

Social Infrastructure

► Social Infrastructure Systems and Community Solutions

Electric Drive System for Series Hybrid Electric Vehicles

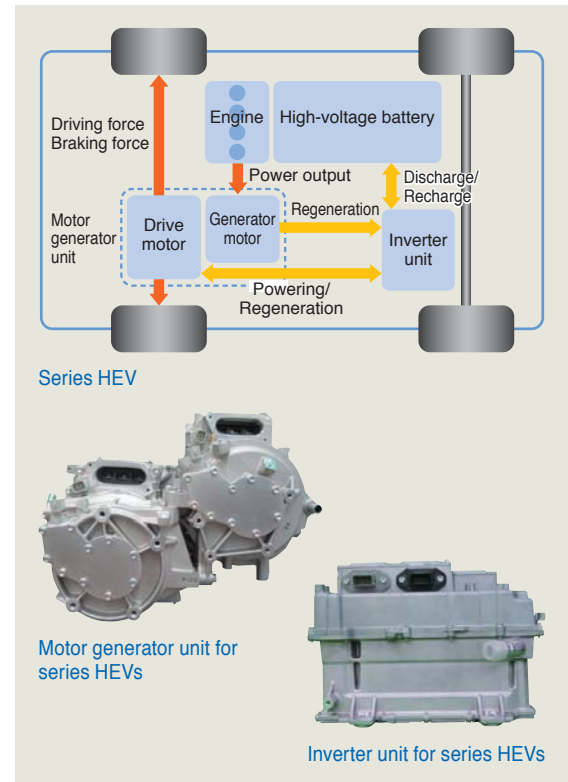
Toshiba has developed an inverter, drive motor, and generator motor as components constituting an electric powertrain system for series hybrid electric vehicles (series HEVs).

The series HEV, an eco-friendly vehicle equipped with an ordinary internal combustion engine and an electric powertrain system, runs on an electric drive motor powered by a high-voltage battery. The generator motor (electric power generating motor) is driven by the internal combustion engine to recharge the battery when its remaining battery power is low, and provide power to the drive motor. The electric drive motor can also serve as a regenerative brake to convert kinetic energy to electric energy.

Since only the electric drive motor provides the propulsion for series HEVs, the tolerance for torque ripple requires considerable stringency. To comply with this requirement, we have added a step of torque compensation to the control algorithm so as to control the maximum torque ripple variation to 3% or less. In addition, the acoustic noise of the drive motor, which is caused by the magnetic force, has a strict requirement. We have conducted electromagnetic analyses and identified the most appropriate magnetic structures for the drive motor and the generator motor that satisfy this requirement while maintaining high performance.

To reduce radiation noise, which is a major issue in this type of vehicle, we have developed a new design approach that suppresses leak current arising from inverter switching.

We have obtained abundant knowledge on the structures and noises of automotive components through this work and will utilize this knowledge for the future development of electric drive components for HEVs.



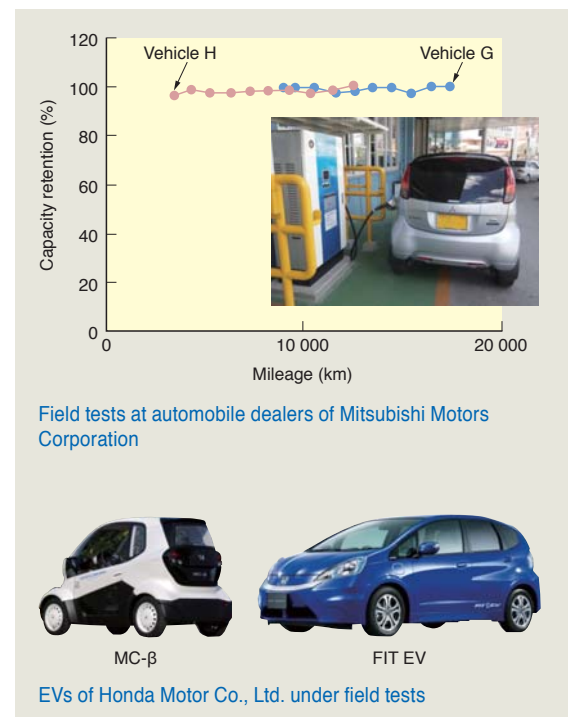
Charging Curve Analysis Method for Diagnosing On-Board Batteries and Its Verification Based on Results of Field Tests

Toshiba has developed a charging curve analysis method as a new battery diagnostic technology to visualize the soundness of lithium-ion batteries installed in electric vehicles (EVs), plug-in hybrid electric vehicles (PHEVs), and energy storage systems.

We have conducted field tests on EV batteries using this charging curve analysis method in cooperation with Mitsubishi Motors Corporation and Honda Motor Co., Ltd. In these field tests, charging curves were periodically collected from Toshiba SCiB™ battery cells installed in operating EVs at automobile dealers throughout Japan. We analyzed the collected charging curves using our new method to calculate the capacities of the batteries and evaluate the performances of the battery packs.

As a result of these analyses, it was found that the capacity degradation of SCiB™ battery cells used in the EVs was extremely small. The field tests therefore verified that this charging curve analysis method is applicable to practical settings.

