KAWASAKI STEEL TECHNICAL REPORT

No.34（March 1996）

Highly Efficient Production and

Application of sheet Produts,and

Application Development in Open System's Age

Personal Computer Networking System to Support Staff Jobs

Keita Harada, Akira Harimoto, Kenji Makabe

Synopsis :

Kawasaki Steel has developed the personal computer networking system which realizes the speedier job of the staff. This system, based on the data-base of the main-frame and the recent computer technology, includes personal computers, work-stations and networks. The personal computers in Kawasaki Steel have rapidly increased in number, and helped to improve the job efficiency at the office section. Also, much information and knowledge can be used commonly among not only at each section but also in whole works.

The body can be viewed from the next page.

Personal Computer Networking System to Support Staff Jobs*

Keita Harada
Staff Manager,
Systems Planning Sec.,
Planning Dept.,
Mizushima Works

Akira Harimoto
Staff General Manger
& Group Manager of
Corporate Planning
Sec., Corporate Plan-
ning & Administration
Dept., Kawasaki Steel
Systems R&D Corp.

Kenji Makabe
Staff Senior Manager
of Planning & Devel-
opment sec., Chiba
Office, Kawasaki Steel
Systems R&D Corp.

Synopsis:

Kawasaki Steel has developed the personal computer networking system which realizes the speedier job of the staff. This system, based on the data-base of the main-frame and the recent computer technology, includes personal computers, work-stations and networks. The personal computers in Kawasaki Steel have rapidly increased in number, and helped to improve the job efficiency at the office section. Also, much information and knowledge can be used commonly among not only at each section but also in whole works.

1 Introduction

At Kawasaki Steel, information systems have been built on the main-frame since the 1960s simultaneously with the construction of equipment, and the foundations for the present production, sales and material-distribution control systems were completed in the 1980s. Since the latter half of the 1980s, these systems have been integrated and applied to wider areas, and systems to assist the intellectual and creative activities of the staff[1] have been built by using the information accumulated in this main-frame.

At the beginning of the 1990s, Japan's economy was confronted with an unprecedented recession triggered by the higher yen after the collapse of the bubble economy. At Kawasaki Steel, programs to improve company business fundamentals have been implemented to secure its market competitiveness in terms of international parity since 1993. The improvement of the productivity of the staff that has lagged behind, rationalization in other areas is the most important problem of this activity.

Great expectations have been held for the contribution of IT (information technology) to the improvement of the staff jobs. There has been a need for systems to ensure that the staff can use information strategically

and efficiently with the aid of new information infra-structures such as LANs (local-area networks) and personal computers by rearranging the information accumulated in the main-frame. The domestic sales and production system PEGASUS[2] presented in this report is an example of such personal computer networking systems to support staff jobs.

This paper describes the development of company-wide personal computer networking systems to support staff jobs, condition of infrastructures for such systems, and typical examples at Mizushima Works.

2 Promotion of Personal Computer Networking Systems to Support Staff Jobs

2.1 History of Development of Personal Computer Networking Systems to Support Staff Jobs

Figure 1 shows the history of development of personal computer networking systems to support the staff jobs.

2.1.1 Phase 1 (1970–1982)

The TQC (total quality control) system was developed in 1970 at Chiba Works and TIS (technical information system) was developed in 1974 at Mizushima Works. These systems work in a batch environment of the main-frame, and simple statistical analyses are made possible by combinations of necessary paramenters.
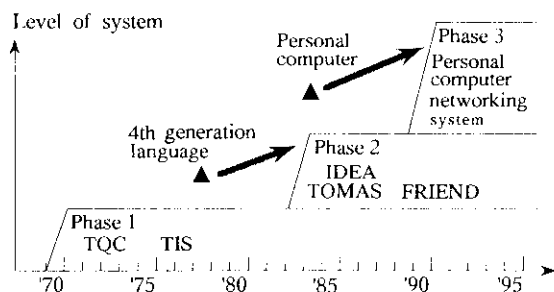
Fig. 1 History of the system development

2.1.2 Phase 2 (1983–1989)[3]

Around 1979 the fourth-generation language, which was developed so that users themselves can conduct programming, began to spread. Furthermore, as the refurbishment of main-frame systems progressed, large amounts of data from various sensors and automated equipment began to be accumulated in a wide varieties of processes.

