

Electric power systems have become highly sophisticated in the growth of technological innovation. Corresponding to the global economical environment, Toshiba is aiming to provide the systems that satisfy the requirements for realizing low cost/high performance operations, and to develop the technology for effective use of the energy. In elevator systems, the machine room-less elevator is highly regarded and production of a super high speed elevator, which will be the fastest elevator in the world, is in progress. An increase of demand for escalators is expected towards the welfare and aging society and a new series has been commercialized. In other industrial fields, the achievements include delivery of an ozone processing system to a water purifying plant and technology for resource recycling.

250 MVA SVC (Static Var Compensator) at Lismore, New South Wales, Australia

The SVC (Static Var Compensator) at TransGrid's Lismore 330 kV Substation in NSW (New South Wales), Australia has been installed in order to perform voltage regulation duties and to improve voltage stability under contingency conditions. Installation of the SVC became necessary due to the high load growth on the Far North Coast of NSW.

The SVC is equipped with a newly developed DC suppression control system in addition to AVR (Automatic Voltage Regulation) control, manual Var control and PSS (Power System Stabiliser) control.

The new DC suppression control system suppresses the DC current component flowing into the SVC transformer which could otherwise cause transformer saturation. The previously used DC suppression control system had an undesirable effect in that harmonic currents were generated when residual harmonic voltages existed in the power system. The newly developed system avoids this problem.

The SVC has been in operation since November 1999 and has provided voltage regulation and has contributed to voltage stability in the power system supplying the Far North Coast of NSW during peak load conditions in the recent Australian summer.



Thyristor valve for Lismore Substation 250 MVA SVC

Shipping and Commissioning of Large Thermal Power Plants



Overview of Tachibanawan PS of Shikoku Electric Power Co., Inc. and Electric Power Development Co., Ltd.

Toshiba has been supplying several world leading thermal power units with the latest technology to improve efficiency as well as to reduce their environmental impact. The following large thermal power units in the commissioning stage apply ultra supercritical steam condition:

Karita Power Station(PS) No.1, Kyushu Electric Power Co., Inc., 360 MW, 24.1 MPa, 566/593 °C;

Tachibanawan PS, Shikoku Electric Power Co., Inc., 700 MW, 24.1 MPa, 566/593 °C;

Tsuruga PS No.2, Hokuriku Electric Power Co., Inc., 700 MW, 24.1 MPa, 593/593°C;

Tachibanawan PS No.1, Electric Power Development Co., Ltd., 1050MW, 25.0 MPa, 600/610 °C.

For the turbine generator, the world's largest 2 pole, 60 Hz, 1120 MVA unit was shipped for Hekinan PS, Chubu Electric Power Co., Inc. in February 2000. This unit will be in commissioned in 2001.

The other ones are units for Chiba Combined Cycle PS, Tokyo Electric Power Co., Inc. One stage has a capacity of 360 MW with a 1300 °C class gas turbine and a reheat turbine on a single shaft. Unit 2 started commercial operation in June 2000.

In the overseas market, a 420 MW, 25.1 MPa, 566/566 °C unit has been shipped to Queensland, Australia in December 1999 and was followed by the shipment of the second unit in June 2000. This is the first export unit from Toshiba for a supercritical application. Commissioning is scheduled to start in January 2001.



LP turbine rotor for Callide PS



Overview of Hekinan Thermal PS No. 4 generator of Chubu Electric Power Co., Inc.



Overview of Chiba Combined Cycle PS of Tokyo Electric Power Co., Inc.

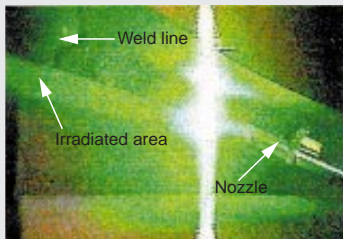
Application of Laser Peening for Core Shroud

Toshiba has developed preventive maintenance technologies for reactor pressure vessel and internals, especially laser application technologies.

Laser peening is a process which introduces a residual compressive stress on material surface to more than about 1 mm in depth by irradiating a laser pulse in water to prevent stress corrosion cracking (SCC).

A laser peening system for core shrouds was developed and applied to the core shroud of Hamaoka nuclear power station unit 1 of Chubu Electric Power Co., Inc. for the first time in the world, and then laser peening was completed on schedule.