We expect that our newly developed method will enhance the reliability of EVs and assist in determining the usability of batteries when they are reused in other applications. Furthermore, this method is expected to stimulate the used EV market and develop businesses for the reuse of lithium-ion batteries.



Emergency Battery System for 1000 Series Train Cars of Tokyo Metro Co., Ltd.

Toshiba has conducted tests on an emergency battery system for the 1000 series train cars of Tokyo Metro Co., Ltd.

Our system consists of a rechargeable emergency battery box and a charger box. The newly developed system is placed on the input side of the variable-voltage variable-frequency (VVVF) inverter to drive the main traction motor. In normal operation, the emergency battery system supplies power to the emergency battery box from the overhead line via the charger box. If the power from the overhead line is lost, the system switches the power source to the emergency battery box to supply power to the VVVF inverter via the charger box. Hence, the train can operate normally with the emergency battery system in the event of a loss of power from the overhead line.

In May 2013, we conducted tests on the emergency battery system at Tokyo Metro's Nakano Depot. The results of a stationary test confirmed the satisfactory operation of the activation, electrical charging, and electrical discharging sequences of the system. A trial run demonstrated that a train can run approximately 1.2 km solely on power from the emergency battery system. We also conducted a trial run at night on the main line and further verified that the emergency battery system works properly.

In the future, we will conduct additional tests with the aim of extending the running distance and enhancing the reliability of the system in order to proceed to the mass-production phase.



Tokyo Metro 1000 series train



Emergency battery box

Propulsion System and Communication and Monitoring System for Pilot Cars and Pre-Production Cars of 7000 Series Railcars of Washington Metropolitan Area Transit Authority, U.S.A.

In late 2010, Toshiba concluded a contract with Kawasaki Rail Car Inc. for the supply of propulsion systems and communication and monitoring systems (CAMS) for the 7000 series railcars of the Washington Metropolitan Area Transit Authority (WMATA), U.S.A. Following the successful completion of the design qualification tests, we have delivered these systems for the pilot cars and pre-production cars of the 7000 series railcars.

The 7000 series railcars are equipped with a train control network (TCN) compliant with the IEC 61375 standard for exchanging train and vehicle control commands, as well as an Ethernet train network (ETN, 100BASE-TX) compliant with the IEEE 1473 standard for train-wide and vehicle-level communication and monitoring.

The TCN and ETN are beneficial for passengers, train operators, and maintenance technicians. For passengers, the network systems improve accessibility to real-time information on train operations and facilitate communication with train operators in the event of an emergency. For train operators, the network systems improve accessibility to information on the operating status of each train subsystem, facilitate the provision of remedial instructions to train operators in the event of a subsystem failure, and allow real-time monitoring of passenger compartments using a closed-circuit television system. For maintenance technicians, the network systems improve accessibility to fault logging data and facilitate preprogrammed maintenance tests on trains prior to departure.

We will deliver 746 sets of propulsion systems and CAMS in accordance with the basic contract and the option contract. Currently, Toshiba International Corporation in Houston, Texas, is manufacturing mass-production models of the propulsion inverter and the traction motor for the propulsion system and the logic control/vehicle monitoring and diagnostic system for the CAMS.

IEC: International Electrotechnical Commission
 IEEE: Institute of Electrical and Electronics Engineers



Propulsion inverter



Traction motor



Logic control/vehicle monitoring and diagnostic system

Propulsion inverter, traction motor, and logic control/vehicle monitoring and diagnostic system for 7000 series railcars of WMATA, U.S.A.

Electrical Equipment for 1000 Series EMUs of Hankyu Corporation

Toshiba has delivered propulsion systems, integrated train information systems, and auxiliary power supply systems for the new 1000 series electric multiple units (EMUs) of Hankyu Corporation.

The propulsion system consists of permanent magnet synchronous motor (PMSM) and VVVF inverter systems. The rotor of the PMSM incorporates a permanent magnet to reduce energy loss, allowing this type of motor to achieve higher efficiency compared with conventional induction motors. As a result, we have succeeded in reducing the energy consumption for driving the new 1000 series EMUs by 50% compared with conventional railcars.

The integrated train information system integrates the functions of a train monitoring system and a passenger information system. The passenger information system is equipped with 32-inch-wide, vertically half-sized liquid crystal displays (LCDs). This makes it possible to display the whole route or complete train information in a row at one time without compromising the font size on the screen, even when the route or train composition is long. In addition, the display can be divided into two screens to concurrently show different types of information, such as moving images and information on the state of services, on the respective screens.

The auxiliary power supply system employs a static inverter with a high-redundancy dual mutual standby control system, allowing operation to continue without interruption in the event of either subsystem failing.

The new 1000 series EMUs started commercial operation on the Kobe Line in November 2013.



1000 series EMU



VVVF inverter system



32-inch-wide, vertically half-sized passenger information system display

Electrical equipment for 1000 series EMUs of Hankyu Corporation

Electrical Equipment for E7 Series Shinkansen Trains of East Japan Railway Company

Toshiba has developed several sets of electrical equipment (main transformer, traction converter/inverter, and traction motor) for the new E7 series Shinkansen trains to be introduced on the Hokuriku Shinkansen Line, and delivered mass-production models of the equipment to East Japan Railway Company.

