

Special Reports

Water and Sewage System Solutions for a Sound Water Environment

Technologies for Public-Private Partnership in Water Supply and Sewerage Field

MATSUI Saburo

Water Environment Problems and Their Solutions

SHINOHARA Tetsuya/ NOGUCHI Kazuhiko

Japan is a country with abundant water. However, when "virtual water" (water necessary to obtain food) is taken into consideration, the country in fact has a lack of water, and imports a large amount of virtual water from around the world. Obtaining water has become associated with risks because of global warming. An examination of the water situation in the world reveals conspicuous insufficiencies and uneven distribution of water resources. The population of Japan has begun to decline and the volume of water required is decreasing. As a result, demand for water is shifting from quantity to quality. Water supply and sewerage services are an essential part of society, and sustaining healthy water circulation is playing an increasingly important role. Toshiba is devoting its efforts to the solution of problems in the water supply and sewerage services field by providing key technologies and promoting partnerships with both government bodies and the private sector, making full use of its systems engineering capabilities.

Water Supply and Sewerage Service Business and Solutions

YAMAKAWA Masahiro / MOTOKURA Yoshihiro/

In recent years, a significant trend in the field of water supply and sewerage services has been the shift from public to private management. Legal preparations have been proceeding, such as the designated administrator system and trust waterworks management. Low cost and high quality are demanded in this service business sector. Toshiba has not only been providing electrical equipment in this sector on a stable basis, but also contributing to water supply and sewerage management and the improvement of facilities. We have also begun the full-fledged provision of one-stop solutions, including in the areas of administration and finance.

Water Service Solution Technologies to Achieve Safety, Stability, and Continuity

TAMAKI Shojiro / KUNIMI Masaki /SOMA Takahiro

Japan's Ministry of Health, Labour and Welfare announced a new water supply service policy in June 2004. This policy, called the "Water Service Vision," sets out concrete solutions to deal with serious future issues related to water supply services. The goals of the policy are to realize safe, stable, efficient, and continuous water supply services. To achieve these goals, the ministry has strong expectations on private corporations in various areas, including high-value-added technologies, new water filtration plant solutions, and private financial initiative projects. Toshiba is developing solution technologies required for the future water supply service business.

Solution Technologies for Sewerage Facilities Utilized in River Basin Management

HATSUSHIKA Yukio / UMEDA Kenji/YAMAMOTO Katsuya

Serious issues in the water environment related to sewerage systems include eutrophication caused by nutrients such as phosphorus and nitrogen, urban type flooding due to sudden storms, and river water pollution from combined-sewer overflows. Sewerage facilities are required to provide countermeasures against such issues. In order to provide countermeasures effectively and efficiently, efforts are being made to realize basin-wide management of sewerage systems based on cooperation between multiple municipalities. Toshiba has been developing instrumentation systems, prediction systems, control systems, and operational support systems for sewerage facilities. This paper outlines our control systems and evaluation techniques for performing basin-wide management.

Maintenance Management and Solution Development Efforts in Water Supply and Sewerage Businesses

SHIMODA Osafumi /YAMATO Ryota

Toshiba is expanding its scope of business activities in the water supply and sewerage maintenance services field from after-sales services to operation and maintenance management, not only of individual electrical facilities but also of plants as a whole. There is a growing movement to consign municipal water supply and sewerage services to private companies, in which Toshiba is also involved. Consignments are made with the expectation of higher quality of maintenance management, improvements in field management, greater running efficiency, and cost reductions. This paper introduces examples of successful operation and maintenance management of municipal water supply and sewerage services consigned to Toshiba.

