Technical Development Framework of JFE Steel†

Abstract:

JFE Steel established the framework for the development of technology aiming at doubling the amount of Only 1 and No.1 products. Company-wide collaborative technical development is ensured by lateral organizations, e.g., Business Planning Function (Sector) and SBU (Strategic Business Unit) for production units, and committees for various fields of technology. Moreover, the corrective research activating of the JFE Group is strengthened, and JFE Steel attempts increased application of the developed results to the whole group. JFE Steel Research Laboratory creates the world's most innovative next-generation products and technologies by the fusion of core technologies and by strengthening collaboration with third parties. The world's most innovative products and technology are changed into intellectual properties, and of which the intellectual property division attempts strategic use.

1. Introduction

The corporate vision of the JFE Group is "to contribute to society with the world's most innovative technology." The mission of JFE Steel is to supply products of high quality, high performance at low price. It goes without saying that technical development is essential for a technology-based company. Thus, in order to grow while also contributing to society, JFE Steel promotes strategic, efficient technical development with its gaze firmly fixed on future directions in technology.

As an introduction to the technical development framework of JFE Steel, this paper describes the basic policy, organization and systems for promoting development in JFE Steel as a whole and in the company's Steel Research Lab. The organization and activity policy of the intellectual property division, which cooperates in technical development, are also discussed.

2. Company-wide Technical Development Framework

2.1 Basic Policy

At the company-wide level, the priority tasks for technical development in JFE Steel are as follows:

(1) Promoting equipment concentration by improving productivity.
(2) Strengthening cost competitiveness by target cost activities.
(3) Doubling the amount of Only 1 and No. 1 products in the company's business by strengthening cooperation with customers.

Among these, the concrete objective for Only 1 and No. 1 products is to increase the sales revenue generated by such products from its present level of 6-7% of total business to 15% or higher within three years. To achieve this, the development of Only 1 and No. 1 products will be promoted by Business Planning Function (Sector)/SBU (Strategic Business Unit) and Technology Committee, as discussed in the following section. In the company-wide technical development, resources are allocated selectively to priority tasks. In establishing these tasks, importance is attached to the effectiveness of investment in development (return on investment in development) and the strategic importance of development from the mid- and long-term viewpoints.

2.2 Business Planning Function (Sector)/ SBU (Strategic Business Unit) and Technology Committee

To solve management problems efficiently, JFE Steel has adopted an organization using a Sector/SBU system which cuts across the divisional lines between manufacturing, research and sales. It is shown schematically in **Fig. 1**.

Sectors are organized by product groups, and comprise 8 Sectors for sheet, plate and others. Each Sector draws up a technical development strategy based on its business plan. The tasks for priority technology are then established and technical development is promoted horizontally across the organization.

SBU comprises 5 sections with common fields of

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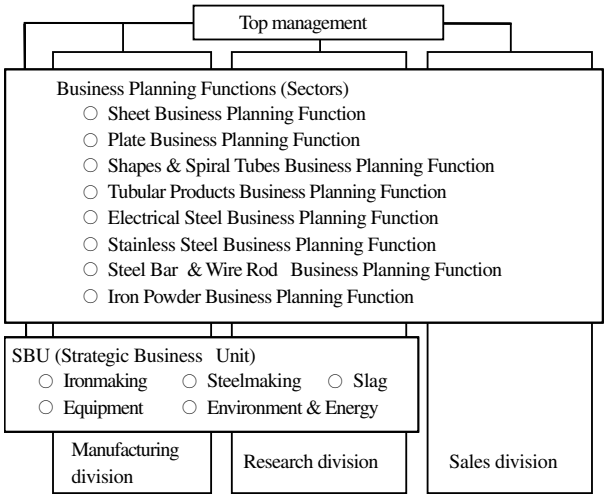

Fig.1 Business Planning Function (Sector)/SBU (Strategic Business Unit) system

technology. They are ironmaking, steelmaking, slag, equipment, and environment & energy. To solve technical problems from the company-wide perspective, the respective SBU establishes divisional strategies and promote technical development horizontally across the organization.

Technology Committees bring together various technical departments in Sectors and SBUs across organizational lines to carry out activities aiming at solving technical problems based on the technology strategies established in the Sectors and SBUs, and in the broader perspective, to strengthen and develop technical capabilities in view of mid- and long-term directions in technology. Technology Committees have been established in 11 common technical fields, including ironmaking, steelmaking, information systems, etc., and 11 product-related technical fields, such as plate, hot rolling, etc.

The main role of Technology Planning Dept. is to provide technical proposals to top management by grasping the future directions of iron and steel technology, and to establish and promote technical topics. This means that Technology Planning Dept. is oriented to the "total best" of the company as a whole as well as the "individual best" of respective fields of technology.