The electrical equipment for the E7 series has been designed based on the highly reliable equipment used for the E5 series and has the same features as the equipment for that series, including good environmental performance, small size, light weight, low noise, and low vibration. The high traction performance of the newly developed equipment will allow the E7 series train cars to easily handle the slopes along the Hokuriku Shinkansen Line. The traction converter/inverter has a switching function compatible with both 50 and 60 Hz AC main power supplies.

The E7 series Shinkansen trains started commercial operation between Tokyo and Nagano in March 2014.



E7/W7 series Shinkansen
(source: East Japan Railway Company)



Traction converter/inverter

Electrical equipment for E7 series Shinkansen trains

Trial Runs with Eco-driving Profile at Comboios de Portugal (CP)

In November and December 2013, Toshiba and Nomad Tech conducted trial runs of a train using an eco-driving profile in cooperation with the Portuguese Railways Company, Comboios de Portugal (CP), and with the support of CP's maintenance division, Empresa de Manutenção de Equipamento Ferroviário (EMEF).

We analyzed the past train operations of CP and energy consumption data to produce driving profiles and conducted trial runs of three round trips per day for three days. In these trial runs, we periodically collected speed, energy, and other train data in real time using Nomad Tech's proprietary telemaintenance technology and utilized the data for our driving assistance development and eco-driving analysis projects.

In order to reduce the energy consumption of trains and prevent variations between drivers' operations, we applied our proprietary algorithm that reduces various significant impacts on the driving profile in order to control the time taken to travel between stations. To minimize the energy consumed by a train in traveling between stations, we optimized a theoretical eco-driving profile using an optimization formula and key factors including the distance between stations, gradient, traction, and braking force of the trains, as well as knowledge of the train operations from CP Operations and Engineering and EMEF/Nomad Tech. The driver received this optimized eco-driving profile in real time via the driving assistance device to drive the train in an energy-efficient manner.

The analysis of the trial runs showed a 10% reduction in average energy consumption compared with that of trains operated on the timetable for the same month in 2012. The results achieved in these trial runs can be further improved by performing additional trial runs.

We expect that these trial runs will promote the use of this newly developed technology by railway operators and that the technology will contribute to their energy-saving efforts.



Driving assistance device

TT-1100 Letter Sorting Machine for Posten Meddelande AB, Sweden

In 2013, Toshiba delivered the first of 13 TT-1100C-SE letter sorting machines to Posten Meddelande AB, the national postal service of Sweden.

The TT-1100, designed specifically for the European market, fully complies with the requirements of the Conformité Européenne (CE) and the Restriction of Hazardous Substances (RoHS) Directive. We have designed the TT-1100 to perform a series of operations consisting of feeding letters one by one from a mail stack, creating image data of the addresses, communicating with an optical character recognition (OCR) platform to obtain the address information, printing barcodes for indexing, then finally sorting and stacking the letters for further sorting or delivery.

The TT-1100C has the following main characteristics:

- high throughput (exceeding 45 000 letters/hour)
- low noise emissions (below 69 dB(A))
- superb ergonomics and space efficiency (two-level stacker configuration).

We have succeeded in greatly increasing the cost competitiveness of the TT-1100 letter sorting machine by manufacturing a large proportion of the machine overseas.



TT-1100 letter sorting machine for Posten Meddelande AB, Sweden

Unified Controller nv series “type1 light” Small- to Medium-Scale Controller

Toshiba has released the “type1 light” controller consisting of three modules, the PUM11 (standard module), PUM12 (advanced module), and PUM14 (duplex-enabled module), as a new addition to the Unified Controller nv series lineup. These modules are the successor to the S2, S2T, and S2E modules of the Integrated Controller V series model 2000 controller.

The features of the type1 light controller are as follows:

- Compatibility with the Integrated Controller V series model 2000 controller
The new controller is compatible with the power supply modules, base units, and input/output (I/O) modules of the Integrated Controller V series model 2000 controller. Use of the nV-Tool engineering tool allows the Unified Controller nv series to operate in a common system configuration with the Integrated Controller V series.
- Connectivity to the Unified Controller nv series system
By using the TC-net I/O subsystem, the new controller can provide an increased number of I/O points compared with the Integrated Controller V series controller. TC-net 100LP modules allow time-deterministic and robust data communication between the Unified Controller nv series controllers.
- Improved robustness
The TC-net I/O subsystem uses optical fiber cables in order to eliminate the influence of field electromagnetic noise on data communication cables. The new controller is also equipped with a high-reliability memory to improve availability.



Unified Controller nv series type1 light small- to medium-scale controller

LQ520 Microwave Density Meter for Asian Market

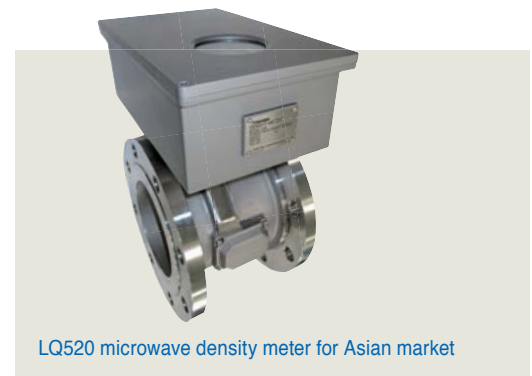
In Asian nations, growth of the population in urban areas is giving rise to the issue of increasing amounts of sewage and sludge. To solve this problem, efforts to expand and construct wastewater plants have continued. Although sludge concentration is usually carried out in the sewage treatment process in these nations, the treatment of such sludge is often insufficient. This problem of insufficient sludge treatment can be addressed while reducing the processing cost per unit amount of sludge if continuous concentration management is performed for sludge treatment as in Japan, European countries, and the U.S.A.

