

**A2**

POWER TRANSFORMERS AND REACTORS

11059_2022**TITLE**

A Case Study of Earth Fault on The Power Transformer Caused by Human Error and Inadequate Design in the Interlock System

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Motivation

- Case study of the earth fault that occurred on the HV system that was caused by human error paralleling with inadequate design in the interlock mechanism.
- Find the root cause of the accident to prevent the reoccurrence of the problem.
- Implement the recommended solution to eliminate the reoccurrence of the problem.

Method/Approach

- Illustrating the problem.
- Collecting data/evidence.
- Nailing the root cause .
- Executing the recommended solutions.
- Following the applied solution.

Experimental setup & test results

- Visual inspection of the affected system.
- Carrying out the electrical tests such as operating times (open and close), the conductivity of the grounding system, gas pressure SF6, and insulation resistance .
- Review of the design of the generator circuit breaker, site conditions and Human factors.

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continued**Consequences**

- Reduction in generation unit availability.
- Assets losses.
- Assets to be replaced like HV fuse.
- Maintenance costs.

Root cause analysis

- Employing some of the root cause methods and techniques such as 5whys, and fishbone.
- The main root cause is the inadequacy in the interlocking design of the earth switch.
- The second root cause is the human error caused by a lack of work instruction related to the operation staff.

Recommended solutions

- Engineering solution by modifying the closing earth switch control circuit though adding two Undervoltage relays to ensure the system is dead(zero voltage) when the earth switch is required to be closed.
- The engineering solution is the highest effective method to eliminate the risk by removing the probability instead of treating the consequences.

Solution tracking

- Check multiple times the effectiveness of the solution by making a trial operation either using a secondary injection or trying to close the earth switch when the system is online.
- Reflecting the solution on the sister generation unit.