Radiation Monitoring System (RMS)

Applying Field Programmable Gate Array (non-CPU) Technology to a Radiation Monitoring System

Features

The Toshiba Radiation Monitoring System (RMS) is based on special Field Programmable Gate Array (FPGA) technology. The FPGA based RMS has the following design advantages:

1) **Long life**: >15 years: Longer than CPU based product
2) **High Reliability**: Less parts, lower temperature operation
3) **Less calibration**: Digital signal has lower drift

Application

Toshiba FPGA based RMS line-up includes:

- Single channel type
- Multi-Channel type
Radiation Monitoring System (RMS)

Applicability of Toshiba RMS

Toshiba FPGA based RMS is applicable to conventional BWR designs.

Features & Benefits

Toshiba provides FPGA-based I&C systems to address known issues with conventional systems - such as product life cycle, drift, and testability. With an FPGA-based system the benefits of long life, high reliability, and signal stability over an analog type or CPU type control system are clear when it is applied to a nuclear power plant control system.

Description

The Toshiba RMS is based on FPGA-based circuits. FPGA-based circuits process signals by hardware only. Therefore, the system does not use a microprocessor. A hardware description language called Very High Speed Integrated Circuit Hardware Definition Language (VHDL) is used to design the FPGA logic. If the supply of a certain type of FPGA is stopped, a different FPGA can be used. The same processing can be implemented by using the same VHDL logic.

Toshiba offers radiation monitoring equipment for both non-safety and safety related applications. Available detector types include ionization chamber, scintillation counter, and solid-state. Toshiba has developed both single channel and multi-channel FPGA-based Radiation Monitoring Systems.

Single channel type: Processing one signal from one detector.

Multi-Channel type: Processes various signals from various detectors. Parameters are input centrally from the flat panel display. CPUs are used for non-safety portions (e.g. flat display and communication interface).

Experience

FPGAs have a long history of application in satellites, military equipment, aerospace, and aircraft systems. Toshiba has a large experience base of installed FPGA-based radiation monitoring systems – over 300 units in 11 Japanese BWR plants.

History

Toshiba has extensive experience in supplying nuclear non-safety and safety-related I&C systems in Japan. Also, Toshiba developed nuclear non-safety and safety-related digital I&C systems and supplied these systems to operating plants as upgrades. Based on this technology, Toshiba designed and manufactured the world’s first fully integrated CPU-based BWR digital safety system. Toshiba has extensive software quality assurance experience in designing and supplying safety systems.

Toshiba has applied both non-safety and safety related CPU-based digital radiation monitoring systems to many Japanese BWR plants.

Toshiba makes extensive use of this experience in the design and manufacture of FPGA-based Radiation Monitoring System products to resolve the issues existing both in conventional analog and CPU-based systems.