Toshiba has been supplying microwave density meters for continuous concentration management in sewage treatment plants, pulp and paper factories, and the food-processing industry. Taking advantage of our abundant experience and leading technologies in this field, we have developed the LQ520 microwave density meter designed specifically to meet the requirements for sewage and sludge treatment in the Asian market.

The LQ520 is lightweight and compact, and has achieved a cost reduction of about 40% compared with the previous model. To ensure reliability of operation in the harsh environment of Asian wastewater plants, the LQ520 has analog and digital circuits with enhanced noise-tolerance performance. It can also operate at temperatures as low as -20°C. To increase its waterproofness, the LQ520 is equipped with an infrared switch so that the user can operate it without opening its converter case. It also has a greatly reduced environmental footprint over the whole product life cycle, corresponding to the requirements of a recycling-based society.

The main specifications of the LQ520 are as follows:

- diameter: 100 mm
- weight: 24 kg
- structure: watertight (equivalent to International Protection (IP) rating of 67)
- usage environment temperature: -20 to 50°C
- power consumption: 6.8 W (AC 100 V)
- repeatability: ±2% full-scale.



LQ520 microwave density meter for Asian market

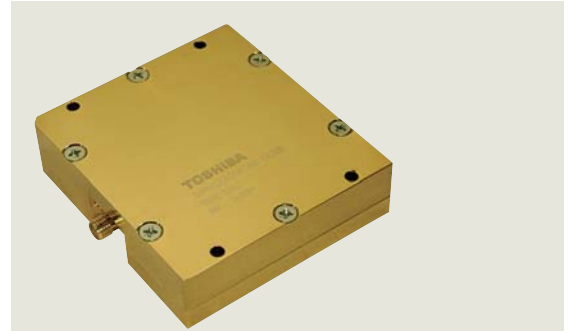
Superconducting Filter for Radio Telescopes

A high-performance frequency-selective filter that can pass very weak signals from space with low insertion loss while suppressing undesired terrestrial signals has been required for astronomical observations by radio telescopes.

The use of a high-temperature superconducting material for such a filter is an effective means of meeting this need. Since a high-temperature superconducting material has extremely low ohmic resistance at the boiling temperature of liquid nitrogen (approx. 77 K), the resonance circuit has very low insertion loss and sharp frequency sensitivity in the superconducting condition. The use of this type of resonance circuit for the filter can realize low insertion loss and a narrow transition band (between the pass band and suppression band).

Toshiba has developed a dual-band superconducting filter for L-band (1–2 GHz) operation, and delivered it to the National Institute of Information and Communications Technology (NICT), Japan. This filter has an insertion loss of less than 0.15 dB at both pass bands and an isolation of more than 47 dB at the suppression band in the temperature range of 10–30 K.

The application of the newly developed superconducting filter to the radio telescope system has confirmed that it can expand the observational bandwidth. Furthermore, this filter containing dual pass bands within the same I/O interface eliminates the need to exchange the filter when the observation band is changed.



Superconducting filter for radio telescopes

C-Band Solid-State Multiparameter Weather Radar

Precipitation caused by typhoons or weather fronts leads to the flooding of rivers and sediment disasters every year. To reduce such disasters, demand has been growing for high-performance C-band (5 GHz band) and X-band (9 GHz band) weather radar systems. A C-band weather radar is used for observing wide-area precipitation, while an X-band weather radar is used for observing local torrential rain.

Toshiba has developed a C-band solid-state multiparameter weather radar equipped with a highly reliable solid-state transmitter following the previous launching of an X-band solid-state multiparameter weather radar. This radar supports multiparameter observations, making it possible to observe precipitation intensity with high precision and to distinguish between rain and snow over a wide area within a radius of 300 km.

This C-band solid-state multiparameter weather radar, the first C-band solid-state multiparameter weather radar to be put into operation in Japan^(*), has been installed within each jurisdiction of the Regional Development Bureau of the Ministry of Land, Infrastructure, Transport and Tourism in the Hokuriku, Kanto, and Chugoku regions, and has commenced operation as a rain and snow gauge.

(*) As of December 2013 (as researched by Toshiba)



Transmitter Receiver and signal processor Antenna

C-band solid-state multiparameter weather radar system

Compact High-Power Generator for Portable Microwave Surgical Instruments

Microwave surgical instruments are used for coagulation and hemostasis by means of dielectric heating through the application of microwave power to the targeted living tissue. In comparison with similar surgical instruments using an ultrasonic or high-frequency current, microwave surgical instruments can minimize damage to tissues around the treatment target and emit less smoke and mist during operation because of their reduced heat generation at the treatment target point.

However, conventional microwave power sources with magnetron tubes are bulky and heavy, weighing more than 10 kg. The need has therefore arisen for a portable instrument that can be used at the site where a person has been injured.

