

TOSHIBA REVIEW

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Special Reports

Control and Measurement Systems

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Special Reports

Control and Measurement Systems

*New Developments in Control and Measurement Systems

YOSHINO Nobu

*New Technological Trends Supporting CIE Integrated Control Systems

OBANA Hideo OHBA Akira
TOSDIC™-CIE is a Toshiba control system that pioneered the integrated platform of computer, instrumentation, and electric control (CIE) in 1989. During its 12-year presence, TOSDIC™-CIE has evolved based on valuable voice of customer feedback from users. This paper explains the open information technologies incorporated in basic components of control systems such as the human-machine interface (HMI), controller, and control LAN, as well as the growth of Toshiba control systems. Finally, the evolution of systems applying TOSDIC™-CIE technology is described in industrial domains such as water supply and sewage treatment, iron and steel, and other fields.

*Core Technologies in New Control Systems

ASHIDA Kazuhide IWABUCHI Osamu HARA Kazuo
In the field of control systems, demand has arisen in recent years for functions that cannot be realized by the programmable logic controller (PLC) or distributed control system (DCS) alone. Demand also exists for supervisory control via networks or the Internet. Moreover, there is a strong need for the apparatus and devices that connect control systems with information systems to conform to de facto standards.

Toshiba has developed and commercialized the V series integrated controller, which expands the scope of applications by adding a computer to a PLC and DCS; "Factory View™," a software that enables remote control and monitoring functions to be realized; and the 2100 series, a new series of industrial personal computers responding to diversified user needs.

*Microwave Density Meter

HIRAI Renzo KANEKO Hiroyuki KOBAYASHI Katsuyuki
The microwave density meter is a measuring instrument that employs the microwave phase difference method. This instrument operates on the principle of capturing the change in a dielectric constant, etc. which originates in a change of density as the microwave propagation speed; that is, the phase difference.

Among the advantages of this type of density meter compared with conventional density meters are its greater strength against adhering dirt and its excellent maintainability. It is widely used in such fields as sewage treatment, the pulp and paper industry, and the food industry, and its application to further fields is expected in the future.

*Evolution of Supervisory Control Systems for Water and Sewage Plants

TONOZUKA Yoshikazu
A quarter of a century has passed since control systems using computers were first installed in public facilities. From now on, the level of requirements demanded of control systems will rise in line with their role as a core technology for wide-area management of public facilities, including unmanned facilities. With the introduction of information technology (IT) to control systems progressing in recent years, safe and robust operations as well as timely and flexible utilization of plant data and operating information must be realized for control systems.

This paper outlines these technological trends, using the TOSWACS™-V series control system.

*Control and Measurement Technologies for Water Supply and Sewage Treatment

KATO Takao KANEKO Masao IYASU Kotaro
Water supply and sewage treatment systems are essential infrastructures for urban life and the water environment. Instrumentation and control technologies are important for the operation of such systems. In recent years, in addition to operation, automation of maintenance has also become an important subject and the application of control and measurement technologies to equipment diagnosis and abnormality detection has been increasing.

Toshiba has been developing instrumentation technologies for abnormality detection, new measurement methods, control technologies for wide-area operation, control technologies based on modeling of biological processes, and other technologies to meet the demand in the water supply and sewage treatment fields.

*Application of Integrated Controller to Steel Plant Control System

NOJIMA Akira KASAHARA Ikuo
This paper describes the application of the V series integrated controller to a steel plant control system. An industrial plant control system requires open, high-performance electrical components. The V series integrated controller has been developed for open, high-performance industrial plant control systems, and can be applied to facilities ranging from small-scale processing lines to single-stand rolling mills, large-scale hot strip mills, and tandem cold mills with the same architecture.

The V series integrated controller can be applied not only to new plants but also to existing plants, because it has been designed taking connectivity to existing control systems into consideration.

*New Human-Machine Interface Technologies in TOSDIC™-CIE DS

OTA Hiroshi
TOSDIC™-CIE DS computer, instrumentation and electrical (CIE) integrated control system is a distributed control system (DCS) which has extensive functions for openness, maintenance, expandability, and flexibility. Applying the open technology of TOSDIC™-CIE DS, new technologies for the human-machine interface (HMI) have been developed with the aim of improving operational efficiency and reducing the user's workload.

The main technologies are DCS operation by a single screen, a remote service system, and an HMI of the panel computer type.

*Energy Management System

KAWASE Tatsuo
The objectives of an energy management system are maintenance management of electric power facilities and reduction of electricity costs by efficient utilization of electricity, as well as energy saving for environmental preservation. This paper describes energy management methods and provides examples ranging from high to low voltage; namely, extended systems using TOSCAM™-EM2 for electricity transmission and substation systems, and a feeder energy recorder that can clarify the actual electricity consumption conditions of low-voltage electric equipment.

