Using SAS Macros to Develop Quality Analysis Application System
at China Steel Corporation

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ABSTRACTS

For the purposes of expansion of data management and data analysis on Hot-Rolled and Cold-Rolled steel sheets, China Steel Corporation(CSC) has developed a「Quality Analysis Application System」(QAAS) for the staff's daily work.

This system has the following functions:

(1) Automatical SAS database files management,

(2) Modular system design: The system is developed and built by SAS software. The application program can be generated by assembling different system modules, and the system modules can be called out and executed dynamically when required,
(3) Preparation of routine quality and production reports automatically.

(4) User friendly design: This system provides Chinese language operation menus, help messages and warning messages. Every staff member can obtain "Required Information" easily only by selecting appropriate options at any time, and

(5) Improvement in data analysis efficiency and accuracy.

This system is running smoothly and has brought much benefit in reducing the workload of data management and analysis, as well as in improving analysis accuracy and efficiency.

INTRODUCTION

While expanding the number of new production lines at China Steel Corporation (CSC), automatic and integrated technical supports were also promoted to improve competitiveness.

In recent years, high quality products were being demanded, and a trend toward multi-kind, small-lot products would be requested by the customers.

In order to meet these requirements, we rely heavily on the power of the SAS MACRO facility and develop a more flexible and versatile Quality Analysis Application System (QAAS) at China Steel Corporation.

This paper describes the hardware configuration, SAS database management, SAS MACRO analysis and system functions.

Hardware Configuration

The computer configuration of this system is based on a simple two-level hierarchy and is composed of host computers and process computers. Fig.1 shows the hardware configuration of the system.

The host computer sends production instructions to each process computer right after the production schedule of the coil is completed by the host computer.

The process computers and measuring devices collect the quality and operation data, and then send the data log back to the host computer automatically.

Further, the host computer receives the data and then constructs a database to manage and analyze quality and production, thereby enhancing efficiency in analysis work.
SAS Database Management

The "Quality Information Delivery" is an important basis for all aspects of the quality assurance activity. Data concerning Hot-Rolled and Cold-Rolled steel sheets such as production, quality, processing, inspection, and testing were systematically sorted out and accumulated into the management and analysis databases.

The databases for the QAAS are composed of an order database, semi-product database, product database, processing database, chemical laboratory database, metallurgical laboratory database, and customer service database.

The databases for the QAAS can be separated into three type of files as followings:

(1) Original Data Files
The host computer receives the data sent from process computers, and is then added to the original data files for preparation of routine reports and individual data inquiry.

(2) Public Data Files
Data of the previous day were collected and added to the public data files daily early in the morning. The public data files are used for non-routine data analysis applications.

(3) Summary Data Files
For the purpose of improving access efficiency, summary data files were prepared for long term storage of data for specific purposes.

SAS MACRO ANALYSIS

In the development of the QAAS, the goals are to have quick and easy use of computer data and efficient execution of collected data such as sorting, and processing various types of data analysis by an individual staff member. The specific goal is to permit each staff member to obtain "Required Information" easily at any time.

This system is widely used not only for the preparation of routine reports of production, production yield, ok yield, rejected yield and rejected coils analysis, but also for the execution of non-routine jobs such as processing analysis, inventory analysis for the various mills, quality evaluation, quality improvement, and claim investigation. Fig.2 shows the outline of the Quality Analysis Application System.

Because it is difficult for the beginner to program data analysis, simple quality item selection functions are provided to relieve the burden of programming work. Through these item selections, even the beginner who does not know the grammar of the analysis language can carry out data analysis easily.
The features of the system are described in the following:

(1) Standards

Every one agrees that standards are necessary. Unfortunately, human nature is to either resent standards or ignore them. However, standardization of data structures, procedures, and reports are applied to this system structure and greatly improve system design and maintenance efficiency.

(2) Modular System Design

The QAAS is developed and built around the SAS MACRO software. The same type of information is constructed in the system module with different quality items selected. Almost every application program can be generated by assembling different system modules, and the system modules can be called out and executed dynamically when required. Fig. 3 shows the structure of the modular system design.

There are many benefits by using modular system design. The system modular design can

a. Improve Productivity - System modules can be used repeatedly across different applications, and then we can get greater productivity by reducing coding time.

b. Enhance Reliability - System modules have already been debugged and tested. Their use, therefore, enhances the reliability of applications.

c. Increase Flexibility - With the help of parameters selection in system modules, many modifications can be accomplished by changing parameters instead of changing the source code.

d. Lower Maintenance - Debugging is very important in maintenance. If a program occurs problem, it can be judged which module maybe wrong easily according to past experience we had. It's not necessary to check the whole program, therefore SAS MACRO modular system design technique can reduce maintenance cost effectively.

(3) User Friendly Design

The system provides Chinese language operation menus, warning messages and help messages. Every staff member can access the "Required Information" as easy as possible only by selecting appropriate options at any time. Fig. 4 shows an example of a data analysis sub-system menu.
(4) Data Dictionary

It is necessary that staff personnel can easily access the data at any time. For this purpose, data should be managed as a resource and made easily accessible through a data dictionary. Data dictionary functions include data items, data descriptions (English & Chinese descriptions), using descriptions and system design documents.

The data dictionary system improves the design of programming and the efficiency of system maintenance.

(5) System Security

Utilization of the QAAS extends over a wide scope including the operation, production planning and quality assurance departments. System security is very important to prevent unauthorized accessing of data.

FUNCTIONS OF THE SYSTEM

The functions of the QAAS are described in the following.

(1) Process computers transmit the produced coil data in real time to the host computer. The host computer collects the produced coil data, sorts it out, and accumulates it in the management and analysis databases automatically.

(2) Automatical SAS database files management,

(3) The structure of QAAS is based on SAS MACRO modular system design. With the aid of modular system design, about 80% of application programs can be generated from reusable modules. The remaining 20% are functions specific to individual application programs.

(4) Preparation of routine quality and production reports automatically.

(5) User Friendly

Adoption of the Quality Analysis Application System in Chinese language. Every staff member can obtain "Required Information" rapidly only by selecting appropriate quality items at any time.

(6) Improvement in data analysis efficiency and accuracy.
CONCLUSIONS

This report has described the Quality Analysis Application System of Hot-Rolled and Cold-Rolled Steel Sheets at China Steel Corporation.

The SAS MACRO facility is extremely powerful and versatile tool. Not only does it allow the user to utilize many of its capacities, but it also provides many advanced features which can be used for more sophisticated field.

The Quality Analysis Application System has contributed to quality analysis, quality improvement and quality management in reducing the workload of data collection and analysis, as well as in improving analysis accuracy and efficiency.

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Fig. 3 The Structure of SAS MACRO Modular System Design

Fig. 4 Cold-Rolled Product Data Analysis Sub-System