier compliance with these guidelines through our CSR Procurement Questionnaire survey. In fiscal 2022, 85% of suppliers responded to our survey.



Materiality 2 Provide Advanced Materials That Support Lives and Lifestyles

The excellent properties of the major base metal of copper and a variety of minor and precious metals have supported the evolution of electronic devices. The JX Metals Group continues to pursue technical rationality and efficiency, as well as make improvements in product quality and properties of these materials, so we can rapidly offer society products and technologies supporting the coming data society and IoT/AI society.



KPIs and Progress

Assessment: 😊 Achieved/Steady Progress ☹️ Not Achieved

KPI	FY2022 Results/Progress	Assessment
Develop advanced materials needed by the IoT/AI society	In order to capture growing demand, we have announced a series of production capacity expansion plans, including the construction of new plants and site acquisition, as well as measures to strengthen our supply chain. Continuing from fiscal 2021, we have pursued open innovation through collaboration with companies and universities to develop advanced materials needed by the IoT/AI society.	😊
Build a framework to support technology-based management	With the goal of continuously generating innovative technologies and products for technology-based management, we have built a framework for development and worked to foster development personnel to generate new innovations and diversify human resources.	😊

Developing Advanced Materials

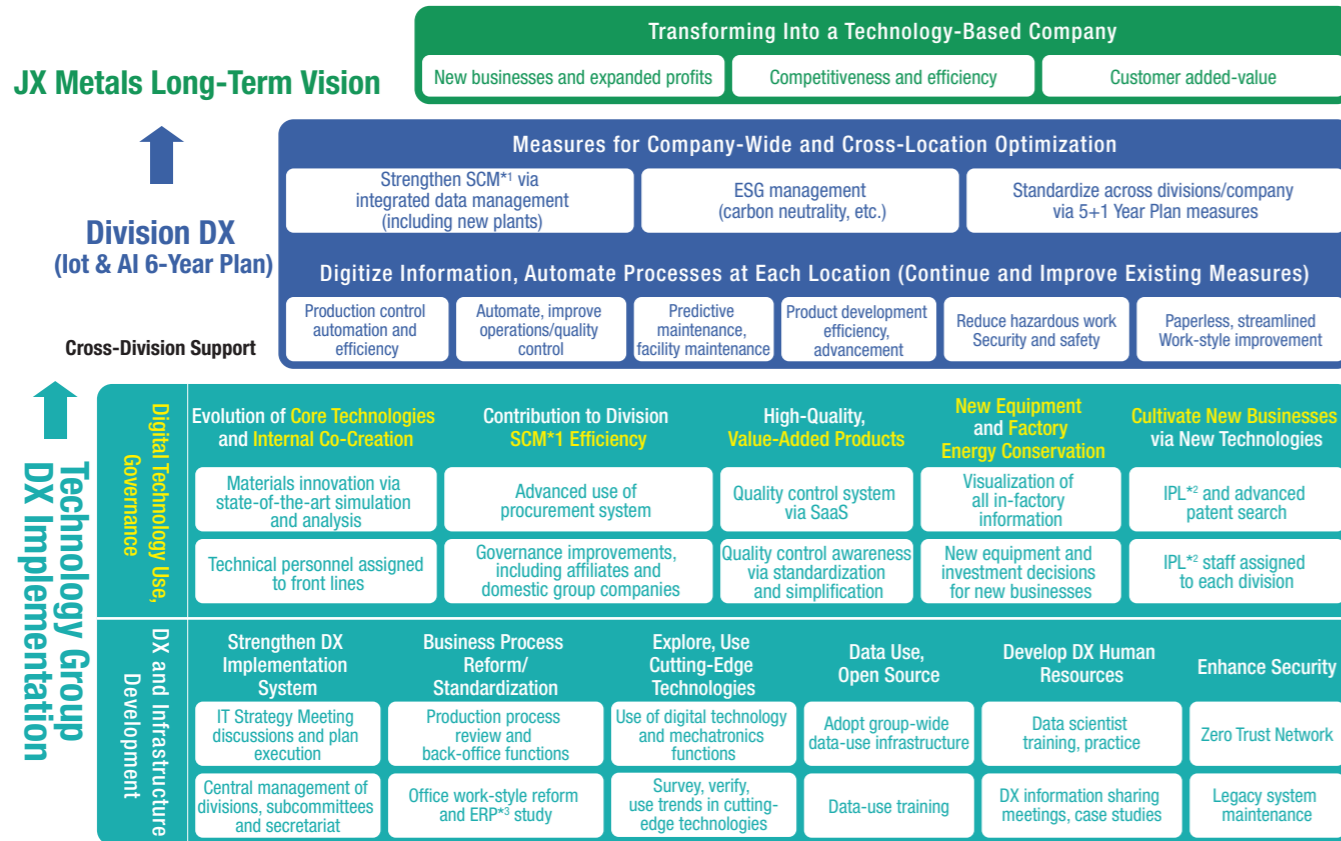
In order to contribute to the development of a sustainable society, the Group relentlessly pursues innovation by advancing and utilizing core technologies accumulated to date, as well as co-creation with outside resources.

