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Special Reports

Efforts toward Eco-innovation in Partnership with Consumers

Expectations on Factor T
INABA Atsushi

Environmentally Conscious Products Promoted by Factor T
HACHIYA Toshimi/TAKEYAMA Norio/INABA Michihiko
The issue of recycling was encountered in the 1990s, followed by the problem of environment-friendly manufacturing in the 2000s. In the 2010s, it will be necessary to deal with the question of how to supply products while coping with environmental constraints in order to maintain a sustainable society. This situation will lead to a new design policy in which environment-friendliness appropriate to the offered services is required. Not only manufacturers but also consumers will need to shoulder the responsibility for realizing new types of products by reviewing and altering their lifestyles. Both parties will benefit from these innovative changes, and the burden on the environment will be reduced as a result.
Toshiba has introduced an eco-efficiency indicator called Factor T, as one of the management metrics to be used as an index to indicate the simultaneous pursuit of environmental preservation and economic development. Our aim is to double overall eco-efficiency in 2010 compared with 10 years earlier under our fourth voluntary environmental plan.

Evaluation Methods and Tools for Development and Manufacturing of Environmentally Conscious Products
KOBAYASHI Hideki/OYASATO Naohiko/KOBAYASHI Yoshinori
Toshiba is promoting the development and manufacturing of environmentally conscious products from the perspective of environmentally conscious management using various evaluation methods and tools. We have newly developed a number of evaluation methods and tools for this purpose. These include Factor T, an indicator to evaluate and improve eco-efficiency; LCSimulatorTM, a life cycle simulator for feasibility studies on various reuse businesses; and EMIOTTM, that facilitates more reliable estimation of material inputs to a business based on material procurement data. Factor T is an indicator expressing both the value of a product and its environmental impact throughout its whole life. It has been applied to hardware products so far, although recently its application has also been extended to the field of information and communication technology (ICT).

User- and Environment-Friendly Drum Type Washer-Dryer Equipped with Heat Pump
IMAI Masahiro/TOZAKI Takashi
In 2000, Toshiba released the TW-F70 drum type washer-dryer on the market in response to the rising worldwide demand for energy saving. The new washer-dryer also corresponded to the social trend away from drying laundry in the sun due to the increases in high-rise residences, hayfever sufferers, and two-income families. The TW-F70 was an epoch-making model that overcame the conventional weak points of washer-dryers: weight and vibration noise. This was achieved by applying the direct drive (DD) motor, the fruit of Toshiba's core technologies, to achieve both weight reduction and vibration damping.
Since the introduction of the TW-F70, the demand for washer-dryers has dramatically increased and their market share is expected to reach about 31% of all washing machines in FY2007. However, washer-dryers also have an environmental impact because their use consumes more water and electricity than sun drying.
Accordingly, we developed an air-conditioner cycle engine with a heat pump system that allows low-temperature drying and released the TW-2500VC "air-conditioner cycle drum" washer-dryer in July 2006. The TW-2500VC has a Factor (an eco-efficiency indicator) of 2.93, and has been shown to reduce both water and electricity consumption by half compared to conventional heater-drying washers. Moreover, the low-temperature drying gives the laundry a good finish, and the machine provides cool air to make the residence comfortable.

REGZA$_{TM}$ Brand LCD TV Realizing High Resolution and Performance with Energy and Resource Saving
NAGAI Kenichi/ITO Hirotsugi/IWASAKI Shunichi
Toshiba has been developing the REGZA$_{TM}$ brand of liquid crystal display (LCD) TVs based on the concepts of authenticity and high quality. To materialize these concepts, we have been pursuing high resolution and performance, sophisticated design, and environmental friendliness in terms of energy and resource saving. However, the pursuit of performance and functionality has always led to greater energy consumption as well as larger and heavier products, reducing their environmental performance. A trade-off relationship has thus existed between the sophistication of products and reduction of their environmental burden.
The REGZA$_{TM}$ Z2000 series LCD TV released in 2006 eliminated this trade-off and realized high resolution and performance in parallel with energy and resource saving through the application of picture modifying technology and functional analysis in the structural design. This series has a product value factor of 1.47, an environmental load reduction factor of 1.83, and a Factor (an eco-efficiency indicator) of 2.69.

Promotion of Environmental Conservation in Offi ces by e-blue$_{TM}$ Decolorable Toner
MATSUMURA Fumiyo/SAIKAN Sadao/TAKAYAMA Satoshi
Toshiba began selling e-blue$_{TM}$ decolorable toner, which allows the reuse of printed paper in offices, in 2003. The utilization of this decolorable toner results in reductions in the purchase and disposal of paper, leading to reduced carbon dioxide emissions as well as the dissemination of environmental consciousness among employees. The introduction of e-blue$_{TM}$ into offices has been shown to decrease paper consumption by 20-60%, thereby significantly contributing to the activities required under the ISO 14001 standards.

