

INSTRUMENTATION EQUIPMENT OF FUJI ELECTRIC

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1 INTRODUCTION

Throughout the last 20 to 30 years, process instrumentation and control technologies have remarkably progressed with the economical and social backgrounds in the generation, especially with the rapid technological innovation by electronics.

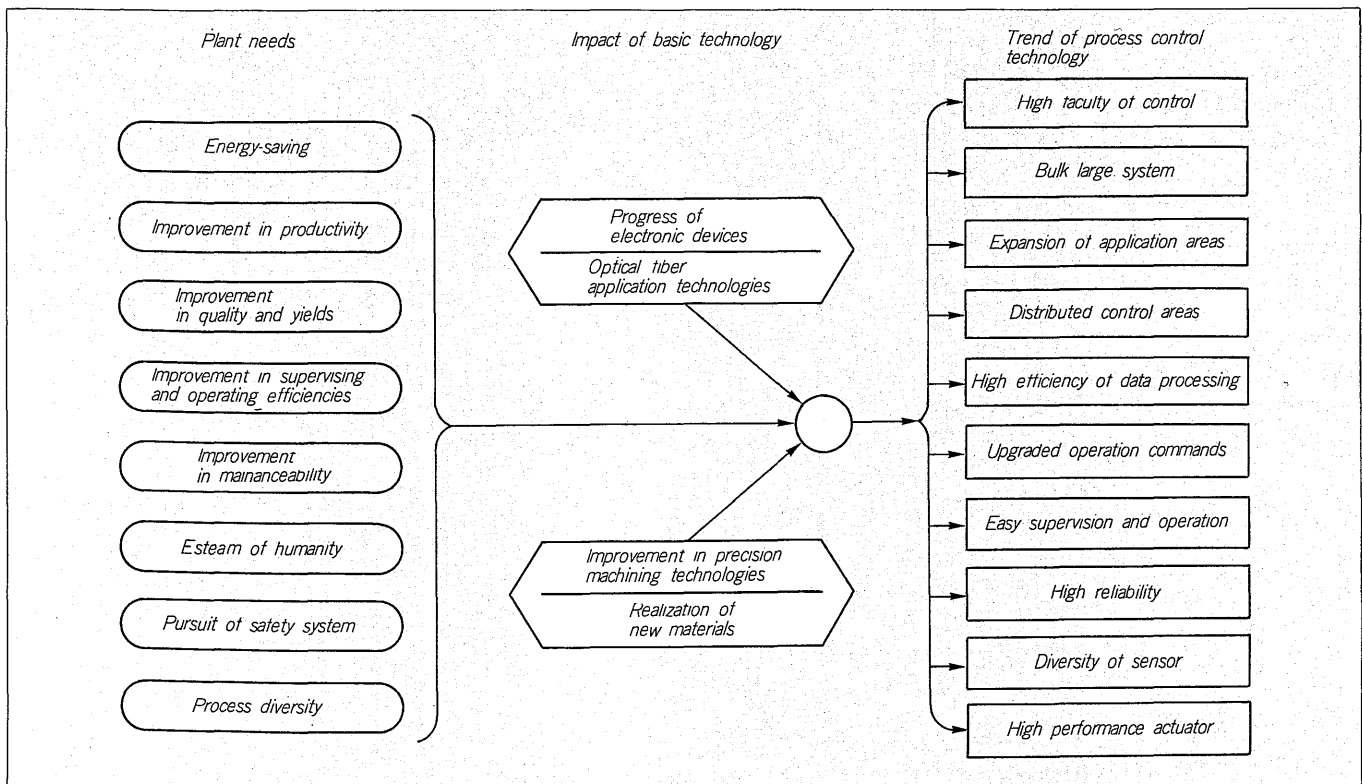
During the early stage, it was limited to process monitoring equipment only. Thereafter, it was progressed to automatically operating devices, and further, it has been developed to the automatic control/management systems having much higher functions. And, process instrumentation and control systems have responded to the needs in the generation such as improvement of productivity, improve-

ment of quality, particularly demanded during recent years, energy savings and improvement of safety as the support and driving force for modernization of the industrial equipment and facility. It would not be too much to say that it is one of the major technologies which have modernized our industry, and also have supported to elevate quality of products in international level.

