



Insulation condition status 24/7

Partial discharge monitoring of power generators

Global energy provider AES recently selected the OMS 600 online continuous partial discharge monitoring system for two turbo generators at its thermal power plant AES 3C Maritza East 1 in Galabovo, Bulgaria. The system keeps an eye on the condition of the generators' stator insulation, making maintenance more efficient and helping to prevent premature equipment failure. AES 3C Maritza East 1 is one of four plants that make up the Maritsa Iztok energy complex, the largest of its kind in southeastern Europe and the biggest producer of energy in Bulgaria.

AES launched its 670MW thermal power energy plant in Galabovo, Bulgaria in 2011. To protect its investment and to extend the life of its two 20 kV, 436MVA generators, AES was looking for a permanently installed online partial discharge (PD) monitoring system. "AES is one of the biggest investors in the Bulgarian power generation sector," says Ivan M. Ivanov, Chief of Electricians at AES 3C Maritza East 1. "To maximize our investment and to ensure reliable service, monitoring the health of our generators is critical on a regular basis."

Generators are subjected to many stress factors

In the course of their operating lifetime, turbo generators are continuously faced with thermal, electrical, and mechanical stress. Failure statistics for rotating machines show that over half of failures are caused by stator insulation damages. Degraded insulation in stator windings causes various inter-turn, phase-to-phase or phase-to-ground faults. These may require unplanned outages or even result in a complete machine failure. Therefore, a majority of

these faults can be predicted by monitoring PD. The data collected during PD monitoring is used to identify trends. This enables appropriate maintenance and repair measures to be planned in advance to extend the life of the asset and prevent unnecessary outages.

Local support is key to OMICRON service

Engineers at the AES plant in Galabovo are already satisfied CT Analyzer users. They first became aware of OMS PD monitoring technology at a recent OMICRON Roadshow in Bulgaria. With the support of Contragent 35 Ltd., OMICRON's Bulgarian sales and engineering partner, local contact was established with the AES team. Contragent provided the customer with details about the OMS system and was present with OMICRON representatives during evaluation meetings, on-site inspections and trainings. OMICRON met on site with the asset management team at AES 3C Maritza East 1 on numerous occasions to define monitoring system requirements and to plan an efficient system ▶



AES 3C Maritza East 1 is a 670MW thermal power plant located in Stara Zagora Province in south-central Bulgaria. It is the first large-scale power plant to be built in Bulgaria in the past 20 years, the single largest foreign investment in Bulgaria, and one of the largest green field investments in southeast Europe.

10 Partial discharge special

► installation with a minimum of downtime required for each generator. "This added face-to-face support in the local language is one of the ways we at OMICRON can best serve the needs of the customer," says Steffen Kurz, OMICRON project leader of the AES installation in Bulgaria.



Contragent 35 Ltd.

OMICRON's local partner in Bulgaria, Contragent 35 Ltd., is specialized in the production and trade of electrical materials and equipment for the Bulgarian power and industry sectors. The company was founded in 1990 and it has grown rapidly into a leading trading and manufacturing company in the Bulgarian market.

 www.contragent.com

Following an extensive review of available PD monitoring solutions, AES selected the OMS 600 system to meet its requirements at the Galabovo power plant. In addition to monitoring equipment, OMICRON's full service package includes customized system design, project management, on-site installation, calibration and commissioning, as well as system training, and remote data analysis and reporting by OMICRON PD experts.

The installed OMS 600 system consists of high-capacitance sensors, data acquisition units with IP65 enclosures, a central monitoring server and monitoring software. The sensors are mounted within the main terminal box of each of the two generators. The sensors' high capacitance (1.1 nF) delivers the critical sensitivity to detect PD impulses in a wide frequency range, providing a deeper look into the condition of windings. In addition, OMICRON PD monitoring systems provide adjustable measurement frequency at any time to maximize the signal-to-noise ratio.