Toshiba has developed a compact high-power generator using a gallium nitride (GaN) power high-electron-mobility transistor (HEMT). We have engineered a matching circuit for the GaN HEMT using a harmonic tuning design to augment the circuit efficiency. Bias circuits are embedded into the GaN HEMT to reduce the size of the generator. To enhance the performance of the generator in a limited space, it is equipped with monolithic microwave integrated circuits (MMICs) for the microwave oscillator, buffer amplifier, and variable attenuator.

As a result, the compact high-power generator, with dimensions of 85 × 40 × 20 mm and a weight of 63 g, generates 50 W output power with an overall efficiency of 52% at 2.45 GHz. This small generator allows the miniaturization of microwave surgical instruments. In spite of its high power output, the generator has a high-efficiency feature that makes it possible for microwave surgical instruments to operate for approximately one hour on battery power.

A team under the direction of the Shiga University of Medical Science will use the generator for its prototype portable microwave surgical instrument.



Compact high-power generator for portable microwave surgical instruments

New TGOGS Ozone Generators

Toshiba launched its ozone generator business in 1976, and has accumulated almost 40 years of experience in this field. We now hold a large share of the market for ozone generators at municipal drinking water treatment plants in Japan.

With the leading technology in the industry, we have developed a new series of ozone generators called TGOGS (Toshiba Green Ozone Generators) that provide enhanced energy efficiency while reducing the footprint and weight of the machine by 40% compared with the conventional model. The air-fed type achieves a 20% decrease in power consumption due to its greater energy efficiency, while the oxygen-fed type has the capability to produce ozone gas with a high concentration of up to 16 wt%. TGOGS incorporates a highly durable electrode made of high-grade stainless steel that ensures stable ozone production throughout its long life.

We have already delivered the new model with an ozone production capability of 12 kg/h to a customer in Japan, and will also expand our business abroad to contribute to the production of good-quality water in various countries.



New TGOGS ozone generator

Improvements realized by TGOGS compared with conventional model

| | Air-fed type | Oxygen-fed type |
|-----------------------------|-------------------------------------|------------------------------------|
| Power consumption | 20% reduction | 12% reduction |
| Rated ozone concentration | Conventional:1.5 wt% TGOGS:3 wt% | Conventional:8 wt% TGOGS:10 wt% |
| Maximum ozone concentration | 4.5 wt% | 16 wt% |
| Footprint | 40% reduction | 38% reduction |
| Weight | 45% reduction | 43% reduction |

Indoor Modular Data Center

Information systems utilizing information and communication technologies (ICTs) are essential to modern life, and data centers operating such systems have become increasingly important as a key element of social infrastructures. However, these information systems have recently been facing various issues, including increases in initial investment costs and the need for energy-saving measures.

As a solution to this situation, Toshiba has developed the Toshiba Indoor Modular Data Center, which offers a modular data center solution for building use that consists of a modular structure and the use of the latest air-conditioning system.

Because the number of modules can be increased as the data volume increases, the Toshiba Indoor Modular Data Center can be deployed step by step. This means that the initial investment cost can be lowered and that the latest air-conditioning and ICT systems are available at any time. The air-conditioning system has a double cooling coil for cold water and refrigerant. The free cooling system that generates cold water using natural outside air helps to save energy, lowering the operating cost.

These technologies combining facility solutions with modular data center solutions are expected to contribute to the construction of robust social infrastructure platforms.



Toshiba Indoor Modular Data Center

Demand Response Demonstration Project in Slovenia

Growing energy supply and demand imbalances, coupled with increased pressure for energy value chain optimization, have focused attention on virtual power plants (VPPs) as a core technology for smart grids.

cyberGRID GmbH, a Toshiba Group company, develops and deploys VPPs as an advanced ICT solution that manages various distributed resources (loads, distributed generation, and storage), thus providing an efficient and environmentally friendly alternative to traditional peaking power plants. VPPs have the possibility of gigawatt-level deployment and enable utilities to use aggregated capacity to optimize their electricity schedule, minimize imbalance costs, and trade on power markets. At the same time, they offer new service models for “prosumers” that are intelligently meeting instant demand.

Elektro Ljubljana d.d., the largest Slovenian utility, has signed a cooperation agreement with cyberGRID in the area of demand response, and has successfully proven the value of an intelligent VPP system. Fully operational since 2011, this system provides reliable ancillary service 24 hours per day, seven days per week, and is currently delivering 12 MW of tertiary reserve to ELES, Ltd., the Slovenian transmission system operator.

Elektro Ljubljana has also successfully demonstrated the integration of Landis+Gyr smart metering infrastructure with cyberGRID VPP technology, taking a further step toward the realization of comprehensive, large-scale VPP systems.



VPP control center of Elektro Ljubljana d.d.

IS-910T Vertical Scanner with Object Recognition System for POS Terminals

Due to the aging of the population and diversification of lifestyles, it has become necessary in recent years for retail stores to stock a wide variety of different goods that many customers purchase only in small individual quantities. This reduces the work efficiency of cashiers, causing long queues of customers waiting for their turn.

As a solution to this problem, Toshiba TEC Corporation has developed the IS-910T scanner for point-of-sale (POS) terminals. This is the world's first scanner to identify fruits and vegetables that usually do not have barcode labels, eliminating the need for cashiers to input their prices manually^(*).