Thus, process instrumentation and control technologies have advanced the steps by keeping the pace with the increasingly enhanced plant needs. *Figure 1* shows the trend.

Fuji Electric started its activities in the field of this process instrumentation and control more 40 years ago, and is one of the manufacturers who have supported this industry. With the system engineering accumulated through the experience toward many years and the most advanced technologies such as electronic technologies represented

Fig. 1 Progress in process control technology depend on plant needs



by microprocessors, new materials and precise machining techniques, Fuji Electric has provided always the users with leading products and systems, in this field.

It is our pleasure to introduce part of the Fuji Electric's process instrumentation and control technologies in this special issue of Fuji Review.

2 APPLIED FIELDS AND FUJI ELECTRIC'S PRODUCTS

Fuji Electric's process instrumentation and control technologies are applied to various fields. First, the large size control systems applied to many kind of industry processes, namely iron and steel works, oil, chemical, cement, textile and food plant, power plant, water and swudge treatment, and incinerator etc. Second, the machine controls applied to injection molding machines, dyeing machines, heat treatment furnaces, etc., and third, various environment measurements and monitorings for air, water radioactive ray, etc.

Fuji Electric is always available to supply series of products with which all sizes of process instrumentation and control system can be composed flexibly and moreover economically at the industrial field as described above.

Figure 2 shows series of Fuji Electric's products by each instrumentation and control field. As shown in the Figure 2, the product series covers various instruments and equipment from sensors for process to indicator, recorder, controller, actuator, analyzer, dosage meter/monitor, process computer, distributed digital controller and data transmitting system. With these series of products, of course various process instrumentation and control systems can be composed.

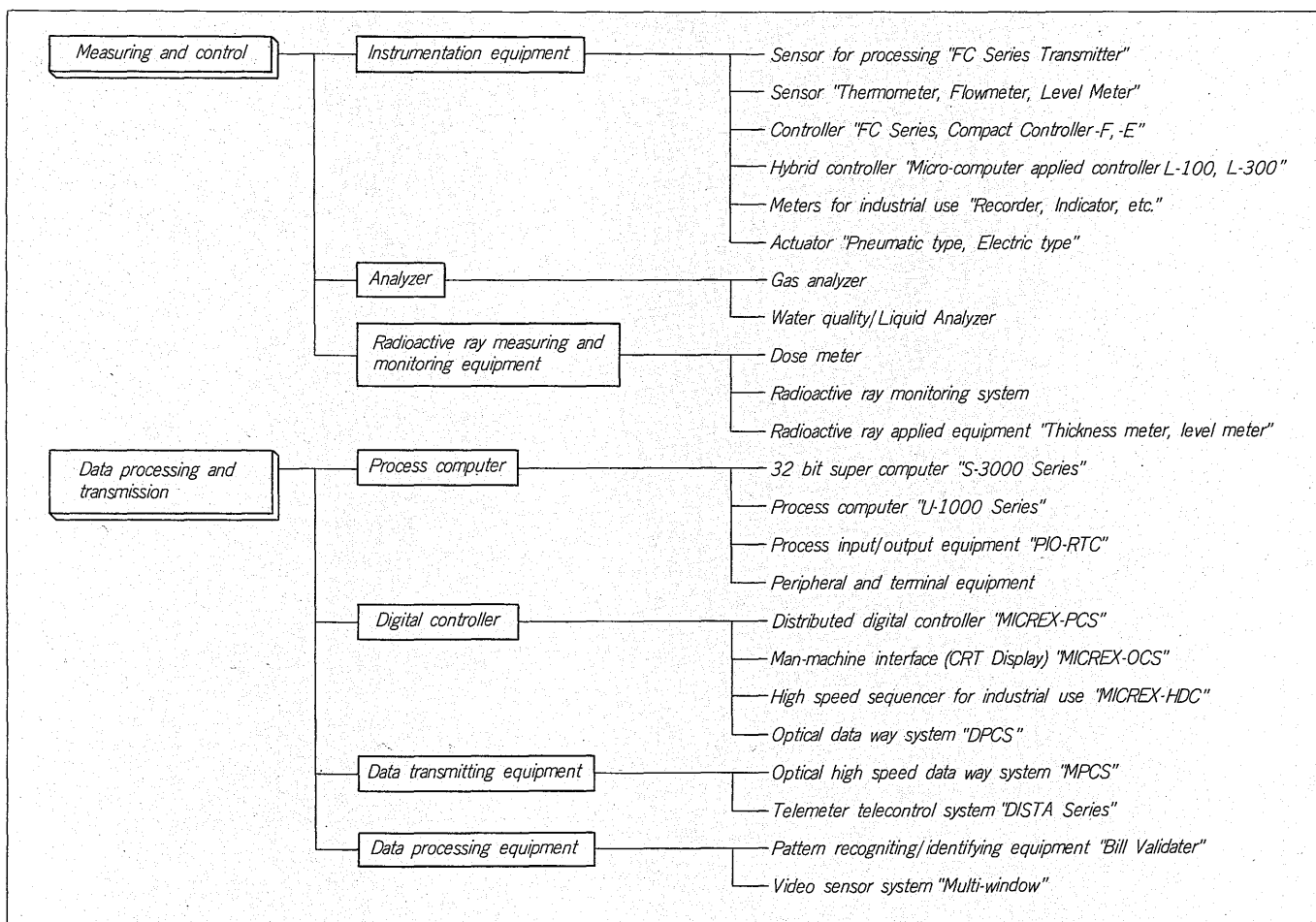
In this special issue of Fuji Review, centering around the system components and equipment such as sensor (for process, gas and radioactive ray), machine controllers, and the newest products, having the features that Fuji Electric is proud of are introduced.