The analytical needs of staff became diverse in a wide range from quality control to production control, and functions, such as statistical analysis, the Japanese language and graphs, became necessary. Against this background, integrated management and analysis data-bases and integrated management and analysis systems based mainly on the fourth-generation language were developed in 1983 to 1984. They were named IDEA (information design aid system) at Mizushima Works, TOMAS (total management and analysis support system) at Chiba Works, and FRIEND (FOCUS report and information support system for end users) at Chita Works and Head Office. The Mizushima IDEA system has about 300 000 data items and is used by more than 1 000 staff members.

2.1.3 Phase 3 (1990–)

Word processors and personal computers have been used increasingly since around 1984. At Kawasaki Steel, they have also been introduced positively to increase the efficiency of office work. Although the adoption of the word processor culture in this period was remarkable, personal computers contributed only to the partial mechanization of individual jobs and were used by part of office workers.

In the 1990s, progress was made in open system techniques, concretely, fundamental techniques for integrated office automation, such as networks, work stations, and multi-function personal computers. At Kawasaki Steel, it became necessary to reform staff jobs based on the use of information by combining the data-bases built in Phase 2 with the above system techniques. Support in terms of the information system to the work not covered by the coventional main-frame systems increases the intellectual productivity of the staff and, at

the same time, is aimed at the strategic use of information.

We call this system a personal computer networking system to support staff jobs and have built such systems in a company-wide manner in the second five-year plan from 1991. These systems are regarded as one means of reforming the conventional framework of jobs, including the job flow, in concert with company-wide common-sense challenge activities.

2.2 Methods of Promoting Personal Computer Networking Systems to Support Staff Jobs

The plan for promoting personal computer networking systems to support staff jobs at Mizushima Works is shown in Fig. 2. Promotion plans for personal computer networking systems to support staff jobs were implemented almost at the same time at Chiba Works and about a year later at the Head Office and Chita Works.

Fig. 2 Promotion plan at Mizushima Works

2.2.1 Trials in model department

With the hot rolling department serving as a model, staff jobs were first analyzed, OA equipment was introduced, a network was built, data-bases were rebuilt, and a system to assisit the extraction and analysis of information was developed. As a result, each basic technique was verified and the way to build a personal computer networking system to support the staff jobs and the effects of such systems were confirmed.

2.2.2 Development to principal departments and building foundations

The promotion of a personal computer networking system to support the staff jobs was extended to other departments subsequent to the hot rolling department by forming a clear concept of system building. Main aims were the use of operation and quality information in the host computer in the production department and the sharing of engineering know-how among the staff members in the engineering department.

As a result of trial and error in the hot rolling department, it became apparent that a high-speed, large-capacity network was inevitable and the 35-km existing network at the works was replaced with a high-speed LAN suitable for FDDI in 1992 and 1993. A specific number

72

of personal computers were installed in each department and enlightenment activities were carried out at the same time for departments other than the hot rolling department.

2.2.3 Full-scale development to all departments of works

Development from activities in each department to interdepartmental activities was aimed at in the subsequent period. At the end of fiscal 1994, personal computers were amply allocated to all departments of the works and the number of personal computers corresponded to the order of 80% of the number of staff members. To raise the efficiency of communication work, an electronic mail network was laid from within the works to the whole company and the scope of the personal computer networking system to support the staff jobs was extended to the office work department and Head Office affairs.

Efficiency and speed of the jobs covering the works and Head Office, such as material allotment, quality design and production planning affairs, were raised. Furthermore, a system for speedy information transmission to the top of the works and Head Office was built as the OA system for directors.