Reference **Special Feature 1**
Contributing to Sustainable Societies Through Advanced Materials ⇒P27-32

Pursuing Digital Transformation (DX)

We pursue DX through measures to optimize and automate every division and corporate department, aiming to establish a foundation to achieve the ideal stated in our Long-Term Vision 2040 of becoming a technology-based company. We leverage new technologies in each department of the Technology Group that supports these efforts and engage in company-wide measures to achieve this technological transformation.

JX Metals DX Structure



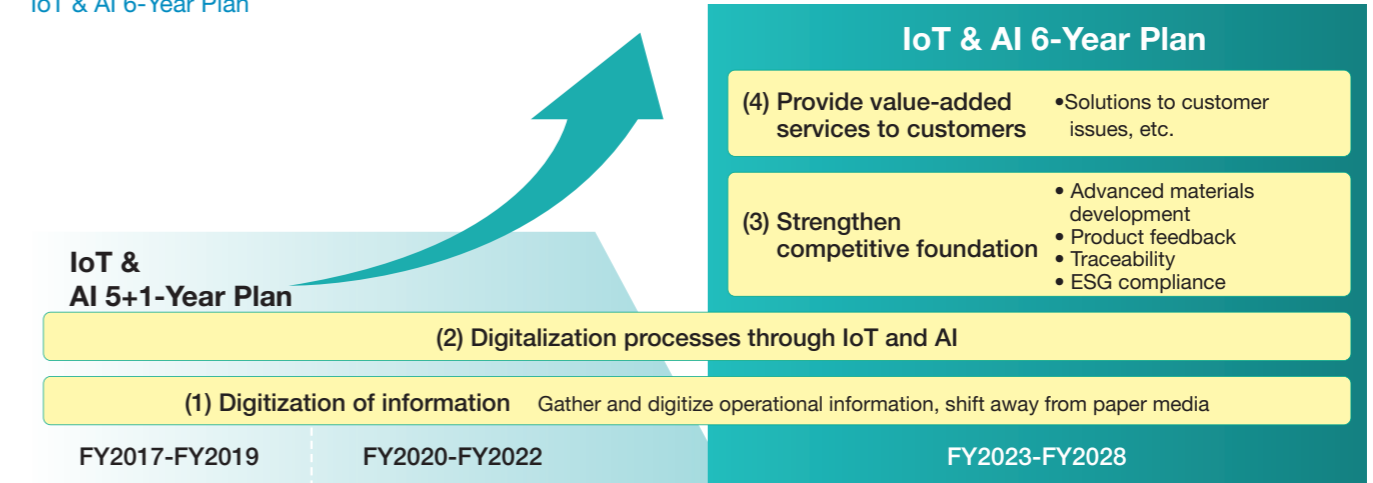
*1 SCM (Supply Chain Management): A management method to optimize all processes through the central control of everything from raw materials procurement to manufacturing and sales.
*2 IPL (Intellectual Property Landscape): Utilizing IP information analysis for management.
*3 ERP (Enterprise Resource Planning): A concept that aims to improve and optimize overall management efficiency through the integrated management of human, physical, and financial resources.

IoT & AI 6-Year Plan Implementation

Since 2017, we have pursued an IoT & AI 5+1-Year Plan. In fiscal 2023, we formed a new IoT & AI 6-Year Plan to advance DX across the Group. This plan includes the digitization of information and processes to date (digitization) and the digital conversion of information and processes (digitalization). In addition, the plan calls for optimizing the entire supply chain in light of chang-

es in our businesses, strengthening our competitive foundation, creating value for customers, and addressing ESG issues such as decarbonization, etc. As in the past, our Technology Group exercises overall control, while subcommittees established in each division act as the main force in driving implementation. Digital innovation staff in the IT Department serve as the secretariat providing implementation and technical support.

