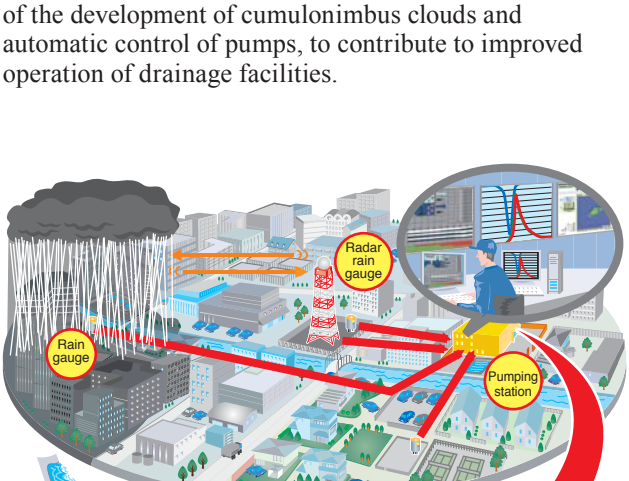
Rainwater Drainage System Using 9 GHz-Band Solid-State Radar

The radar rain gauge is a highly effective means of observing torrential downpours, which have been occurring more often in recent years due to global climate change. The 9 GHz-band solid-state radar developed by Toshiba allows accurate observations of rainfall by obtaining information not only from the strength of the radar echo, but also from the phase, wind speed, etc. In addition, the cost of maintenance and operation is lower than ever before.

We have now developed a rainwater drainage system as an application using the solid-state radar. The typical functions of this system include:

- rainfall inflow forecasting technology, which forecasts the inflow of water to a pumping station in advance
- support for pumping operations, which decreases flood risk at the time of rainfall
- identification of unexpected infiltration points in a separate sewerage system by off-line analysis.

In the future, we will endeavor to develop further applications of the rainwater drainage system such as technologies for forecasting torrential rain by observation of the development of cumulonimbus clouds and automatic control of pumps, to contribute to improved operation of drainage facilities.



Rainwater drainage system

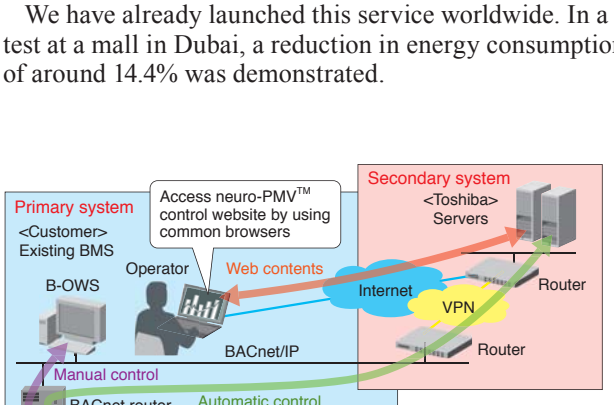
Remotely Managed Energy-Efficiency Service for Air-Conditioning Systems

Toshiba has developed a service that can help customers (owners of buildings) to easily realize energy efficiency for their building air-conditioning systems. Although various high-efficiency and energy-efficiency devices have recently become available through technical innovations, the high initial costs discourage customers from installing these devices for energy-saving. In contrast, our remotely managed energy-efficiency service for air-conditioning systems eliminates the need for high initial costs because customers can receive the service simply by paying a certain percentage of the savings achieved by the service itself as the charge. In other words, if energy consumption is not reduced, the customer does not have to pay the service fee.

A feature of this service is that it maintains comfort levels while preventing energy wastage by connecting the Toshiba energy-efficiency system to a customer's existing building automation system via the Internet. First, the Toshiba energy-efficiency system reads information on the customer's air-conditioning systems using BACnet, a communication protocol for building automation and control networks standardized by the International Organization for Standardization (ISO). Then, the system calculates and writes an optimum temperature set point for each device in the customer's building.

The service not only reduces wastage of energy such as by excess cooling or heating, but also helps building operators better manage their facilities on a daily basis.

