Customer Success Story:
ISS IT & Business Services GmbH

Market segment
Commercial Buildings

Effective arc fault protection for switchgear

Every data center has two important priorities: to uphold safety and ensure a reliable energy supply. It is therefore vital to protect the building's low-voltage main distribution system against arc flashes, which can cause catastrophic damage. The Hewlett Packard (HP) data center in Rüsselsheim chose to update its switchgear with Eaton technology, including the ARCON arc fault protection system, to ensure the highest levels of safety and reliability.

Location:
Rüsselsheim, Germany

Challenge:
Arc flashes pose a grave threat to people, equipment and security of supply

Solution:
The ARCON arc fault protection system

Results:
Enhanced safety in the data center due to active arc fault protection

"Eaton's ARCON system makes an important contribution to the reliable operation of the data center." Rainer Weil, ISS IT & Business Services GmbH

Background

The Hewlett Packard data center in Rüsselsheim was originally set up by Opel. To ensure full operational capacity, the low-voltage main distribution (NS-HV1), installed in 1998, included an arc fault protection system.

Arc flashes pose a threat to a building's power supply and should not be underestimated. They are caused by insulation flashes between the conductors, or between the conductor and earth, respectively. Even with all the standard precautions, arc flashes can still occur in electrical energy distribution systems today.

There are many possible causes, including human error while operating the switchgear, contamination, condensation or overvoltage. At their worst, arc flashes can replicate the force of an explosion, with potentially fatal consequences for anyone working on the installation or standing in its vicinity.

The resulting power failure is likely to be costly and may last for days or even weeks. Additionally, the damage to switchgear may be so extensive that it requires complete replacement, which can be expensive and time-consuming.

Challenge

"As a service provider for HP, we want to make sure we minimize any such risk," explains Rainer Weil, Site Manager at the Düsseldorf-based ISS IT & Business Services GmbH (ISS).

With more than 494,000 employees in 75 countries, ISS is a leading provider of facility services.

The ISS team is responsible for managing the entire infrastructure at the data center, from cleaning to electrical maintenance.

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The low-voltage main distribution contained 20 sections of Eaton's Modan switchgear, which had proved its effectiveness over the preceding two decades. However, ISS and HP decided to implement a new arc fault protection system.

Another key challenge was to ensure the continued operation of the data center at all times, despite the new installation requiring complete shutdown of the main power distribution.

Eaton had to find a way to overcome this and complete the project as quickly as possible, despite the complexity of the existing plant, which includes six main busbar sections.

Solution

The implementation of the new ARCON arc fault protection system was carefully planned to minimize the impact of shutting down the primary, low-voltage, main distribution (NS-HV1), which supplies power to the building's infrastructure and climate control. The solution was to rely upon two newer low-voltage main distribution systems (NS-HV2 and NS-HV3), which provide the servers in the data center with power. These are also based on Eaton's Modan range but, unlike the primary system , have the latest ARCON system pre-installed.

When the primary distribution system (NS-HV1) was shut down, the two newer systems were able to carry the load.

The timing of the installation was also carefully considered. "Since the building consumes about 20 per cent less energy in the winter, compared with the summer, when the servers require a high cooling capacity, we implemented the project during the cold season", says Mr. Weil. "Under these conditions, NS-HV2 and NS-HV3 can take over from NS-HV1 for a limited time. We had scheduled three weeks for the conversion."

The ARCON system detects arc flashes based on two independent indicators: a measuring transformer that detects any overcurrent and optical fiber sensors that register the light emitted by an arc flash. Should both detection values simultaneously exceed a fixed threshold, the electronic evaluation systems will trigger the quenching device.

The quenching device effectively cuts off the energy supply to the arc. It initiates a three-phase short circuit that diverts the current away from the arc. This short circuit is activated as close as possible to the infeed, in parallel to the fault location, via a built-in pyrotechnic drive, which takes less than one millisecond to perform this function.

The drive accelerates a copper bolt, which punctures an insulating plate and thereby creates an electrical contact. Regardless of its strength, the current takes the line of least resistance, redirecting away from the arc and towards the short circuit instead.

From beginning to end, the complete process of detection, evaluation and quenching is completed in only two milliseconds.

Subsequently, the feed-in circuit breaker disconnects the affected busbar section from the system, with all non-affected sections remaining in operation.

The retrofit project involved the expansion of the old ARCON system, including the optical fibers, as well as the installation of six new ARCON master modules (ARC-EM) for the six busbar sections. Eaton's installation team connected these to two 2.5 megawatt transformers, in addition to a diesel generator and a dynamic Uninterruptible Power System (UPS), which ensure emergency power supply.

After installing and wiring 12 converter sets, as well as the current-sensor modules (ARC-EC1), Eaton also installed new optical fiber technology and 13 sensor modules (ARC-EL3). Furthermore, Eaton configured and commissioned the system, including the completion of functional testing and updating of relevant documentation.

Results

The Eaton team completed the conversion in only two-and-a-half weeks, without any errors. The entire project, from tender to projecting, installation and acceptance, was managed by Eaton's after-sales service.

The new ARCON arc fault protection system, with its shorter reaction time and even more robust fiber-optic technology, has virtually eliminated the risk of arc-flash induced personal injury. At the same time, it also minimizes the potential damage to the switchgear, thereby allowing it to return to operation quickly and without incurring large costs.

Eaton's solution sets new standards of security. As the project leader Rainer Weil says: "Thanks to the professional work of Eaton's after-sales service team, we were able to put primary low-voltage main distribution NS-HV1 back into operation even before the planned deadline. Our arc fault protection concept places special emphasis on ensuring that, in the event of an arc flash, the non-affected sections continue to be supplied with power. Today, the new ARCON system makes an important contribution to the reliable operation of the data center."

The low-voltage main distribution at the Rüsselsheim data center is based on Eaton's Modan switchgear, which was equipped with the ARCON arc fault protection system when it was first installed.

Depending on the circumstances, the effects of an arc flash can be comparable to those of an explosion.

As part of the retrofit project, Eaton secured the six main busbar sections with a new ARCON system, including a door-mounted master module and two slave modules in the control cabinet for current and light detection.

Less than one millisecond after the detection of an arc flash, the ARCON quenching device initiates a three-phase short-circuit, thereby cutting off the arc's energy supply.

Eaton
EMEA Headquarters
Route de la Longeraie 7
1110 Morges, Switzerland
Eaton.eu

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