

System Technologies for Water and the Environment

Technological Contributions toward Realizing an Environmental Nation in the 21st Century

FURUMAI Hiroaki

Water and Environmental Solution Technologies Aimed at Stable Supply and Environmental Restoration of Resources

NAKADA Masajiro / AMEMIYA Takashi

Countermeasures against environmental problems on a global scale have become an important issue in recent years. Such countermeasures include prevention of global warming, building a sustainable society, and securing a robust water cycle necessary to protect the environment from water resource shortages.

Toshiba is promoting innovation to solve global environmental problems, in which a trade-off relationship is considered to exist between the enjoyment of an affluent life on the one hand, and the reduction of environmental impacts on the other. To improve the efficiency of this relationship, we have been developing eco-friendly products and advanced water and environmental systems for the stable supply and environmental restoration of resources.

Environmentally Conscious Products for Water and Sewage Plants

MIYAO Keiichi / SUNOUCHI Yasumasa / SUGINO Toshiharu

The growing worldwide trend toward environmental preservation in recent years, including the reduction of carbon dioxide (CO₂) emissions, has also had an impact in the field of water supply and sewage services, where demand for further energy saving has been increasing. This reflects the fact that the electric power consumed in the operation of such plants accounts for about 1.68% of Japan's total electricity consumption.

Toshiba has been applying highly efficient system control and other technologies to the development of environmentally conscious products and systems, including those for water supply and sewage plant operation, in order to reduce specific toxic substances and (CO₂) emissions.

Water Treatment Equipment for Environmental Load Reduction

TAMAKI Shojiro / MORIKAWA Akira / MATSUSHIRO Takeshi

With the increasing seriousness of environmental degradation due to global warming, measures to deal with environmental issues are also necessary in the water supply field. Toshiba has been providing various energy-saving equipment as well as monitoring and control systems, ranging from systems for the effective operational control of individual processes to water management systems covering wide-area facilities to achieve comprehensive efficiency.

We intend to continue our efforts in such areas as the development of ultraviolet (UV) disinfection equipment and membrane filtration equipment, which are expected to play a role in the future expansion of water supply facilities while also meeting the requirements for environmental preservation.

Methane Fermentation and Wastewater Treatment

TAMURA Hiroshi / YAMAMOTO Katsuya / TAKAMATSU Seisho

In the industrial field, particularly in the food industry, the organic load of industrial wastewater is so high that reducing the space of wastewater treatment facilities and cutting maintenance costs have arisen as issues. The conventional activated sludge process for treating wastewater has been replaced in recent years by improved wastewater treatment technology incorporating a methane fermentation process, realizing an ecologically friendly system. Application of the methane fermentation system is expected to expand from food-processing factories to various new fields.

Toshiba has been developing wastewater treatment technologies based on the upflow anaerobic sludge blanket (UASB) system, including a double-stage UASB system, biodesulfurizing system, and hydrosulfide stripping system, as well as applications for these technologies.

Remediation Technology for PCB-Contaminated Soil

SATO Takeshi / TAKAYANAGI Shuji

In recent years, problems related to polychlorinated biphenyl (PCB) -contaminated soil have been increasingly manifesting. Safe and dependable remediation technology is therefore required to reduce the burden of environmental protection borne by future generations.

Toshiba has developed a technology called "geosteam technology" for the remediation of PCB-contaminated soil. This technology realizes the dependable destruction of PCBs by a chemical reaction using steam. Following the step-by-step verification of this technology by public tests, Term Corporation, in cooperation with Toshiba and Konoike Construction Co., Ltd., has built Japan's first commercial plant for remediation of PCB-contaminated soil in Kitakyushu City. Term Corporation concluded an agreement on environmental protection with Kitakyushu City in March 2007, and started practical remediation in August of the same year.

We intend to continue our efforts for the development of remediation technology to reduce the future environmental burden.

Advanced Collection and Reuse Technologies for Biomass Resources

IMAI Tadashi / YAMAMOTO Katsuya / KOMINE Hideaki

Demand is growing in society for the effective utilization of various types of biomass. In order to maintain a sustainable society, Toshiba has been researching and developing a variety of biomass utilization technologies.

In the field of energy applications, we have been developing a conversion technology for the degradation of sewage sludge into combustible gas and solid fuel that can be easily transported, with high-temperature burning of the gas providing thermal energy for the process and serving as a means of reducing greenhouse gases. We are now evaluating the thermal decomposition performance of this technology using a demonstration plant.