3 Foundation Techniques of Personal Computer Networking Systems to Support Staff Jobs

3.1 Hardware

3.1.1 Multi-function personal computers

At the start in 1990, Macintosh was adopted at Mizushima and Chiba Works. This is because simple operation and graphical interfaces were judged to be inevitable for the use by all staff from younger members to the heads of departments and sections. In terms of cost also, Macintosh, which has AppleTalk as standard, was superior to other personal computers of MS-DOS and OS/2 when the use of networks was considered.

On the other hand, in consideration of the external interchange of documents, Windows that has a high share in the market was adopted at Head Office, where the promotion of a personal computer networking system to support the staff jobs was started on a full scale around 1993. Finally, however, Windows was also adopted at the works and Macintosh was also adopted at the Head Office in a multi-platform manner according to the needs of users.

The number of personal computers in each district in July 1994 is shown in **Fig. 3**. The company is planning to supply one personal computer to each staff member during fiscal 1995.

3.1.2 Information server
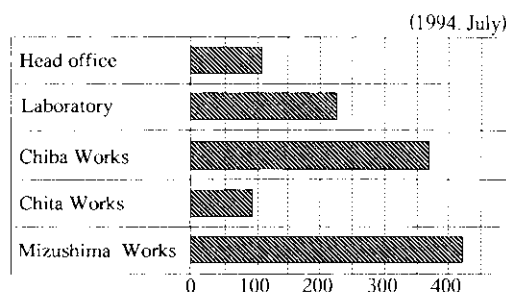
A UNIX work station was introduced in each

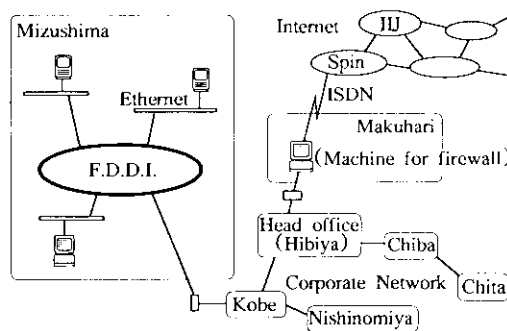Fig. 3 Number of personal computers

Fig. 4 Outline of network

department as a server for accumulating the data primarily extracted for each purpose from the master data-base on the host computer and information peculiar to each department. This server performs also the common departmental filing of the material prepared by personal computers and simple technical calculation.[4]

3.1.3 Network

The company-wide network configuration is shown in **Fig. 4**. In each department, Ethernet and Localtalk (peculiar to Macintosh) were laid at the timing of introduction of personal computers. FDDI was installed in 1990 at Chiba Works and in 1993 at Mizushima and Chita Works as a backbone LAN that connects them. In the Head Office building, Ethernet was laid in 1993 and as a result of this, a company-wide LAN connection that supports multiprotocols such as TCP/IP and Apple Talk completed in 1993. Furthermore, the company-wide LAN was connected to Internet via Spin in 1994.

3.2 Software

3.2.1 Package software

Table 1 shows the standard package software installed in Macintosh and Windows. For almost all these software, concurrent-use license is provided by KeyServer (Quality Corp.). The effects of KeyServer are (1) keeping down the software cost, (2) prevention of illegal copying, and (3) reduction of the burden of software management.

Table 1 Software of personal computer

	Macintosh	Windows
Word processing	MacWrite II (Claris Corp.)	OASYS/Win (Fujitsu Ltd.) MS-Word (Microsoft Corp.)
Drawing	MacDraw II MacDraw-Pro. (Claris Corp.)	
Spread sheet	Wingz (ASC II Corp.) Excel	Excel (Microsoft Corp.)
Database	FileForce (ACI) FileMaker (Claris Corp.)	Access (Microsoft Corp.)
Electronic mail	QuickMail (CE Software, Inc.)	

QuickMail was adopted as electronic mail software. This is because QuickMail can be used commonly between Macintosh and Windows. Furthermore, Eudora-J was installed in part of Macintoshes to permit the use of e-mail of Internet.

