SATEC

Power Plant Automation Retrofit

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Darkhan Thermal Power Plant is a state owned 48MW coal power plant in Mongolia, which provides electricity to the 100,000 residence of Darkhan city and Selenge province. The plant was built in 1963 and consists of four 12MW turbines. Due to inevitable aging, a step by step modernization process has been ongoing since 2012. The objective of the renovation is improving control, as well as raising the total power capacity to 83mW.

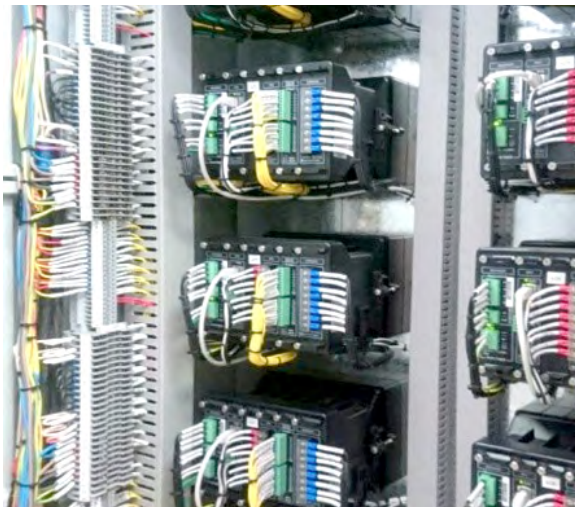
THE PROBLEM

The existing fault recording and automation systems are based on Russian equipment commissioned in 2002. Additional equipment was required to support the increased capacity, and it was not possible to interface this with the existing systems due to the age of the systems.

The user specified new needs including:

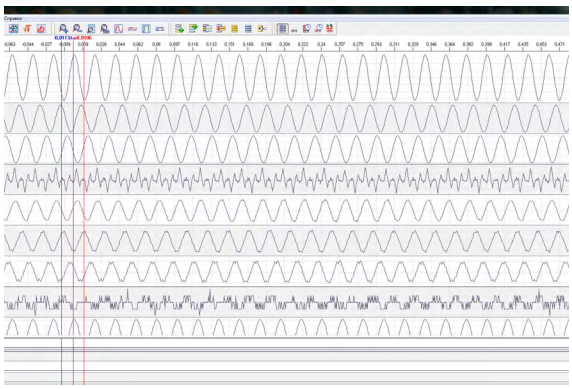
1. Distributed fault registration system (individual IEDs)
2. Monitoring and dispatch system featuring a 1-second data update time
3. High accuracy Energy Metering System based on same platform
4. Capability for analyzing fault event waveforms from separate devices on one screen
5. SNTP time synchronization between different IEDs
6. Flexible hardware and software solution, based on an array of modules, screens and languages

THE SOLUTION



MSEL (http://www.msel.mn/) is SATEC's partner in Mongolia, and a well known company in the Mongolian energy market. MSEL provides engineering services for 0.4-110kV substations and distribution facilities, including the supply of protection relays, metering and testing equipment, and HMI and SCADA systems. The company focuses on substation and power plant automation, ensuring the reliable operation of these systems.

Based on the extensive experience of the well qualified team, MSEL designed and built the first modern system for fault registration in Mongolia. As said, this system includes monitoring, control and high accuracy energy metering per customer requirements.



The system utilizes 39 SATEC PM180 power quality analyzers, 3 Ethernet switches, a DELL server, 5 electrical cabinets, a SEL-2488 satellite-synchronized network clock, and SEDMAX software.

SEDMAX (sedmax.ru) is an industrial informational and analytical system that

can be widely used for local and complex automation purposes in the energy industry, industrial enterprises, manufacturing, etc.

MSEL built five complete new cabinets with all the equipment.
The PM180 included various I/O, as well as a DFR (Digital Fault Recorder) module. The DFR module allows simultaneous connection to one device of the measurement CTs and the protection CTs, to provide both revenue grade accurate measurement and 40 × I_n fault recording.
Upon completion of the project, the power station receives all the needed data in real-time.
This includes measurements through 380 analogue signals, 624 status signals, normal mode currents and fault currents. In addition, 88 additional calculated parameters and 420 triggered alerts are provided, set up as immediate notifications about changes in the technological process.

MSEL designed the system to operate in both standard and fault scenario. Under standard operation, it provides high accuracy measurements. This enables calculation of energy consumption in selected parts of the station with Class 0.2S accuracy. During fault events the system performs fault recording of currents up to 40 × I_n and and records waveforms up to 3.5 minutes long. With zero gap between consecutive logs, there is no practical limit for continuous logging.

In addition to Class 0.2S accuracy for energy metering, the PM180 is certified as Class A, Ed. 3 per IEC 61000-4-30 for power quality monitoring. Comprehensive power quality monitoring, based on the EN50160 standard, enables detection of power quality issues, correcting these before they affect system reliability.

SEDMAX software collects all real-time measurements, I/O states, waveforms, and logs from the PM180 over Modbus. Likewise, it collects diagnostic from the server, ethernet switches and the clock via SNMP and ICMP, storing the data and providing flexible tools for data management and processing. SEDMAX software uses a versatile web-based interface for configuration and data visualization. It provides an informative system that includes waveforms and event logs, giving a full historical overview of system operation. Furthermore, tens of mimic diagrams were developed for full detailed control of the processes at the Darkhan Thermal Power Plant.

The design of the new system is very flexible, allowing the operator to easily make changes, such as adding monitoring devices (such as the SATEC PM180), more I/Os in exiting devices or retrieving additional information from the thousands of different parameters available from each PM180. The PM180 I/O modules can be installed or removed from the unit while the system is up and running (“hot swap”), allowing change in hardware configuration without any interruption.

The PM180 is a high-performance Class Power Quality Analyzer that can simultaneously host several applications, including Phasor Measurement Unit functionality.

- Power Quality Analyzer (Class A, Ed. 3)
- PMU per IEEE C37.118.1
- Disturbance Direction Detection
- 40 × I_n Digital Fault Recording
- Up to 48 digital and analog I/O
- EN5016 Power Quality Analysis

For further information on this device

CONCLUSION

The SATEC PM180 is a multi-purpose device that replaces several IEDs. In this case study it was used for revenue metering, power quality analysis, automation control and digital fault recording. Implementing one single device saves space and cost without compromising performance.