In the field of material applications, we have been researching both separation and recovery technologies for phosphorus from the wastewater of sewage plants, as well as a technology with a simple system configuration for the conversion of wood into high-performance carbon material.

Water Supply and Sewerage Operation Services to Achieve Safety, Stability, and Continuity

INOMATA Yoshinori / OSAWA Yosuke / SUZUKI Haruo

The management of water supply and sewerage facilities of local public entities has been shifting in recent years from public to private management, such as comprehensive third-party commissioning and performance orders, due to financial circumstances. Taking advantage of private-sector management and technical capabilities in comprehensive private management, not only the maintenance of quality but also high efficiency of services and improvement of economic efficiency are demanded.

Toshiba has been providing new water supply and sewerage operation services in the operation and maintenance management field, based on operating improvement techniques, applicable support technologies, and technologies contributing to environmental preservation.

Feature Articles

Analog Imperfection Correction Schemes Using Digital Signal Processing for Wireless Communications

TANABE Yasuhiko / TAKEDA Daisuke / EGASHIRA Yoshimasa

Imperfections in analog circuits are a serious obstacle to the achievement of high-data-rate transmission in wireless communications. In general, highly accurate analog circuits require a relatively large area and high power consumption. On the other hand, it is not necessary that the area and power consumption of large-scale integrated circuits (LSIs) for digital signal processing increase proportionally as signal processing in the physical layer increases.

Toshiba has developed techniques to correct analog imperfections using digital signal processing for multi-input multi-output (MIMO) orthogonal frequency division multiplexing (OFDM). These techniques make it possible to realize highly accurate devices for wireless communications, even when low-cost and low-power-consumption analog integrated circuits are used.

Weight-Saving and High-Speed Data Transmission Technologies for Flexible Printed Circuits

MURO Kiyomi / TORIGOSHI Yasuki

High-speed transmission technologies such as Universal Serial Bus 2.0 (USB 2.0), Peripheral Component Interconnect Express (PCI Express), and Serial Advanced Technology Attachment (SATA) are being adopted in mobile notebook PCs for high-speed and large-capacity data transmission. As a result, demand for improved transmission characteristics of the flexible printed circuits (FPCs) connected to the main printed circuit board (PCB) and of individual component parts is also becoming severe.

Toshiba has developed a weight-saving FPC in pursuit of thinner and lighter mobile notebook PCs, and has been making efforts to improve the transmission characteristics of FPCs toward the next generation of high-speed technology.

Ku-Band 50 W-Class GaN HEMT

TAKAGI Kazutaka / MATSUSHITA Keiichi / ONODERA Ken

Toshiba has developed a gallium nitride high-electron-mobility transistor (GaN HEMT) with an output power exceeding 50 W for the Ku-band (12-15 GHz) frequency range used in base stations for satellite microwave communications, radar systems, and other applications. We adopted a via-hole technology newly developed for semiconductor dies at Ku-band frequencies, based on the technology developed for X-band (8-12 GHz) GaN HEMTs. The new device achieved a peak output power of 65 W at 14.5 GHz. Solid-state amplifiers incorporating this HEMT are expected to replace electron tubes for Ku-band applications.

VIDEOSTM SE Flash Memory Video Server for Sportscast and Program Editing

DACHIKU Kenshi / SHIRATORI Masashi / HANAFUSA Yuichiro

Toshiba has developed the VIDEOSTM SE flash memory video server featuring small size and high reliability, making it ideal for sportscast and program editing. The size of the equipment has been miniaturized from the conventional 7U (310 mm in height) to the 4U (177 mm in height) size, and it can be used in narrow spaces such as a relay car. With the JPEG-2000 image compression system, images can be randomly accessed at high speeds with frame-by-frame accuracy. Furthermore, insertion, split, and assemble editing are possible in combination with the supporting controllers.

Stereo Vision Technology for Automotive Applications

HATTORI Hiroshi

Toshiba has developed a domain-specific, area-based stereo vision method for safe navigation, which is applicable to the detection of cars, pedestrians, and other objects on the road. High-speed and highly precise stereo calculation is achieved by incorporating a spatial restriction in the height direction of road scenes into the recursive computation of correlation measures. We mounted this system on our ViscontiTM image-recognition LSI and realized stereo calculation operation equivalent to that of a processor with a processing speed of 2.8 GHz. We also applied this technology to a side-collision warning system for a heavy-duty truck when making left turns, and verified the validity of the system in an experiment using actual images.

Frontiers of Research & Development

Evaluation of Risk in Health Care Processes Using Risk Failure Mode and Effects Analysis (RFMEA) and Incident Reports