



Function Checks on Protective Relaying Trip Circuits

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Testing electrical components, such as cables, relays, switchgear, breakers, etc.... is very important to the reliability of electrical system. ANSI/NETA MTS 2015 provides the best practice for the testing of each component that includes visual and mechanical inspection and electrical tests. Often, each electrical component is tested individually and only small outages are required to allow for this testing. During a shut-down or turn around, it is great time to test the protective trip circuits of the relays, breakers, and switchgear as a system. Often, a relay trips multiple items and it is difficult to properly function test the circuit unless a majority or all power is down.

ANSI/NETA MTS 2015 requires that you verify each of the protective relay contacts performs its intended function in the control scheme, including breaker trips, close inhibit tests, 86 lockout tests, and alarm functions. This should include all auxiliary relay contacts as well as the protective relay contacts. The testing of the protective relaying control circuits is often not done at the same time as the component testing because of the risk of tripping equipment that is in service. In order to perform these tests, a step by step procedure should be created. The procedure should include steps required to keep from tripping any part of the facility that is on line, and peer verification for any critical steps. In order to create a procedure, up-to-date switchgear and relaying control drawings are required. For microprocessor style relays, the logic files will also be required. With microprocessor relays, control wiring is often reduced, and much of the trip logic is programmable. Each element programmed in the relay should be function checked for its trip function and mapping to the relay outputs. Procedures should be kept and maintained for future testing, so any pitfalls or issues found during testing are documented for future tests. If the procedures are properly developed and maintained, the time and effort to perform this task in the future will be greatly reduced.

Functional testing of protective relay circuits is important. This is because additions to equipment and wiring modifications may have occurred, without verification to ensure the original circuits were not interrupted. Function checks should be done after any wiring modifications and as part of a routine maintenance practice. If the relaying is calibrated and works properly, but the circuit does not get the trip signal to the proper devices, the electrical fault will not be interrupted. Also, relay logic files can accidentally be changed and function checks should prove the relay logic is sound at the conclusion of the test. Another item that can be found is improper fuse sizing. Fuses are often pulled out for safety and then replaced with the wrong fuse type or rating. The physical shape and size are identical for many different ampacities of fuses. It is easy for someone to replace the fuses with the wrong size if careful attention to detail is not used when pulling fuses for lock out/tag out purposes. If an undersized fuse is placed in the trip circuit, it may not have the ampacity to trip the device. Lockout or auxiliary relays may not be working properly, and unless they are exercised, and each contact is verified for its function, any issues in protection due to this will not be discovered. Often prints are found not to be updated, and, during functional testing, prints should be verified. If issues are found, wires can be traced to determine

how the circuit is wired. Alarm circuits are often overlooked, but these circuits are very important to verify. Many trip circuits have alarms for loss of DC, or low oil or SF6 gas in a breaker. It is critical for equipment reliability to know when these conditions exist.

So, make sure a quality functional check is done on all protective relay circuits to ensure your electrical equipment will work properly when called on to clear a fault. For more information visit www.shermco.com/sto.