IoT & AI 6-Year Plan

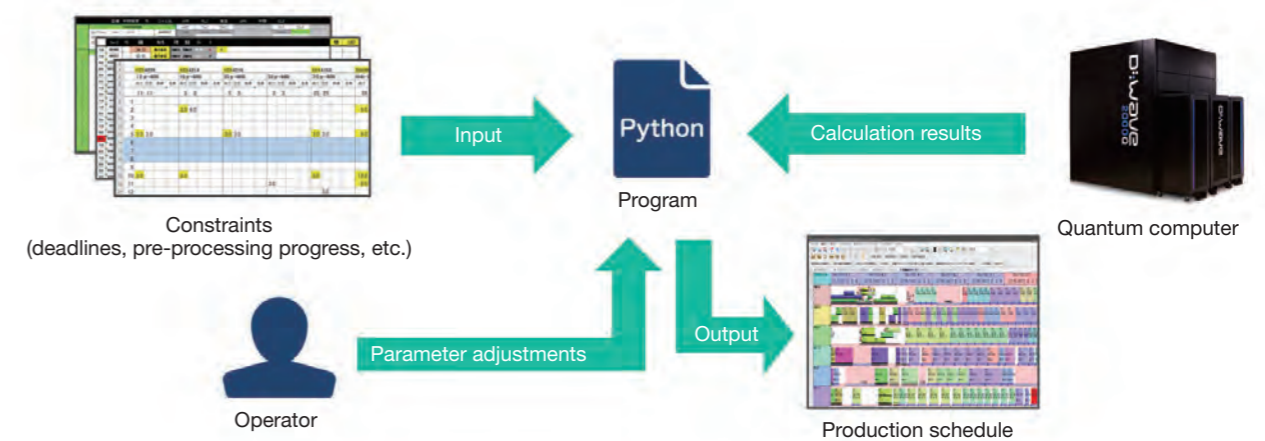


Foundation Supporting DX

Exploring Cutting-Edge Technologies

We conduct proof-of-concept tests to verify the newest technologies and consider applicability to our operations. Test content includes the application of optimization calculation technology to planning tasks using quantum annealing technology and AI-camera-based human detection technology.

Quantum Annealing Used in Production Planning



We adapt optimization techniques to highly challenging planning tasks that combine various constraints, etc. In this way, we avoid dependence on the accumulated skills of veteran staff and improve work efficiency.

Proof-of-concept tests of automated human detection on forklift trucks equipped with AI cameras



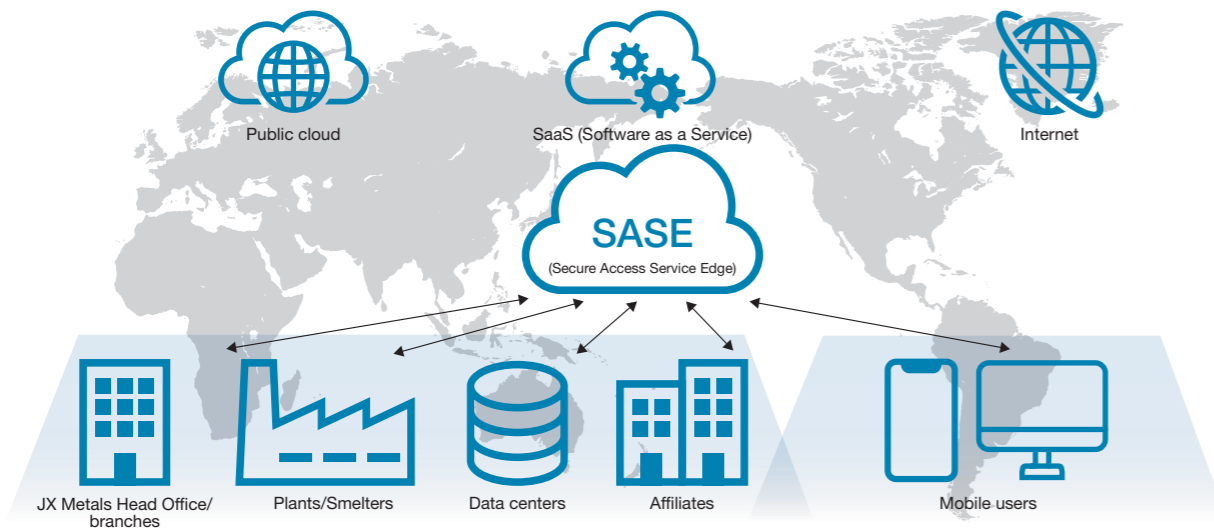
AI cameras are positioned in all directions to detect humans, strengthening and making safety measures more reliable

● Strengthening DX Infrastructure (Zero Trust Network)

In response to changes in work styles amid the COVID-19 pandemic and requests from business partners to strengthen security measures, the Group has been upgrading our own network based on the concept of zero trust. This is the most advanced cloud-based security service available today, enabling

security management at the terminal and user level that cannot be achieved with conventional perimeter security networks, thereby raising the security level of the entire Group in a uniform manner. This system is already in operation at JX Metals Head Office and operating sites, and will be rolled out to Group companies in Japan and overseas in stages.