"NeuroPMV control" Air-Conditioning Control System Prioritizing Comfort
HANADA Yuuichi/YONEZAWA Kenzo
There is a pressing need for energy conservation measures for commercial buildings against the background of the entry into force of the Kyoto Protocol for global warming mitigation as well as the present-day worldwide shortage of energy resources. On the other hand, building owners are making demands for the low-cost operation of building facilities together with a comfortable living environment for tenants.
To meet these requirements, Toshiba has developed a new air-conditioning control system called "NeuroPMV control." This system, which operates based on the predicted mean vote (PMV) comfort index, utilizes information technology and advanced sensor technology to prevent excessive cooling and heating in real time. It thus becomes possible to achieve a good balance between a comfortable living environment and energy saving. This technology is positioned as one of the measures of the building energy management system (BEMS), which is being widely introduced into commercial buildings for energy conservation.

Super Flex Modular Chiller High-Effi ciency Large-Capacity Heat Pump Chilling Unit Using Refrigerant R410A
MUROI Kunio
Toyo Carrier Engineering Co., Ltd. has developed the Super Flex Modular Chiller, a large-capacity heat pump chilling unit employing the highly efficient refrigerant R410A with Tokyo Electric Power Company and Toshiba Carrier Airconditioning Systems Corporation. The new unit has a unique X-frame chassis and is designed to be used in parallel connections to multiply its capacity.
The following five features characterize the new unit: (1) a large and wide range of capacity due to its modular structure, (2) easy moving and flexible installation suitable for renewal work, (3) a dual-mode heat pump system that can supply both hot and chilled water, (4) simultaneous pursuit of energy saving and reduction in CO_2 emissions by high partial-load efficiency, and (5) simultaneous pursuit of lower price and higher efficiency by its modular structure.

SPACEL-EX$_{TM}$ Safe, Secure, and Environmentally Conscious Elevator
MURAKAMI Hiroshi/FURUMOTO Yasushi/KINOSHITA Toru
An elevator is a highly public vertical transportation system. Toshiba Elevator and Building Systems Corporation has been devoting efforts to making elevators safer and more environmentally conscious products from the viewpoints of energy conservation and effective utilization of natural resources.
We have developed and commercialized a new elevator system called SPACEL-$_{TM}$, which is Japan's first elevator system without a machine room. It also has a gearless winch system, which contributes to energy saving. The latest model in this series, the SPACEL-EX$_{TM}$, has been developed with the aim of further reducing the burden on the environment. The new elevator has a Factor value of 1.20, taking the 2000 model as the base. Factor is an eco-efficiency indicator developed by Toshiba.

User- and Environment-Friendly Medical Equipment and Information Systems
WATANABE Naofumi/HIRAKUI Katsuya/KATO Yutaka
In addition to the conventional needs of healthcare facilities for medical equipment that provides diagnostic accuracy and efficiency as well as reduction of maintenance costs, demand is increasing for equipment that places a lower burden on patients by reducing examination times and exposure doses. With Japan rapidly becoming an aging society, the entire healthcare workflow from disease prevention and screening to diagnosis, treatment, and follow-up must be taken into consideration in medical equipment-related business activities. It is also important to respond to environmental needs such as the conservation of energy and natural resources.
Toshiba Medical Systems Corporation has been addressing these challenges to contribute to a sustainable society through its products.

Eco-Friendly NAND Flash Memories
YOSHIKAWA Susumu/TADAUCHI Masahiro
Reduction of the environmental impact of products is becoming increasingly important every year. This trend also extends to semiconductor products. Toshiba has achieved significant reductions in the environmental impact of its NAND flash memories by reducing raw material usage and power consumption per product. Furthermore, the development and dissemination of downsized memory cards is contributing to resource conservation.
For example, environmental impact in terms of carbon dioxide emissions can be reduced by up to 40% by changing the structure of products from the surface mount technology (SMT) to the system in package (SiP) type.

Mobile Fuel Cell Providing New Advantages for Mobile Electronic Appliances
MORI Yasushi
Many new and advanced functions are now being implemented on mobile electronic appliances such as cellular phones and notebook PCs.
These newly implemented functions consume so much energy that there is strong demand among end users for higher energy capacity and shorter charging time of the rechargeable batteries inside these appliances.
The direct methanol fuel cell (DMFC), which generates electricity through an electrochemical reaction of methanol fuel, has been attracting attention as a new energy source for mobile electronic appliances. It enables virtually continuous operation of the appliance by the addition of methanol fuel. The DMFC is also environmentally friendly because it discharges only clean substances containing no atmospheric pollutants such as nitrogen oxides and sulfur oxides.