The IS-910T incorporates the following innovations:

- object recognition technology that precisely identifies the variety of a vegetable or a fruit, by quickly and robustly referencing an input image to an image database
- technology that simultaneously recognizes and tracks a moving object
- a self-learning function that improves the recognition ratio with ongoing use.

With these features, the IS-910T helps to reduce the workload on and improve the efficiency of cashiers and other clerks. It is also environmentally friendly, allowing retailers to create effective displays of goods since it eliminates the need for packages and barcode labels.

To expand the applications of this POS scanner, technologies to identify fish and meat products are being developed.

^(*) As of October 2013 (as researched by Toshiba)



IS-910T vertical scanner with object recognition system for POS terminals

e-STUDIO™ 5055C Full-Color MFP Series Realizing Cloud Computing and Advanced Security Services

Toshiba TEC Corporation has developed the e-STUDIO™ 2555C/3055C/3555C/4555C/5055C A3 full-color multifunctional peripherals (MFPs) that integrate the latest functions, including high image quality, cloud computing services^(*), and advanced security support, in a compact body.

The newly developed MFPs provide a print speed of 25 to 50 pages per minute in A4 landscape mode and are equipped with a security hard disk drive (HDD) as standard, making it possible to directly upload scanner data to the cloud. In addition, the new MFPs have a warm-up time of approximately 27 seconds and a sleep recovery time of approximately 12 seconds, which are considerably faster than those of our existing color models.

These MFPs offer a comfortable operating environment with a combination of high functionality and user friendliness.

^(*) An optional device, the GS-1020 external interface enabler, is required.



e-STUDIO™ 5055C series full-color MFP

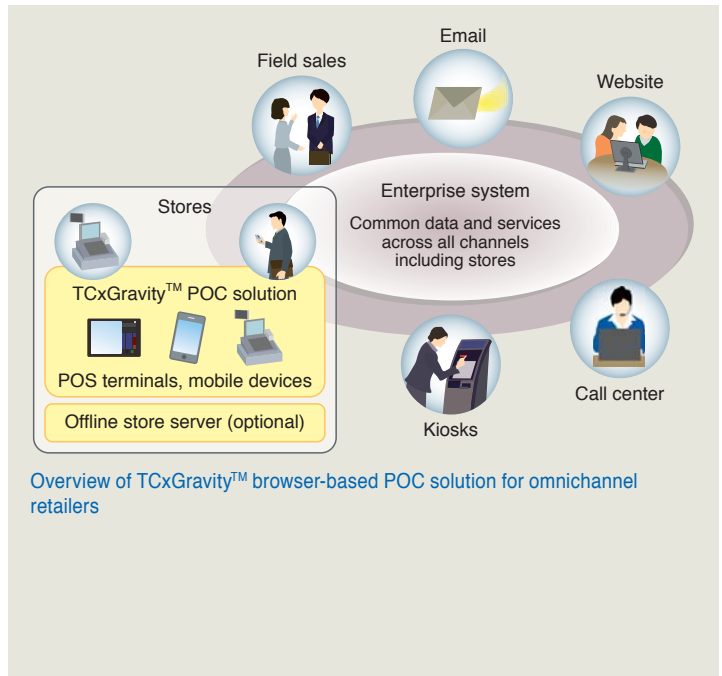
TCxGravity™ Retail Solution Supporting Omnichannel Retailing

Toshiba Global Commerce Solutions, Inc. has developed a point-of-commerce (POC) retail solution called TCxGravity™ that realizes seamless omnichannel retailing by integrating various sales channels, including Web-to-call-center and other online-to-offline (O2O) channels.

The main features of TCxGravity™ are as follows:

- The cloud platform integrates common data and services and makes them available through the full spectrum of channels.
- Device-independent thin client systems on all channels provide common usability, based on Web 2.0 technology.
- The support for mobile and other devices provides significant flexibility for use scenarios.

TCxGravity™ was first released to specialty stores in North America. Since then, we have been expanding its functionality to encompass wider geographical areas and business segments.



Medi Match™ Dispensing Check System and Medi Regi™ Registration System

The Ministry of Health, Labour and Welfare of Japan has been promoting the safety control of medical drugs by standardizing barcoding. In response, Toshiba TEC Corporation has expanded the application of its proven and highly reliable retail POS systems to the medical field.

As a result, we have developed the following easy-to-operate drug management systems that incorporate our automatic recognition technology:

- Dispensing check system
 This system checks whether all drugs have been correctly prepared, based on prescriptions and other documents.
- Drug registration system
 This system registers all drugs prescribed at different departments in a hospital including operating and emergency rooms, thus preventing the omission of any drugs from the bill.