3 FUJI ELECTRIC'S SENSOR TECHNOLOGIES

As an instrumentation control system manufacturer, Fuji Electric has thousands of the performance and accumulation of basic technologies for sensors which are needed in various systems, and is concentrating its efforts in responding to the further diversified needs.

Table 1 outlines the Fuji Electric's sensor technologies, where the main products and applied fields are classified by

Fig. 2 Fuji Electric's Product Series for the field of instrumentation and control



the elemental technologies.

As shown in this table, Fuji Electric is manufacturing various sensors such as those for temperature, pressure, flow and level which are most fundamental process measuring sensors, sensors for gas and water quality/content analyzers, sensors for various environment monitors used to analyze radioactive ray and concentration, sensors for thickness and dimensions, sensors for medical equipment, etc.

When observed from the phase of elemental technologies, they are supported by four large columns, namely, electromagnetic/static electricity applied technology, ultrasonic applied technology, optics applied technology and dosage applied technology.

And being supported by the development of micro-processors, data processing technologies have remarkably been advanced, and this has caused the expectation to sensors to increase. The other side, the various new materials appeared during the recent years and far advanced

precise machining technologies, for example, NC machines, welders using electron, laser, etc., have enhanced the improvement of products in this field.

FC Series transmitters and electromagnetic flowmeters are the results. They are widely used to measure pressure, flow and level at various process, and enjoying the high evaluations by the users.

Applications of ultrasonic wave, light and radioactive ray to the sensing technologies are expected to be ways of contactless measurements, and this is one of the elemental technologies to which Fuji Electric is particularly concentrating its efforts. In this special issue, ultrasonic flowmeters, infrared gas analyzers and seamless pipe thickness gauge are introduced.

As for new elemental technologies, there are applications of correlation technologies, new fine ceramic, bio-sensors (fixing enzyme), etc., and further developments of them are expected.