2.3 Technical Development Framework of JFE Group and Cooperation with Research Laboratories

From the viewpoint of consolidated management, it will be increasingly important to consider the technical development in the JFE Group as a whole in the coming years. Several of the group companies affiliated with JFE Steel have their own, independent technical development frameworks. They carry out technical development with distinctive features from positions which are close to their own customers. Where the core technologies and element technologies owned by JFE Steel are concerned, however, JFE Group will continue to promote the development of technologies which are important for the entire group through effective activities by the JFE Group as a whole.

The JFE Group has three research institutes, Steel Research Lab. of JFE Steel itself, Engineering Research Center of JFE Engineering, and an independent research organization called JFE R&D. Promoting technical development in the JFE Group as a whole through organic cooperation among the three research institutes is essential for increased efficiency in technical development. Among them, common fundamental technologies of the JFE Group come to the responsibility of JFE R&D, which is assigned the mission of solving group-wide research problems based on advanced seed technologies.

3. Research and Development Framework of Steel Research Laboratory

3.1 Policy of Research Laboratory

The merger between Kawasaki Steel and NKK, which brought together the research institutes of two leading Japanese steel makers, also created one of the world's foremost steel research laboratories. The objective of Steel Research Lab. is to "create the world's most innovative products and technologies for the next generation." The policy for realizing this objective is shown in **Fig. 2**. The first key point is fusion of technologies. Steel Research Lab. intends to achieve a quantum leap as a result of the synergies generated by the diverse technological cultures of their predecessor laboratories. This is not limited to the compensation of mutual weaknesses. Rather, the objective of the new Steel Research Lab. is to create products and technolo-

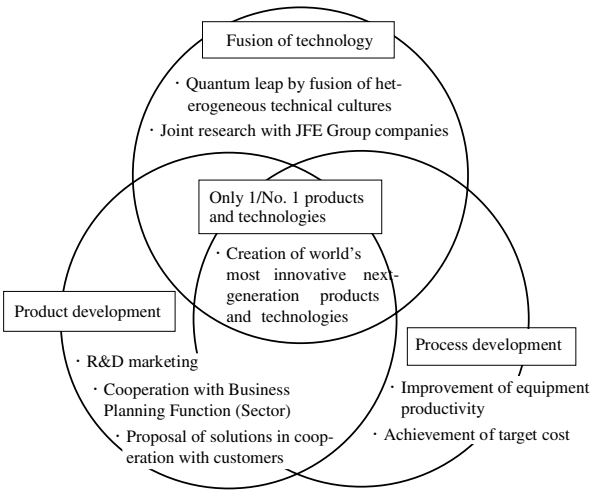

Fig.2 Research policy for development of Only 1 and No. 1 products and technologies

gies for the next generation through a fusion of different core technologies. This fusion of technologies will also be expanded to the joint research with other group companies.

Technical development can be roughly classified as product development and process development. However, both developments commonly aim the expansion of Only 1 and No. 1 products and technologies. In the product development, proposals of solutions are emphasized through the cooperation with the customers. To obtain an accurate grasp of trends in customers' needs, marketing activities will be intensified from the researchers' viewpoints. Researchers closely cooperate with the respective product sectors in the selection and performance of R&D themes.

Process development emphasizes the R&D which contributes to the improvement of productivity and the reduction of manufacturing cost. An significant increase in equipment productivity, contributes to the future consolidation of production facilities and higher operation rate. The R&D to reduce manufacturing costs, aims the achievement of "target cost" established by the respective manufacturing department.

Product development must be integrated with process development. In many cases, the creation of Only 1 and No. 1 products is supported or made possible by the development of innovative new processes. The product development will continue to be carried out by combining leading-edge metallurgy and process technology. The development of process usage technologies which take into consideration of the customers' process is intensified in the cooperation with the product development.

3.2 Organization of Steel Research Laboratory

The organization of Steel Research Lab. is shown in **Fig. 3**. Four research departments were created to attach importance to customers and also to enhance product development and use technology. They are Joining & Strength Research Dept., Corrosion Protection Research Dept., Can & Laminated Materials Research Dept., and Bar & Wire Research Dept.