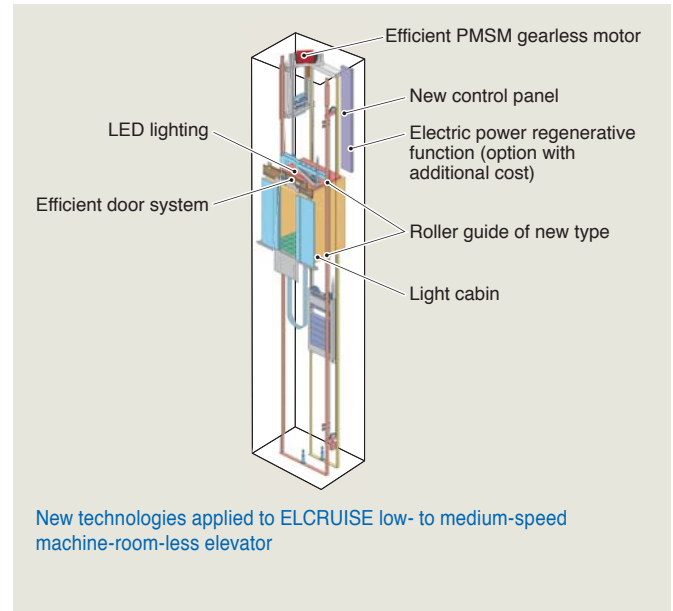


ELCRUISE Custom-Built Elevators

Following the introduction of its ORDER SPACEL-GR custom-built machine-room-less (MRL) elevators, Toshiba Elevator and Building Systems Corporation has released the ELCRUISE range of custom-built elevators with and without a machine room. ELCRUISE comes in low- to medium-speed models and high-speed models.

Embodying our energy-saving technologies, ELCRUISE consumes up to 50% less power than its predecessor. This reduction in power consumption has been achieved by decreasing standby power through the use of new roller guides and a new control panel, as well as by adopting an electric power regenerative function and light-emitting diode (LED) lighting. Furthermore, ELCRUISE is available in many design variations to satisfy various customer needs.

ELCRUISE has won awards from the Ministry of Economy, Trade and Industry and the Ministry of the Environment for its excellence in energy efficiency, environmental friendliness, and earthquake-proof design.



New technologies applied to ELCRUISE low- to medium-speed machine-room-less elevator

Power Storage and Supply System for Residential Buildings

Toshiba Elevator and Building Systems Corporation has released a lithium-ion battery system that provides backup power to the elevators of small- to medium-sized buildings in the event of a power failure.

The newly developed lithium-ion battery system allows elevators to continue running at normal speed in the event of a power failure. In addition, it has the capability to supply electric power to any of the facilities in a building such as the lights in a common building area, a water feed pump, or a mechanically operated parking facility, simply by switching the power source. It is the first lithium-ion battery system in the elevator industry to provide these features^(*).

The new lithium-ion battery system has a power peak shift function to store electricity during the nighttime when electricity demand is lower and supply electricity during the daytime when electricity demand is higher. In addition, the peak cut function allows electricity to be drawn from the battery if the contract demand is likely to be exceeded. The lithium-ion battery can also be combined with solar photovoltaic cells. Furthermore, in the event of a power failure, the LCD display on the wall of the elevator cabin shows the remaining battery charge to relieve the anxiety of onboard passengers.

(*) As of October 2013 (as researched by Toshiba Elevator and Building Systems Corporation)



Lithium-ion battery system for elevators

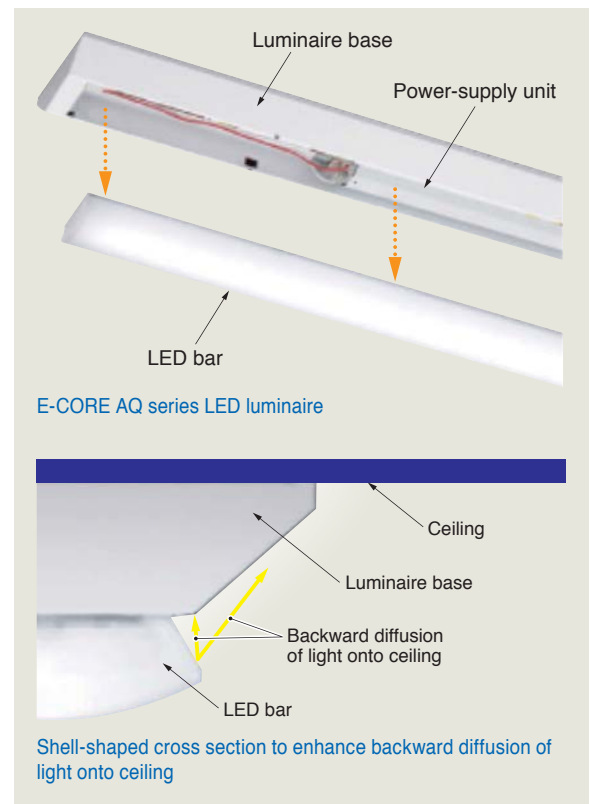
High-Efficacy E-CORE AQ LED Luminaire Series

Toshiba Lighting & Technology Corporation has launched the E-CORE AQ series of high-efficacy LED luminaires.

The AQ series is characterized by its structure consisting of a linear light source called an LED bar and the luminaire base. These two parts can be freely combined to create design variations with a wide range of performance options. For example, customers can choose the brightness (luminous flux) and color according to the situation, purpose, or personal preference. In addition, the AQ series has a luminous efficacy as high as 163.1 lm/W as it employs high-luminance LEDs and highly diffusive/transmissive cover materials for the LED bar.

