

Though importance of electric power system and energy apparatus, which support the continuously varying and developing society will not change, rationalization and cost reduction are required more to correspond global economical environment and problems of material and environment of the earth. We should answer to those problems and promote engineering development for the problems of stable power source and electrical power supply, energy apparatus, and pursuit of high efficiency system.

First Core Shroud Replacement Successful Completion

Toshiba in June 1998 successfully completed core shroud replacement in a boiling water reactor (BWR), the world's first field application, at No.1 Fukushima Nuclear Power Station



Installation of core shroud into reactor pressure vessel

Unit No.3 of Tokyo Electric Power Co., Inc.. The unit was restarted and is now being operated successfully.

The core shroud is the main component of the BWR core structure. Stress corrosion cracking (SCC) in the core shroud has been found in early over seas and domestic plants since 1990. Plant owners requested the drastic countermeasure as a response. Toshiba developed the method in a short period to replace existing core shrouds with new ones made of SCC resistant material. After completing this large scale project, Toshiba has been highly evaluated internationally.

An important feature of this replacement method is that personal access into the exposed reactor was realized by the application of in-vessel chemical decontamination and the installation of a radiation shield. In addition, adoption of newly developed technologies, such as a shroud lifting device with remote landing and alignment system, and a narrow groove welding machine to enable high efficiency and less deformation of welding, has led to shortened schedule and reduction of personal exposure.



Work in reactor pressure vessel after chemical decontamination

In August 1998, the next phase of this replacement was started at Unit No.2 of the same station, and Toshiba again implemented the work as main contractor.



Outside welding machine



Inside welding machine

Core shroud welding machine

420kV GCB and 500kV Oil-Immersed Transformer for Export

In order to gain third party proof of product performance, type test for gas circuit breaker (GCB) and transformer were carried out at world renowned third party test institute KEMA (Keuring van Elektrotechnische Materialen) in the Netherlands. All the test items were successfully finished, and an official test certificate has been issued to Toshiba.



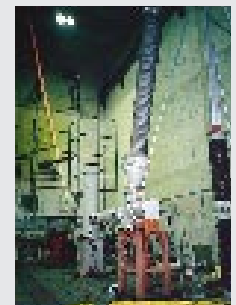
KEMA certificate (420 kV gas circuit breaker short-circuit performance)

The short circuit breaking test and the short time withstand test were carried out for 420kV-63kA single break GCB. The GCB is intended for countries which have 420kV power grids such as India, Saudi Arabia, Singapore, United Arab Emirates, etc.

With respect to 250MVA-500/√3 kV oil-immersed transformer, a full scale short circuit withstand test was carried out jointly with EGAT (Electricity Generation Authority of Thailand) who is one of the highly reputable utilities in the Asia.



250MVA-500/√3 kV large capacity, high voltage single-phase oil-immersed transformer



420kV-63kA single break GCB

Outline of KEMA test

Continuous Business of Gas Insulated Transformer for Overseas Market

Nine 50MVA-110kV gas insulated transformers for Beijing Power Supply Bureau were delivered recently. All of the transformers are for underground substations in the center of Beijing. The delivery began with the Fuguo underground substation in December 1997 and was completed in March 1999 with the Guomao underground substation.

Following this satisfactory result, Toshiba received an additional order for eight 63MVA-110kV gas insulated transformers from the customer in September 1998. These gas insulated transformers are the largest capacity being used in China, and they will be installed within 1999 as one of the projects celebrating the 50th anniversary of the country's founding.



50MVA-110kV gas insulated transformer

Completion of Thermal Power Plants

During 1998, the advanced combined cycle power plant at Unit No.7 (4 stage x 350MW) of the Yokohama Thermal Power Station of The Tokyo Electric Power Co., Inc. and Unit No.7 (6 stage x 243MW) of the Shin-Nagoya Thermal Power Station of The Chubu Electric Power Co., Inc. began commercial operation in January and December. These plants consist of new 1,300°C-class advanced gas turbines and have a thermal efficiency of about 49 percent.



Overview of Shin-Nagoya Unit No.7 of the Chubu Electric Power Co., Inc.

The latest coal fired thermal power plant at Unit No.2 (700MW) of the Nanao-ohta of the Hokuriku Electric Power Co., Inc., which apply steam conditions of 24.1 MPa and 593/593°C, began commercial operation in July 1998.



Nanao-Ohta Thermal Power Station of the Hokuriku Electric Power Co., Inc.