Next-Generation IT Infrastructure Using a Zero Trust Model



● Developing DX Human Resources

Beginning in fiscal 2019, we have been working to enhance our digital resources and strengthen their training. In data scientist education, we have expanded our training programs according to the level of each employee, such as beginner programs for young employees and intermediate programs for mid-career employees. We began literacy training for all employees in fiscal

2022 and launched workshops at operating sites in fiscal 2023.

We are also working to improve the level of our DX education by strengthening cooperation with educational institutions, such as joint research with Tohoku University and dispatching employees to the Shiga University Graduate School of Data Science.

Pursuing Open Innovation

We are promoting co-creation in a variety of formats, including collaboration with unique technologies held by Group companies, joint research with universities and other research institutions, and partnerships with external companies. These activities aim to build a system for generating new technologies and value.

Investment in North American Venture Capital Fund, Accelerating Collaborations With Startups

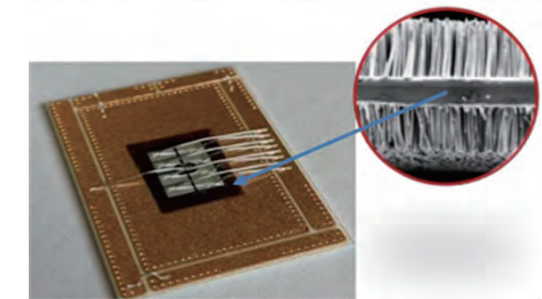
JX Metals Corporation invested as a limited partner in Pangaea Ventures Impact Fund, LP, a venture capital fund managed by Pangaea Ventures. Pangaea Ventures is based in Canada and the U.S. The purpose of the fund is to contribute solutions to social issues such as decarbonization, climate change, and water resources by reducing CO₂ emissions by 550 million tons by 2030. The fund will accomplish this objective by investing in startup companies with innovative technologies. The fund has an extensive network of startups in advanced materials and hard tech in North America.

Through this investment, we intend to accelerate open innovation and new business development in North America, tying investments to collaborations with North American startup companies that boast superior technologies.

Investment in German Company, Collaboration in Metal Nanowires

JX Metals made the decision to invest in NanoWired, a German startup. Germany is home to a flourishing environment in cutting-edge research in IoT, AI, and more. NanoWired develops technologies and manufacturing equipment for growing nanowires of less than 1μm diameter on various substrates. Growing nanowires on substrates enables bonding at room temperature or lower and at higher density in a shorter time, making it possible to achieve high electrical and thermal conductivity and bonding strength.

Through this investment JX Metals intends to strengthen this relationship with NanoWired and undertake various forms of collaboration. Examples include providing materials required for nanowire growing processes, such as copper foil and plating materials; joint development focused on future social trends, including those in the semiconductor mounting field, where growth is expected to accelerate; and application of nanowire technologies to the JX Metals products.



Nanowires grown on metal surfaces

● Speaking at the German-Japanese Innovation Initiative 160 Pre-Event

On December 5, 2022, we presented the collaboration between JX Metals and NanoWired as a best practice case study at the German-Japanese Innovation Initiative 160 pre-event held in Berlin, Germany.

The Japan External Trade Organization (JETRO) and the Germany Trade and Invest (GTAI), in cooperation with the Japanese and German governments and industry support organizations, launched the German-Japanese Innovation Initiative 160 in December 2021. The first event marked the 160th anniversary of the signing of the Treaty of Amity and Commerce between Germany and Japan and aims to achieve the SDGs by solving climate change and other global issues. In the year or so since its inception, the event selected five cases as best practices, including the JX Metals collaboration with NanoWired.

In addition to in-person participation, the event was broadcast live online, closing on a high note with more than 100 participants from around the world.



Frankfurt Office General Manager Tsuchiya speaking from the podium

Activities of the JX Metals Endowed Unit

Despite growing needs for a stable supply of nonferrous metal materials in recent years, the pool of researchers and engineers in Japan working in fields related to smelting, refining, and recycling nonferrous metals has been on the decline. In response to this situation, JX Metals, in collaboration with the Institute of Industrial Science, The University of Tokyo, launched the Endowed Research Unit for Nonferrous Metal Resource Recovery Engineering (JX Metals Endowed Unit) in 2012. The purpose of this organization is to develop new environmentally friendly recycling technologies for nonferrous metals while also developing the human resources responsible for the work in this field.

