

TOSHIBA REVIEW

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Special Reports

Paper Handling Technologies of the Toshiba Group

Continuous Innovation of Paper Handling Technologies of the Toshiba Group ICHIHARA Issei

Toshiba Paper Handling Technologies at Forefront of the Era

FUKASAWA Kazuo / KAWAGOE Hiroshi / HATTORI Shunsuke

Equipment for handling paper and other flexible media, such as copiers, printers, letter processing systems, and automatic ticket gates, is generically referred to as paper handling machines. As a leading company in the field of paper handling machines, Toshiba has been supplying a wide variety of products to the world market by consistently developing state-of-the-art technologies, thereby contributing to the progress of society. These technical innovations are based on our corporate heritage, comprising both our accumulated mechatronics technologies and our spirit of challenging the creation of new products, nurtured since our company's establishment. We are continuing our efforts to develop new-concept products for the future.

High-Performance Feeding Technology for Mail Processing Machines

HIRAMITSU Naruaki / MITSUYA Yusuke / WATANABE Tetsuo

A letter sorting machine separates pieces of mail one by one from a stack of various types of mail, reads information such as their postcodes and addresses, then stacks and sorts them according to the reading results. Recently, the performance requirements for such machines have become increasingly stringent in overseas markets.

In order to meet these requirements, Toshiba has developed a world top-class technology that can process more than 43,000 pieces of mail per hour, employing an air-absorption technique. This technology will facilitate our further expansion into overseas markets.

Indirect Thermal Transfer Printing Technology

UKAI Makoto / JOJIMA Yosuke / MORI Hiroyuki / AOYAGI Toshiaki

High-level forgery prevention functions are required as security measures against alteration, forgery, and falsification of official means of identification such as passports and licenses.

Toshiba has developed an indirect thermal transfer printing technology employing thin-film transfer that offers advanced forgery prevention functions, based on our accumulated technologies in such areas as printing, paper handling, and mechanism design. We have also launched an integrated circuit (IC) passport (e-passport) printer incorporating this technology targeted at overseas markets.

High-Speed Positioning Control Technology for Paper Media

NARUOKA Yoshihiko / ASARI Yukio / TODORIKI Toru

Mail sorting machines are required to provide faster processing of diverse types of mail, while banknote processing machines must be capable of batch processing a wide variety of banknotes. To meet these requirements, a high-speed positioning control technology is necessary that can effectively handle thin objects conveyed at high speed after being picked up separately from a bulk lot.

Toshiba has developed a high-speed positioning control technology for paper being conveyed at high speed, using nonholonomic control. The effectiveness of this method was confirmed by an evaluation test.

Paper Transport Technologies for Multifunctional Peripherals

MURAKAMI Reiji

Multifunctional peripherals (MFPs) utilize a variety of paper transport technologies, from paper pickup to alignment, image transfer, fusing, finishing, and paper output. All of these technologies are of fundamental importance, supporting the functions required of an MFP. Recently, continuing progress has been made in these technologies, especially in response to the growth of color MFPs and diversification of media.

Toshiba TEC Corporation is actively introducing the simulation technology.

Paper Transport Technologies for RADFs and Finishers in Multifunctional Peripherals

IWAMOTO Masakazu / KAWAGUCHI Takahiro

Toshiba has developed new technologies for reverse automatic document feeders (RADFs) and paper finishing devices (finishers), which work together with multifunctional peripherals (MFPs) to achieve high productivity and reliability.

For RADFs, the reliability of scanned images has been significantly improved when different types of original paper with varying thicknesses are fed at a constant speed. For finishers, a unique paper stacking technology has been adopted that simultaneously realizes high stapling productivity and high paper sorting performance. Furthermore, a new function has been incorporated for the first time to detect and adjust paper skew during transport, and a highly accurate hole punching technology that surpasses the technologies of competitors has also been established.

