



Mercedes-Benz Uses Power Management System To Assure Plant Uptime



Training helps chief electrical engineer optimize benefits

When Mercedes-Benz USA International (MBUSI) began building a sophisticated plant to manufacture its M-Class sport utility vehicle, the company was determined to find an equally sophisticated system for monitoring and troubleshooting power quality problems, minimizing downtime, and reducing energy costs. The system they got from Square D paid for itself in two years – one year ahead of schedule.

“In the automotive industry, loads are very sensitive to power quality due to the high quantity of PLCs (programmable logic controllers), drives, and computer equipment,” said Randall Sagan, facilities electrical engineer for the MBUSI manufacturing plant in Tuscaloosa County, Alabama. Tasked with choosing a power monitoring and control system for the new facility, Sagan insisted on a system that emphasized power quality and disturbance monitoring, yet included an exceptional meter.

Sagan had two primary goals for the system: prevent power outages based on the data gathered, and have the necessary information to quickly diagnose power problems. “I specifically wanted a system that was primarily a power monitoring system,” he said. “By emphasizing power monitoring I knew we would get a good metering system as well. The Square D PowerLogic system was superior in its ability to perform power quality and disturbance monitoring functions.”

Based on previous experience, Sagan installed PowerLogic CM-2350 circuit monitors on the mains of the plant’s 13.8 kV switchgear and on every 480 volt feeder serving the 1.2 million square foot facility. A Sy/Net communications network connects the 75 circuit monitors to a central PC in the plant’s control room. Sagan uses Square D’s System Manager software to check system status, enunciate alarms, view real-time and historical data collected from circuit monitors, and analyze waveforms. He exports data from System Manager software to Microsoft Excel via Dynamic Data Exchange (DDE) where he performs additional analysis and runs a series of custom reports.



Training is Power

Soon after the system was installed and the plant was brought online, Sagan attended PpowerLogic training sessions. “The power quality course was the best I’ve had anywhere,” Sagan said. “I was able to come back and get my devices set up with the correct setpoints for sags and swells, and I was able to use the correct terminology when speaking with my utility.

The training soon paid off when the plant’s power monitoring system recorded a voltage sag, and notified Sagan via an alarm. When Sagan called the utility, he was told that an entire substation had been lost. While a utility service crew was en route to the substation, Sagan studied the waveforms captured by his circuit monitor and theorized that the sag resulted from a failed lightning arrestor on Phase B. He reported his theory to the power company, which later confirmed Sagan’s diagnosis.

In another incident, the PowerLogic system captured a 70% voltage sag that interrupted production. As the facility restarted processes, Sagan analyzed the data from his circuit monitors. The system showed that there had been a momentary phase A-B short, followed by a momentary phase B-C short. Sagan called the utility and told them it seemed like the A and B phases, then the B and C phases on a transmission line had slapped together. The utility discovered that another industrial customer served from the same 115 kV transmission line had caused the problem. A fork truck driver, carrying a load of steel, had run into a utility pole guyline, causing the pole to snap. The top half of the pole swung freely and the conductors touched – first A-B, then B-C – causing the faults, just as Sagan had suggested.

“The utility company is keenly aware that MBUSI can monitor everything on their system that might effect us,” Sagan said. “As a result, they have always notified us before performing any switching or maintenance on their system in the nearby area. We have a very good relationship with our utility company and the ability to share information with them has enhanced the relationship.”

Diagnoses, not Guesses

The system’s technology, coupled with Sagan’s training, also helps MBUSI troubleshoot problems that originate inside the facility, by producing waveform data. Once, a 250-hp motor unexpectedly shut down inside the plant’s Energy Center, which houses 13.8 kV switchgear and unit substations for feeding the chiller plant, cooling towers, pumps, air compressors and hot water boilers. By analyzing waveform data from the circuit monitors, Sagan discovered a 2,400-amp current swell had occurred on a 1,200-amp full load circuit. Evidently, a fault had blown the fuse at the motor starter, and a cable in a junction box feeding the 250-hp motor had shorted phase to ground.

Without the information from the circuit monitors, operators would likely have replaced the fuses while the fault condition still existed, risking injury and damage to the starter,” Sagan said. “In addition to the safety benefits, the information we capture in our power management system made the response to that problem much faster.”



On several occasions the PowerLogic system has helped MBUSI avoid shutdowns due to overload conditions. For example, in the Energy Center an alarm in System Manager software showed four motors running on an MCC with a 1,200-amp main. The combined load of 1,300 amps could have caused a shutdown, but the warning allowed operators to immediately start a motor on a second MCC and keep the process running.

MBUSI also uses data from the PowerLogic system to help design power quality correction equipment for the existing power system. Before installing the correction equipment, the plant was running at 83% power factor at full load. The company consulted Square D's power system studies group, which analyzed the plant's historical data and made recommendations on specific ways to modify circuit monitor data logs to collect information on loading, harmonics and THD for the power factor control design.

"The recommendations allowed us to install the correct size capacitor banks in the right places," Sagan said. "The power factor correction project was approved based on a return on investment of three years. Because we were able to use such detailed information when designing the system, the power factor correction equipment has actually exceeded expectations.

"The plant exceeded its target of 95% and now runs at 99% power factor most of the year. Since we pay a kVA demand charge each month, this improved power factor means that the system has paid for itself in less than two years."

Tracking Power Bills

In addition to using the power quality features, the system monitors energy use by department. Sagan tracks energy readings from the two incoming mains, creates kWh trend charts, and estimates bills. He compares the data to his energy bills for verification purposes.

MBUSI plans to extend the power management system when it expands its physical plant by almost 100%. A new electrical building, located almost a mile from the manufacturing plant, will house medium voltage switchgear equipped with Square D's new CM-4000 circuit monitors on the mains and CM-2350 circuit monitors on feeders. The monitors in the remote building will tie into the existing PowerLogic system via high-speed Ethernet communications over a fiber-optic cable.

Sagan said the newest circuit monitors help detect sags, swells and voltage transients, and will produce power system data from any PC in the facility, using only a standard web browser. "The PowerLogic system optimizes production uptime and cost efficiency," Sagan said. "Its ability to store massive amounts of data on each monitor is what sets it apart from other systems. Using PowerLogic throughout our entire operation compounds its value."