Synchronous, multi-channel PD data acquisition

The outputs of the sensors are each connected by a short coaxial cable to the corresponding 3-channel data acquisition unit, which collects and processes PD signals from all sensors synchronously. In addition, the OMS 600 allows suppression of noise signals and evaluation of singular PD sources within the stator winding. This data allows reliable identification of phase-to-ground and phase-to-phase PD phenomena.

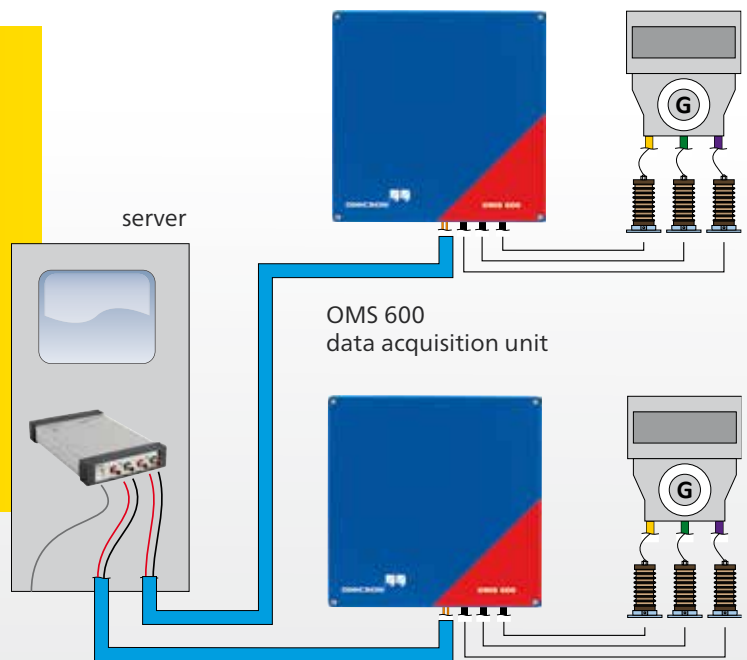
The collected PD data is sent from each acquisition unit in digital format via fiber optic cable to the central monitoring server. This server performs the real-time data processing as well as comprehensive analysis and reporting of PD data. All channels of the plant's turbo generators can be observed simultaneously using the OMICRON monitoring software.

Monitoring is conducted at customer-defined intervals. Once a defined threshold is reached, the software triggers the monitoring system to make and record a measurement. Data and statistical information of PD events, such as apparent charge value, number, polarity, time and phase angle position of PD occurrences can be visualized, recorded and stored for further processing.

OMS 600

- > Synchronous multi-channel PD data acquisition
- > PD source separation through advanced technology like 3PARD and 3CFRD
- > Denoising using several gating methods
- > Optical isolation between partial discharge acquisition unit and server
- > High capacitance of coupling capacitors

www.omicron.at/oms600



OMS 600 – OMICRON’s continuous PD monitoring system installed at two turbo generators in the AES thermal power plant in Galabovo.

Remote data access

The software supports remote access via a web-based TCP/IP connection. This allows operators to remotely configure and control the system’s acquisition units. It also enables access to the stored data and quick reaction to problem alerts from any remote location. As part of the project, this remote analysis is performed by OMICRON. Detailed reports are provided to AES by OMICRON PD experts.

“OMICRON’s solution provides AES with comprehensive online PD monitoring with superior technology and advanced warning of bad trends in our winding insulation,” says Ivan M. Ivanov. “The technology monitors the complete winding using a wide frequency range for PD analysis. The remote check and reports made by OMICRON experts provide excellent professional support for our engineers.”



»The remote check and reports made by OMICRON experts provide excellent professional support for our engineers.«

Ivan M. Ivanov
Chief of Electricians at AES 3C Maritza East 1

AES Corporation

AES provides affordable, sustainable energy to 27 countries through its diverse portfolio of distribution businesses as well as thermal and renewable generation facilities. A workforce of over 27 000 employees is committed to operational excellence and meeting the world’s changing power needs.

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