The unit began Phase 3 (five years) in January 2022. In Phase 3, we are developing activities to promote a further understanding and awareness of the importance and future of the nonferrous metals industry, as well as focus on activities for realizing the SDGs and for STEAM education* to nurture the next generation.

* STEAM education: An educational concept that combines the initial letters of five words: Science, Technology, Engineering, Art, and Mathematics. This concept aims to develop logical thinking and creative skills that lead to problem-solving in the real world



At the press conference for the start of Phase 3
From left to right: Executive Officer Suwabe, Senior Executive Officer Tani, Project Professor Kurokawa, Project Professor Tokoro, Deputy Chief Executive Officer Sugawara, Director General and Project Professor Okabe, Project Professor Sugano, Project Lecturer Ouchi

● Received the 2022 Shokumon Award from the University of Tokyo

In recognition of activities at the JX Metals Endowed Unit, we received the 2022 Shokumon Award* from the University of Tokyo. The University of Tokyo's Shokumon Award was established in 2002 to recognize individuals, corporations, and other organizations that have made major contributions to the growth of The University of Tokyo, either through volunteer work or endowed courses and research centers. The award was given in recognition of our outstanding contributions to creating a center for research, exchange, and education that has attracted outstanding human resources and advanced information from all over the world for many years.

* Shokumon is the name of the castle gate in the capital of the ancient Chinese state Qi (now Shandong Province) during the nation's civil war era (403-221 B.C.). The name of the award is derived from a legend that the king of Qi treated scholars well, which led to the gathering of the wisest minds in the capital of Qi and the flourishing of academic activities.



Presentation of the Shokumon Award plaque (Prof. Fujii Teruo, President of The University of Tokyo (left) and Chairman Murayama Seichi, JX Metals (right))

JX Metals Endowed Unit

Members (FY2022) * Positions and other information as of FY2022

Project Professor Okabe Toru H.
Director General, Institute of Industrial Science, The University of Tokyo
Professor, Research Center for Sustainable Material Energy Integration

Project Professor Tokoro Chiharu
Professor, Faculty of Science and Engineering, Waseda University
Professor, Graduate School of Engineering, The University of Tokyo
Project Professor, Institute of Industrial Science, The University of Tokyo

Project Professor Kurokawa Harumasa
Project Professor, Institute of Industrial Science, The University of Tokyo

Project Professor Sugano Tomoko
Professor, Institute of Industrial Science and Deputy Director General, Division of University Corporate Relations, The University of Tokyo
Director, Public Relations Strategic Planning Office, Division for Strategic Public Relations, The University of Tokyo
Patent Attorney

Project Lecturer Ouchi Takanari
Lecturer, Institute of Industrial Science, The University of Tokyo
Lecturer, Research Center for Sustainable Material Energy Integration
(Yamanaka Shunji, distinguished professor at the University of Tokyo, joined as a project professor in April 2023)

Main Activities in FY2022

- ▶ November 18, 2022
Science Council of Japan Open Symposium (cosponsored by JX Metals Endowed Unit)
Why the SDGs? SDGs and Carbon Neutrality in Resource and Material Circulation
- ▶ January 6, 2023
10th Precious Metals Symposium Frontier of Extraction and Recycling Technology for Precious Metals



Activities of the JX Metals Endowed Unit (Japanese Only)
<http://www.metals-recycling.iis.u-tokyo.ac.jp/>

Building a Development Framework and Fostering Development Personnel

The Group is working to build a framework for the continuous generation of innovative technologies and products, such as decarbonization technologies, by promoting DX support in the areas of production and development, developing platforms for the creation of new development ideas, and strengthening development process management. In addition, we are fostering personnel responsible for technology development and technology-based business development.

Strengthening Internal Processes for New Business and Technology Development

We have introduced the Stage-Gate Process as our management system for business development. In addition, we established the Idea Seed Bank as a platform for generating topics and ideas. These efforts are handled by the Advanced Technology & Strategy Department, a department dedicated to the planning and formulation of Group-wide technology strategies.

● Introduction of the Stage-Gate Process

In promoting new development themes, we have introduced the Stage-Gate Process, which divides the development process into multiple stages. We use Stage-Gate Process for applications from discovery of medium-to long-term topics to commercialization for new products and technologies. The effective functioning of this Stage-Gate Process promotes activities that continuously generate innovative technologies and products, such as decarbonization technologies.