Feature Articles

Markerless Motion Capture Using Cell Broadband Engine^{TM}
OKADA Ryuzo/KONDOH Nobuhiro
Motion capture is a technique for capturing human motion and inputting the data into a computer. It has a variety of applications, including the production of computer graphic (CG) contents, surveillance by monitoring people's motions, and gesture input for computers. Conventional motion capture systems require markers and sensors attached to key parts of the body, which creates a certain amount of difficulty.
Toshiba has developed a markerless motion capture system that enables a single camera to capture human motion with no markers or sensors. This system utilizes the high computational performance of the Cell Broadband Engine^{TM} to capture human motion in real time.

Hand Gesture User Interface Implemented on Cell Broadband Engine^{TM}
IKE Tsukasa/Bjorn STENGER/KISHIKAWA Nobuhisa/KONDOH Nobuhiro
Toshiba has developed a hand gesture user interface (HGUI) system that enables users to control equipment without the use of manipulation devices. Hand gesture recognition is a technique for recognizing the user's hand postures and movements using images captured by a video camera. The system recognizes hand gestures under various environments with a robust detection method. We have also introduced parallel operations for feature computation and implemented them on the Cell Broadband Engine^{TM}. The system runs at sufficiently high speed to recognize the user's hand gestures in real time.

Real-Time 3D Face Tracking with Cell Broadband Engine^{TM}
HIWADA Kazuhiro
The Cell Broadband Engine^{TM} (Cell/B.E.) is a high-performance real-time processor that effectively handles multimedia data. However, to elicit the high performance of the Cell/B.E., it is necessary to use synergistic processor elements (SPEs) in a meaningful way.
Toshiba's" F-TYPE Digital Mirror" is a computer-vision application that exploits the high performance of the Cell/B.E.. This system uses a facetracking algorithm, which was previously difficult to process in real time. Toshiba successfully developed an advanced face-tracking algorithm suitable for multicore processing and implemented it on the Cell/B.E.. As a result, a practical system has been realized that is able to process face tracking at a speed of 10 ms per frame.

Model 911T W-CDMA Cellular Phone
SANADA Yoshihiro/SHIBATA Shigeru/SHIOMI Takuro
With the start of mobile number portability (MNP) in Japan in October 2006 and the increasing competition among cellular phone business operators, the development of more attractive handsets is urgently required in order to succeed in this business field.
Toshiba has launched a new third-generation W-CDMA cellular phone, model 911T, as Softbank Mobile Corp.'s flagship spring model. Its large, high-resolution 3-inch wide-VGA liquid crystal display (LCD) is the industry's highest level display. The 911T can handle all mobile services including one-segment TV broadcast reception, the FeliCa and Suica card payment systems, assisted global positioning service (A-GPS), and high-speed downlink packet access (HSDPA). Moreover, this handset is only 17.9 mm in thickness, thus dispelling the image of high-end models as being bulky and thick. It also has a second-generation (2G)-like user interface with which Toshiba has been receiving high evaluations from users.

Technologies for Rehabilitation of Hydraulic Runners
ABE Yasuhisa/NAKAMURA Takanori
The construction of hydroelectric power stations increased rapidly during the 1960s and grew by 10 to 20 GW annually over the following 20 years. Since this period of growth, there has been a need for large-scale rehabilitation work of hydraulic equipment constructed 30 to 40 years earlier. In these rehabilitation projects at hydroelectric power stations, not only is it necessary to restore the performance and functions of equipment, but also to improve runner efficiency, etc. Toshiba has actively concentrated on these rehabilitation projects with technologies for the improvement of runner efficiency and obtained good results in this market, especially in overseas large-scale power stations.

Control and Monitoring System for Power Supply Facilities of Sendai Airport Access Line
KITAMURA Tsuneaki/TAKAHASHI Yoshio/SUZUKI Hidenori
The Sendai Airport Access Line is a new railroad that is expected to offer better access to Sendai Airport. It is a single-track, electrified, 7.1 km railroad from Japan Railway (JR) Sendai Station to Sendai Airport. The new line required a substation for the railroad and three power distribution rooms ?one for each of the three stations.
Toshiba designed a simple and reliable supervisory control and data acquisition (SCADA) system to furnish this new line with a power control system, together with a telemeter control system and a control and relay panel system.

Solutions to Establish Effective Internal Controls
IWATA Seiji/HANAI Katsuyuki/IWASAKI Motokazu
The establishment of effective internal controls is an essential task for listed companies. Before the first auditing, internal controls are broken down into the following three stages: "a preparatory period in which the internal control project is set up", "a documentation and assessment period", and "an operation and auditing period". After the first auditing there is one more stage: "a continual improvement period in which management and internal controls are upgraded."
Toshiba Solutions Corporation prepares optimal solutions that assure effective internal controls covering any phase and any situation that the customer is encountering.

Frontiers of Research & Development

"UPnP AV" Technology to Ensure Interoperability of Audiovisual Home Network Devices