SUPERVISORY CONTROL SYSTEM FOR SUNZU WATER SUPPLY WORKS, SHIZUOKA PREFECTURE

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1. FOREWORD

The Sunzu waterworks has the Kakita River of the Kano River water system, famous for its high quality spring water, as the water source and started to supply water in March 1975 as a wide area waterworks that supplies waterworks water to the cities of Atami and Mishima and the town of Kannami in Shizuoka Prefecture.

The supervisory control system, centered about a computer, used the newest technology at the time. About 14 years have elasped since its introduction and a relative drop in the performance of each device is seen due to aging and the advance of technology.

Therefore, the Nakajima filtration plant supervisory control system was updated and its functions improved for a stable water supply in the future.

2. OUTLINE OF FACILITY

The Sunzu waterworks water supply facility is outlined below (*Table 1*).

Table 1 Outline of facility

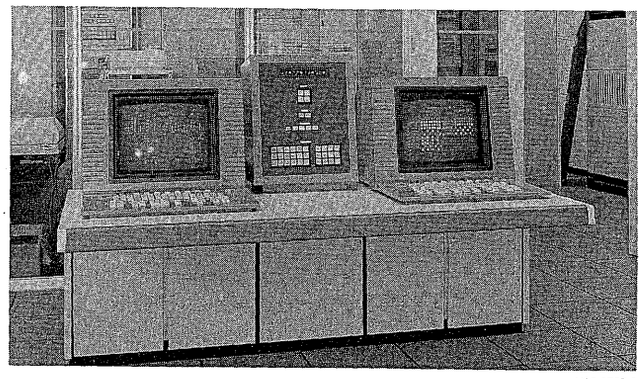
Water source	Kakita River (surface water/spring water)
Supply capacity	100,000 m^3/d
Filtration facility	Trough 1 Filter basis 12 Pump well 1 Service pump 4
Water intake station	1
Pump station	3
Surge tank	2
Service area	Atami, Mishima, Kannami

3. SYSTEM CONFIGURATION AND FUNCTIONS

The system block diagram is shown in *Fig. 2*.

Two computers (A-70), two operator stations (OSC-1500W), and two database stations (DBS-1500W) are installed in the central control room as the computer system and pump control, supervisory control by CRT with touch panel, and slip and alarm printing by printer are performed. An operator console with mini graphics is also installed for CRT back up and the status of the entire plant is grasped.

Fig. 1 CRT operator console



N99-1787-9

A microcontroller (PCS-500W) is installed in the Nakajima Filtration Plant electric room and various commands, dosing facility based on set values, service pump, and other control are performed.

Data collection and control are performed for each pump station, water intake station, and surge-tank outside the plant by telemeter telecontroller (SAS-500/50). The SAS-500/50 uses a $2:N$ system and performs high-speed transmission by HDLC transmission protocol. (2400 bits/sec)

Data transmission between computer system, PCS-500W, and SAS-500 is performed by control dataway (DPCS-F). The DPCS-F is a high-speed dataway (10M bits/sec) and uses an optical dataway that is unaffected by noise and surges. A direct system is used between the SAS-500 and mini graphics operator console, considering back up when the dataway is abnormal.

4. SYSTEM FEATURES

Besides the use of the newest control system technology, detailed functions improvements and functions additions were made from the long operating record of