We have already launched this service worldwide. In a test at a mall in Dubai, a reduction in energy consumption of around 14.4% was demonstrated.



PMV: Predicted Mean Vote
IP: Internet Protocol
B-OWS: BACnet operator workstation
DDC: direct digital controller
AHU: air handling unit
VPN: virtual private network
BMS: building management system

System diagram of energy-efficiency service

TOSAQLEAR Medium-Pressure Ultraviolet Irradiation Equipment for Safe Drinking Water Supply

Ultraviolet (UV) irradiation is attracting attention as a safe method for the disinfection of drinking water, which avoids residual toxicity caused by the addition of chemicals. In Japan, UV treatment was newly approved for water purification systems as a countermeasure against chlorine-resistant pathogenic organisms such as cryptosporidium(*) by the Ministry of Health, Labor and Welfare in 2007.

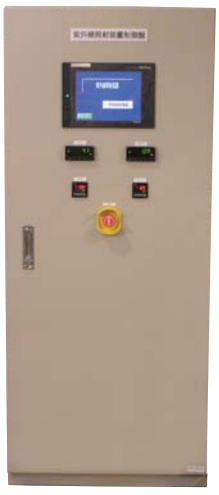
With this as a background, Toshiba has developed the TOSAQLEAR UV irradiation equipment with a capacity of 2 000 to 31 500 m^3/day.

This equipment consists of a UV irradiation reactor that irradiates raw water with UV rays and a control panel that supplies electric power to the UV lamps. Since the equipment uses medium-pressure lamps, a smaller number of lamps is required compared with systems that use low-pressure lamps, and the equipment can be applied to larger plants, resulting in a lower initial cost. Other features of this equipment include easy maintenance, and greater freedom of installation due to the compact dimensions of the equipment.

Thanks to the use of simulation technology for the design of the UV irradiation reactor and medium-pressure lamps, TOSAQLEAR achieves the top level of irradiation efficiency in the industry as well as reduced running costs.

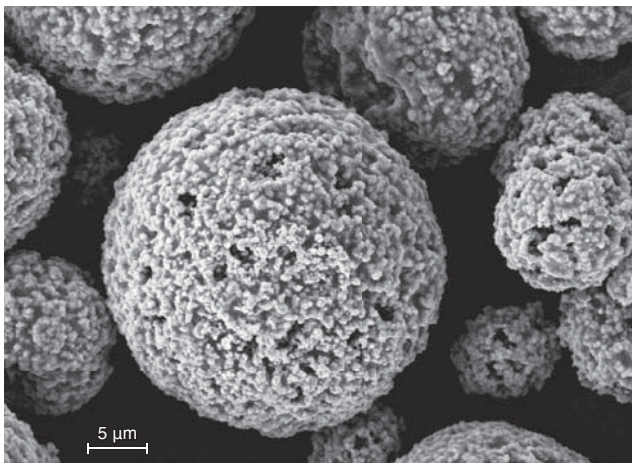
(*) A highly chlorine-resistant protozoan parasite that infects a wide range of mammals and causes diarrhea

UV irradiation reactor



Control panel

New Highly Selective and Reusable Functional Powder Adsorbent for Wastewater



Scanning electron microscope (SEM) image of oil adsorption material for wastewater treatment

Toshiba has developed a new functional powder (FP) adsorbent that adsorbs only toxic materials or valuable materials in wastewater.

Unlike conventional adsorbents used for disposal, this FP is easily reusable and the adsorbed material is removable from the FP at high concentrations. The FP can be readily adapted for various target materials by controlling its molecular structure.

The ability of the FP to adsorb oil components in oil-containing wastewater exceeds that of conventional adsorbents. Low-concentration oil in industrial wastewater is associated with high waste-disposal costs. The FP can adsorb 99% or more of oil present in wastewater at a concentration of several hundred ppm, and the adsorption-desorption cycle can be repeated 100 times or more. Consequently, the application of this new wastewater treatment method reduces the cost of sludge disposal.

