



Transformer Core Grounding & Gassing, Proposed Text for IEEE Standards

-- Technical Presentation --
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1. Abstract

There have been numerous reports of unusual hydrogen gas evolution in distribution and Class I power transformers with wound cores and voltages of 15 kV or higher. These anomalies have occurred within wind power, solar power, and even in general purpose installations.

This subject has been debated and presented in various IEEE meetings and conferences, including those related to the subjects of wind, solar, distribution transformers, and performance characteristics.

A revision is proposed to provide guidance on core grounding in IEEE Standard C57.12.00, and guidance for partial discharge testing in IEEE C57.12.90 to test for susceptibility of transformer design for the gassing issue.

This presentation has three parts:

1. Phil Hopkinson will remind us of the technical issue.
2. Kip Whitehead will provide some real-world user experience.
3. David Buckmaster will describe the proposed proof test and modifications to the IEEE documents.

2. Learning Objectives

This presentation plans to:

- Explain what fundamentally causes gassing.
- Describe how the proposed test will sort out the differences between core grounds that always work versus those that are associated with gassing
- Establish credibility with user experience.

3. Learning Outcomes

As a result of attending this session, participants will gain an understanding of the following:

- The importance of proper core grounding to prevent excessive voltage on a core with subsequent core gassing.
- That gassing is always accompanied by partial discharge.
- The importance of partial discharge design tests to identify susceptible designs.

4. Presenters' Biographies

Dr. David E. Buckmaster is President & CEO of Transformer Forensics, LLC, specializing in transformers, stationary power systems, MV, HV and EHV design parameters. David has ventured into the wind energy field and has studied the impact on transformers from this technology and the hurdles to overcome associated with new requirements of NFPA-70E. In 1998, David received his Honorary Ph.D. degree from Moscow State University in Moscow, Russia, in Electrical Power Engineering. He has over 36 years of combined experience (professional and pre-professional) in the area of power, distribution, transformers, and transmission grid designs. David co-authored a new chapter in an electrical engineering handbook on transformer design with Dr. Hem Shertukde and Mr. Jim Harlow. He is active in the IEEE/PES Transformers Committee and several IEEE subcommittees, including but not limited to IEEE-USA Climate Change Technology Subcommittee.

Philip J. Hopkinson (IEEE Life Fellow) is a Professional Engineer and President & CEO of HVOLT Inc. Additionally, Phil is Technical Adviser to the US National Committee for IEC TC 14, Power Transformers. He received his BS degree in Electrical Engineering from Worcester Polytechnic Institute in 1966. He also graduated from GE's Advanced Engineering Course in 1970 and in the same year received his MS in System Science (EE) from Brooklyn Polytechnic Institute. From 1966 to 2002, Phil held numerous design and engineering management assignments in the transformer businesses of GE, Cooper Power Systems, and Square D in liquid-filled, dry, and cast resin transformers of all power ratings and voltage classes. In 2001, Phil formed a power transformer consulting company, called HVOLT Inc. He currently holds 15 US patents, and he has been studying the core gassing issue since 2008.

Kip R. Whitehead has been in the engineering and construction industry for over 45 years, including 14 years with RMT Inc., performing wind farm construction and trouble-shooting wind farm transformer issues. For the past 5 years, he has been a consultant to Infrastructure and Energy Alternatives (IEA Inc.), and to wind farm operators concerning wind farm pad-mount transformers. Kip has managed numerous warranty claims involving hundreds of gassing pad-mount transformers. He has an AS degree in Nuclear Engineering and a BS in Engineering.