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IEEE Guide for Failure Investigation, Documentation, Analysis, and Reporting for Power Transformers and Shunt Reactors

IEEE Power and Energy Society

Sponsored by the
Transformers Committee

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IEEE Std C57.125™-2015
(Revision of
IEEE Std C57.125-1991)

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Abstract: A procedure to be used to perform a failure analysis is recommended. The procedure is primarily focused on power transformers used on electric utility systems, although it may be used for an investigation into any ac transformer failure. This document provides a methodology by which the most probable cause of any particular transformer failure may be determined. This document is also intended to encourage the establishment of routine and uniform data collection procedures, consistency of nomenclature and compatibility with similar efforts by other organizations, and cooperative efforts by users and manufacturers during the failure analysis.

Keywords: Diagnostic tests, electrical tests, failure analysis, IEEE C57.125™.

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Introduction

This introduction is not part of IEEE Std C57.125™-2015, IEEE Guide for Failure Investigation, Documentation, Analysis, and Reporting for Power Transformers and Shunt Reactors.

When IEEE Std C57.117™ was developed, there was both a need for failure reporting and a means to collect the data. While the reporting was being developed, it became clear that a consistent and uniform method of analyzing failures was also needed. Thus was born the failure analysis and reporting group of documents. The resulting documents became known as IEEE Std C57.117-1986 and IEEE Std C57.125™-1991.

Unfortunately, an outcome of competition in the utility industry was a perception that such data would be proprietary and so the means to share the data disappeared. Although the means to share the information disappeared, the need remains. However, the population must now be limited to those assets controlled by an individual entity. In the next iteration, perhaps a single trustworthy entity will emerge to whom the data can be reported and useful reports can thus be generated.

The current version of IEEE Std C57.125 combines the methodology of failure analysis with the data collection methodology and contains forms and methods to collect data in a consistent manner, if only at a sub-set of the larger population.

The analysis of failures is still an important aspect of asset management, if for no other reason than to improve the ability to identify and eliminate the root cause of the failure and prevent its recurrence. By applying the Scientific Method in its most straightforward form, we hope to provide the guidance necessary to achieve consistency in reporting and correcting root causes as they appear in the industry.

In addition, this update to IEEE Std C57.125 has adopted the most current (and approved by IEEE-SA) safety methods taken directly from IEEE Std C57.152™.[1] Where these methods may conflict with local practices by individual utilities, the local practices should be those to which the safety practice adheres.

There is the hope in the industry that a guide will be developed that will allow users to reach an unequivocal conclusion as to the root cause of the failure. This is, unfortunately, not yet achievable. Once statistics are available this may become more likely. However, the user must realize that the high level of energy available from the power system may destroy the evidence of root cause. Any complex system will provide multiple possible outcomes to a single event, and the event of a major failure is, in reality, multiple events, the sequence of which may not be readily determined.

[1] Information on references can be found in Clause 2.

Contents

IEEE Guide for Failure Investigation, Documentation, Analysis, and Reporting for Power Transformers and Shunt Reactors

1. Overview

1.1 Scope

This guide recommends a procedure to be used to perform and document a failure analysis and the reporting and statistical analysis of reliability of power transformers and shunt reactors used on electric power systems.

1.2 Purpose

This document is intended to provide a methodology by which the most probable cause of any particular transformer failure may be determined by applying the scientific method to investigations; provide sufficient guidelines, examples, and case histories to promote uniformity in the analysis of transformer failures; encourage the establishment of routine and uniform data collection so that valuable facts are not lost or destroyed; encourage consistency of nomenclature and compatibility with similar efforts by other organizations (Examples include but not limited to CIGRE, EEI, IEC, NEMA, NERC, and AEIC); and encourage cooperative efforts by users and manufacturers during the failure analysis.