ON-AIR MAX™ FLASH Flash Memory Video Server

ON-AIR MAX™ FLASH

Toshiba developed the world's first flash memory video server, the ON-AIR MAX™, in the mid-1990s. This marked the introduction of a flash memory system with a high level of hardware reliability unmatched by previous hard disk drive (HDD) server models into the broadcasting market.

With flash memories accepted today as the standard for data storage, we continue to move forw1ard with a new-generation flash memory video server, the ON-AIR MAX™ FLASH, now well over a decade later.

The ON-AIR MAX™ FLASH has 10 Internet Protocol (IP) ports, each with approximately 700 Mbits/s of dedicated bandwidth for non-real-time file transfers, enabling the server to handle files such as Material Exchange Format (MXF) faster. It also offers simultaneous input/output operation with 40 channels of frame-accurate real-time baseband output ports, enabling flash memory storage to currently be scaled up to 60 Tbytes.

With its open-architecture design, the ON-AIR MAX™ FLASH can easily incorporate additional formats such as H.264 upgrades. For control, the system offers an open application program interface (API) over IP, allowing various media asset management (MAM) applications and third-party controllers to neatly tie into the ON-AIR MAX™ FLASH for more intricate workflows. The standard Video Disk Control Protocol (VDCP) is also accepted.

The ON-AIR MAX™ FLASH can be upgraded and serviced with hot-swappable components and can be adapted to the customer's ever-changing workflow, creating a flexible system that grows as requirements expand.

Nanocarbon from Woody Biomass

Nanocarbon is known as a performance material that can improve strength, electrical conductivity, and thermal conductivity when added to base materials such as plastics, ceramics, and metals.

Based on its original technology, Toshiba has developed a method of producing nanocarbon employing unused woody biomass as the raw material, instead of fossil resources that have generally been used so far. The adoption of biomass makes relatively stable procurement of raw materials possible.

The aim of this project is to put nanocarbon on the market at a feasible price.

We are now verifying not only the quality of the nanocarbon produced but also the efficiency of the process, such as the ratio of the mass of nanocarbon (output product) to the mass of woody biomass (input material). This project will also lead to improved management of forests, contributing to increased carbon dioxide (CO_2) absorption.

Flow from material to product

Distributed Antenna System for Outdoor Coverage of Cellular Phone Base Transceiver Stations

Distributed antenna system for outdoor coverage of cellular phone base transceiver stations

A distributed antenna system for outdoor coverage enables expansion of cellular phone communication areas by distributing the radio frequency (RF) signals from base transceiver stations (BTSs) to multiple antennas via optical fibers. Fiber optic technology makes it possible to transmit the signals over long distances, realizing a wider communication area.

Toshiba has developed a distributed antenna system for outdoor coverage that is applicable to both Long Term Evolution (LTE) 3.9th-generation (3.9G) and third-generation (3G) BTSs.

This new system uses high-speed digital sampling technology for the RF signals. This technology has already demonstrated excellent performance with a strong track record in our indoor coverage systems over the years. By optimizing the technology for outdoor solutions, our new outdoor coverage system has following technical features:

- transmission of wideband BTS signals
- distribution of signals to multiple antenna locations
- long-reach transmission using dark fiber(*).

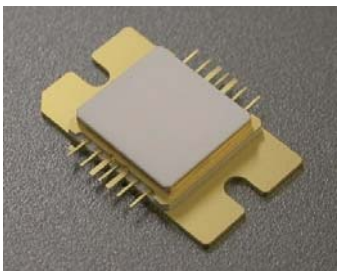
We have also applied high-power amplifiers for the transmitters and low-noise amplifiers for the receivers of this system.

Thanks to the above technologies, our new outdoor coverage system makes it possible to flexibly realize a large variety of communication areas. Solutions for communication areas include:

- solutions for radio shadow areas outdoors
- solutions for radio congestion spots outdoors
- solutions for handover communication areas (communication areas along highways, railways, etc.).