One distinctive feature of the research organization is a flat structure under the General Superintendent of the Steel Research Lab. Furthermore, as shown in **Fig. 4**, laboratory sites are located at East Japan Works, West Japan Works, and Chita Works. Each research department has an organization which is capable of carrying out activities in its product or process area in close cooperation with the related manufacturing departments. Moreover, each research department has a horizontally unified management under one general manager regardless of the actual researching

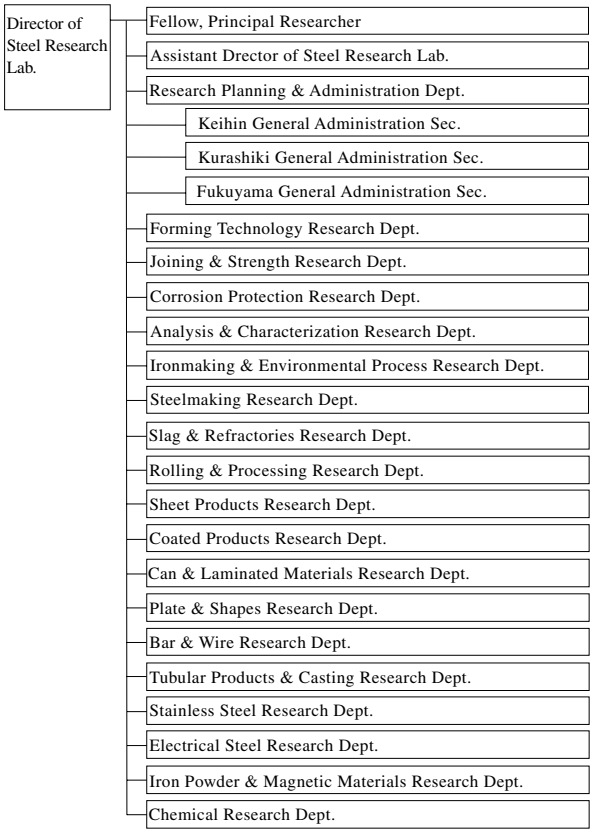

Fig. 3 Organization of Steel Research Laboratory

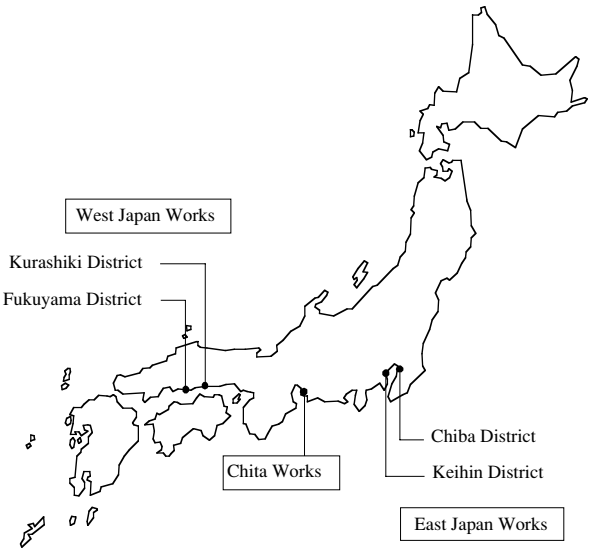

Fig. 4 Geographic relationship of 4 research laboratory sites and 3 steel works

site. Fellows and principal researchers are assigned as research specialists to carry out activities using their abilities around their specialized particular research fields.

3.3 Fusion of Technologies and Internal/ External Cooperative Relationships

For future research and development, it will be extremely important to discard the self-reliant, "not invented here" attitude and develop cooperative rela-

