

EIC Integrated DCS with Single Console

HIROSHI KAWAHARA and HONG TAE HWA

Technical Development Dpt.
of
Measuring Instrumentation
FUJI ELECTRIC CO., LTD.
TOKYO JAPAN

Automation & Instruments
Sales Dpt.
Goldstar Instrument & Electric
Co., Ltd.
SEOUL KOREA

Abstract

Control technology has been making remarkable progress in electrical control (E), instrumentation & control (I) and computer control (C) field respectively

In order to rationalize system engineering and simplify system configuration and operation work, so called, EIC are now to be integrated into one system.

FUJI has developed it's own E, I&C integrated system, to meet above mentioned market requirements of variety.

This paper describes basic concept of FUJI's Integrated Man-Machine Interface, hereinafter called SINGLE CONSOLE, from some view points of E,I,C integration technology.

1. Introduction

The main components required for plant automation are the process computer (C), electrical control equipment (E) and instrumentation control equipment (I). Presently drawing attention with regard to plant operation is CIM (Computer Integrated Manufacturing) or total automation. The basic concept of DCS is to distribute control while centralizing supervisory operation. Although this distribution and centralization has taken place only in the areas of electrical control (E) and instrumentation control (I) heretofore, an expansion of this distribution and centralization to other areas is now in demand, as represented by the CIM. Other factors in the development of an EIC integrated system are economy and so on. The background for integration is as follows.

- o To increase the investment effect.
- o To increase reliability.
- o Use of the same microprocessor and memory in EIC components. --- the boundaries of EIC have become vague.
- o To increase the efficiency of development.
- o To increase the work efficiency with manufacturing and test facilities.
- o To return to actual plant operation rather than having MMI dependent on machines.
- o To reduce maintenance costs.

Although the flow which requires consideration with regard to system configuration is shown in Fig. 1, it becomes in effect an EIC integrated system for the purpose of realizing total automation.

2. EIC integrated system

2.1 System configuration

A comparison with the conventional system is shown in Fig. 2. This system features simplicity of both software and hardware, without unnecessary interfaces. Another feature in the integrated system is the provision of a data base station for collective control rather than individual control of each type of data. Since controller program, various data, process trend data, operation records etc. are primarily managed and recorded at this data base station, it greatly facilitates maintenance.

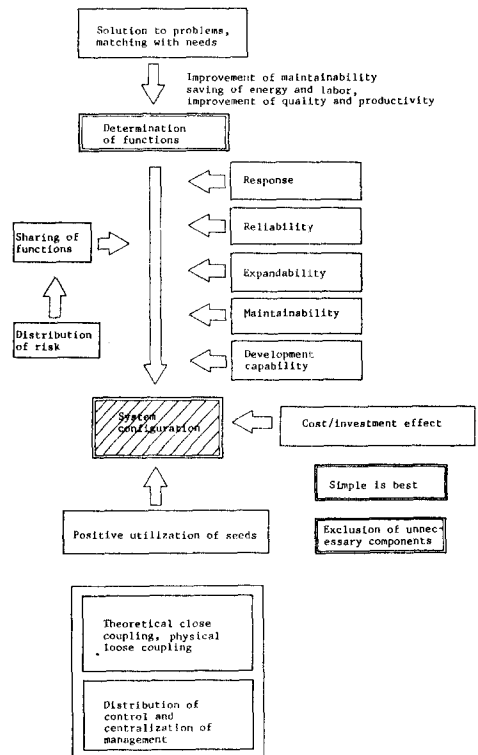


Fig. 1 Background for integration

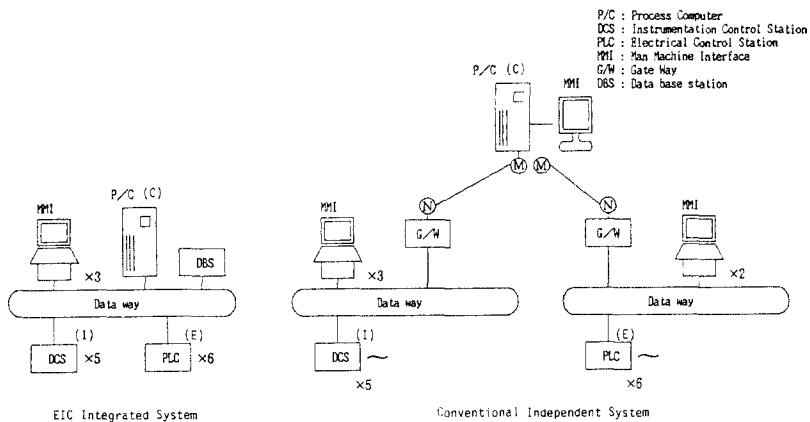


Fig. 2 Comparison of system configuration in continuous casting process in steel making plant