Feature Articles

*InGaAIP-Based Red Vertical-Cavity Surface-Emitting Lasers for High-Speed POF Data Links

TAKAOKA Keiji HATAKOSHI Gen-ichi
Vertical-cavity surface-emitting lasers (VCSELs) are very attractive devices for use as light sources in low-cost, high-speed data links, because the output beam is emitted in a direction vertical to the substrate and the lasers can be as easily assembled as light-emitting diodes (LEDs).

Toshiba has successfully fabricated InGaAIP-based red VCSELs suitable for plastic optical fiber (POF)-based, low-cost, high-speed data links. A maximum continuous-wave (CW) lasing temperature of 60 °C, the highest value for red VCSELs emitting at wavelength regions shorter than 670 nm, has been realized with a very circular and narrow laser beam.

*Spherical Phosphors for Projection CRTs

ALBESSARD Ariane Keiko MATSUDA Naotoshi TAMATANI Masaaki
We have developed spherical phosphors and used them in projection cathode ray tubes (CRTs) for the first time in the world. Decomposition of the phosphor materials has been minimized by optimizing both the plasma treatment and annealing conditions. Phosphor layers made of spherical phosphors are found to be dense and thin. Thus, by optimizing the phosphor particle size with the aid of simulation calculations and using a newly developed electron gun, the resolution of the projection CRT has been increased by up to 40 %.

*Digital Switchboard for Tohoku and Joetsu Shinkansen Lines

IEIRI Ichiro HIRAGA Kazuhiro NAKAMURA Satoru
Nineteen years have passed since the opening of the Tohoku and Joetsu Shinkansen lines, and aging of the Shinkansen electric power control system, which performs supervisory control of remote facilities such as substations, is progressing. A decision was therefore made to renew the switchboards, encompassing 18 substations, as well as the supervisory control and data acquisition (SCADA) system.

Toshiba has been given responsibility for renewal of the local switchboards. For this purpose, Toshiba has developed a digital switchboard incorporating the latest microelectronic technologies to realize high functionality and improved reliability.

*A2 and A3 Series DC Twin-Rotary Compressors for Light Commercial Use

HAYANO Makoto KAWABE Isao KAWAMURA Kiyotaka
In order to protect the ozone layer and prevent global warming, it is necessary to develop air conditioners that use hydrofluorocarbons (HFCs) instead of hydrochlorofluorocarbons (HCFCs) and have greater energy efficiency than ever before.

We have developed a DC twin-rotary compressor series for light commercial air conditioners using the new refrigerant R410A (HFC) for the first time. This compressor series achieves 20 % higher efficiency and 33 to 50 % less weight than conventional compressors by using the twin-rotary mechanism and a new DC motor consisting of a rotor with a rare-earth permanent magnet and a concentrated-winding type stator.

*Vacuum Interrupter Type On-Load Tap Changer for Oil-Immersed Transformers

TAKIGUCHI Yukinobu TANIGUCHI Yoshinobu EBINA Sadanobu
The diverter switch of the on-load tap changer (OLTC) for conventional oil-immersed transformers is immersed in oil that becomes stained by arcing during changing operations. Consequently, the oil must be purified by an oil filter and the filter must be replaced at regular intervals. On the other hand, there is a need for mitigation of OLTC maintenance management.

Toshiba has developed a vacuum interrupter type OLTC applicable to oil transformers up to the 66~77 kV/20~30 MVA class. The vacuum interrupter type OLTC has the merit of mitigated maintenance management. Because the oil is only stained slightly, the contacts of the vacuum interrupter are not significantly worn away. Good results were obtained in various tests performed on the new OLTC, confirming its reliability.

*Compact Ceramic Metal Halide Lamp System

HONDA Hisashi MITA Kazutoshi ASHIDA Seiji
We have developed a miniature-high efficiency ceramic metal halide lamp with a compact high-frequency inverter which offers higher efficiency, truer color quality, and smaller size. This lamp is as small and as bright as a 100 W halogen lamp. The lifetime of this lamp is four times longer than that of a halogen lamp.

This system will offer larger energy-saving possibilities by replacing halogen and incandescent lamps.

*Digital Library System at National Theatre of Japan

YAMADA Takahiro WAKIZONO Ryuji OHNO Takako
The rapid expansion of the information society is dramatic, as exemplified by the Internet. The Japan Arts Council has developed a digital library system at the National Theatre of Japan, which records traditional Japanese arts and modern theatrical arts using the latest technology. It is intended that the contents will be used by educational institutions and preserved as an artistic heritage.

Toshiba has devoted its efforts to the realization of this system making full use of its high technology and know-how.

Techno Notes

*Meeting the Challenge of Medical Solutions

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