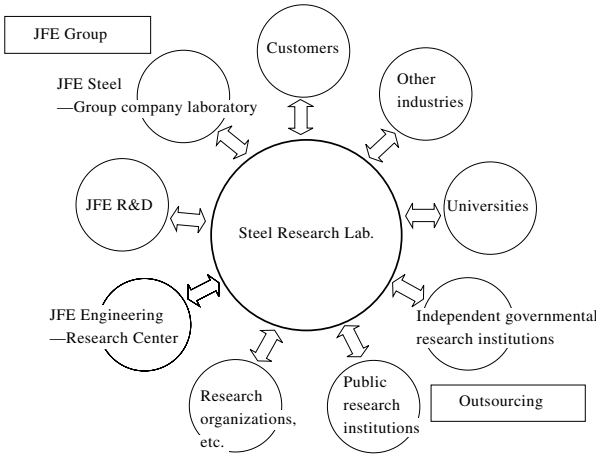

Fig.5 Cooperation inside and outside JFE Group

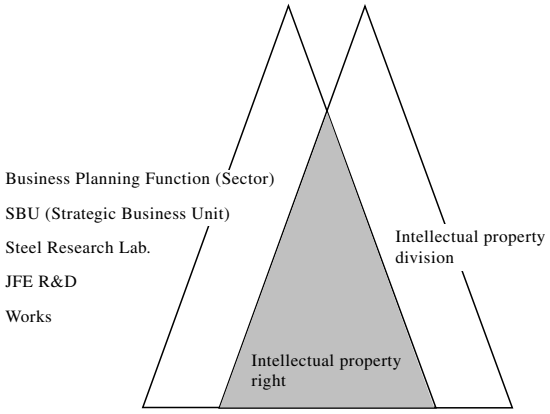

Fig.6 Creation of intellectual property rights

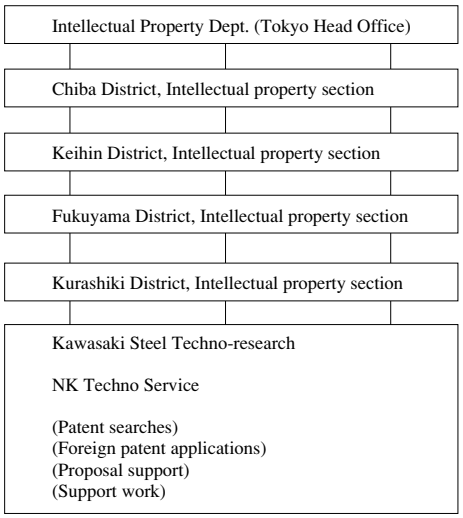

Fig.7 Organization of intellectual property division

tionships outside the laboratories. **Figure 5** is a schematic diagram of cooperative relationships inside and outside JFE Group. Internal R&D organizations within the group itself include Engineering Research Center of JFE Engineering, JFE R&D, and the research laboratories of individual group companies. To respond quickly and accurately to the diversifying customers' needs, it is necessary to bring together the seed technologies within the group in a comprehensive manner. JFE Group also seeks advanced seed technologies outside the group and positively cooperates with other companies in their development. In particular, the company puts special effort into cooperation with other industries, universities, etc. as outsourcing relationships.

4. Intellectual Property Division

The mission of the intellectual property division in technical development is first, to transform "the world's most innovative technology" into the form of intellectual property, and second, to enforce and license intellectual property rights as a management resource.

The fundamental concept of activities in the intellectual property division is shown in **Fig. 6**. While maintaining close relationships with the Sectors, SBUs, research division and manufacturing departments, it creates intellectual property rights and establishes these rights as strategic assets in order to realize their value as intangible assets.

The overall organization of JFE Steel's intellectual property division is shown in **Fig. 7**. The Head Office, Intellectual Property Dept. formulates and implements intellectual property strategy in cooperation with Sectors and SBUs, centering on the enforcement and licensing activities of intellectual properties owned by JFE Steel. The main work of intellectual property sections in each works is to make intellectual property right on the results of the development of the world's most innovative technology in close cooperation with the actual site where that technology is developed. While recognizing the importance of maintaining close contact with the inventor, JFE Steel also understands that it is essential to respond sensitively in the early developmental stages of important inventions. For this reason, intellectual property sections of four district have been established at Chiba, Keihin, Fukuyama and Kurashiki Districts.

Support for intellectual property-related activities, including patent searches and filling foreign patent applications, is provided by experienced staff at Kawasaki Steel Techno-research and NK Techno Service. Managing these activities as part of a common mission is an additional role of Head Office, Intellectual Property Dept.

In the intellectual property activities, as in other business, JFE Steel takes a global view with the aim of achieving corporate excellence at the world level. In this respect as well, the company intends to strategically act on the global stage, while possessing a high

level of specialization in intellectual property.

5. Summary

This paper describes the basic policies, organization and systems for promoting development in JFE Steel as a whole and in the company's Steel Research Lab. as the technical development framework of JFE Steel. The organization and policy for the activities of the intellectual property division, which cooperates in technical development, were also discussed. Main points are summarized below.

(1) Company-Level Technical Development Framework

Technical development related to important issues such as doubling the amount of Only 1 and No. 1 products in the company's business is promoted efficiently, horizontally across organizational lines by Business Planning Function (Sector)/SBU (Strategic Business Unit) and Technology Committee. By strengthening cooperation inside and outside the group and unifying the group as a whole, the company expects to efficiently expand its development results.

(2) R&D Framework of Steel Research Laboratory

In order to create the world's most innovative products and technologies for the next generation, JFE Steel is seeking to achieve a fusion of core technologies and strengthen cooperation inside and outside the company. The organization of Steel Research Lab. has a flat structure and is capable of carrying out research activities in close cooperation with both customers and manufacturing departments. Four new research departments have been created to attach importance to customers and enhance product development and use technologies.

(3) Framework of Intellectual Property Division

Intellectual Property Dept. is located in Head Office, and is responsible for developing and implementing intellectual property strategy in cooperation with Sectors and SBUs. In creating intellectual property rights, intellectual property sections at 4 sites of Chiba, Keihin, Kurashiki and Fukuyama Districts carry out activities in close cooperation with the inventors who develop the world's most innovative technologies.