FOREWORD

Takeo Ohnishi

Member of the Board and Senior Executive Officer

Measurement and control technology in the steel industry has reached an advanced level by following the route of progress and development in electronics, as represented by the computer, and has made important contributions to the improvement of steel product quality and cost competitiveness and to the development of new products.

For example, with the progress of power electronics, AC motor drives are now generally used even for the large capacity applications in iron and steel production processes, greatly improving not only the maintainability, but also the control accuracy and cost of DC type. In the field of sensing, in addition to progress in detecting devices such as CCD cameras, so-called "intelligent sensors," which are equipped with data processing functions, including image processing, have now appeared. These devices are contributing to higher levels of product quality and quality assurance as such by expanding the range of objects which can be grasped quantitatively. Progress in computers has been even more dramatic, and with the development of large capacity, high speed and low cost machines, the computer is fast becoming another household appliance. At production sites, progress in this field has made it easy to apply rigorous physical models and high level control theory, and to accumulate and analyze huge quantities of data.

Thus, the steel industry has received great benefits from the technical progress of the age through measurement and control technology. In this process, it goes without saying that there was a strong progressive disposition toward the introduction of new technology in the steel industry as a whole. Moreover, positive technical development has cleared the problems which were impossible to solve simply by introducing existing technology.

Since the collapse of the "bubble economy" in the early 1990s, Japan's economic growth has remained low, and at the same time, the economy has plunged into the new era of global mega-competition. The steel industry is no exception, but even during this period, productivity, unit consumption, and other indexes of the steel industry have been steadily improved. Moreover, the steel industry, to win customer satisfaction, has developed new products and improved product quality and the level of quality assurance by making good use of measurement and control technology. Some examples of these improvement are described in this special issue.

On the other hand, problems of rising of maintenance costs due to the superannuation of equipment, and realizing high accuracy control in processes which are difficult to quantify, have also become manifest in recent years.

First, considering the problem of maintenance, it has now been around 30 years since Japan's steel works and other manufacturing plants were constructed, and we are reaching the time when thorough repairs and maintenance will be necessary in both machinery and control equipment. How to carry out this maintenance efficiently and economically has become the most important task for steel works management. Taking parts such as bearings and rolls as an example, it is desirable to extend the life and further reduce the cost of these components on the basis of life extension tech-

nologies and highly accurate equipment diagnosis technologies. Although technical development of these is in progress, drastic solutions and research of which concepts come from basic principles will also be necessary in the future. For example, in elucidating the behavior of motors, it will be necessary to penetrate to the mechanism which determines the life of the equipment.

How to realize high accuracy in the control of hard-to-quantify processes is a long-standing issue and still important one. This special issue presents examples of recent accomplishments in this area. Remarkable results have been achieved in recent years in inventory reduction and short term delivery by refining the production control system and sales system and improving the technology used to manage these systems. However, one final problem, which continues to disrupt the production schedule and flow of material, is the quality of unsteady state parts such as the top and bottom slabs in continuous casting and the head and tail ends of strips in rolling. Although considerable improvement has been realized, the quality of these parts is still not sufficiently stable. How to solve this problem will be an important task for steel works in the future, and is a task which should be tackled by taking advantage of the collective wisdom in all fields, and not only in the field of control technology.

Next, as one viewpoint which should be taken up in the field of process control in the future, I would like to point out the construction of a control system which enables the optimum operation and management of the steel works considered as a single process. Even now, production control, physical distribution, and sales systems exist and have been optimized in each plant by IE and OR. In the future, however, more advanced systems will become necessary in order to respond quickly to increasingly diverse customer needs. As mentioned above, this is also a task which cannot be solved by control technology alone, but is one which we should tackle in the future.

Finally, I would like to discuss briefly the scope of responsibility of control technology. As already described, results of great importance have been achieved in the field of process control in equipment units and plant units. However, because the majority of products shipped by a steel works are reprocessed by the customer, in the future, we should attempt to optimize the entire process, based on research on the customer's processes, and devise and propose methods which will benefit both the maker and the customer. This may be one strategy for succeeding, with our customers, in this era of mega-competition.

The period of low growth and mega-competition is expected to continue for a while, while on the other hand, the advanced information society is becoming a reality. Measurement and control technology has been a representative player in technical progress to date. In order to maintain and expand that role in the coming years, we must overcome the problems I have mentioned here, broaden our perspective, and advance into new field by adopting different concepts from those up to now. At this particular time, with the 21st century immediately ahead of us, I will be most gratified if this special issue proves helpful in thinking about the directions which we should take in accomplishing these goals.