FOREWORD

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The management environment surrounding the steel industry has changed with dizzying speed since the collapse of the "bubble economy" in Japan in the early 1990s. Further strengthening of business fundamentals, improved customer satisfaction, and the ability to contribute widely to society are becoming essential conditions for corporate survival in an era of life-or-death competition. Specifically, the challenges that companies such as Kawasaki Steel face in this new business environment include corporate globalization, consolidated accounting covering all group companies, management with priority on cash flow, supplier selection on the customer side, and further improvement in global environmental protection. Under such conditions, equipment engineers, whose function is to ensure full use of production equipment and raise total equipment efficiency to its ultimate limit, now play a crucial role.

The steel industry is an equipment-intensive manufacturing industry in which composite technologies of various types are combined at a high level. Through Kawasaki Steel's experience in the development of iron and steel production processes, plant construction, and maintenance up to the present day, the company has steadily accumulated know-how related to equipment technology. This know-how in connection with equipment technology can be considered an important primary technology which forms the basis for a variety of activities in iron and steel manufacturing technology, such as productivity improvement, quality improvement, cost reduction, and new product development, and further development is expected in the future.

One of key functions of equipment technology is maintenance technology oriented toward maximizing the total efficiency of equipment. The level of maintenance technology has a large influence on how effectively production equipment is used (e.g. calendar-time working ratio, production efficiency), and on the level of product quality and the cost of manufactured products. Furthermore, maintenance technology is also becoming increasingly important in minimizing the reduction in equipment performance that normally accompanies the aging of facilities, and in maintaining and improving equipment functions that are required at all times.

To improve total equipment efficiency to its limit, Kawasaki Steel is grappling with the development of technologies for prolonging equipment life, equipment diagnosis technologies, evaluation and analysis technologies, maintenance support systems, technologies for improving construction efficiency, and others. As a result, the company has realized remarkable benefits in terms of an improved calendar-time working ratio, reduced maintenance costs, and other indexes.

However, with progress in activities to improve the level of equipment maintenance technology, cost performance tends to decline. In other words, the balance between the cost required to realize further improvement in the level of maintenance technology and the benefits that can be realized by such improvement deteriorates. The fact that equipment engineers will run up against this dilemma can be viewed as a general phenomenon. To solve this dilemma, Kawasaki Steel is currently engaged in in-company development of mechanical elements in a program that the company has named the

"Maintenance Revolution." This program places emphasis on basic mechanical parts that account for a large percentage of equipment trouble and maintenance costs, such as nuts and bolts, bearings, hoses, wire rope, rolls, and lubricants, and is gradually bearing fruit. This special issue of Kawasaki Steel Technical Report introduces some of these new technologies.

Today's iron and steel manufacturing equipment is progressing in the direction of more advanced technologies, greater complexity, and automation. To make the maximum use of equipment as a management resource under environmental conditions that include aging equipment and the rising average age of maintenance personnel, a leap to a higher level of maintenance technology and further development of such technology are needed. For this, we are confident that we can achieve dramatic new progress in total equipment efficiency by combining the innovative mechanical element technologies created by the Maintenance Revolution activities mentioned above, including material development in maintenance technology development as an extension of past activities. Moreover, micro machines and IT (information technology) have drawn strong interest in recent years. By applying these technologies to equipment maintenance, in the near future we hope to eliminate dangerous, dirty, and disagreeable jobs and realize remote maintenance and at-home maintenance, which will play a strategic role in worldwide maintenance.

We trust that equipment engineers with responsibilities in the area of equipment maintenance will find this special issue useful.