Fig. 2 System block diagram

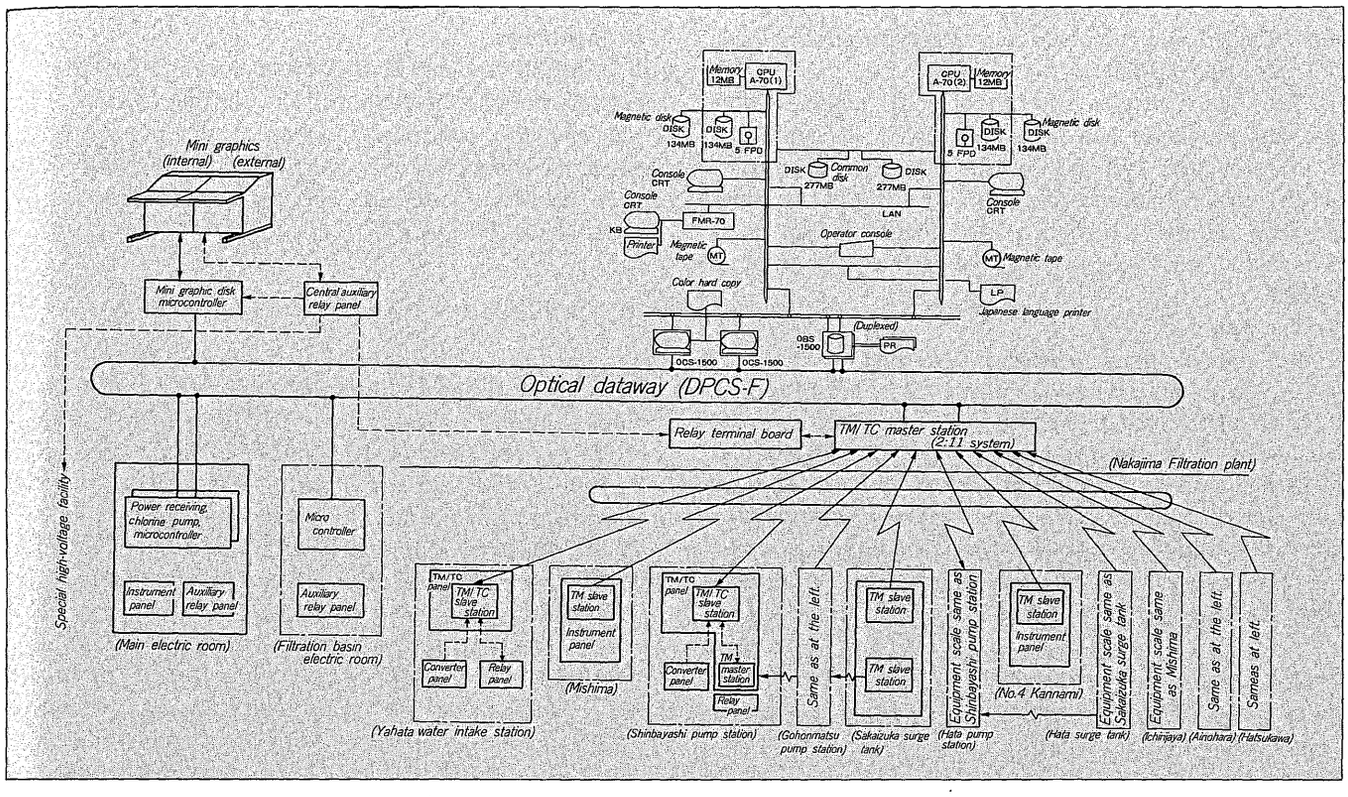
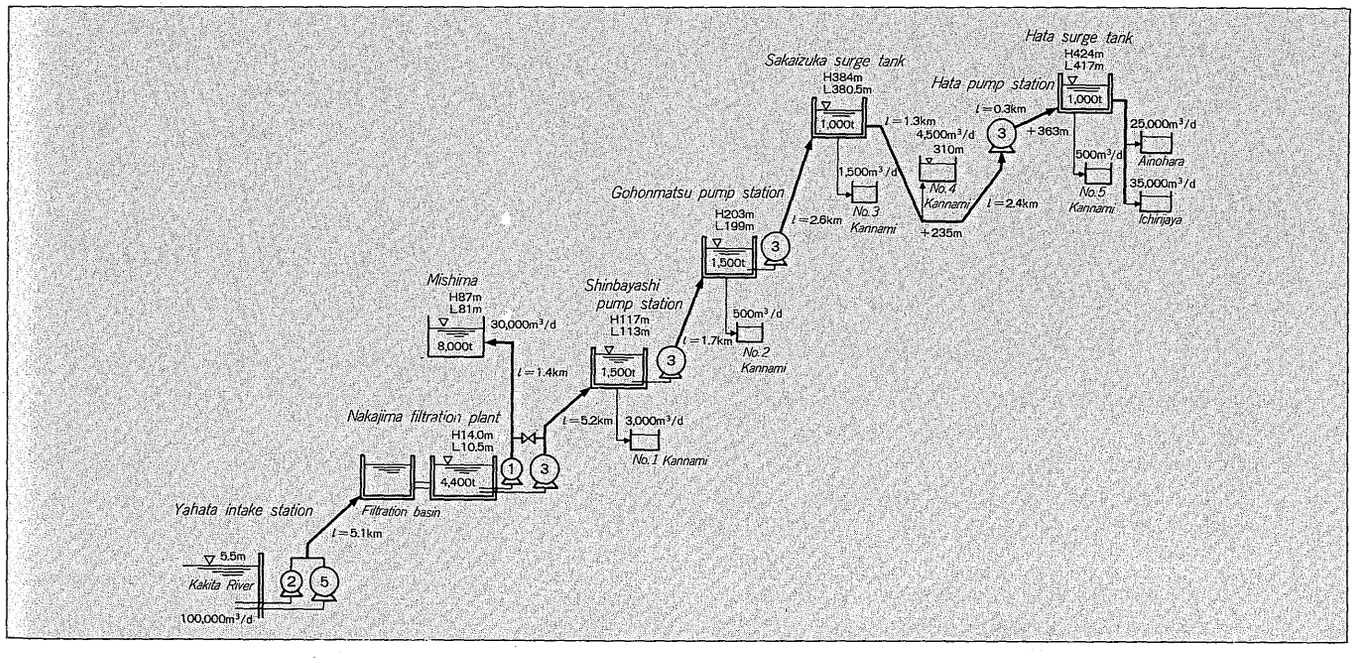


