BURNS McDONNELL

SERVICE FEATURE / **TECHNICAL FIELD SERVICES**

FUTURE-FOCUSED TECHNICAL ASSESSMENTS REDUCE RISKS OF ELECTRICAL FAILURES

Well-maintained electrical systems are the foundation of reliable refinery and industrial plant operations. Testing and assessments of critical electrical infrastructure can reduce risks of plant downtime.

TESTING AND ASSESSMENTS CAN PROVIDE CRUCIAL DATA FOR PLANT OPERATIONS

INDUSTRIAL ELECTRICAL SYSTEMS DRIVE PROFITABILITY

For many industrial plant operators, day-to-day demands of keeping the plant running can often put preventive maintenance far down the list of priorities. The cost of taking critical processes — or even the entire plant — offline can mean the difference between profit and loss for a given reporting period.

So, it's no surprise that many operators put off expensive and time-consuming capital replacement programs until electrical equipment either fails or is close to that point and not performing as designed.

When the plant reaches crisis mode, a quick response team must be assembled to begin troubleshooting, identify needed parts and components, and expedite delivery. This emergency response can quickly add up, requiring staggering sums of money.

SYSTEMWIDE ASSESSMENT AND TESTING

With a regular, planned program of preventive testing and assessment, plant operators can get ahead of the "break/fix" curve by feeding these results into an asset management database that carefully tracks the current and projected condition of every component within the electrical system.

Transformers, for example, that are within five years of the end of their expected 20- to 30-year design lives can be taken out and replaced during the next scheduled plant shutdown. With a proactive look at which breaker may be in danger of overloading, or which transformer is showing trouble signs, parts can be ordered on a regular schedule without rush charges, to be installed by plant facilities and maintenance on a regular schedule. Emergency response is sometimes necessary but should not be a routine part of standard procedure for your industrial plant. Paying premium rates for dozens of technicians to arrive at your plant within 30-60 minutes is a cost you can plan to avoid.

IMPROVE POWER QUALITY WHILE MITIGATING RISKS

Investing in protection of the industrial plant electrical system is a prudent step that can offset the risk of major expenditures later. These measures can both mitigate the risk of catastrophic power outages and improve overall power quality.

Poor power quality can be traced to issues like voltage sags, voltage spikes, harmonic distortion, inadequate grounding, and faults caused by lightning strikes, wildlife contact with energized equipment and a host of other issues that may trip the system.

Voltage sags or faults can be caused by overloading of the power system when large motors or other equipment are started. Voltage spikes are a reverse condition caused by the rapid loss of load or equipment failure. Harmonic distortion is another power quality issue that results when a load draws electrical current out of its normal 60-hertz alternating current (AC) phase.

Any of these issues can lead to unplanned power loss, unplanned expenses to repair damaged electrical equipment, and loss of production.

TESTING AND ASSESSMENT PROTOCOLS

Technical field services for industrial power systems can range from acceptance testing and field engineering to maintenance, repair, troubleshooting and modifications of all elements of the industrial power system behind the meter at industrial facilities ranging from oil and gas refineries and petrochemical plants to heavy manufacturing.

Technical field assessments generally start at the plant substation where the plant electrical system interconnects with the utility supplier. Services are broad and include testing and analysis of electrical apparatus, such as switchgear, plant power systems, motors, breakers, generators and protective relay panels.

The testing and assessment runs from the substation or switchyard, where voltage can range up to 500-kV, through sequential transformer step-downs. These typically range from 35-kV to 2,400 volts and then to 480 volts.

THREE SERVICE CATEGORIES

Technical assessments typically entail a series of field tests to assess the suitability and reliability of electrical equipment. Protocols may include:

1. Apparatus testing, involving a series of diagnostics of major components such as breakers, transformers, switchgear and arresters within substations, electrical buildings or utility rooms, along with any other high-voltage equipment installed in the yard.
2. Relay testing, to verify intended design of protection and controls.

This process includes SCADA testing and confirmation that the tie-ins of all apparatus equipment have the wiring and logic needed for the protective relay to operate as designed. This step can include test blends to confirm the relay works in conformity with protection settings.

3. Commissioning, to verify that all electrical components are tied together. This is the final step to review the entire scope from apparatus testing to relay testing and SCADA.

DATABASE OF TEST RESULTS

Testing and assessments are intended to reveal the current state of equipment functionality and any needed maintenance, upgrades or replacement that must be scheduled. It is critical that a database of this information be maintained and monitored periodically by plant personnel.

This process can easily be augmented via on-site or virtual training modules that can help plant facilities and maintenance personnel learn the tips and tricks of tracking and monitoring the data. Training sessions may include:

- How to spot trouble signs with transformers, breakers, relays and other equipment.
- How the relays communicate throughout the electrical system.
- What to do when you get an alarm.
- Basics of differential, feeder and transformer protection.

SERVICE-FIRST RELATIONSHIP

No matter the exact scope of testing and assessment, questions will come up during the project and afterward. Routine questions, like those regarding the resetting relays or clearing of alarms, can be answered via a single phone call or text. Others may require a short visit to the plant.

In all cases, our goal is to help you understand your system, get the information you need to manage and maintain settings, and build a solid relationship that is not focused on charges for miscellaneous service calls. Our focus will always be on getting you to the most cost-effective solution that helps avoid costly downtime and the stress and anxiety of unanticipated problems.

A BROAD SCOPE

The range of electrical equipment can be broad and complex. The scope of testing and assessments can include:

- Acceptance testing
- Protective relay replacement/ testing and calibration
- Low-circuit breaker testing and maintenance
- Motor testing
- Bus inspection and testing
- Cable testing and fault location
- Circuit breaker testing, SF6 gas analysis and filing
- Station battery and load bank testing
- Infrared thermography
- Insulation power factor and hi-pot testing
- Power line carrier testing
- Power system metering
- Power transformer testing and commissioning
- Switchgear and motor control center (MCC) testing
- Point-to-point testing and circuit checks
- Capacitor bank testing
- SCADA and HMI systems testing and commissioning
- IEC 61850 performance testing and commissioning
- Energization sequence planning
- Instrument transformer tests
- Functional checkout

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