CASE STUDY
IMPROVING RELIABILITY

S&C ELECTRIC COMPANY
Excellence Through Innovation

A Unique Solution to a Refinery's Power Quality Problems

S&C Featured Solution: Engineering Services

Location: Canada

Customer Challenge

A Canadian oil refinery had been experiencing excessive power disturbances from its local electric utility and decided to build a 230-kV substation that would allow the facilities to be served from a coal-fired power plant located a mere mile away. One problem: The refinery's consultant determined a means would be needed for detecting and interrupting low-level ground faults because its system was reactively grounded. The existing 25-year-old S&C switchgear at the refinery was equipped with manually operated feeder bays and thus did not meet this requirement. The power fuses in the gear would properly protect equipment from high-level faults, but relays and power-operated switches would be required to protect against low-level ground faults.

While it is not uncommon for large facilities to simply replace their old switchgear with new equipment offering this added capability, the refinery was fearful of an extended shutdown, the subsequent loss of production associated with removal of the existing gear, and installation and commissioning of new equipment.

S&C Solution

Upon learning of the dilemma through the refinery's consultant, S&C proposed a turnkey solution wherein the 10 feeder bays of the switchgear would be modified to allow automatic switch operation upon sensing low-level fault currents. It would involve the installation of current transformers, ground fault relays, and motorized switch operators into bays that were not originally designed to accept them.

Because there was insufficient room on the stile of each feeder bay to incorporate a motorized switch operator, a special design was developed in which the operator would be mounted behind the switch on the outside of the gear. Each operator would be connected to its associated switch using a chaindrive. A combination mounting bracket/sheet-steel cutting template would be installed prior to the shutdown, ensuring proper alignment of the drive and significantly reducing the duration of the outage.

Well in advance of the agreed-to shutdown date, S&C engineers designed and built a similar feeder bay and prototype operator mounting bracket to determine the ease with which the procedure could be performed on the actual gear. From this mock-up, it was determined the concept was sound and, after a few modifications, the design drawings were finalized. The mock-up was invaluable in convincing the refinery staff of S&C's ability to achieve the desired results in the required time and as a training tool for instructing key members of the team who would perform the upgrade work.

Another challenge for S&C was procurement of split-core window current transformers for detection of ground faults. (Installing conventional solid-core window CTs in the gear would require time-consuming disassembly work in the field and risk damage to the existing oil-filled terminators.) After some investigation, S&C found a transformer manufacturer that would build such special split-core window CTs with the correct turns ratio and adequate window opening.

By 6:30 a.m. on the day of the shutdown, S&C had assembled a crew of 19 skilled factory technicians, low-voltage and medium-voltage electricians, and installers. Luckily, the weather was favorable and after properly grounding the equipment, work commenced at 7:30 AM.

Results

With each key team member well aware of the required methods and goals—and with all other members having been assigned a particular responsibility—the procedure went off like clockwork. The refinery was able to reenergize the gear at about 5:00 p.m., one hour before the scheduled completion time.

The customer is very happy with the performance of S&C and the upgraded switchgear installation, and it continues to work with S&C on a variety of new projects.