



DUAL-SENSING ARC PROTECTION BOOSTS SAFETY WITHOUT NUISANCE TRIPPING

By Clyde Marcus, EECOL Electric Corp.

An electrical arc protection system that employs both light and current sensing has helped Shell Canada to improve operator safety at its petrochemical refinery in Sarnia.

An electrical arc protection system that employs both light and current sensing has helped Shell Canada to improve operator safety at its petrochemical refinery in Sarnia, Ontario while also protecting the continuous-processing plant against costly nuisance trips.

The upgrade was prompted by recent major refurbishments. The capacity of the overhead electricity lines that feed the refinery had to be increased, potentially taking the incident energy level at the air-insulated switchgear substation to more than 100 calories per square centimeter.

Such an energy level would demand the use of cumbersome personal protective equipment (PPE) and, in any event,

is above the levels prescribed by Shell Canada's electrical safety policies in this area.

The company follows the NFPA 70E standard, and wherever possible avoids live work on any equipment with incident energy levels above 40 calories — with live work prohibited on equipment with energy levels beyond 100 calories. If levels are between 40 and 100 calories, then equipment must preferably be scheduled for service during plant shutdowns. If this cannot happen, live work can only be sanctioned following a detailed analysis of the hazard that takes into account factors including equipment age, maintenance history, access and the ability to perform the required tasks when wearing

100 calorie PPE.

Shell Canada's Electrical Reliability Specialist, Phil Lasek, started to look for a protection solution that would optimize operator safety at this location but, ideally, wanted one that would also minimize nuisance trips. This is because the plant operates continuously, and is protected by a fail-safe, emergency shutdown system. Nuisance trips can potentially result in substantial financial loss, as they can initiate a sequence of controlled shutdowns that halts production, necessitating a time-consuming controlled start-up.

After searching the market, Lasek discovered the Vamp 221 system. The 221's use of specialized arc light sensing

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Reliability retrofit

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lem is corrected under a defined procedure.”

COMPREHENSIVE SYSTEM FEATURES

Transfer scheme design parameters include a selectable preferred source, automated and synchronized transfer to a second source in case of a power sag or other disturbance, and remote alarm notification to the building engineering staff should there be a loss of the standby (secondary) source. Overcurrent protection and lockout features are standard functions of the SEL-351 Relay and are incorporated into the overall design.

“Other features of the SEL-351 Relay have provided tremendous benefit in reporting and troubleshooting,” says Davidson. “Event reports, communications, load profiling, ease of installation, flexible programmable logic, and enhanced protection features have considerably improved the reliability of this system for the property owners.”

With the successful installation of this system at five facilities within the Calgary marketplace, the building owners have seen the benefits of the installation in that they have not experienced any malfunctions and have renewed confidence in the event of a problem with the alternate supply. An unforeseen benefit is that they now are aware when the utility transfers them onto the alternate source without notification, and they are aware if there is a problem with the utility alternate source.

A NEW FOCUS ON COMMERCIAL FACILITIES

A past winner of the BOMA (Building Owners and Managers Association) Service Excellence Award, ARX Engineering has been nominated for the BOMA Innovations Award for the Calgary area because of these new automated transfer schemes and related equipment recently installed in several of the city’s high-rise office buildings.

From the outset, the management of ARX Engineering Ltd. recognized that complex electrical distribution systems existed in major commercial facilities and were essentially being ignored by the industry. As the market place has become more competitive, proactive building owners have challenged ARX Engineering Ltd. to find innovative solu-

tions to enhance the reliability of the power supply at these facilities.

“Commercial power systems like those found in high-rise buildings can now enjoy the same benefits of high-speed digital protection and control that electric utilities have enjoyed for decades,” says Erik Newman, Vice President of Sales and Customer Service at SEL.

“The use of older electromechanical

technology for protection of the building’s power system can now be updated with digital technology built by SEL.

Commercial customers will enjoy the benefits of safe, reliable, and economical power while gaining additional information about the status of the power system that was not available from the older technology. As ARX Engineering has demonstrated, the sky is the limit!”

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Due-Sensing Arc Protection

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technology looked very attractive, as it meant that the system would trip within 7 milliseconds, providing faster and more efficient protection than standalone over-current relays or busbar differential schemes, and greatly reducing incident energy levels. However, its current sensing capability gave it the added bonus of safeguarding against nuisance trips that any single-sensing system might be prone to. Light-only sensing could be falsely triggered by external light sources such as a camera flash for example.

As safety is paramount for Shell, Lasek decided to verify the system before installation and enlisted the aid of a local high-voltage engineering consultant. The engineers could not verify the tripping speed to the finest accuracy, as they had no practical way of generating a true arc flash and fault simultaneously. But they were able to devise a triggered flash bulb system and simulated fault current arrangement that could measure the response speed with a resolution that proved the incident energy will never exceed 35 calories/cm². Lasek is sure that the actual incident energy level would be considerably less than this — probably under 25 calories — but to ensure operator safety he nevertheless protects his staff for the 35 level — using the next grade higher PPE equipment which is rated to 42 calories. Further refinement of test procedures will allow for a more accurate determination of total clearing time and actual calorie exposure.

The multi-zone capability of the Vamp 221, which can manage up to four light zones, is also minimizing ongoing costs for Shell Canada, as Phil Lasek has recently extended the system to protect a secondary busbar in the facility substations.

“The Vamp system has given us a simple add-on for the switchgear at this plant that minimizes risk in the event of an arc flash, while also positively contributing to plant reliability”, says Phil Lasek of Shell Canada. “The system’s modularity also gives me welcome flexibility for future expansion and improvements.”

The Vamp 221 module comes with 3-phase current measurement (and 2-phase and earth-fault current measurement), 50BF breaker failure protection



The VAMP Ltd Vamp 221 system use of specialized arc light sensing technology is very attractive, providing faster and more efficient protection than standalone over-current relays or busbar differential schemes.

stages, four normally open trip contacts, and two alarm contacts. It can be programmed to sense electric arc conditions

less than a quarter of the time of traditional alternative technologies. With four light zones available, the 221 unit offers

Shell Canada's Electrical Reliability

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using either simultaneous light and current data, or light sensor information only, and operates in just 7 milliseconds -

a highly flexible arc protection solution that can accommodate a wide variety of equipment configurations, ranging from simple single-cabinet applications, to complex configurations with selective tripping of busbar, breaker and cable compartments. Up to three different I/O units are available to extend the system’s capability and configuration flexibility. The choice of expansion modules includes a 10-channel point sensor I/O unit, a I/O module which supports up to 70 meters of fiber cable light sensor in up to three loops, plus a separate over-current I/O unit that will expand the feeder monitoring capability of the overall system to up to 16. The 221 comes with its own keypad, display and LED

indicators, making it simple to program, as well as identify the location of any faults.