Transformer Forensics

Failure Analysis of Utility Submersible Transformer

KINECTRICS

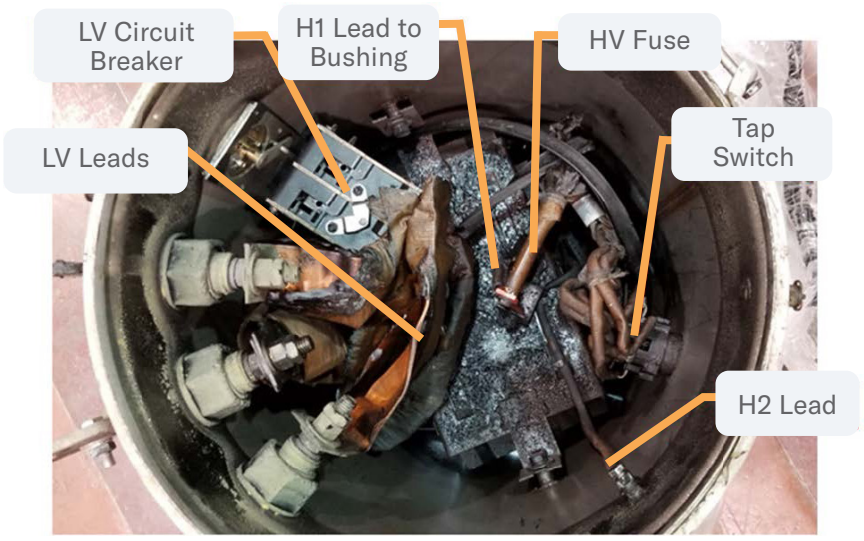
Project Objective

A municipal electric utility experienced a catastrophic failure of a completely self-protected submersible transformer in a residential neighborhood.

Kinectrics was hired to perform a forensic examination of the transformer and undertake a failure analysis to determine the root cause of the fault.

Client: Municipal Utility

Location: Ontario, Canada



Scope of Work

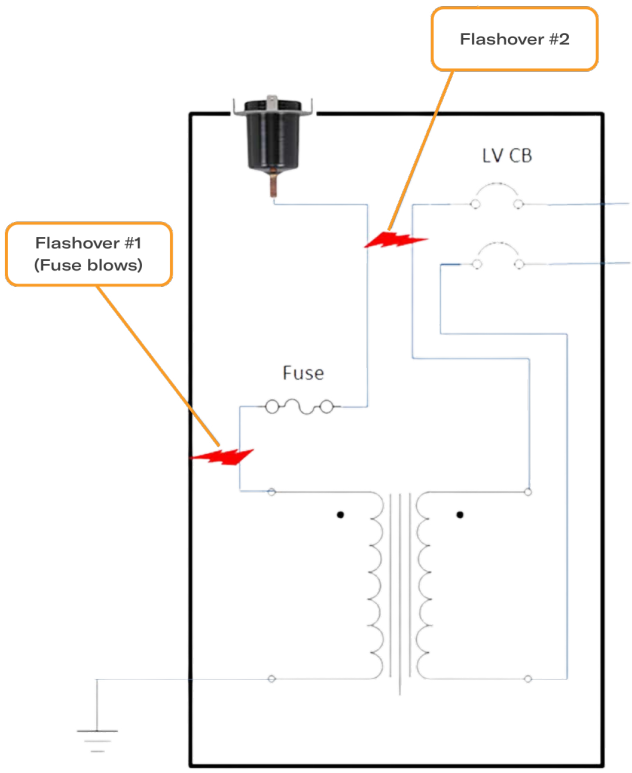
Kinectrics performed detailed oil analysis and electrical diagnostics, followed by a thorough inspection during a complete tear-down of the transformer to understand fault locations. This systematic approach allowed engineers to trace the fault to its point of origin to understand the conditions that precipitated the catastrophic failure.

Failure Analysis

An inspection and test plan was developed based on a holistic approach to the forensic study. The basic steps were:

- Review of the incident report provided by the utility.
- Assessment of the maintenance history and records for the transformer.
- Oil testing, including general oil quality and dissolved gas analysis.
- Basic electrical testing.
- Complete tear-down of the unit to determine fault locations and “reverse-engineer” the assembly to understand the dielectric stresses inside the tank.

The transformer was shipped to Kinectrics’ laboratories in Toronto, Canada, where the work was performed.



Value-Added Results

The forensic investigation pinpointed the root cause of the transformer failure, enabling the utility to mitigate future incidents, while improving the safety and reliability of its distribution system.