

SUPERVISORY CONTROL SYSTEM FOR EASTERN DISTRICT FILTRATION PLANT, KAGAWA PREFECTURE

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1. FOREWORD

In 1975, the Kagawa Prefecture Waterworks Bureau built four filtration plants (western, middle, Aya River, eastern) using Kagawa water from the Yoshino River as a water acquisition measure. At the same time, the wide area waterworks control system, with the Aya River Filtration Plant as the control center, was completed. As a waterworks computer system, this system was unique at the time. Updating of the computer system for the purpose of increasing system reliability and operation and control efficiency, besides aging of the entire system, is currently progressing.

The Eastern District Filtration Plant system was also updated as one link of this. This system, which introduced the newest computer and microcomputer, is outlined and its features are introduced.

2. OUTLINE OF FACILITY

The facility is outlined in *Table 1*.

Table 1 Outline of facility

Site	631-10 Okamoto, Takamatsu City
Filtration plant processing capacity	102,100m ³ /d
Water-conveyance facility	Settling basin 3
Filter basin facility	Filter basin (siphon type) 4
Distribution facility	Distribution pump well 1, distribution pump 4
Dosing facility	Band dosing facility 1, soda dosing facility 1, hyposal dosing facility 1
Waste water processing facility	Waste water basin 2, sludge basin 2, concentration tank 2, dehydrator 2
Service area	Takamatsu city and Kagawa, Konan, Murei, Anji, Miki, Nagao, and Shido towns

3. SYSTEM CONFIGURATION AND FUNCTIONS

The system block diagram is shown in *Fig. 1*. A

computer (A-50, duplexed), operator station (OCS-1500W), database station (DBS-1500W, duplexed), and central supervisory panel and operator console are installed at the center and are coupled to a process station (PCS-500W) installed at each facility by an optical dataway. On the other hand, supervisory control of outside facilities is performed by a remote supervisory control system (SAS-500, 50) using an NTT (Nippon Telegraph and Telephone) leased line.

The central computer executes water operation and control, dosage operation, etc. Plant supervision and operation is performed by operator station CRT display or central supervision panel and operator console. The database station is responsible for the preparation of daily report, monthly report, and other documents. The process station of each site performs process interfacing with the plant facilities and various sequence control and loop control.

A back up system is provided at the central supervision panel. Operation of important devices and water level, flow, water quality, etc. indication and recording are possible.

4. FEATURES OF SYSTEM

The features of this system are described below.

(1) Exhaustive componentization

The information processing machines of this system were exhaustively componentized and reliability and expandability were strengthened by duplexing each component device.

Each component device is outlined in *Table 2*.

(2) Man-machine interface device and operation

The man-machine interface devices of the center are two operator stations. These stations have functions for mutual back-up. All operations use a touch panel system so that the equipment inside and outside the plant are operated by touching the symbol of the pump, valve, etc. displayed on the screen with the finger. This increases the feeling of oneness with the screen and improves operability. A laptop type personal computer is installed at the central operator console as a dedicated data display device for the purpose of monitoring the main data so

