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APPLICATION OF FFI SYSTEM TO CHEMICAL AND FOOD PLANTS

Shigeru Tominaga
Toshiaki Suganuma

1 INTRODUCTION

Since the development of the low-loss optical fiber in 1970, the optical transmission technology has brought revolutionary changes to the communication field and remarkable progress to associated elementary techniques. Since the beginning of the 1980s, the revolutionary waves have reached the instrumentation control field. Various experimental trials to utilize the features of the optical transmission have been reported.

Fuji Electric Co., Ltd. published the Fuji Optical Fiber Field Instrumentation System (FFI) in 1984 (ISA) and in 1985 (JEMIMA). Employing the state-of-the-art opto-electronic technology, the FFI system can fulfill client needs-high reliability, rationalization, remote maintenance, etc. -by means of sensor intelligence and optical fiber transmission. The FFI system is the instrumentation system of the new generation succeeding the pneumatic and the electronic instrumentation systems. The FFI system has completed field proof tests and is now operating in actual plants. This report describes practical application of the FFI system in chemical plants and a food plant.

2 SUMMARY

In 1985 the FFI system was delivered to each of a special chemical plant 'A', a resin plant 'B', and a food material plant 'C'. *Table 1* shows the equipment employed for individual plant.

Table 1 List of equipment for 3 plants

Equipment \ Plant	A	B	C
Optical fiber resistance bulb transmitter	○	○	○
Optical fiber pressure transmitter		○	○
Optical fiber differential pressure transmitter		○	
Optical fiber diaphragm differential pressure transmitter	○		
Monobloc magnetic flow meter	○		
O/E converter	○		
Digital process control system MICREX-P Process station PCS-100 Operator station OCS-150	○	○	○

The FFI system for 'A' plant is described below. This FFI system includes electronic instruments in addition to optical fiber instrumentation. To secure reliability, the master station (MS), the FFI controller (FFIC), and the power supply part are provided duplex. Digital control system-MICREX-P (PCS/OCS)-is employed as the supervising/control part.

Fig. 1 shows the system configuration.

3 APPLICATION TO OPERATING PLANT

Through field tests for a few years, the FFI transmitters have been proved to function as expected. This Section discusses the MICREX-P/FFI system including the optical star coupler, transmitter, and the operator station; its adaptability to the plant, workability at plant construction, test efficiency, duration of installation, etc.

(1) The connector (water-proof optical connector) method, as a method of treating optical fiber cable ends, has significantly reduced the man-power for the connecting work compared with the splicing method.

(2) Optical transmission circuit loss margin was measured:
A Plant: 9-11.5 dB
B Plant: 8-12 dB
C Plant: 10-11 dB
These values satisfy the system design criteria.

(3) In an electronic instrumentation system, much time is spent for loop check for noise, insufficient insulation, insufficient grounding, etc. The opto-digital signals in the FFI system substantially eliminate the necessity of such checking work. As a result, the field test time has been significantly reduced.

(4) It has been proved extremely effective for plant start-up and operation that FFI transmitter output signals can be directly read as industrial values on the digital field indicators (liquid crystal=LCD).

(5) The optical fiber analyzer can detect cable break points by emitting optical pulse and measuring the reflected light, which is impossible by the two-wire current (DC-4-20mA) transmitting method. This has resulted in improved maintainability of the system.

(6) The MICREX-P/FFI systems have been working

Fig. 1 System configuration (A plant)

