

# FOREWORD

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In the environment surrounding the iron and steel industry, in Japan, decreased demand can be seen in many fields against the backdrop of this country's declining population and labor shortages. In addition, there is an increasing feeling of the presence of imported materials from Korea, China and other countries. Difficult conditions are also assumed in overseas markets due to the progress of local manufacturing and expansion of protectionist trade policies in various countries.

To meet the challenges of these changes in the business environment, at JFE Steel, a stronger and tougher domestic steel business supporting the company's growth strategy is necessary. Under the basic policy of "transition from quantity to quality," our policy is increased profitability by enhancing the lineup of high value-added products in our product mix, early market development of those products, and a detailed response to the needs of our customers. Steel sheet products are widely used across diverse fields, including automobiles, household electrical appliances, building materials, containers and others. JFE Steel supplies high-quality, high-performance steel sheet products in these respective fields, making full use of this company's state-of-the-art production equipment and technologies. This "Special Issue on Automotive Steel Sheets and High-Performance Steel Sheets" (No. 36) of JFE Technical Report presents an overview of the product groups and application technologies that are distinctive features of JFE Steel, as well as the advanced elemental technologies which support them.

In the automotive sector, vehicle electrification to reduce greenhouse gas (GHG) emissions is progressing with the aim of protecting the global environment, and there are heightened needs for improvement of auto body crash performance and lightweighting by applying high-strength steels. On the other hand, the auto body structure of battery electric vehicles (BEV) is significantly different from that of conventional automobiles because an engine is not required, and installation and protection of the battery pack is necessary. New technologies for auto body production have also been proposed, including technologies for parts integration of multiple parts by hot stamping, a parts integration technology called gigacasting for large-scale parts using aluminum alloy as the material, etc. Based on this background, for auto body lightweighting and high strength in BEV, this Special Issue introduces ultra-high strength steel

sheets with high deformation resistance in crashes utilizing the WQ-CAL (water quenching continuous annealing line) process, which are suitable for non-deformed parts that protect the cabin and battery, and ultra-high strength steel sheets with excellent fracture resistance under deformation, which are suitable for crash energy-absorbing parts, as high-performance high-strength steel sheet product groups for applications using cold stamping, a process with excellent economic rationality and superior environmental performance and is a focus of efforts at JFE Steel. This issue also presents detailed description of characteristic technologies for effective use of press-forming and joining when applying these ultra-high strength steel sheets to automobile bodies, and original evaluation technologies developed by JFE Steel for delayed fracture and LME (liquid metal embrittlement), etc. which are challenges for practical application. Furthermore, recent technologies for structural design supporting safety and technological innovation in auto body manufacturing, such as body structures specific to BEVs and parts integration by cold stamping, are also described.

JFE Steel is utilizing these EVI (Early Vendor Involvement) technologies to contribute to new automobile manufacturing and value creation by various automakers.

In the field of steel sheet building materials, there are increasing needs for higher performance of the steel sheet surface to improve the durability of steel structures and reduce the environmental impact of the chromate-free treatment layer and paints, while in the container materials field, there are heightened needs not only for container performance, but also for reduction of environmental impacts in manufacturing processes. JFE Steel is engaged in technology development of surface treatment technologies that secure high surface performance. In the building materials field, this issue of JFE Technical Report introduces the mechanism of rust prevention of the cut edge of coated building materials and new products with excellent corrosion resistance and formability. In the container field, papers examine the film design of laminated steel sheets for high formability applications and high strength materials with formability for cans.

Cutting-edge DX technologies support the manufacturing base for stably supplying the advanced high-quality, high-performance steel sheet products described above. This Special Issue includes detailed descriptions of “J-dscom<sup>TM</sup>,” which improves productivity by advanced prevention of equipment trouble, “J-astquad<sup>TM</sup>,” which makes it possible to improve both quality and productivity by speeding up the aggregation and analysis of large volumes of data and implementation of operational improvement, an original surface inspection system that achieves advanced QA, etc.

Going forward, JFE Steel and the companies of the JFE Steel Group will continue to take on the challenges of developing innovative iron and steel materials and new technologies for co-creation of the future with our customers in various product sectors as a trusted “best partner.” We sincerely request the guidance and encouragement of all concerned.