Paper Feed Mechanism of Printer for Point of Sale Terminals

KOYAMA Hiroyuki / YAMADA Koichi

Toshiba TEC Corporation offers high-performance receipt printers mounted in point of sale (POS) terminals for retail outlets.

These thermal printers are required by the market to be not only compact in design but also to provide high-speed printing with high printing quality. It is therefore necessary for these printers to feed thermosensitive papers with high stability.

We have developed a new printer for POS terminals that realizes stable receipt paper feed by optimizing the shape of the receipt paper holding mechanism.

Simulation of Paper Feed for Point of Sale Terminal Receipt Printers

SATO Katsutoshi / MIZUTANI Kikuo

The receipt printers of point of sale (POS) terminals are required to provide high-speed printing and fine printing quality. In order to meet these requirements, it is necessary to realize accurate and stable paper feed for paper being conveyed at high speed.

Toshiba TEC Corporation has improved on the conventional development process by utilizing simulation technologies. We have developed a new mechanism for the paper feed of receipt printers and optimized the design parameters by means of this simulation.

Paper Feeding, Stacking, and Storage Technologies for OCR Scanners

NAKANO Michihiro / KASHIMA Hideyuki / OMATA Toshiyasu

Optical character reader (OCR) scanners have recently become capable of handling paper of various sizes, thicknesses, and qualities, and are required to input these various types of paper in large volumes and at high speed.

In order to satisfy these requirements, Toshiba Solutions Corporation has been developing basic technologies such as those for paper feeding, stacking, and storage, which are key technologies for paper transport. We have also been enhancing the reliability of OCR scanners in such areas as reading papers with tags, continuously reading 1-meter-long paper sheets, and storing large volumes of nationwide gift coupons, which were difficult to achieve using the conventional technologies.

Rubber for High-Performance Transport Rollers of OCR Scanners

OBARA Tadashi / NAGAI Tomio / YOKOYAMA Kenichi

Optical character reader (OCR) scanners are required to scan documents with accurate image size (minimal expansion or contraction) in the transport direction in order to improve the performance of character recognition. Moreover, with the increasing usage of OCR scanners, they must also be able to handle a wide variety of paper types including thick, thin, recycled, impact, and thermal papers.

Toshiba Solutions Corporation has developed rubber for the transport rollers of OCR scanners to enable them to fulfill these requirements and maintain stable performance over the long term.

Web Handling Technology for Rotogravure Printing Machines and Coating Machines

ARAI Hideyuki / YOSHIDA Yuta

Toshiba Machine Co., Ltd. has been supplying rotogravure printing machines and coating machines (coaters) to the converting market utilizing its own technologies and organization to manufacture high-precision products.

For rotogravure printing machines, we have developed a sectional drive type servomotor control system for the main drive instead of the conventional drive shaft control mechanism. In addition, we have developed a web tension control system with a servomotor to enhance the precision printing process. For coating machines, we have developed a precision coating technology using not only the same web tension control system but also highly advanced techniques for manufacturing precision rollers and coating dies.

Fundamental Study of Belt Mistracking Affected by Rotation Speed and Other Factors

KOBAYASHI Yuko / TOYA Kiminori

Demand for higher-speed rotating products may cause belts to come off their rollers. In order to understand the effect of belt transport speed and other factors that may cause belt mistracking, Toshiba has begun by examining belt mistracking for a basic belt conveyor system, consisting of one flat belt and two crown-face rollers, by experimentation and simulation.

Simulations were conducted using a commercial motion system analysis software. Another purpose of our study was to obtain simulation technology for flexible sheet-type media.

It was found that the qualitative tendencies of the simulation results were in good agreement with the experimental results. We also formulated an experimental expression of the amount of belt mistracking using roller misalignment parameters. With regard to transport speed, higher speed did not increase belt mistracking. This phenomenon was explained by automotive engineering. Quantitatively, when the axial load on rollers and other parameters were made equal, belt mistracking according to the simulation was generally in agreement with the experimental value, confirming the applicability of the analysis model.