3.2.2 Home-developed software

To make the most of personal computers, the following software was developed in addition to the package software:

(1) Emulator of Host-Computer Terminals[5]

This emulator emulates the terminals of a Fujitsu host-computer on a Macintosh and those of an IBM host-computer/Fujitsu host-computer on a Windows.

(2) FiBridge (Retrieval System of a Large Volume of Documents)[6]

A large volume of documents prepared by an IBM or Fujitsu host computer is stored in a UNIX server machine and retrieved at a high speed from a Macintosh or Windows personal computer. Furthermore, it is possible to copy retrieved information onto spreadsheet software and to analyze and graph it on a personal computer. This contributes to the promotion of paperless work and increases the speed of work.

(3) Software for the Retrieval of Electronic File Information[7]

This software is for retrieving and referring to the image data stored in a server of Panafile (Matsushita Graphic Communication Systems Inc.) through a network.

(4) Data Extraction and Analysis Support System Based on Client/Server System[8]

This software is for supporting the retrieval of data on a UNIX information server using the data dictionary built for the master database of a host computer. The application of UNIX servers to the integrated

control and analysis systems developed in Phase 2, such as IDEA system, has already been realized and this software played a major role in this connection.

4 Examples of Personal Computer Networking System to Support Staff Jobs

Examples of the application of personal computer networking system to the staff jobs are broadly classified into the three groups:

(1) Practical use of Host Computer Information

Recently, there has been an increasing need for an analysis that covers multiple processes and a trend analysis, but a great burden is required to rearrange and analyse information only by conventional systems such as IDEA. Thus, in the first mode of practical use of this system, data was downloaded from the database of a host computer and reprocessed and analyzed directly. This is a typical pattern of a personal computer networking system to support the staff jobs in the operating departments of a steelworks represented by the hot rolling department at the Mizushima Works and contributed to raising the efficiency, speed, and control level of operation control and quality control tasks.

(2) Sharing of Departmental Information Using an Information Server

We judged that sharing various kinds of information obtained by engineers is important in the engineering departments of equipment maintenance, electricity, control, etc. Hence, we constructed a system in which trouble records, purchase information, drawing information, etc., of equipment are accumulated in the information server of each department and used by multiple departments. This concept which was developed to the whole works and the whole company is called the OA system for directors. Although it is still in the step of a prototype system, we directly aim at the information supply to directors with raised efficiency and at a higher speed, and further the sharing of accumulated information as a management database.

(3) Raising Efficiency of Communication Using a Network

In the office work department, although main tasks are covered by a mainframe, the information gathering for input and distribution of its output are conducted using paper in many cases. However, they are expected to be improved by using electronic mail. The way of cooperative work among departments itself can be improved by introducing what is called groupware. At Kawasaki Steel also, there are trends toward the introduction of the sector organization (cost control system for each kind of product) and the reduction of the Head Office work. In response to this background, it has become more and more necessary to improve the conventional way of doing work using IT. The ironmaking material allotment system is a pio-

neering trial in this field.

4.1 Operation Control and Analysis System for Hot Rolling Department[9]

This system was built in 1991 as a model at Mizushima Works. To raise the productivity in the operating departments, the foundations for personal computer networking systems to support the staff jobs were built in parallel with the inventory-taking of tasks. The configuration of the system is shown in **Fig. 5**.