Fig. 1 System block diagram

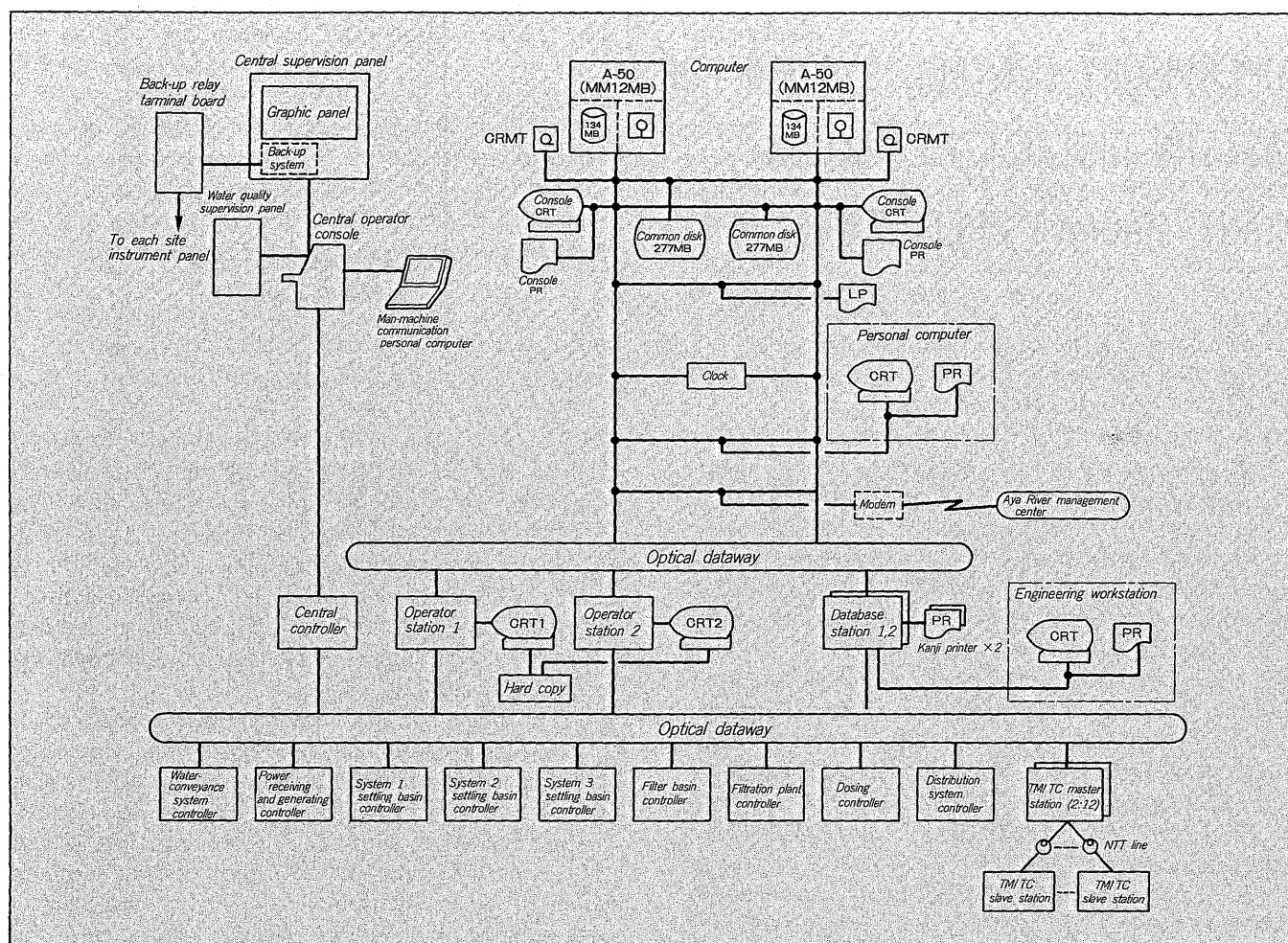
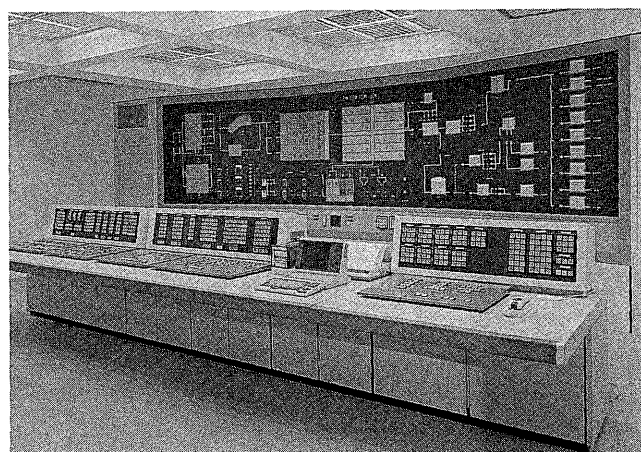