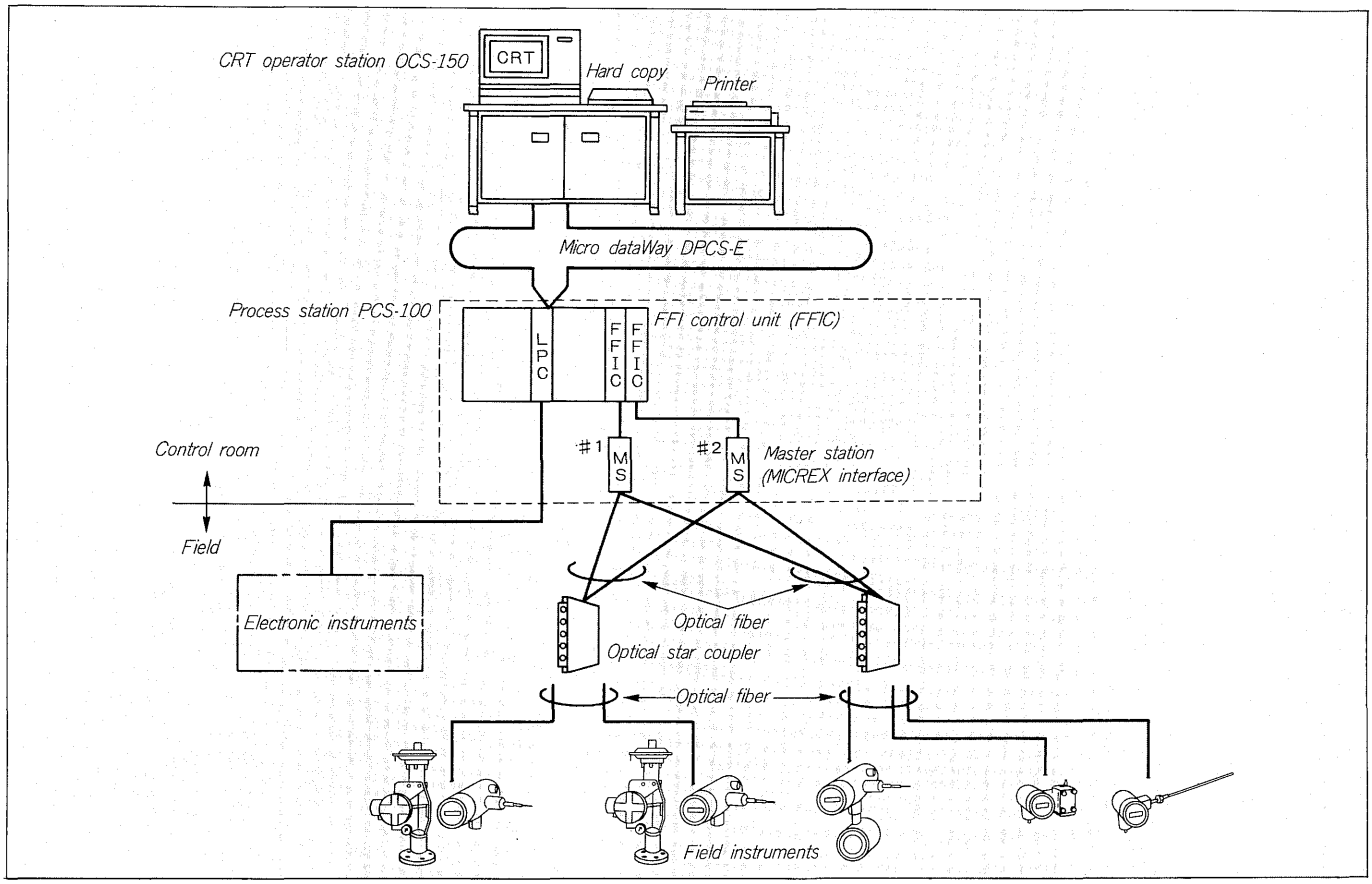


Fig. 2 Installation of optical fiber FFI transmitter

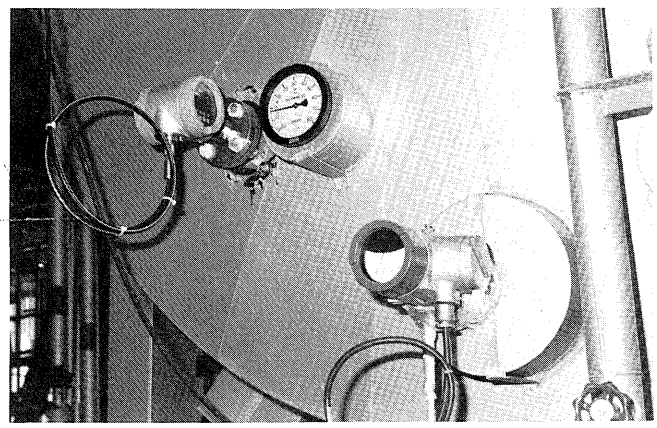
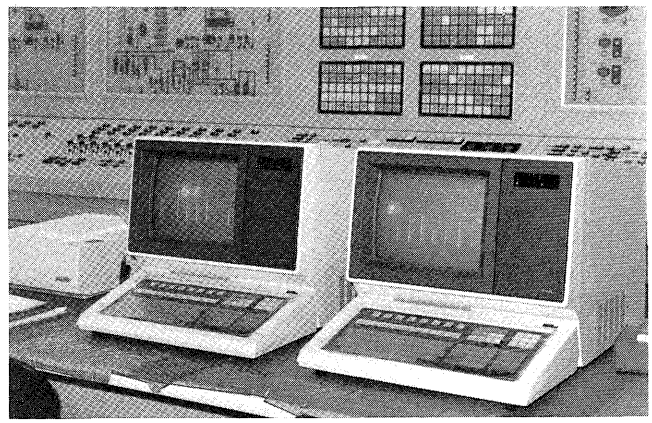


Fig. 3 Operator station OCS



without any trouble for several months since their installation. The system superiority in functions, performance, reliability, and maintainability has been proved as expected. (7) On the basis of valuable data, experience, and know-how obtained through experiments and installation work at plant site, we are confident that the MICREX-P/FFI system will be successfully applied to a larger plant scheduled in the future.

4 CONCLUSION

The optical technology, including optical communication and optical measurement, has been increasingly applied to industrial fields. As demands for optical fibers are rapidly increasing, the cost of optical fibers are markedly decreasing: the cost problem of optical fiber instrumentation systems has been almost debottlenecked.

We are confident that the FFI systems will be the main current of the field instrumentation in the near future, outstripping the electronic systems; similarly to the history that the electronic systems, co-existing with the pneumatic systems, gradually outstripped the latter. Wider application of optical fiber instrumentation systems is expected through various standardization in the optical transmission field. Fuji Electric would like to make more efforts to promote standardization.