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Meet NEC® Requirements While Keeping Workers Safe, with Littelfuse Ground-Fault & Phase-Voltage Indicator

CASE STUDY

Introduction

A major oil and natural gas extraction company faced a dilemma. The company wanted to keep workers safe and comply with NEC® requirements to use ground fault detectors on ungrounded electrical equipment, but because the equipment was exposed to the elements of nature, managers determined that the detectors themselves could increase the risk of dangerous electric shock.

Many processors use ungrounded electrical systems because production can continue in the presence of a ground fault. Ungrounded systems are innately hazardous; a ground fault will not open a fuse or trip a circuit breaker. The worst type of ground fault is when current flows to ground through a worker's body, which is a major cause of workplace injury. A recent IEEE white paper points out that electric shock is the cause of nearly all electrical fatalities and accounts for 61% of non-fatal electrical injuries. What's more, a second ground fault on an ungrounded system may constitute a phase-to-phase fault that can result in arcing, fires and severe damage or injuries.

Product: EL3100 Ground-Fault & Phase-Voltage Indicator

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Usually it is not obvious to workers that a ground fault is present. That's why the National Electric Code (NEC®) and Canadian Electrical Code (CEC®) require the use of ground fault detectors in ungrounded environments. However in some applications compliance can be a challenge.

Such was the case with this major oil & gas company, whose pumps and related electrical panels are located outdoors at drilling sites, exposed to wet conditions. Often these devices indicate a ground fault condition via a digital output or via an LED display visible through a cutout in the door of the electrical panel. As these units are connected directly to energized phases, they bring high voltage to the door of the electrical panel on which they are mounted.

Situation

An engineer contacted Littelfuse about using one of the existing ground fault indication products for the pump panel application. The ground fault monitor has three sets of LEDs (marked A, B and C to represent three phases of electric power) on the front panel. When a ground fault occurs on the B phase, for example, the LEDs for that phase go dim and the two other LEDs get brighter, alerting the operator to a ground fault somewhere on the B phase.

"We sent a sample for them to test but it didn't work for their application," said Littelfuse Sales Engineer Justin Mahaffey. The problem was how the unit was mounted

The LEDs are not waterproof, so mounting the unit on pump panel doors in the field was simply not an option. What's more, the unit is connected to a 480-volt power source, potentially exposing an operator to a high amount of voltage.

Outcome

"To solve the problem, the Littelfuse engineering team worked closely with the customer and developed a new ground fault relay customized to their specifications," said Mahaffey. The EL3100 Ground Fault Relay functions like its predecessor, with four LEDs representing the three phases and ground fault. While the main unit is similarly connected to a 480V power source, there is a separate low-voltage 'remote' display with waterproof LEDs that can be mounted to the front door of the pump panels, never exposing the operator to the risk of shock.

What's more, the new ground fault relay is the first phase- and ground-fault-indication device that enables users to monitor the system voltage both locally and remotely. A unique feature is its contact output for alarm communication with a SCADA system or PLC, so maintenance staff can quickly see the location of the fault without checking indicators on individual panels.

The LEDs can be configured based on customer specifications. In this case, managers wanted only one LED to be visible externally, so it would have to drill only one hole in the panel door, but other users may wish to see indication of each phase, so they can more quickly identify the location of a fault.

The customer liked the solution because it allowed them to meet NEC® requirements for ground fault indication without endangering workers. Over the next several months the company installed hundreds of the new ground fault relays, and it plans to install more at future wells as they are drilled.

For more information on the EL3100 Ground-Fault and Phase-Voltage Indicator, visit **Littelfuse.com/EL3100**.

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