FOREWORD

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Stainless steel is a high strength material with excellent corrosion resistance and heat resistance. Because it also has outstanding design properties, workability and weldability, it is used in a wide range of fields, including containers, cutlery, brake disks, kitchen equipment, electrical appliances, automotive exhaust gas components and industrial machinery. Many examples of use can also be seen in the construction and civil engineering fields, where stainless steel is used to create maintenance-free structures and reduce life cycle cost. Although stainless steel has become an important material that supports comfortable human life, much stainless steel is recovered and recycled after use. From this viewpoint, stainless steel can also be considered an environment-friendly material with low environmental impacts.

More than 100 years have passed since the development of stainless steel. World stainless steel production was 7 million tons in 1980, but had reached 52 million tons in 2019. This means that production increased at an average annual rate of 5.3% over the past four decades. Stainless steel production also continued to increase at a high average annual rate of 4.6% during the recent 5 years from 2014 to 2019. In 2020, world production declined by 2.5% from the previous year due to the effects of the novel coronavirus pandemic, but demand for environment-friendly stainless steel recovered rapidly, and global demand is predicted to show an increase of 9.0 to 10.0% from the previous year in 2021. Demand for stainless steel as a material which supports the social infrastructure is also expected to increase in the future.

In the field of stainless steel sheets, JFE Steel is the world's only stainless steel maker that specializes in the production of Cr-type stainless steels (ferritic stainless steel and martensitic stainless steel). To date, JFE Steel has been positioned to lead the world's Cr-based stainless steel industry with a series of highly original technologies, represented by smelting reduction of Cr ore, the strongly-stirred vacuum oxygen decarburization (SS-VOD) system, production of high formability products by metallographic structure control in an integrated process and various other production processes, production of high productivity cold-rolled products called "functional products" utilizing the tandem rolling mill and continuous anneal-

ing line (CAL), which are used in common with plain carbon steel, and foil rolling with a width of 1 000 mm.

JFE Steel develops, produces and sells Cr-based stainless steels with a variety of excellent properties, including high corrosion resistance, high heat resistance and high formability. As resource-saving high corrosion resistance ferritic stainless steels, in addition to the Ni-, Mo-free high corrosion resistance stainless steel "JFE443CT," which can be used as a substitute for SUS304, the company has also commercialized "JFE443MT" and "JFE445NT" with even higher corrosion resistance, and provides a complete lineup with these three grades as the "JFE443 Family" of Ni-free high corrosion resistance ferritic stainless steels. As high heat resistance ferritic stainless steels for use in automotive exhaust manifolds and other components, in addition to "JFE429EX," JFE has also commercialized "JFE-MH1" with higher heat resistance, which was followed by commercialization of a Mo-free high heat resistance stainless steel "JFE-TF1." We have also developed a high Lankford value technology to improve the formability of these high heat resistance ferritic stainless steels, contributing to performance improvement of automotive exhaust system components, together with EVI (Early Vendor Involvement) activities with customers, which is a distinctive feature of JFE Steel. Ferritic stainless steel foils with high temperature oxidation resistance for use as catalyst carriers in exhaust gas purification devices (catalytic converters) include "JFE20–5USR" and JFE18–3USR," and we have also commercialized "JFE20–5HS" with remarkably higher high-temperature strength. Among martensitic stainless steels, JFE Steel provides "JFE410DB" as a martensitic stainless steel used for motorcycle brake disks and has also commercialized "JFE410DB-ER" with improved softening resistance at higher temperatures.

This "Special Issue" introduces the history of stainless steel manufacturing at JFE Steel, as well as the company's most recent technologies and products. We hope that all our readers will find this information useful.

From a broader perspective, significant changes are expected in the demand structure of stainless steel in the future accompanying the rapid growth of various types of electric vehicles (xEVs) and the widespread of renewable energy and hydrogen energy. In particular, as the traditional internal combustion engine is phased out, demand for exhaust system components is expected to decrease, and it will be necessary to cultivate new demand and develop new products. Moreover, in order to build a decarbonized society, the establishment of production methods which reduce CO_2 emissions is also becoming increasingly necessary. We at JFE Steel are committed to supplying products that will continue to meet the future needs of society and requirements of customers, and we request your further guidance and support for achieving these goals.