Vacuum Circuit Breaker Maintenance After Fault Interruption

February 24, 2012

Routine maintenance is essential to the health of a circuit breaker. Various factors such as dust, corrosive gases, and humidity influence the maintenance interval. The manufacturer’s instruction guide for the equipment will provide details for routine maintenance and a recommended frequency based on environmental conditions, time in service, and level of service. It is further recommended that an inspection be performed as soon as is practical after a circuit breaker interrupts a fault at or near its short-circuit rating. Load current or rated continuous current operations should not be confused with high current fault interruptions.

Damage from severe mechanical stresses and metalizing of the interior of the vacuum interrupter may occur during fault interruption. The most reliable indication of the stress a circuit breaker has been subjected to during a fault interruption is found in the protective relay memory or in automatic oscillograph records. Deterioration of the circuit breaker contacts may be assumed to be proportional to the energy dissipated in the breaker during the interruption.

The energy dissipated is approximately proportional to the current and the duration of contact arcing. However, the parting of contacts is not always evident on the oscillographs, making a physical inspection of the circuit breaker and switchgear necessary.

It is recommended that the standard maintenance service be performed in accordance with the manufacturer’s instructions. As a minimum, the following items should be inspected and the indicated tests be performed. Any deviation from the manufacturer’s specific functional/operating parameters is cause to replace the damaged item with a new item from the original manufacturer.

De-energize the equipment and follow all safety practices required at the site.

Physical inspection of the Circuit Breaker

1. Primary disconnecting devices.
   Look for signs of pitting, discoloration from over-heating, and contaminated lubricant at the contact surfaces and for any damage to the physical structure and any insulation.
2. Measure the Primary Contact resistance, open contact gap, and “wipe” or overtravel on the circuit breaker.
3. Follow the recommended procedures in the manufacturer's Instruction Bulletin. Perform dielectric tests on the circuit breaker.
   Test the vacuum interrupter tubes for vacuum integrity
   Test the entire circuit breaker insulation system by performing and AC High Potential test.
   If insulation resistance testing is part of the normal maintenance records, perform this test for comparison to previous measurements.
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4. Perform timing tests.
   Operational tests at nominal control voltage that can be compared to the operating range indicated in the Instruction Bulletin or against “as received” Factory or Field test records.

5. Perform any other routine maintenance necessary.
   Verify hardware torque
   Lubricate per the Instruction Bulletin.

Physical inspection of the Switchgear
1. Primary disconnecting devices.
   Look for signs of pitting, discoloration from over-heating, and contaminated lubricant at the contact surfaces and for any damage to the physical structure and any insulation.

2. Primary bus, cables and connections.
   Look for signs of discoloration from over-heating at connection points, any damage to the circuit support structure and insulators, and bus or cable insulation.

If all is well the circuit breaker may be returned to service. If there is any deviation from the manufacturer's specifications discovered, the circuit breaker should be locked-out per the site operation and safety requirements until full maintenance and repair can be performed.

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