Fig. 3 Outline of water-conveyance system



the existing system. The features of this system are described below.

(1) Clarification of function load

The central control room computer system used an independent distributed system made up of a control system (A-70), data processing system (DBS-1500W), man-machine interface system (OCS-1500W) and devices separated in function units. This was done to improve the reliability of the entire system by distributing the system load and localizing the affect even when trouble occurs at a device.

(2) Highly reliable system

For the computer system, which is the nucleus of this system, high reliability was planned by duplexing control system and data processing system by duplex system, duplexing the common magnetic disk unit that performs

data recovery, and mutual back up of the shared I/O devices. For the man-machine interface system, two CRTs were installed and minimum supervisory control at each CRT was made possible.

The microcontroller and telecontroller master station were also duplexed and harmonized with the reliability of the computer system. For the telemeter telecontrol system, various abnormalities at the master station, line, and slave stations were taken into account and an inter-slave station telemeter was installed at the pump stations and last

(3) Pump control

For the five pumps connected in series (Yahata pump station, Nakajima filtration plant, Shinbayashi pump station, Gohonmatsu pump station, Hata pump station), number of units control is performed according to the pump well, surge tank, and receiving water level and flow in and out amount. For this plant, because five pumps are linked in series, the capacity of each pond is also small. Therefore, in pump control, consideration is given so that when the process data has become abnormal because of some equipment trouble, etc., deduction processing and alternate processing are performed automatically and control continues.

Shifting to pump control by microcontroller when the central computer is abnormal and shifting to control by programmable controller installed at the pump stations when the microcontroller is abnormal double and triple back up was considered. The water-conveyance system is outlined in *Fig. 3.*

5. CONCLUSION

The new supervisory control system of the Sunzu Waterworks Nakajima Filtration Plant was outlined above. Future filtration plant management systems will demand advances functions and high reliability like those of this system because updating of existing systems will be substantial. In that sense, the supervisory control system of the Nakajima Filtration Plant is said to point to a new posture of filtration plant supervisory control systems from here on.