FOREWORD

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This Special Issue on Steel Plates is the first in six and a half years, since the previous issue was published in 2014. During this time, demand for iron and steel products has been strongly affected by a series of major events related to the global economy, including a rapid drop in the price of crude oil, American sanctions against Iran, trade friction between the United States and China, the Paris Agreement on measures against global warming and, most recently, the global pandemic caused by the novel coronavirus. However, the importance of steel plates as a key material supporting the foundations of society in fields such as shipbuilding, construction, bridges, construction and industrial machinery and energy-related fields remains unchanged. Moreover, in addition to the larger scale of structures, safe and secure design and higher efficiency in manufacturing processes, it is thought that increasingly high performance and diverse functions will also be required in steel plates from the viewpoints of the global environment and life cycle cost.

JFE Steel has plate mills at three of its sites, the Kurashiki District and Fukuyama District of West Japan Works and the Keihin District of East Japan Works, and has created a system for supplying plate products to customers that takes full advantage of the locations and features of these respective plants. Kurashiki District has a continuous caster capable of produces slabs with a thickness of 310 mm, which is the largest of the three plants, and a wide-width rolling mill with a maximum width of 5 350 mm. Utilizing these capabilities, Kurashiki has put great effort into developing high performance steel plates for the shipbuilding and energy fields, including extra thickness materials and heavy weight materials, and establishing a mass production system for these products. The Fukuyama District, which has a welded pipe mill, produces high performance steel plates centering on materials for UOE steel pipes. This plate mill has been a leader in introducing advanced TMCP (thermo-mechanical control process) technology, which is the basis of material microstructure and mechanical property control technology for plate manufacturing, and was the first steel works to introduce JFE Steel's original accelerated cooling device for plates, the *Super*-OLAC™, and a further evolution of that technology called the *Super*-OLAC™-A. The Keihin

District, which has heat treatment equipment capable of quenching plates with a maximum width of 5 300 mm, is particularly strong in the production of heat-treated plates such as the EVERHARD™ Series of abrasion-resistant steel plates and tempered HITEN products of 80 kg/mm^2 class and higher. Keihin also plays a key role as a supply base for plates for building construction, taking advantage of its location in the Metropolitan Tokyo area.

Based on this system, we have worked to develop new products and processes to stably supply plate products that can be used safely and with complete confidence, corresponding to the needs of customers. This Special Issue introduces the recent results of this technical development.

In JFE Steel's lineup of corrosion-resistant steel plates, we have commercialized "JFE-SIP™-OT1, -OT2" corrosion-resistant steel plates for the cargo oil tanks of crude oil tankers, "EXPAL™" for extended paint life and the new weathering steel "LALAC™-HS" for high salinity environments. These products are expected to contribute to reducing the life cycle cost of ships, bridges and other steel structures.

"Brittle crack propagation arrest technology using fillet welding (structural arrest technology)" and "ARRESTEX™ high arrestability steel plate," which prevent fracture in container ships, and "Steel plates for linepipes with low surface hardness for severe sour environments," which prevents serious accidents in pipelines transporting sour gas, are indispensable new technologies and new products for securing the safety of these steel structures. "ARRESTEX™ high arrestability steel plate" is a highly evaluated technology which was awarded the 66th Okochi Memorial Prize (FY 2019), and was also the reason for the selection of JFE Steel as one of "2020 Global Niche Top 100 Companies" by the Ministry of Economy, Trade and Industry (METI). "YP500 N/mm^2 class high strength steel plates for offshore structures with excellent CTOD properties at welded joints," "YP690 N/mm^2 class heavy gauge steel plates with extreme low temperature toughness for offshore structures" and "TS780 N/mm^2 class steel with excellent reheat cracking (stress relief cracking) sensitivity" are other new JFE Steel products that contribute to safety design of large-scale structures.

As one effort to appeal to customers when selecting suppliers, JFE Steel has devoted great effort to improving quality assurance (QA) in recent years, including the development of a "Steel plate identification technology" that greatly reduces manual work, "Automatic phased array ultrasonic (UT) inspection technology" for realizing enhanced accuracy in inspections of welds in steel pipes and the "Twin-illumination and subtraction surface inspection method," which enables automatic inspection of surface flaws of steel plates for the first time.

A dialogue with customers through the development of use technologies such as welding, processing and safety evaluation is also considered important for application of steel plate products to actual structures. As one effort for this purpose, JFE Steel opened the "JFE Welding Institute — Center for Integrity against Fatigue and Fracture" (abbreviated JWI-CIF[2]) in February 2019. The Center, which is the world's largest class facility of its kind, is equipped with many large-scale experimental devices for investigation of fatigue and fracture in the steel field, and will also be used as a base for joint research with customers, universities and other research institutions with the aim of creating new innovations. This Special Issue also introduces a high-efficiency narrow-groove welding technology for building frames using "J-STAR™" welding and the various guidelines for application of JFE's EVER-HARD™ Series abrasion-resistant steels as efforts for dialogue with customers. On the other hand, the world's first application of "High power vacuum laser welding technology" to the clad steel plate production process is an example of application of the results of research and development on laser welding as a plate use technology for customers at this company's own plants.

Other items introduced in this Special Issue are "TMCP type KSUS329J3L clad steel plate for chemical tankers" as a new product, and "Product length expansion up to 30 m" and "Heat-treatment equipment for plates with heavy weight and extra thickness" as new technologies.

In the future as well, JFE Steel will continue research and development on new processes and new products in order to contribute to society by stably supplying high performance steel plates that customers can select with confidence. We ask for your further guidance and support in achieving this goal.