



Reliable delivery of ESP downhole data despite electrical system faults

GE Oil & Gas' unique Zenith Ground Fault Immune (GFI™) gauge demonstrates superior stability and performance in a critical well in South East Asia.

Challenge

GE Oil & Gas have been working with an oilfield operator in South East Asia, who use Electrical Submersible Pump (ESP) as its method of artificial lift. The operator recognizes that one of the most common yet critical threats to its ESP operations are cable ground faults. Loss of data due to ground fault can result in up to 25% reduction in fluid output compared to a pump optimised with a live downhole gauge, resulting in a significant loss of production and potential equipment damage. For an operator, this can mean incurring costs in replacing the power cable or running blindly with no clear sight of well performance.

The operator previously faced some issues with a number of its ESP systems developing in-well ground faults, resulting in the loss of downhole gauge readings from the existing gauge. This loss of data meant that it was not possible to continuously monitor downhole pressure and temperature conditions, critical to the efficiency of its operations.

As a supplier of artificial lift equipment and downhole gauges in this area, GE Oil & Gas was keen to collaborate with this customer to help sustain reliable measurements surrounding their ESPs, providing confidence in pushing each system to its optimum performance and enabling maximum production with the knowledge that the pump is running within its specified limits.



CHALLENGE

One of the most common threats to ESP operations is cable ground fault. Consequent loss of downhole data can result in up to 25% reduction in fluid output, leading to significant production loss and potential equipment damage.



SOLUTION

The Zenith GFI™ gauge offers an industry leading, robust downhole monitoring solution for ESP wells, ensuring insulation breakdown caused by ground faults will not short the system and data delivery is maintained.



BENEFITS

With Zenith GFI™ in place, this operator was able to maintain continuous surveillance throughout various electrical faults in a well where reliability of data for effective well performance management is critical.

Solution

GE Oil & Gas proposed a trial of their new-technology Zenith Ground Fault Immune (GFI™) ESP gauge on a single well in a field where reliability of data for effective well performance management is critical.

The GFI™ gauge offers an industry leading, robust monitoring solution which is unparalleled in reliability of data delivery regardless of disturbance by cable ground faults. This system runs a unique power and communication system so that the insulation breakdown caused by ground faults will not short the system.

The trial included a hybrid GFI™ gauge that was designed to operate with the existing E-Series surface equipment, yet included the GFI™ system electronics for security of operation in case of ground fault conditions.

“The Zenith GFI™ gauge delivered critical downhole data and cable information over an unbalanced three phase system.

This meant that the operator was able to access downhole readings during an insulation fault and monitor the ESP cable status, which has not been possible in the past and demonstrates GFI’s infield performance.”

Amer Kassab, Engineer, GE Oil & Gas

Experience and outcome

The GFI™ gauge was installed in the well at a measured depth of around 10,000 feet. Following installation and surface equipment commissioning, the GFI™ system was started and successfully transmitted downhole sensor and ESP cable data for 11 hours prior to the ESP start up. Once the ESP started, the gauge system continued to monitor and save data at 1 minute intervals.

Phase sequence correction

After some time, the GFI™ gauge indicated a rise in motor temperature, so the ESP was shut down for cable phase rotation.

The GFI system continued to monitor and log the data.

The ESP was restarted with the correct rotation and the gauge system continued to work as normal. The production team confirmed that both the ESP and well were in production.

Locating phase to phase ground short



GFI™ system surface display indicating the cable problem

Shortly after the ESP restart, the GFI™ data logger unit indicated a cable fault as a phase to phase ground short circuit.

The GFI™ fault locator calculated the fault depth to be between 9,000 and 10,000 feet.

The ESP team carried out the standard electrical checks and the test results reinforced those of the GFI™, that a phase - phase - ground short circuit had occurred between 9,000 and 10,000 feet. These electrical tests were repeated after a period of time to ensure the well fluid level was in a stable condition. Once more, they matched those of the GFI™ system.

A final and successful GFI™ gauge test was carried out and confirmed that data was being transmitted to the surface. The operator has since installed around 30 Zenith GFI™ ESP gauges across the region.