

TOSHIBA REVIEW

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Special Reports-1

Digital Manufacturing

Special Reports-2

Hydroelectric Power Systems Effectively Utilizing Water Resources

Special Reports-1 Digital Manufacturing	Special Reports-2 Hydroelectric Power Systems Effectively Utilizing Water Resources	Feature Articles	Frontiers of Research & Development
<ul style="list-style-type: none">*Digital Manufacturing Realizing 21st Century Type Manufacturing*Digital Manufacturing for Innovative Manufacturing Management and Engineering*PCB Virtual Design to Reduce Design Process Retrogression*Design and Manufacturing System Realizing Shorter Development Times for Thin-Wall, High-Rigidity Housings of Mobile Products*Virtual Design Technology Featuring Consistency from Product Design to Manufacturing Line Construction*Digital QC System Using Data Mining Technique for Production Line*Global REALMICS™ Management Information and Control System for Globally Distributed Manufacturing Sites*Design and Manufacturing Support System Enabling Consistent Utilization of Digital Data	<ul style="list-style-type: none">*Hydroelectric Power System: Renewable, Recyclable, Natural Energy*Technological Trends in Hydroelectric Power Systems*Toward Increased Power Generation Output with Same Water Power*Hydroelectric Power Technologies Contributing to Power System Quality Improvement*Hydroelectric Power Technologies Contributing to Environmental Preservation and Extension of Facility Life*Application of Advanced Technologies to Hydroelectric Power Plants Worldwide*Effective Utilization of Water -- Hydro-e KIDS™ Micro-Hydroelectric Generating Equipment	<ul style="list-style-type: none">*Advanced Mask Inspection Method Using Deep UV Reflected Light Source*Distributed Control System for Industrial Power Generation Plants	<ul style="list-style-type: none">*MPEG-4 AVC/H.264: New Video Coding Standard*Oxide Ceramic Coating Technology Using Electron-Beam Physical Vapor Deposition

Special Reports-1

Digital Manufacturing

*Digital Manufacturing Realizing 21st Century Type Manufacturing

ATSUMI Koichiro

*Digital Manufacturing for Innovative Manufacturing Management and Engineering

SEINO Takehisa IKEDA Yoshio

The circumstances surrounding manufacturing industries have dramatically changed in recent years, including rapid changes in user needs and market demands, shifting of production overseas, and so on. In order to adapt to these circumstances, speeding up of development and production, and globalization of production, are important issues for manufacturers. Information technology (IT) provides a key for overcoming these issues by converting tacit knowledge to explicit knowledge and digital data. Digital manufacturing is a methodology that effectively uses IT with explicit knowledge and digital data to promote innovative manufacturing management and engineering.

*PCB Virtual Design to Reduce Design Process Retrogression

HARA Satoru ITO Kenji HASHIMOTO Eiji

Reduction of the development period of printed circuit boards (PCBs) is becoming an important issue. Toshiba is employing the concept of digital manufacturing in order to solve this issue, and has proposed a PCB virtual design system. Using this system, the design data at each design stage are estimated by, for example, simulation of thermal distribution or the design rule for a soldering electrode. This makes it possible to reduce retrogression of the design process (i.e., the need for design changes) after trial manufacturing, by feeding back design change data before trial production.

*Design and Manufacturing System Realizing Shorter Development Times for Thin-Wall, High-Rigidity Housings of Mobile Products

TAKAHASHI Fujio AOKI Yukinori HAYAMA Hideki

Plastic resin outer housings of cellular phones and notebook personal computers, which protect the incorporated components, are required to have thinner walls and a higher level of rigidity. Additionally, as the life cycles of products have become shorter, reducing development lead times for outer housings has become an important issue. Toshiba has developed a design and manufacturing system for plastic outer housings by combining technologies utilizing three-dimensional computer data that contribute to design and manufacturing, and core technologies for manufacturing of actual components. This paper introduces the distinctive features of the system and describes the result of shortening the development time of a battery pack for cellular phones.

*Virtual Design Technology Featuring Consistency from Product Design to Manufacturing Line Construction

OOUCHI Toshihiro

Speedy production startup and globalization of production are essential to cope with the rapid changes in the manufacturing environment. In order to respond to this situation, rapid development of new products and swift startup of efficient production lines are indispensable.