The functions of the system are as follows:
(1) Control and Analysis Support System

Functions and databases necessary for operation control and problem analysis are rebuilt for each level of hierarchy.
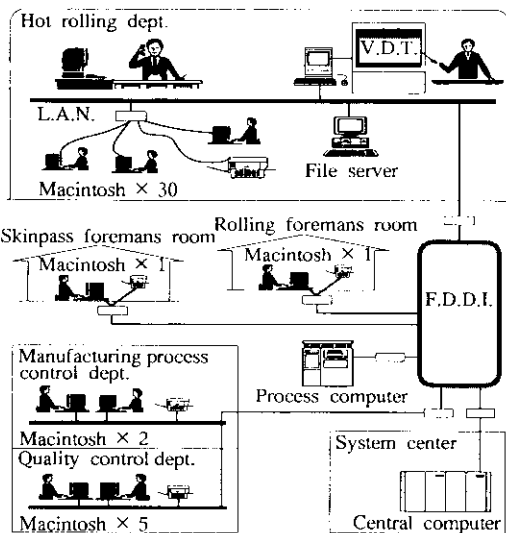
(2) Document Creation System

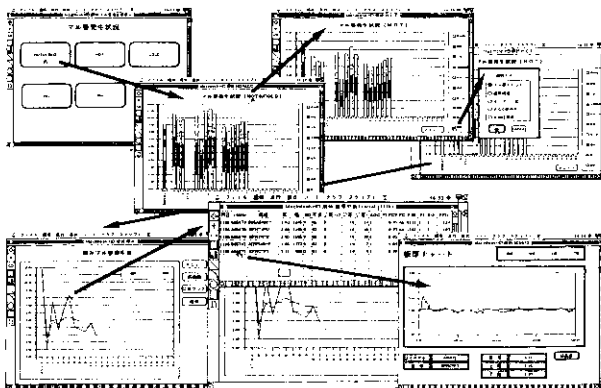Fig. 5 Construction of the system for hot rolling section

Fig. 6 Sample of operation for analyzing thickness of hot coils

One Macintosh is introduced for two staff members.

(3) Document Management System

A common filing system is built by introducing information servers.

Figure 6 shows an example of operation for analyzing off-gauge that is very effective in the set-up of process control level and in the clarification of the causes.

The introduction of this system enabled the efficiency of data gathering-and-processing and document creation to be raised, and the weight of creative work to be increased by more than 10%. Furthermore, this system contributes greatly to the early training of newcomers.

4.2 OA System for Directors

This system was developed in 1994, when the information foundations in each department were built to a certain degree. This system is aimed at speedier supply of information to the directors of works and Head Office and sharing of accumulated information.

An outline of the system at the Mizushima Works is shown in **Fig. 7**. In consideration of directors who are
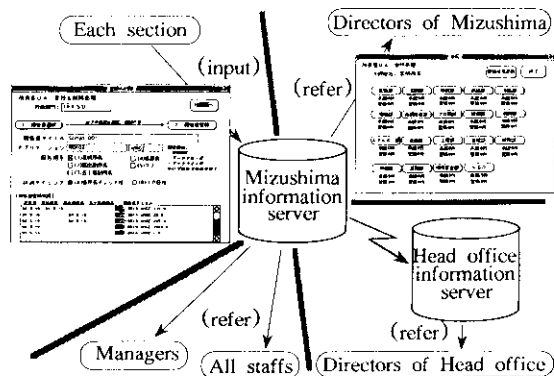

Fig. 7 Outline of the system for directors

very busy, a menu function is provided so that an overview of entered information is made possible by a one-touch operation and standardizing material formats by Wingz. There is a control function that enables each department to refer to the results of reading by directors. Information is divided by three stages of access: information limited to directors, information limited to managers, and free information.

The development of the system was conducted by prototyping method. This system can be used among the works and Head Office.

4.3 Ironmaking Material Allotment System

In the raw material purchase department of Head Office, the control of ships arriving in port is conducted in consideration of the stock condition of raw materials at each works. At each works, the blending of raw materials is conducted by referring to the operating condition of blast furnaces and schedules of ships arriving in port.
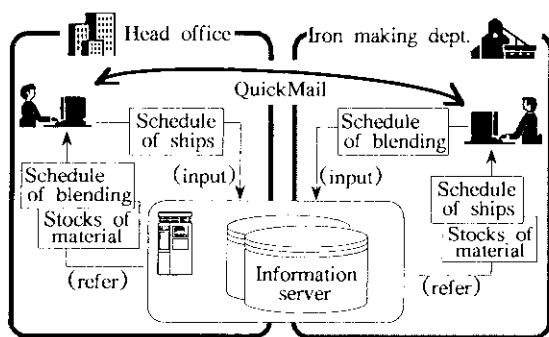
Fig. 8 Outline of the system for material allotment

This work requires close information interchange between the Head Office and the works, and hence this frequent communication using phone and FAX has so far required much labor. In addition, the action taken by both of the Head Office and the works was apt to be partially optimum.