Process Equipment and Instrument and Control Technologies Supporting Effective Operation of Water Treatment Plants

MATSUSHIRO Takeshi / YOKOKAWA Katsuya / ABE Norimitsu

In response to the growing social awareness of the need for safe and palatable water, Toshiba has been offering highly advanced and effective systems for the operation of municipal water treatment plants utilizing water treatment devices such as ozonizers as well as instrument and control technologies. We intend to continue our efforts to develop advanced water treatment facilities as well as facilities management systems covering a wider area, with the aim of optimizing the total system and realizing more effective and economical operation of municipal water services. For this purpose, we are conducting R&D work on membrane filtration, ultraviolet disinfection, ozone injection control, and water operation scheduling system technologies.

System Technologies for Urban Drainage

NAGAMORI Yasuhiko /KATAYAMA Kyosuke

Sewerage facilities are required to reduce the effluent load on receiving water bodies such as rivers and to prevent urban flooding as well as overflowing of combined sewers. Toshiba has been developing and supplying various advanced operational control systems to support the efficient operation of sewerage facilities, based on system technologies such as instrument and control, simulation, prediction, and optimization technologies. This paper addresses the subjects of chlorine injection rate control for residual chlorine reduction, and drainage pump control in a combined sewer facility for simultaneous prevention of flooding and combined sewer overflow.

Feature Articles

Development of High-Performance MOSFETs with Dopant-Segregated Schottky Junctions

KINOSHITA Atsuhiko /UCHIDA Ken / KOGA Junji

The performance of metal-oxide-semiconductor field-effect transistors (MOSFETs) with dopant-segregated Schottky (DSS) junctions was compared to that of conventional MOSFETs. The DSS technique makes it possible to form shallower junctions with much lower resistance than the conventional source/drain structures. Additionally, it does not degrade the channel mobility.

Toshiba has demonstrated complementary metal-oxide semiconductor (CMOS) ring oscillation with sub-100 nm-channel DSS source/drain MOSFETs for the first time in the world. A DSS n-type MOSFET with a 50 nm channel length shows a drive current 25 % greater than that of a conventional n-type MOSFET. The drive current of DSS transistors corresponds to that of the next generation of conventional transistors.

Biaxial Superconductor Films with Excellent Properties Derived from Highly Purified Coating Solution

ARAKI Takeshi

The yttrium (Y)-based superconductor is one of the most attractive oxide superconductors, because it has the largest critical current density (Jc) among them at 77 K, 0 T. Recently, this superconductor has been produced by non-vacuum chemical means. The predominant process employed in this field is metal-organic deposition using trifluoroacetates (TFA-MOD). However, purified coating solution, which is indispensable for the preparation of high-Jc superconductors, is difficult to obtain. Hydrogen bonds between the fluorine and hydrogen atoms disturb the purifying process and increase impurities. Toshiba proposed and indirectly confirmed an impurity-trapping scheme and utilized it to effectively expel the impurities. Ultimately, the amount of water, which is the most harmful impurity in TFA-MOD, was reduced to one-twentieth, and the resultant coating solution successfully yielded a superconductor with a Jc eight times that of the conventional type. This promising result has stimulated studies on the application of this process to microwave filters, wires, and tapes.β

Image Processing System Compatible with MPEG-2 Specifications

AKINOSHITA Haruki / SUZUKI Yoshihiko

Toshiba has developed traffic surveillance systems that automatically detect unusual occurrences by processing images obtained from surveillance cameras installed in tunnels on expressways and other roads. With the progress of communications technology, digital transmission of camera images has become the standard and direct processing of online images is required.

In response to these circumstances, we have now developed a traffic surveillance system that complies with the MPEG-2 specifications, as well as an image processing technology that can stably extract the car region from only one image taken in an environment of continuously changing illuminance.

Vodafone 904T Vodafone 904T W-CDMA Phone

SANADA Yoshihiro / NOMA Satoru / TANISADA Masahiro

The Vodafone Group has been developing third-generation (3G) cellular phone convergence models that can be used in more than 100 countries worldwide, while many vendors are also shifting their services to 3G cellular phones. It has been more than one year since 3G service was launched, and users have been steadily changing to 3G cellular phones. Toshiba brought its first product in this line to market in June 2005, and has been releasing a succession of products since then. We are now launching our long-awaited fourth product, the 904T model, on the market, in preparation for the introduction of mobile number portability (MNP) in Japan in 2006. The Vodafone 904T wideband code division multiple access (W-CDMA) phone is a high-tier cellular phone that supports dual-mode radio technology, which expands the available area of coverage; video telephone functions; and all of the latest Vodafone 3G services. It also features Toshiba's original "Grip style" with a seven-button layout under the LCD, which improves operability.