● Development of Platforms for Generating Ideas

The Idea Seed Bank (ISB), one of the Advanced Technology & Strategy Department's initiatives, is a platform to encourage employees to generate and cultivate ideas. It provides support for the conception of ideas, support for internal reviews, and

discussions among members. It also offers a forum for employees from different departments and sites can interact with each other, providing them stimulus to give shape to their own ideas. One of these ideas generated at the ISB has even been approved as a development theme for one of our divisions in August 2021.

Internal Training Held by the Advanced Technology & Strategy Department

In addition to human resources development through the Idea Seed Bank, the Advanced Technology & Strategy Department holds cross-organizational study groups to help each individual member of the Group understand the JX Metals Group and products outside of their responsibility, and to promote cooperation between divisions beyond their own. At these cross-organizational study groups, all employees learn about each division's business lines, products, and services. Through active Q&A and discussion, each employee gains a better understanding of the Group, which in turn leads to wider communication with external stakeholders. Through these efforts, we are developing human resources who can play an active role in finding potential co-creation partners, exploring new development themes, and further expanding existing businesses.

VOICE

Comments From an ISB Member

Even when joining the ISB, I was never confident that I could offer new ideas easily. Or even if I did offer a new idea, I never believed it would become a reality. But before anything else, IBS provided an opportunity for new relationships. It started with a pleasant chat at a lunch meeting. After attending a seminar on ideation, members worked together to come up with ideas for solving business issues in their own departments. I look forward to engaging in exciting work together with my new friends.



JX Metals Corporation
NPM Promotion Department
Shibuya Norimitsu

Basic Policy on Intellectual Property Strategy

Intellectual property is an important asset for the technology-based company that the JX Metals Group aims to be. In fiscal

2022, we formulated the JX Metals Group Basic Policy on Intellectual Property. Under this policy, we engage in intellectual property activities throughout the Group.

JX Metals Group Basic Policy on Intellectual Property

We, the JX Metals Group, recognize that intellectual property is an important asset and perform activities in accordance with the following policy in order to contribute to the development of a sustainable society as a technology-based firm.

1. We will reflect our management, business, and technical strategies in the performance of intellectual property activities through cooperation between all divisions including the management, the business division, the technology division, and the intellectual property division.
2. We will establish a competitive advantage in terms of technology by appropriately acquiring intellectual property rights and managing knowhow.
3. We will promote co-creation with various external partners by cooperating with them in connection with intellectual property.
4. We will take appropriate measures, including asserting our rights, against any suspected infringement of intellectual property rights owned by us in order to protect our technologies and products.
5. We will respect the intellectual property of other parties and appropriately respond to the risk of infringing the intellectual property of other parties.

Using Intellectual Property Information

The JX Metals Group regards intellectual property information (patent information, etc.) as big data useful for understanding technological trends. We utilize intellectual property information not only for the purpose of preventing infringement and determining patentability, but also for various other purposes. For example, by combining internal and external patent information with business and market information, we conduct research and analysis (IP landscape) to anticipate changes in customer needs and technology trends, propose business strategies, contribute to the creation of development themes, and search for partners.

We also encourage the use of intellectual property information by others besides personnel in charge of intellectual property directly. In fiscal 2022, we held internal workshops with external lecturers, using hypothetical examples to create a mock IP landscape with IP and marketing personnel.



A workshop in progress

Initiatives for Promoting Invention

In accordance with the Patent Act, the Group has established the Regulations Concerning Handling of Employee Inventions. In addition to incentives at the time of application and registration, we have established our own unique system to award inventors of profitable patents and inventors of outstanding inventions to encourage development and invention and promote activities as a technology-based company.

In fiscal 2022, five inventions were eligible for awards, including the development of new copper foil, increased copper foil productivity, and new sputtering target. In addition, we also recognize inventions that are kept secret as expertise, as well as patents.

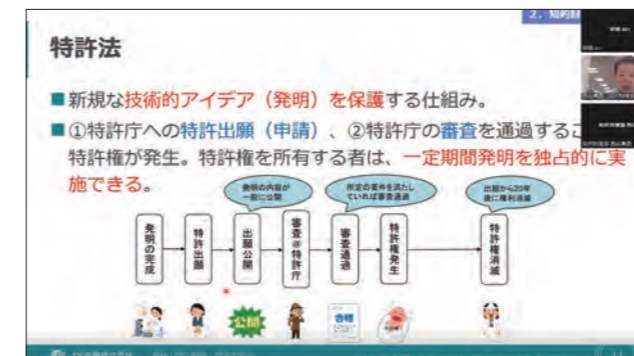


Fiscal 2022 award ceremony

Developing Intellectual Property Human Resources

The development of intellectual property human resources is important to carry out our intellectual property activities. In the interest of the appropriate acquisition, protection, and utilization of intellectual property and management of intellectual property risks, the Group provides all employees, including clerical staff, with intellectual property education based on a systematic program and using our own teaching materials.