An outline of this system is shown in **Fig. 8**. Databases of inventory information and arriving ship information are stored in the server installed at the Head Office and shared by the Head Office and the works. Although different types of personal computers are used, the data on the server can be used by both of the Head Office and the works using spread sheet software. Communication is conducted by electronic mail with records kept.

5 Evaluation and Future Problems

The building of personal computer networking systems to support the staff jobs, that has been conducted since 1991, is evaluated at the present stage as follows:
(1) In the departments in which personal computer networking systems are constructed, the work cycle has been speeded up, contributing greatly to labor-saving and an increase in productivity.
(2) The sharing of department-level information is well under way and, on the basis of the OA system for directors, developing to works-level information sharing.
(3) In terms of individual level, more than 70% of staff members at Mizushima Works use personal computers in some form. The use of electronic mail has expanded rapidly since the introduction of personal computer networking systems.

It is essential to allot one personal computer to one person in order to ensure that personal computer networking systems display their performance to the highest degree. Therefore, it is necessary to increase the number of personal computers in future and to promote the use of personal computers. For this purpose, it is necessary to solve the following problems:
(1) Enhancement of the enlightenment and support ac-

tivities for increasing the number of users
(2) Promotion of use of electronic mail
(3) Making easy the information interchange between different types of personal computers
(4) Introduction of the work flow system (function of electronic decision)
(5) Devising an effective method for system development in close cooperation with user departments

6 Conclusions

The development of the personal computer networking systems to support the staff jobs at Kawasaki Steel was described. The features of the systems are as follows:
(1) In addition to the data-bases built on the main-frame as principal systems, the latest information infrastructures such as multi-function personal computers, work stations, and networks are provided to support various tasks of the staff.
(2) The personal computer networking systems to support the staff jobs were built for ① using host computer information, ② sharing of departmental information using an information server, and ③ raising the efficiency of communication using networks.
(3) In the departments where the building of personal computer networking systems is completed, the work cycle has been speeded up, contributing greatly to labor-saving and an increase in productivity. Furthermore, the sharing of information has expanded to the works level.

Personal computers are becoming a tool indispensable for carrying out tasks, and information infrastructures are undoubtedly indispensable for raising the productivity of staff members. We intend further to develop personal computer networking systems to support the staff jobs and promote the reform of the structure of the staff jobs.

References

1) K. Harada: Preprint of the 55th meeting of Intelligent FA, Institute of Systems, Control and Information engineers, No.94-1, Jan. (1994), 11–28
2) M. Kasai and M. Yoshimoto: Kawasaki Steel Giho, 27(1995)2, 74
3) S. Tanaka, T. Ariki, M. Igata, S. Yamazaki, I. Takahashi, and T. Sekio: Kawasaki Steel Giho, 20(1988)2, 138–143
4) I. Ichihara, K. Shiraishi, and M. Yamane: Kawasaki Steel Giho, 27(1995)2, 115
5) S. Okamoto: Kawasaki Steel Giho, 26(1994)3, 39–40
6) H. Watanabe and S. Miyamoto: Kawasaki Steel Giho, 26(1994) 3, 37–38
7) M. Tomisawa and H. Tada: Kawasaki Steel Giho, 27(1995)2, 126
8) H. Kinoshita: Kawasaki Steel Giho, 27(1995)2, 128
9) K. Arita and M. Furukawa: Fujitsu Family-Kai Ronbun-shu, 27(1994), 1–11