W41T CDMA2000 1xEV-DO Cellular Phone for Japanese Market

NAKAMURA Masaru / YUKI Yoshinori / KOJIMA Kei

Japanese cellular phone service provider au launched the CDMA2000 1xEV-DO (code division multiple access 2000 1x evolution data only) service in November 2003. This service provides a maximum forward link communication speed of 2.4 Mbps, enabling higher quality music or other large-volume contents to be downloaded. Consequently, the cellular phones must have a large memory storage capacity. To meet this requirement, Toshiba has developed the W41T model, Japan's first music player cellular phone with a built-in hard disk drive (HDD), with 4 GB of memory storage. The W41T also supports mass-storage-class universal serial bus (USB), allowing users to enjoy music, pictures, and movies or to carry large volumes of data. Durability against vibration and impact in operation is improved by the adoption of a buffer memory for playing music and the application of shock-absorbing gel around the HDD.

High-Speed Board Simulation Technologies for Notebook PCs

KAWAGUCHI Hitoshi / KONDO Yasumasa / KOGA Yuichi

We are entering the age of Giga Hertz PC when the transmission speed of signal lines of notebook PCs exceeds 1 GHz. In addition, high-speed signal lines make up an ever-growing share on the PCBs. The faster transmission speed degrades quality of signal transmission and causes noise current on the power plane as well as EMI noise, which cause unexpected delay in development period.

Toshiba's notebook PC development divisions are using CAE tools such as simulators, design rule checkers, and so on at the initial stage of hardware design, in order to deal with these problems and shorten the development period of products. Recently, these tools have also come to be used at the PC specifications or wiring guidance study stages, significantly contributing, together with wiring miniaturization to make PCs thinner and lighter, to the advancement of Toshiba's philosophy of "Thin & Light PCs."

Startup of High-Head Pump-Turbine with World's Largest Capacity at Kannagawa Power Station

TODA Kazunori / KUROKAWA Toshifumi / KONNAI Tadashi

The first unit at the Kannagawa Pumped-Storage Power Station of The Tokyo Electric Power Co., Inc. was recently commissioned. This new facility is equipped with a high-head reversible pump-turbine having the largest capacity in the world. The equipment designed and manufactured by Toshiba for this power station represents a number of impressive firsts. The reversible pump-turbine has the world's largest unit capacity of 482 MW, and the pumping head of 728 m ranks among the world's highest. A splitter runner with five long blades and five short blades in circumferentially alternate positions was adopted as an advanced technology, and has contributed to a wider operating range and higher reliability of the pump-turbine through its higher hydraulic performance and smaller pressure fluctuation than conventional runners. An advanced control governor based on the latest numerical technology was also adopted, contributing to a reduction in construction costs through its function of suppressing water surges in the waterway during automatic power and frequency control (APFC) operation.

Paper Transport Technology for OCR Scanners

KASHIMA Hideyuki / NAGAI Tomio

Toshiba Solutions Corp. has been developing and manufacturing scanners for optical character readers (OCRs) that read and recognize the contents of paper documents. In this device, a variety of information such as images, colors, characters, and meanings is acquired as electronic data from paper that is transported by paper transport technology. Accompanying the advances in character recognition and image processing technologies, the types of vouchers and other forms that OCR scanners can handle are increasing. At the same time, paper transport technology capable of handling paper of different thicknesses, sizes, and qualities has also been evolving.

Frontiers of Research & Development

Application of Fiber-Reinforced-Plastic Composite Bearing to Hydroelectric Generator