Toshiba has developed a manufacturing line virtual design technology that enables all of the processes from product information gathering to process planning, layout design, line capacity simulation, and work instruction documentation to be carried out based on a design and manufacturing database. This technology makes it possible to realize the rapid development of new products and speedy startup of efficient production lines.

*Digital QC System Using Data Mining Technique for Production Line

KONDO Haruhiko

As manufacturing processes become more complicated and more sensitive to disturbances, there is growing demand for the analysis of historical manufacturing data to identify the causes of defects. However, the amount of data involved is huge and increasing.

Toshiba has developed a digital quality control (QC) system as one frame of digital manufacturing, in which data analysis is highly automated using a data mining technique. The system supports quick improvement of a production line by automatically extracting and feeding back factors related to defects.

*Global REALMICS™ Management Information and Control System for Globally Distributed Manufacturing Sites

NAMIOKA Yasuo ISHIHARA Yukihiko NAKAJIMA Mitsuo

This paper describes Global REALMICS™, a management information and control system for globally distributed manufacturing sites. One of the most important aspects of managing worldwide manufacturing is the efficiency of monitoring manufacturing sites' information regarding production and quality control. Global REALMICS™ provides functions to integrate the manufacturing data from distributed manufacturing sites, monitor the changes in quality indexes, and analyze defect events across the different sites.

Global REALMICS™ has been applied to notebook PC manufacturing, where it has shortened the usual cycle time of global quality control from weekly to daily.

*Design and Manufacturing Support System Enabling Consistent Utilization of Digital Data

SATO Shinichi KUMADA Takao TSUMAGARI Takashi

Product data management (PDM) has entered widespread use in recent years. Although this system has been developed to execute unified management of digital data from product design through manufacturing, it is not yet able to utilize digital data efficiently at each phase of product development.

Toshiba has constructed a support system with PDM as the core. Using this system, digital data for products can be utilized throughout the design, logistics, and manufacturing departments. The system makes it possible to share attribute information on a product model between an upstream design department and downstream logistics and manufacturing departments when developing manufacturing equipment for an indent order. The development lead time can be shortened through real-time grasping of the situation regarding the applicability of standard parts, estimated machining cost of new parts, and logistics.

Special Reports-2

Hydroelectric Power Systems Effectively Utilizing Water Resources

*Hydroelectric Power System: Renewable, Recyclable, Natural Energy

KAWAI Kensuke

*Technological Trends in Hydroelectric Power Systems

SHINOHARA Akira MORI Junji

The advantages of hydroelectric power are that it is a domestic resource, and that it utilizes clean natural energy without discharging gases that would adversely affect the earth's environment. Taking diversification of power supply sources and effective operation of electric power systems into consideration in the context of the trends toward global warming prevention and electric power liberalization, Toshiba is developing technologies that promote the effective use of energy, contribute to the power system, simplify the equipments, and improve maintenance, rather than focusing primarily on technologies for higher head, larger output, and higher speed machines.

*Toward Increased Power Generation Output with Same Water Power

TEZUKA Kotaro NAMBA Satoshi NOGUCHI Tetsuya

Hydroelectric power is the most effective generating system using natural energy and has a long history of use. Drawing out the latent potential of existing power plants leads to more effective use of energy resources and contributes to environmental preservation. Recent design technologies for hydraulic turbines and generators to improve their performance, as well as optimal distribution control, can enable aging plants to generate more electricity than other plants with the same water power.

*Hydroelectric Power Technologies Contributing to Power System Quality Improvement

MUKAI Kazuma UTOU Yuuetsu

A power system must be controlled to maintain high-quality and stable frequency, voltage, and other electricity supply conditions even with the occurrence of load fluctuations. Hydroelectric power plants have functions suitable for the rapid adjustment of generating power over a wide range. In particular, generator-motors for pumped storage and synchronous condensers have the function of adjusting large reactive power. An adjustable-speed pumped storage system is able to perform automatic frequency control (AFC) even when in pumping mode, and flywheel generators, which are an application of the adjustable-speed pumped storage system, are able to adjust both active and reactive power. These hydroelectric power technologies are contributing to the quality improvement of power systems.