In addition, in order to address intellectual property work that is becoming more sophisticated every year, the Intellectual Property Department encourages the acquisition of patent attorney qualifications and intellectual property analyst certifications from the Association of Intellectual Property Education, etc. The department conducts study groups internally to improve practical skills and enhance expertise further.



Intellectual property training (online)

Leveraging Intellectual Property to Contribute to the SDGs

Since fiscal 2021, we have been participating in the SDGs Project, an activity of the Japan Intellectual Property Association (JIPA).

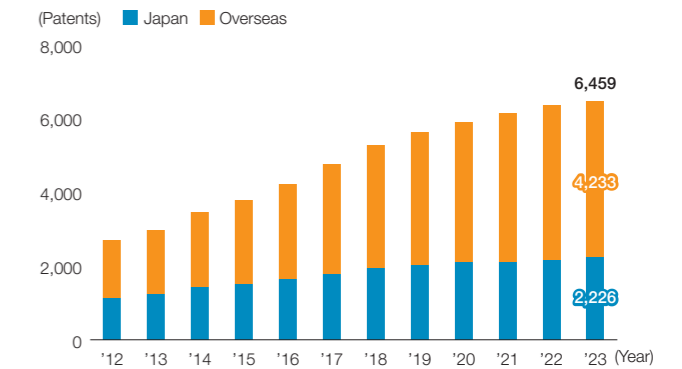
In fiscal 2022, we conducted studies and activities to contribute to the SDGs through intellectual property, working together with other participating companies. We continue to leverage our intellectual property to contribute to the SDGs through this project and other activities.



Status of Held Patent Rights

Our Group is actively promoting research and development to become a technology-based company. In line with our business strategy, we conduct appropriate rights-acquisition activities in Japan and overseas for inventions generated in the course of research and development.

Number of Patents Held

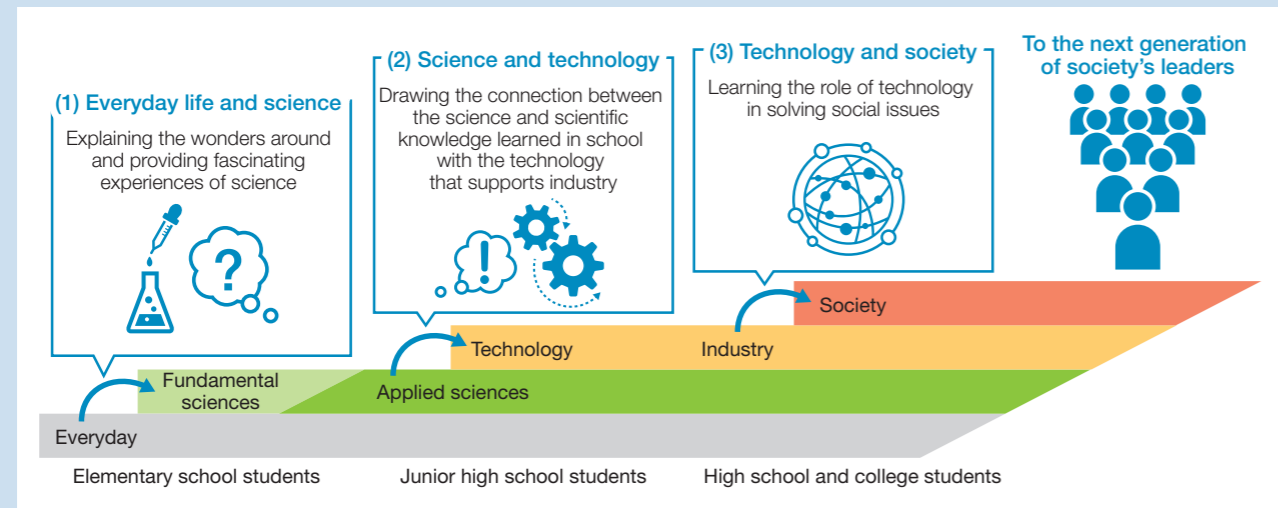


Column

Efforts to Cultivate the Next Generation

In order to keep stability in securing and supplying irreplaceable nonferrous metal resources and materials, it is essential to develop human resources who can take on future challenges. The JX Metals group provides opportunities for young people, from elementary school to university age, to engage in a variety of hands-on and practical activities to create opportunities to learn about nonferrous metals.