Further, intelligent sensors realized by applying a

Table 1 Sensor technologies in FUJI Electric

Elemental technology	Product	Application field
Electro-magnetic & Electrostatic sensing technique	• Capacitance type FC-series transmitter (pressure, flow, level)	Process
	• Electro-magnetic flow meter	Process
	• Electrolyte conductivity meter	Process
	• Paramagnetic oxygen analyzer	Furnace
	• Thermal conductivity gas analyzer	Furnace
	• Thermo couple & Resistance bulb (temperature)	Process, Furnace
Corelation technique	• Pulverised coal flow meter	Furnace
Ultrasonic sensing technique	• Flow meter	Water treatment
	• Level meter	Nuclear plant
Ceramic application technique	• Zirconia oxygen analyzer	Furnace
Semi-conductor technique	• Diffused silicon gauge (pressure, flow) (pressure, flow)	Automobile engine control
	• Pressure sensor/Level sensor	Process
	• Silicon γ -ray detector	Monitoring of RI radiation
Biochemical, microorganism application technique	• Immobilized enzyme electrode sensor (for blood glucose, uric acid, amylase)	Medical analyzer
	• Respiration rate meter	Water treatment
Optical sensing technique	• Non-dispersion infra-red gas analyzer (SO ₂ , NO, CO, CO ₂ , HC water vapour, anesthetic gas)	Process & Environmental pollution
	• Phosphorus luminescence trace oxygen analyzer	Medical analyzer
	• Ultra violet organic pollution meter	Oxygen manufacturing Plant
	• Infra-red plastic film thickness gauge	Water treatment
	• Video sensor (detector of surface defect)	Plastic film machine
Dosimetry technique	• Dosimeter	Machine
	• Thickness gauge	Process
	• Level meter	Process
	• Density meter	Process

microprocessors to the sensor and by providing a signal processing function have also been progressed, and digital and multiple data transmission systems have also been developed by using optical fiber instead of the conventional DC4 to 20 mA signal. The special issue introduces these newest technologies of Fuji Electric.

4 POSTSCRIPT

Fuji Electric's instrumentation and control technologies and products were outlined, and the products and technologies covered in this special issue were introduced.

This special issue introduces sensors as system components, and control equipment mainly. We hope you will

understand the Fuji Electric's technologies in this field.

The instrumentation and control technologies and distributed digital control system for large size control systems such as those for iron and steel works, chemical plants, cement plant, water and swadge treatment and power plants will be introduced in other special issue.

References:

- (1) 大山泰司：プロセス制御技術の現状と展望，富士時報，55，11，pp. 703～706（1982）
- (2) 秋山茂ほか：富士電機のセンサ技術の展望，富士時報，54，8，pp. 515～517

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TOPICS

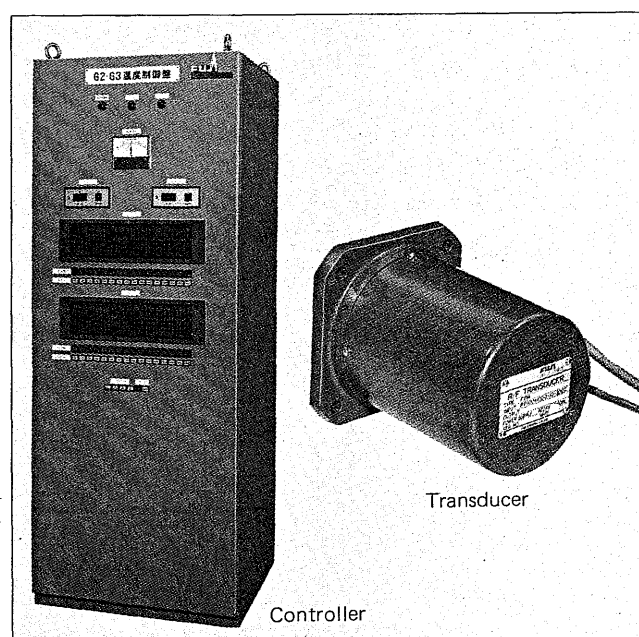
ROLL HEATER TEMPERATURE CONTROLLER

This controller measures and controls surface temperatures of a high speed roll heater used in a textile industries. Temperature transducer (Type: FTM)

1. A platinum resistance bulb is buried under the surface layer of the roller. Temperature signals detected by the platinum resistance bulb is converted to electro-optical pulse by the electronic circuit built-in the rotary body, and the pulse signals are sent to the stationaly unit. Power is supplied to the electronic circuit by the rotary transformer. With this desing, absolute values of temperature can be measured under contactless manner.
2. The electronic circuit constructed in a special hexagonal column structure provides highly accurate measuring performance and high reliability under a high speed rotation.

Controller

1. Since an over-shoot preventing function is added to the PI operation control, control can be made stably.
2. Abnormal occurrences which are typical on textile treating machines such as overheating of the heater, broken heater wire, fault of sensor and broken string are taken into considerations so that operators can take actions quickly for the occurrences.



3. With the temperature signal transfer function, the controller can be connected to a higher level monitoring system.