(*) Dark fiber: Optical fiber infrastructure that is currently in place but not being used

18 GHz 2 W-Class GaAs Monolithic Microwave Integrated Circuit

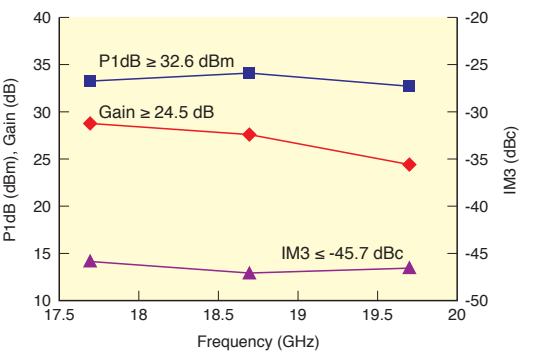


GaAs MMIC for 18 GHz band

Toshiba has developed a 2 W-class gallium arsenide (GaAs) high-power amplifier (HPA) monolithic microwave integrated circuit (MMIC) for the 18 GHz band.

Mounted in a highly reliable hermetically sealed drop-in type package, the HPA MMIC achieves a minimum 1 dB-compression gain of 24.5 dB and a minimum output power of 32.6 dBm in the frequency range of 17.7 to 19.7 GHz. It also has a highly linear performance, with a third-order intermodulation (IM3) level of -45.7 dBc across the frequency band. These features, especially the low-distortion characteristics, make this MMIC ideal for point-to-point (P-to-P) radio link applications in the 18 GHz band.

With the adoption of a 0.5 µm high electron mobility transistor (HEMT) process, which is a well-established process for discrete devices, together with the hermetically sealed package, the MMIC attains excellent reliability.



P1dB: Power at 1 dB compression

Frequency-dependent characteristics of 18 GHz MMIC

Radio Source Visualizing System for Wireless LAN Systems

Appearance of radio source visualizing system for wireless LAN and example of radio source indication on monitor display

With the rapid dissemination of cellular phones, wireless LAN, and other wireless communication systems, e-mail and Web browsing have become commonplace in various situations. However, radio interference or crosstalk among wireless communication devices has become a serious problem due to congestion of radio wave spectrums. In order to realize a secure communication environment, the need has arisen for a system that can reveal the actual locations of conflicting sources of radio wave emissions at an early stage of building a communications infrastructure.

In response to this need, primarily for the detection of wireless LAN systems, Toshiba has developed a mobile radio source visualizing system whose monitor display visually pinpoints suspected locations of the sources of conflicting radio wave emissions in the frequency range of 2.4 to 2.5 GHz used for wireless LAN systems.

Trials of the radio source visualizing system, in which radio wave emissions coexisting with direct and/or indirect conflicting waves from other equipment were monitored, have confirmed that the system achieves satisfactory performance and can provide an effective means of deconflicting such radio emissions by facilitating the optimal placement of radio wave absorbers, shielding walls, etc.

With the system's capability of searching for radio wave emissions, each location of possible sources of conflict can be readily identified on its monitor display as a highlighted circle overlaid on the screen.

Financial Smart Card for Overseas Markets

Financial smart card

Toshiba has newly developed and commercialized a financial smart card product for widespread use in overseas financial markets such as Europe, Latin America, Asia, Africa, and the Middle East.

In addition to the credit/debit payment functions of MasterCard® and VISA®, this smart card has functions supporting local loyalty programs and automatic teller machine (ATM) payments.

The necessary functions of the card can be freely selected and activated by the manufacturer or issuer of the card. Because multiple combinations of functions can be chosen in this product, card manufacturers or issuers have the advantage of reducing their card inventory.

In the future, new products with various applications will be developed based on this product, further enhancing our lineup of financial smart cards.

VISA is a registered trademark of Visa in the United States and other countries.

MasterCard is a registered trademark of MasterCard Worldwide in the United States and other countries.