The features of the AQ series include the following:

- Availability of slim and retrofit types
The slim type with a width of 120 mm is 25% narrower than a conventional luminaire. The retrofit type with a width of 230 mm is suitable as a replacement for a conventional luminaire when renovating a lighting system.
- Shell-shaped cross section of the LED bar
The LED bar has a unique shell-shaped cross section, which diffuses the light backwards onto the ceiling. The indirect lighting effect on the ceiling creates a brighter impression in the surrounding space.
- Easy attaching/detaching mechanism
The LED bar can be attached and detached with a single push. This attaching/detaching mechanism makes installation, replacement, and maintenance much easier than in the case of a conventional luminaire.



E-CORE LED Ceiling Light Fixtures with High CRI

Toshiba Lighting & Technology Corporation has launched a lineup of E-CORE LED ceiling light fixtures with a high color rendering index (CRI) under the new -kireiro- brand name.

Lighting with a high CRI makes the colors of objects such as human skin and food look more natural. In addition, these ceiling lights have dimming and color control functions, allowing users to choose the brightness and color to suit their lifestyle. Although high-CRI LEDs generally have low luminous efficacy, the newly developed ceiling lights provide a luminous efficacy as high as 100 lm/W.

The features of these E-CORE LED ceiling lights and their technical backgrounds are summarized below.

- High CRI exceeding 90
The emission wavelength and the mixture of phosphors of the LEDs have been optimized for each correlated color temperature.
- Thin form factor with a thickness of 80 mm
A wide-angle lens cover provides a highly uniform luminescent surface and a form factor as thin as 80 mm.
- Fine-step dimming and color control
The 20-step dimming and 21-step color controls allow users to adjust the lighting according to various scenes of daily life.

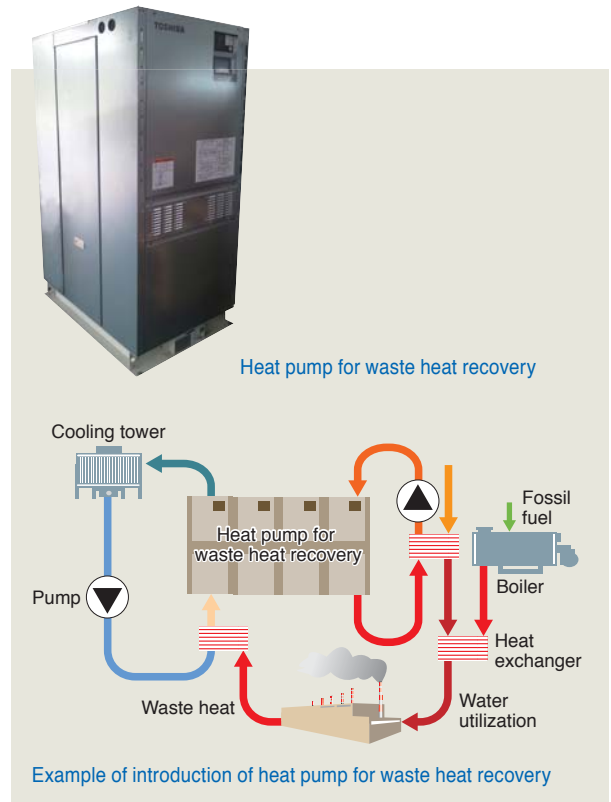


Heat Pump for Waste Heat Recovery

Toshiba Carrier Corporation has developed a heat pump based on waste heat recovery technology that can supply hot water of up to 85°C. This development marks a shift from the conventional combustion engine-driven type to the heat recovery type that emits less carbon dioxide (CO₂) into the environment.

The newly developed heat pump produces high-temperature water by recovering unused heat, such as waste heat from a machine cooling device that was previously released into the atmosphere. In addition, the new heat pump relies on electricity as a power source, thus reducing not only CO₂ emissions by 48% but also running costs by 52% compared with a boiler type heating system.

The new heat pump has twin rotary inverter compressors to stabilize the water temperature in the refrigeration cycle and utilizes R134a refrigerant, which is suitable for use at high water temperatures. In addition, it consists of multiple modules so that users can activate an appropriate number of modules according to the load. In contrast to an integrated heat source machine, this modular design helps to disperse risk and makes it possible to select a configuration with the optimal capacity. The modular design also simplifies expansion of the system according to increases in load.



Outdoor Units of Digital Inverter 4 Series Heat-Pump Air-Conditioning System

Toshiba Carrier Corporation has developed four outdoor unit models with a capacity of 5.6 kW (2 hp) to 12.0 kW (5 hp) for heat-pump air-conditioning systems applicable to light commercial use. These outdoor units are extremely light in weight, compact, and low-priced.

Despite their top-class compactness in the industry^(*1), the new outdoor units meet the requirements for the year 2014 of the ErP Lot 10 Directive^(*2), a set of European energy-saving regulations.

The 4 hp and 5 hp models incorporate a smaller and more efficient compressor with 11% less weight than that of the conventional models, thus reducing the burden of installation work.

By improving the cooling structure for electronic components and the embedded software, we have successfully extended their outdoor operating temperature range from 43°C to 46°C. Furthermore, the night operation mode suppresses the operating noise level of the outdoor unit by approximately 12 dB(A), and the energy-saving mode makes it possible to decrease peak power consumption by reducing the operating current by 50% to 100% in steps of 1%.

(*1) As of August 2013 (as researched by Toshiba Carrier Corporation)

(*2) The Ecodesign Directive for Energy Related Products of the European Commission (EC). The regulations for air-conditioning systems are stipulated by Lot 10.