Feature Articles

Ring Signature Scheme with Deniability of Involved Entities

KOMANO Yuichi / KATO Takehisa / SHIMBO Atsushi / OHTA Kazuo

With the enactment of the Whistleblower Protection Act, the confidentiality of whistleblowers is guaranteed and their rights have to be protected. In the case of using electronic documents as a means of whistleblowing, the ring signature scheme has been proposed because of the perfect anonymity of the signer of the document. However, the whistleblower cannot be adequately protected from oppression by this scheme and, in addition, the involved entities in the whistleblower's organization may be damaged by suspicions.

Toshiba and the University of Electro-Communications have developed a provably secure ring signature scheme with deniability of involved entities. This scheme also makes it possible to construct other applications that ensure users' privacy similarly to whistleblower protection.

Work Sheet Editor: Engineering Tool for Upstream Processes of Industrial Control Systems

KAJIHARA Shigeru / OTANI Hideyuki

The engineering environment for the conventional V series integrated controller applicable to both programmable logic controllers (PLCs) and distributed control system (DCS) controllers has already improved the productivity and quality of applications by using program language in accordance with IEC standard 61131-3, a graphical editor, customized symbols, and so on.

Toshiba has now developed a work sheet editor as a new engineering tool to meet users' requirements. This tool covers the whole engineering environment, expanding the areas supported to the upstream processes, and offers more convenient and easy-to-use functions for the development of industrial control systems.

Logic Controller for Automatic Block Signal between Railway Stations

MORI Minoru / TANUMA Hideo / ANDO Hikaru / ISHIMA Reiji

In a conventional railway signaling system for automatic block signal between stations, signaling devices are distributed and connected with copper wires to exchange control signals. Complicated hardware and wiring work are therefore required. In addition, the system has some disadvantages such as low reliability due to the fact that all the devices are simplex, and limited information for maintenance. As a solution to these disadvantages, East Japan Railway Company (JR East) has been developing a new signaling system for automatic block signal between stations that controls the signaling devices via an Internet Protocol (IP) network.

JR East and Toshiba have developed a logic controller (LC) for the new system in which all of the control logics are integrated for greater reliability. The LC is also equipped with advanced functions to support installation tests and maintenance work.

Virtual Platform Simulator for Verification of Embedded Software

ISHII Shogo / YURA Koji / ARAKI Dai

The development of embedded systems is characterized by the concurrent development of hardware and software. However, software engineers are unable to use a test bed for their work until the hardware prototype is produced. This may cause a delay in the development schedule and result in a deterioration in the quality of the final product.

Toshiba Solutions Corporation has developed VPDK™, a virtual platform development kit comprising a simulator for verifying embedded software, in order to enhance software development productivity and quality. We quantitatively evaluated the embedded software verification capability of VPDK™ Ver. 1.0 by applying it to the development of a commercial software product, and confirmed its effectiveness.

E-CORE™ High-Efficiency LED Luminaires

INOUE Masaru

White light-emitting diodes (LEDs) are expected to be the next-generation light source for lighting applications, which are expanding to various areas including outdoor visual guidance, store lighting, and special lighting such as overhead reading lights in Shinkansen trains. The efficiency of white LEDs has been improving year by year, with 100 lm/W-class elements having become available in 2006. Moreover, the light intensity has been increasing with the improvement in efficiency. In order to broaden the LED lighting business to the general lighting area, new products must satisfy the following three requirements: (1) miniaturized and thin design, (2) high performance in both brightness and efficiency, and (3) cost and economic efficiency. Toshiba Lighting & Technology Corporation has developed E-CORE™, a new series of LED downlights that are superior to incandescent luminaires in terms of miniaturization, performance, and economic efficiency and therefore place a reduced burden on the environment.

Frontiers of Research & Development

Topic Segmentation Using Closed Captions