*Hydroelectric Power Technologies Contributing to Environmental Preservation and Extension of Facility Life

NAKANO Fujio

Environmental protection is required in hydroelectric generating facilities to prevent the contamination of rivers. Among the preventive measures for this purpose are the electrification of hydraulic servomotors and the adoption of brush seals to prevent oil mist leakage from bearings. Moreover, technologies to extend facility life include surface treatment technology to protect metal parts from silt in the river water, and the use of plastic materials for bearings to reduce wear.

These technologies have been applied to hydroelectric generating facilities, and their effectiveness has been confirmed. Toshiba is making efforts to widen their scope of application so as to further contribute to environmental preservation and extension of equipment life in the future.

*Application of Advanced Technologies to Hydroelectric Power Plants Worldwide

ARAI Hidetada OHTA Hitoshi SAKAMOTO Shigeru

The role of hydroelectric power changes according to the times, and Toshiba continuously responds to these changes with the development and application of technologies for this field. In Japan, Toshiba has been supplying higher head, larger output, and higher speed machines up to now in pursuit of economic efficiency. At present, hydroelectric power technologies are required for optimal utilization and simplification of equipment as well as more economical maintenance. Toshiba has applied technologies to the hydroelectric power field for improvement of efficiency, simplification of equipment (e.g., technologies to eliminate pressurized-oil system, cooling system, etc.), and prolongation of equipment life. In addition, technologies to contribute to environmental preservation are being called for in the global market.

*Effective Utilization of Water -- Hydro-e KIDS™ Micro-Hydroelectric Generating Equipment

SHINOHARA Akira ODAGIRI Naruhito SAKANASHI Yasushi

Toshiba has developed the Hydro-e KIDS™ micro-hydroelectric generating equipment based on the concepts of reduced construction costs, reduced generating equipment costs by standardization, reduced operation and maintenance costs, and more reliable and safer facilities, taking global warming and environmental conservation into consideration. This small-scale hydroelectric generating equipment is suitable for use with water supply and sewerage systems, irrigation, water for industrial use, responsible discharge from dams, and so on.

For utilization of small-volume water discharge, industrial users are studying the utilization of discharges from factories and water treatment facilities (e.g., various types of cooling equipment) in order to contribute to environmental conservation and promote energy saving by using renewable energy. Toshiba has recently developed a new type of Hydro-e KIDS™ (SS Type) to expand the range of applications in response to these market needs.

Feature Articles

*Advanced Mask Inspection Method Using Deep UV Reflected Light Source

FUJIWARA Takeshi TSUCHIYA Hideo ENDO Satoshi

The shrinkage of design rules in semiconductor devices requires an advanced mask inspection tool with an inspection light source having a shorter wavelength for detecting minute defects.

We have developed deep ultraviolet (UV) laser illumination optics with a wavelength of 257 nm for application to a mask inspection tool. Optical simulation confirmed that it is possible to enhance the signal contrast by changing the illumination optical system from a transmission optical system to a reflective optical system. Furthermore, by combining these two methods, we have succeeded in detecting signals of minute pinhole defects in phase shift masks for ArF exposure used for the fabrication of devices of the 90 nm generation and beyond.

*Distributed Control System for Industrial Power Generation Plants

TOKITA Ichiro HASHIMOTO Shinnosuke OOTSUKA Tatsuya

Various types of industries apply power generation plants for industrial usage, and operating patterns differ among users. On the other hand, there are common areas of concern including energy cost reduction, environmental protection, industrial rationalization, and maintenance cost reduction. In the area of plant supervisory control, users have strong requirements for improved reliability, supervision, controllability, maintenance implementation, and labor savings.

Toshiba has applied the TOSMAP-DS™ distributed control system (DCS) to an industrial plant for the first time in response to such customer needs. To solve the large number of diverse issues faced by users, introduction of the latest supervisory control equipment and the application of information technology to supervisory control systems will become increasingly important from now on.

Frontiers of Research & Development

*MPEG-4 AVC/H.264: New Video Coding Standard

*Oxide Ceramic Coating Technology Using Electron-Beam Physical Vapor Deposition