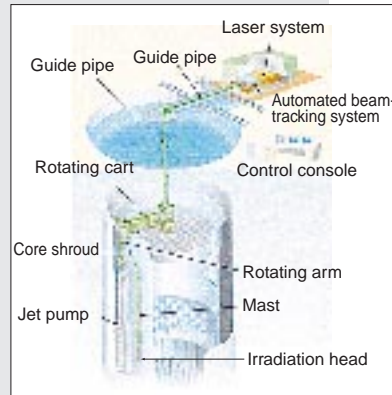
The applicability of laser peening technology will be extended to other areas of core shrouds and other components in the future.



Laser peening irradiation to core shroud



Laser peening irradiation head



Concept of laser peening of core shroud

Development of PEFC for FC Vending Machine and Residential Applications

Toshiba has developed a fuel cell (FC) vending machine, which is powered by a propane-fueled PEFC (Polymer Electrolyte Fuel Cell).

A 1kW PEFC is built into the vending machine, which realizes a co-generation system: beverage cans are cooled down by electricity or heated up by the exhaust heat from the FC, respectively.

A compact-type integrated fuel processing reactor, with which propane fuel can be reformed into low-CO, H₂-rich process gas, is incorporated into the system.

The 1 kW class unit is expected to be applied to residential and portable FC units.



Vending machine with PEFC as a power source

ELEXCIA™ High-Speed Elevator

In November 1999 Toshiba launched an all-new high-speed elevator series ELEXCIA™.

ELEXCIA™ uses a newly-developed gearless traction machine and control panel in addition to an improved cage structure, and door system.

This compact and lighter-weight equipment provides passengers with more stable riding comfort and quieter operation.

Some of the key features include:

- A gearless traction machine utilizing a permanent magnetic synchronous motor (PMSM), which shapes outside rotor and inside stator, achieves light weight (40% less than conventional type).
- Double-skin cage wall and floor structure achieves lower noise levels during running.
- Door-operating PMSM motor and microprocessor for inverter control achieve smoother door operating performance.
- White colored LED illumination provides brightness for hall buttons and car operating panels.



ELEXCIA™ high-speed elevator

TD Series Escalator

The TD series escalator, utilizing a direct-drive system, has been launched on the market. In contrast to conventional escalators, steps and handrails are driven by a direct-drive system, so the TD series does not require a driving chain.

Major features include:

- Further space-saving is realized through the shortened overall length of the escalator.
- Lubricant for the chain is reduced by 90%*, making the escalators more environmentally-friendly.
- Weight reduction by around 20%* is realized by a thorough review of packaging, including steps.
- Smart appearance is realized with the new design of balustrades and landing plates inspired by the gentle flow of passengers.

* In comparison with Toshiba's conventional products.



TD series escalator

Advanced Water Purification Facilities Delivered to Large-Scale Purification Plants



Ozone generator

In April 1999, advanced water purification facilities were in operation at the Niwakubo Purification Plant of the Osaka Municipal Government and the Misato Purification Plant of the Tokyo Metropolitan Government. Toshiba installed ozone treatment system, which are the key component of advanced water purification facilities.



Ozone reactor

The ozone treatment is applied to the water purification process at a rate of 840,000 m³ a day at the Niwakubo Purification Plant. A feature of this ozone generation system is its ability to control the distribution of air at adequate rates from air supplying units to plural ozone generators with different capacity. So, a 30% reduction in installation space of a system is achieved from the general ozone system, which is comprised of one air supply unit and one ozone generator.

Some 550,000m³ of water is treated each day at the Misato Purification Plant. Toshiba installed four ozone generators with single unit capacity of 31 kg(O₃), which is at the world's highest level of air source base type. Toshiba analyzed flows of air and cooling water, and thermal distribution of air and cooling water in the ozone generator. And Toshiba designed the ozone generator, which has an optimized structure to minimize temperature differences within the generator. The result was an improvement in the rate of ozone yield by more than 10% relative to our existing models.

POWDERMAN™ Micro-Grinding Machine

The micro-grinding machine POWDERMAN™ shown in photo, has been developed as a preliminary treatment unit to recycle solid waste.

POWDERMAN™ can easily grind the hard glass-fiber reinforced plastic (FRP) parts and the metal-polymer composites of circuit-boards in TVs and computer parts into fine-grained powders by the rotary tool with cutting edges. This machine can grind the large parts measuring a few ten centimeters square in one pass, and is capable of controlling the particle size from the order of mm to 10μm by selecting the operation parameters of tool edge size, pressure and rotating speed.

The first POWDERMAN™ has been installed at the premises of the fabricator of office automation machine parts, Asahi Glass Matex Co., Ltd., a company which has established a recycling process for waste FRP powders.



POWDERMAN™ micro-grinding machine