IEEE/PES Transformers Committee
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"Transformer Tank Rupture and Mitigation"

-- Technical Presentation --
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1. Abstract

This technical presentation is resulted from ten presentations made by members of the Task Force on Transformer Tank Rupture and Mitigation, and meeting discussions over past years. Contributions from members and guest are appreciated.

Transformer tank rupture occurs when an internal arcing fault vaporizes the insulating fluid and generates an expanding gas bubble. This causes a pressure rise in the transformer tank. The location, duration and magnitude of the arcing fault will greatly influence the size of the pressure rise in the transformer tank. Transformer tank rupture due to internal arcing fault is a complex problem.

For years, people look for solutions to control or minimize the situations of the tank rupture during internal faults. This presentation provides an overview on current sate of practice and knowledge on the subject, and the mitigations are reviewed.

2. Learning Objectives

The tutorial provides a technical introduction to the current sate of practice and knowledge on the subject, and emphasis will be focused on power transformers. This tutorial presentation includes users' experience, manufacturer's practice, and R&D results on tank ruptures and mitigations.

Also reviewed will be the present coverage from IEEE Transformer Standards on the subject.

3. Learning Outcomes

Attendees will gain the following information from their attendance at this tutorial:

- Understanding of transformer tanks rupture and mitigation
- Phenomenon and nature of the tank rupture
- User experience
- Current state of practice and knowledge

4. Presenters' Biographies

Nicholas Abi-Samra: is responsible for the root-cause analysis efforts at the Electric Power Research Institute (EPRI) for major equipment including transformers. He is also the principal EPRI investigator into major blackouts, in the U.S. and abroad. Prior to EPRI, he was with Westinghouse Electric, where he held positions of increasing responsibilities in engineering and management. He was a Westinghouse Fellow Engineer, providing consultations on a wide spectrum of power system problems. He has taught post-graduate courses at Penn State and Carnegie Mellon Universities and has co-authored over 50 papers. Mr. Abi-Samra is a Registered Professional Engineer and is the recipient of over 15 engineering awards.

William S. Darovny: received a Bachelor of Applied Science degree in Mechanical Engineering from the University of Windsor, Ontario Canada. Bill has over 35 years experience in the power transformer industry. He began his carrier with Westinghouse Canada and was senior Mechanical Engineer involved in the development and design of power transformers and reactors up to 750 MVA and 735 kV. In 1990 he moved to Ferranti- Packard Transformers St. Catharines Ontario Canada where he was Development Manager and Director of Engineering. He was registered as welding engineer for the design and production of power transformers by the Canadian Welding Bureau. Bill joined Siemens Canada in 2006 and provides technical consultation on matters related to transformers. Bill is a member of the IEEE/PES Transformers Committee participating in several working groups within the fluids and power transformers sub committees.

Marc Foata: olds a Mechanical Engineering Degree from the École Polytechnique de Montréal (1983) and a Master's degree in Engineering Mechanics from the University of California in San Diego (1984). After a short stay at Pratt & Whitney in 1984, Mr Foata joined Hydro-Québec in 1985 at the R&D laboratories (IREQ). During his 20 years stay at IREQ, he has been involved in the problems of explosion of high voltage equipment, vibrations of overhead transmission lines and the development of acoustic diagnostic techniques. In 2005, he joined TransÉnergie where he is now a substation engineer with the department of technical expertise and support. Mr. Foata holds a Mechanical Engineering Degree from the École Polytechnique de Montréal (1983) and a Master's degree in Engineering Mechanics from the University of California in San-Diego (1984).

Joshua Herz: received a B.S. Mechanical Engineering degree from Massachusetts Institute of Technology in 1980 and is currently a Principal Engineer at Qualitrol LLC in Fairport, NY. He has worked as a design engineer in process controls and components at United Electric Controls, Cambion and C & K Components, and holds several patents related to pressure relief.

Craig Swinderman: received his B.S. mechanical engineering degree from the Pennsylvania State University in 1997. He has been working in the electric power generation, transmission and distribution industry since 1997 and joined Mitsubishi Electric Power Products, Inc. in 1999 as an engineer specializing in large power transformers. He is currently Product Line Manager for the transformer department. He is a member of the IEEE/PES Transformers Committee and is currently the Working Group Chair for revision of IEEE 638; Qualification of Class 1E Transformers for Nuclear Power Generating Stations.

Peter D. Zhao: worked in the transformer industry from 1983 to 2003 in areas of engineering design, R&D, testing and QA. From 2004, he started his electrical utility career in Hydro One as an equipment engineer. He has published several technical papers in the field of transformers. He has been an active member on the IEEE/PES Transformers Committee for the past ten years in development of transformer standards. He is the Chair of the Task Force for Transformer Rupture and Mitigation. His education includes a B.Sc in EE Engineering, a M.Sc in Transformer Engineering, and a M.Eng in High Voltage and Insulation.