Three multi-stage extraction condensing turbines applied a block design system, and coupled with air cooled generators began commercial operation during 1998:

the 60MW Unit No.7 of the Niigata plant of the Hokuetsu Paper Co., Ltd., in February; the 43MW Unit No.5 of the Kishu plant of the Kishu Paper Co., Ltd., in June; the 65MW Unit No.1 of the Oji Paper Co., Ltd., in October.



SCSF 134MW turbine for Penuelas at Keihin Works

As power plants for export, two steam turbine generators composed of single casing single flow (SCSF) type steam turbine rotors using newly developed material were completed. The first plant, 134MW at the Saba power plant in Pakistan was completed FOB in April 1998, and another plant, 214MW at the Penuelas power plant in Puerto Rico was completed FOB in September 1988. Both plants are owned by independent power producer (IPP).

WORLD ENERGY 21 Series Three Phase Induction Motor

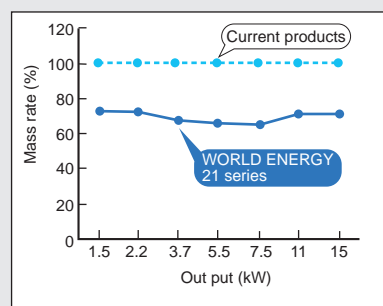
In October 1998, Toshiba launched a new series of totally enclosed fan-cooled three phase squirrel cage induction motors, WORLD ENERGY 21 series, ranging from 2 to 6 poles and from 0.75 to 18.5 kW.

Several new technologies, including specially designed aluminum die-cast frame and newly designed low-noise cooling fan, have achieved 20% smaller motor volume, 30% lighter weight and 3dB(A) lower sound noise compared with the former series.

The electrical and mechanical characteristics of the new motors also comply with the relevant standards and are interchangeable with the former motors in installation.



Totally enclosed fan-cooled motor



Comparison of mass of WORLD ENERGY 21 series and current products

Toshiba T98 Series Horizontal Foot Mount Squirrel Cage Induction Motors

For 2 years Toshiba Research and Development Engineers have been developing the new T98 series squirrel cage induction motor. This exciting successor to the T90 series offers a new 3-phase induction motor that is specifically designed to meet customer needs.

The T98 series provides motor frames from 450 to 900 suiting international standards, and greatly increases the range of standard bracket type motors up to 15,000kW. The reduced physical size of the T98 series provides great savings in installation and civil costs — a major benefit to customers. Another major benefit is time saving — standardization of design reduces manufacturing time, which means fast time delivery to customers.

To clearly demonstrate the benefits of the T98 series, a CD-ROM is available which provides full performance characteristics and dimensions. Designed and manufactured by Keihin Products Operations, a world leader in providing power generating equipment and with more than 100 years of experience in motor manufacturing, the T98 series squirrel cage induction motor is an exciting addition to the Toshiba High Voltage Motor range.



TOSMIGHTY™ -T98 series high-voltage squirrel cage type induction motor

TOSVERT™ VF-A7 The New Generation High- Performance Inverter

Toshiba has applied the newly developed, improved sensorless vector control technology to the VF-A7 inverter, so that the starting torque of a motor is increased more than 200% at 0.5 Hz. This is suitable for heavy loads or heavy duty machines, such as crane/hoists and injection machines.

With these improvements, torque limit function, online auto-tuning of motor constants and torque control can now be performed. Higher accuracy speed control, torque control and positioning can be performed by options and a motor with sensor. This means that the application field for general purpose inverters is drastically enlarged to that using specially prepared inverters.

Built-In EMI noise filter is installed as standard for small/middle model (200V class up to 7.5kW, 400V class up to 15kW), it can dramatically reduce conducted/radiated noise, and conform to CE marking in EU.



TOSVERT™ VF-A7 series (0.4 to 280 kW)

New Model LQ300 Microwave Density (Consistency) Meter

The new microwave density (consistency) meter model LQ300 has been developed based on a new measurement principle. It measures the concentration of materials dissolved or mixed in industrial processes on the basis of phase changes associated with microwaves. This measurement is not easily affected by the presence of contamination or bubbles. As there are no moving parts and no inline projections, high reliability and a minimal maintenance requirement are guaranteed. Furthermore, the latest phase detection technology, termed dual phase detection in phase change of microwaves is adopted in the LQ300. This technology offers higher accuracy and stability than the conventional type of mechanical, optical or ultrasonic measurements. LQ300 also has certification for worldwide use such as the CE Mark and FCC approval. Its applications for density measurement in manufacturing processes include the pulp & paper, building materials and food & beverage industries.



LQ300 microwave density meter