Basic Approach to Educating the Next Generation



(1) Science and everyday life

Copper Study Event in Collaboration With the Shiba Regional City Office in Minato City

On July 30, 2023, we sponsored the Shiba Nature University, an event for elementary school students organized by the Shiba Regional City Office. As part of the event, we hosted a copper study event. This year's event marked the fifth such school. We invited 19 pairs of elementary school students and their parents (40 participants) to our head office to learn about the properties of copper through fun quizzes, videos, and experiments. In the post-event questionnaire, participants commented that they became more familiar with copper.



JX Metals employees teach about copper recycling

(2) Science and technology

Copper Laboratory

On September 3, 2022, the International Copper Association, Japan Copper Development Association, and Leave a Nest Co., Ltd. co-sponsored a lab event called *The Surprising Power of Everyday Copper: Super Antibacterial Properties!* The event was held at the Square Lab space in our head office. A total of 13 junior and senior high school students participated in experiments on the super antibacterial properties of copper and copper alloys, which inhibit the growth of bacteria. Participants also experimented on the antiviral performance of copper and copper alloys, which inactivate viruses (rendering them less infectious). At the workshop held after the experiments, students proposed unique ideas for use in everyday life. Ideas included applying copper-containing film to mold-prone areas in bathrooms and on mirrors and coating keyboards with copper.



Workshop on the use of copper

(3) Technology and society

Major Lecture at the Department of Materials Engineering, Graduate School of Engineering, The University of Tokyo Head Office Tour for University Students

On July 15, 2022, we invited 32 students and eight faculty members of the Department of Materials Engineering to visit our head office. Through a simulated experience of the Sagayoseki Smelter & Refinery's operations using virtual reality (VR), participants learned about the processes by which copper and other nonferrous metal materials are provided to society and contribute to social development. We also held a workshop titled *A Future With Next-Generation Communications and Sensors*. The workshop addressed next-generation technology and product development and included lively discussions. The experience was valuable for us as well, as we gained fresh insights from the students.



Participants experienced a refinery tour via VR

Initiatives to Popularize STEAM* Education

A Collaboration of Nonferrous Metals and Comedy

JX Metals has been a regular member of the Platform for Learning Innovation-Japan (PLIJ) since its establishment. PLIJ is an organization established by the Cabinet Office and the University of Tokyo to enrich and promote STEAM education content. Together with Yoshimoto Kogyo, another PLIJ member, we created content and videos in a cross-industry collaboration of nonferrous metals and comedy as part of our work to develop human resources who will lead the future.

* STEAM education: An educational concept that combines the initial letters of five words: Science Technology, Engineering, Arts, and Mathematics.

1 Learn With *Paraderu Manga!* The Unknown World of Copper

As the first part of the collaboration project, we published a *paraderu manga* together with artist Honda Osamu, *The Unknown World of Copper*. The term *paraderu* is a combination of words meaning *flip book* and *pop-up*, and *paraderu* videos have become very popular. This particular work depicts clearly how copper is manufactured and utilized, from recycling to resource circulation, in a comical manner.



2 Educational Variety Shows by Comedians

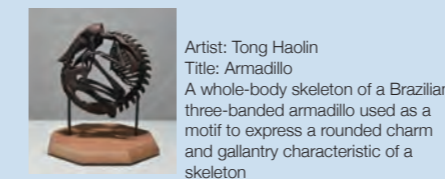
Another part of the project consists of quizzes and on-location refinery videos presented by popular comedians, including *Chocolate Planet*, *Kaeru Tei*, and *Rice*. The program content educates viewers in an enjoyable way, communicating a wide range of copper-related knowledge, from copper's properties and smelting methods to the appeal of copper materials that support today's digital society and the importance of resource recycling.



The JX Metals Prize at the Tokyo University of the Arts

We established the JX Metals Prize to recognize outstanding students who represent the next generation of metal casting artists. This annual award is given to one student enrolled in the Department of Metal Casting at the Tokyo University of the Arts who achieves particularly outstanding academic results.

We held the ceremony for the JX Metals Prize 2022 on October 25, 2022. This year's winner was Tong Haolin, a second-year student in the MFA program at the university's Graduate School of Fine Arts. By supporting the development of the art of metal casting, we continue to spread an understanding of the appeal and importance of metals, contributing to the wider recognition of culture and the arts.



Artist: Tong Haolin
Title: Armadillo
A whole-body skeleton of a Brazilian three-banded armadillo used as a motif to express a rounded charm and gallantry characteristic of a skeleton