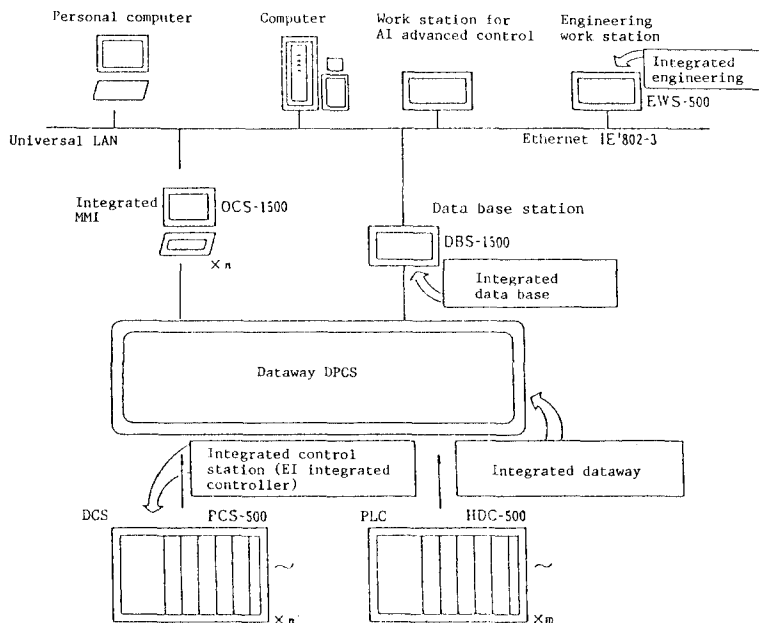


Fig. 3 Points of MICREX integration

2.2 Concept and technology required for EIC integration

Table 1 shows the concept and technology required. And Fig. 3 shows the points for integration. It is desirable for this concept to be realized even if the components are not of the same manufacturer. The philosophy of open architecture came about from this point. Standardization is advancing especially with regard to LAN, internal bus, OS, etc.

2.3 Merits of EIC integrated system

The merits are shown in Fig. 4. They are largely divided into the merits of simplification and the merits of MMI integration. There are outstanding advantages for even the user in engineering and maintenance work etc. The EIC integrated system offers a cost reduction of 10 to 15%.

Table 1 Concept and technology required for integrated control system

Item	Concept	Technology required
System configuration	Integration, adaptability to CIM, hierarchical system configuration using network	Vertical/horizontal distribution technology, and technology on the following components
Network	Open system network, unified protocol, 3-stage network, (universal LAN, control-use LAN, field bus)	IEEE802.3, TCP/IP
Hardware architecture	Single architecture, open system architecture (international)	MULTIBUS [®] II, MICREX-F500, unification of components, DPCS-F
Man-machine interface MMI	Single console (window + keyboard), unified MMI specifications, unified operation procedure	Single window, dynamic keyboard
Data management	Distribution file	Data name access (unified keywords)
Engineering	Integrated programming support tool programming, independence from target machine	

3. Integrated MMI

Among the distribution and centralization, the integrated MMI plays a large role in the centralization. The conditions possessed by the integrated MMI are shown in Table 2. Heretofore the image of the belonging MMI has been persistent as regards operation and supervision of computer or control station. This integrated MMI has changed this image of the device belonging MMI into an MMI which decides how the plant will be operated (1) safety, (2) rapidly and (3) efficiently. As shown in Fig. 5, a variety of information can be acquired as a common MMI.

3.1 Single console with dynamic keyboard (DKB)

The development of the dynamic keyboard is one of the technologies with which this MMI was realized. As for the meaning of the single console, a single keyboard function was added to a single window to realize supervisory operation with a single operator station. Fig. 6 shows the concept of the single console. It wouldn't be extreme to say that the entire plant is operable by a single operator console. Of course the number of operator consoles to be installed is decided by the reliability level required, number of screens to be continually monitored, number of operators required, and so on.

Table 2 Conditions required of integrated MMI

1. Single window should be possible.
2. Single console should be possible.
3. All information should be freely accessible.
4. Keyboard should not be dependent on specific controller. (should be a single keyboard)
5. Should have an interactive screen generating function.
6. Should have alarm monitoring and recording functions.