Table 2 Outline of component devices

Component	Outline of function	Remarks
Computer	(1) Performs demand forecasting, pump operation plan, etc. operator guidance or automatic control. (2) Performs optimum dosing operation and automatic dosing control.	Duplexed
Operator station	(1) Performs pump and other equipment control mode modification and start/stop operation. (2) Reports alarms to the operator. (3) Performs detailed report confirmation and maintenance for each process station. (4) Reports the demand forecast value and other operated results sent from the computer to the operator.	2 installed
Database station	(1) One-dimensionally manages the data displayed to each operator station and the process data that performs document printing. (2) Records alarm messages. (3) Automatically prints daily reports, monthly reports, and yearly reports.	Duplexed
Engineering Workstation	(1) Maintains the software of each process station and the plant database (timer value, etc.).	
Management personal computer	(1) Prepares annual management reports, etc. issued each year and improves business processing efficiency. (2) Saves the water quality manual analysis data and other manually input data.	

Fig. 2 Central supervision room



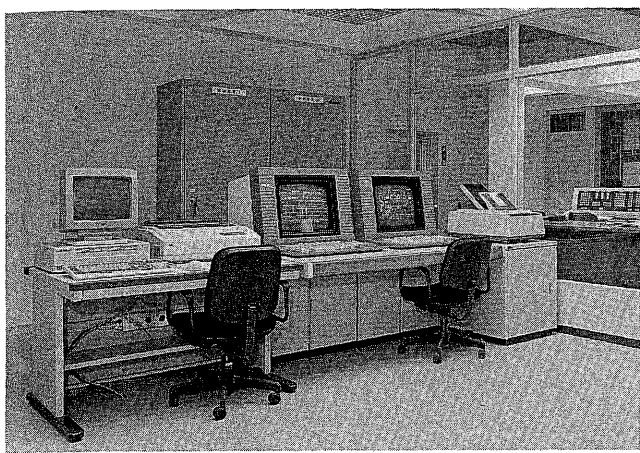
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that monitoring by both CRT monitor and personal computer is possible.

(3) Data transmission with Aya River control center

The Aya River control center is organically coupled to the four filtration plant systems under Kagawa Prefecture, including the Eastern District Filtration Plant system. However, the Eastern District Filtration Plant system

Fig. 3 CRT operator console



reports the water distribution data, etc. by NTT leased line.

(4) Wide area remote control facility

Supervisory control of the water receiving facility installed at each water distribution destination city and town is performed by remote supervisory control system (SAS-500, 50).

The SAS-500, 50 performs high speed transmission of 2,400 bits/second by HDLC protocol. A high reliability system is obtained by duplexing the master station SAS-500. The SAS-500 is a rack mounted type and is installed in the instrument panel of each site.

(5) Back-up system

A back-up computer system is providing at the central supervision panel for back-up when process station, etc.

trouble occurs. The back-up contents are:

- (a) Measurement item specification and recording: important water level, flow, water quality
- (b) Machinery operation: Distribution pump, settling basin inflow valve
- (c) Dosing control: Band, soda, hyposalt
- (6) Updating of existing system

The point which should be noting regarding the construction of this system is the complete updating of the existing instrumentation and computer systems. The existing system is a centralized supervision centralized control system built around a FACOM U-200 computer. This time, sequential switching to the new distributed system at each facility was performed without stopping the functions of the entire filtration plant. Therefore, during the switching period, the system took a supervisory and control form in which the facility which performs supervision by means of the existing system and the facility that performs supervision by means of the new system were independent.

5. CONCLUSION

The supervisory and control system for Eastern District Filtration Plant was described above. Besides aiming for filtration plant total stable operation and efficient operation, the expectation of application to a digital control system including a computer is steadily becoming greater. At the same time, updating of the existing computer facility will also increase in the future. We will be happy if this system is referenced as an example.