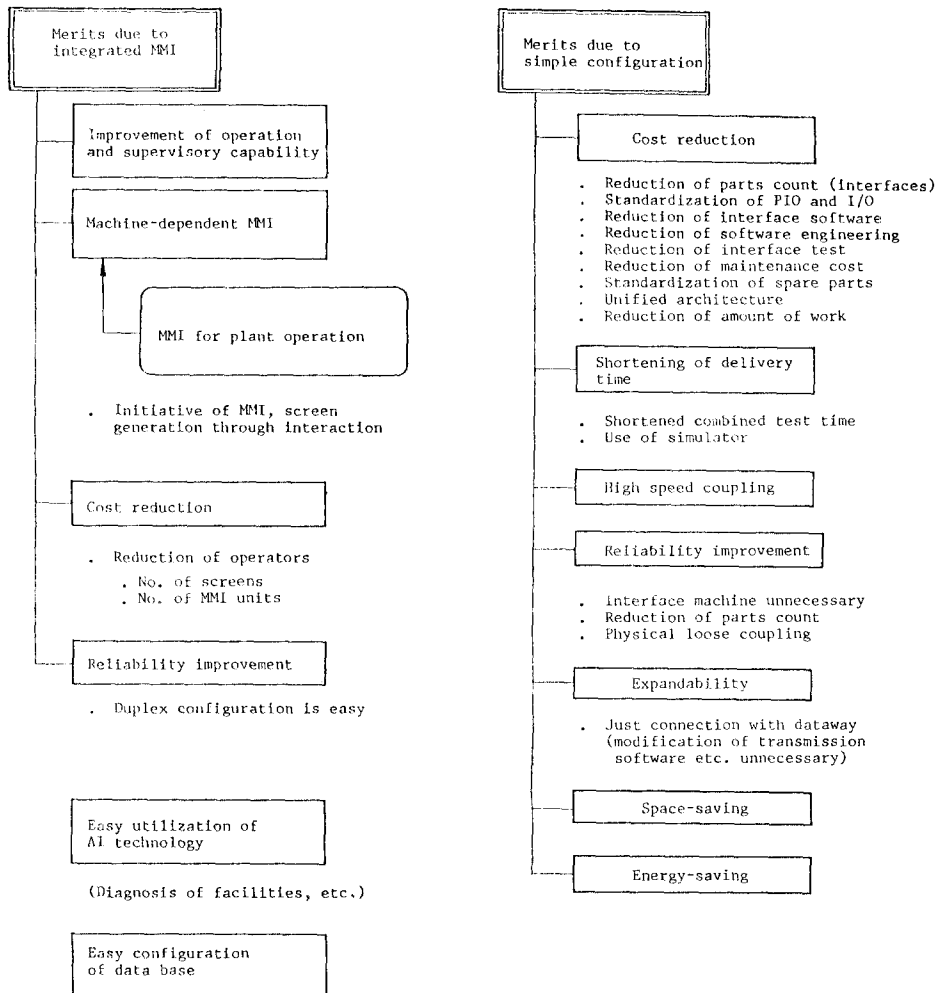


Fig. 4 Merits of EIC integrated system

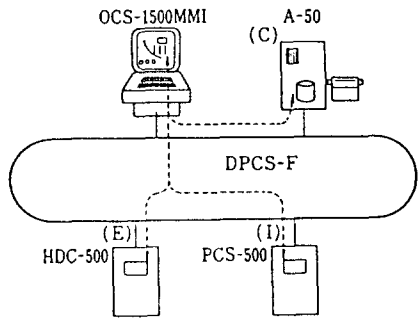


Fig. 5 Integrated MMI

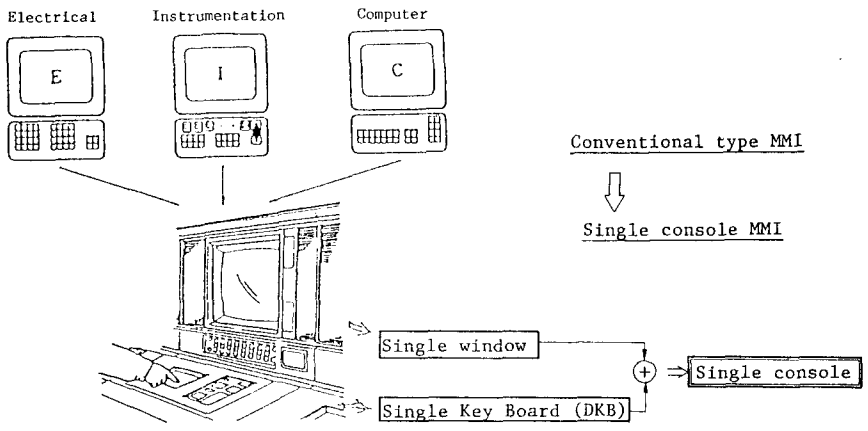


Fig. 6 Concept of single console

3.2 Dynamic keyboard

One of the main technologies which realized the single console was the DKB. As opposed to the generally used static keyboard (SKB) with which the key functions are fixed, the DKB is in a dynamic form. The specifications of DKB are given in Table 3. The methods of using DKB are explained below.

- (1) Tables for key information and screen information are preliminarily defined, and the necessary key is output automatically together with the display.
- (2) For displaying information from the computer on the screen, key information is added to screen information and the key is displayed simultaneously with the transmitted screen.
- (3) When the next operation to be made is already determined, the next key is automatically displayed via interrupt.

Another merit of DKB is that a confirmation display is possible in the case of switch operation.

Table 3 Specifications of DKB

Item	Specification
Display	9 inch plasma display (orange neon display) Display area 212 x 133 mm 640 x 400 dots
Touch screen	Photoelectric type using infrared rays
No. of keys displayable	No. of basic keys: 8 columns x 6 rows = 48 keys/page (1st row is key menu display)
Standard keys	① Standard screen selection keys ② Trend mode selection keys ③ Alphabet keys, etc.
User keys	One-touch keys No. of characters on key name display (basic key size): 16 characters (alphabet) 8 characters (Chinese characters)

4. Conclusion

The concept of EIC intergration, in particular integrated MMI using DKB, has been described. The integration has eliminated unnecessary and duplicate sections and realized simplification. Rather than considering the open system and integrated system as opposites, it is thought that the two should be retained and advanced in parallel. And continued effort is intended in this direction.

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