IEEE/PES Transformers Committee
Fall 2010 Meeting
Toronto, Ontario CANADA

"Taps in Autotransformers"

-- Technical Presentation --
Monday, October 25, 2010

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1. Abstract

This tutorial will assist end-users to procure reliable and economical autotransformers. This tutorial will also assist manufacturers, consultants and others to familiarize with various aspects of taps in autotransformers.

Different types of taps, their electrical connection and physical location, and their effects on cost and design are discussed in depth. Differences in designs of two winding and autotransformers with taps are illustrated. How to specify the taps in autotransformer procurement specifications is highlighted. Methods to procure autotransformers that meet system needs are suggested. Influence of taps on maintenance and operation are explained. Role of the organizations like IEEE, IEC, CSA etc., to help transformer personnel are recommended.

2. Learning Objectives

This tutorial will help personnel associated with transformers to learn/familiarize the following:

- How to determine tap range and their electrical location.
- Influences of taps on autotransformer designs compared to those on two winding transformers.
- Effects of taps location on cost and reliability.
- Differences in constant flux taps and variable flux taps.
- Application of various types of de-energized taps (DETC) and on-load taps (LTC).
- Changes in impedance, flux density, sound level etc., over the tap range of constant flux taps and also over the tap range of variable flux taps.
- Salient points to be considered in design of tertiary (buried and brought-out) winding with different types of taps in the main windings.
- Role and limitations of standards in writing autotransformer procurement specifications.
- Write specifications that will help to procure autotransformers with least life costs.
- Ways users and manufacturers can work together for mutual benefit.

3. Learning Outcomes

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

- To procure economical autotransformers after knowing the differences of taps in two winding transformers and taps in autotransformers.
- To operate autotransformers trouble free after knowing the effects of taps during step-down and step-up operations.
- To write functional specifications that can promote innovation.

- Selection of type of taps and their location based on operational requirements and cost.
- To design reliable autotransformers from understanding the influences of taps on short-circuit forces and dielectric stresses.
- To determine correct tap range that can meet overloads and regulation.
- Constructive participation of users, consultants and manufacturers from understanding autotransformer design complications.
- Impartial evaluation of tenders from correctly understanding the tender designs.
- Active participation in committees of IEEE, IEC, CSA etc., for progress of transformer industry.

4. Presenters' Biographies

Dr. Tomasz Kalicki graduated from Poznan University of Technology in Poland, Faculty of Electrical Engineering with master's degree in 1993. In 1998, he graduated with Ph.D from Poznan University of Technology, Faculty of Power Systems Engineering, High Voltage Engineering. From 1993 until 1999, he worked as assistant and later as assistant professor at Poznan University of Technology.

He has worked as Equipment Engineer Specialist in Hydro One Inc for the past four years. Previously, he worked as a transformer designer at Pauwels Canada in Winnipeg (presently CG Power Systems Canada Inc.). At Winnipeg, he worked on many projects concerning large power transformers, autotransformers and HVDC converter transformers. Research experiences are with Ontario Hydro Technology, Department of Power System Technology at Stuttgart University, Institute of Power Transmission and High Voltage Technology.

V. Sankar has been a member of IEEE for 27 years and is a member of IEEE/PES Transformers Committee. His earlier tutorials at Committee meetings included "Standards, Specifications, Designs and Their Relationships", and "Taps". He also presented "Reliability of Transformers, Contribution by Users" at TRAFOTECH2006 in Mumbai.

Sankar's experience includes 24 years as a transformer design engineer at Pauwels (presently CG Power Systems), Westinghouse, Federal Pioneer in North America, and other transformer manufacturers in England and India. He has worked for 18 years at Hydro One (earlier Ontario Hydro) in Toronto as a transformer maintenance and equipment engineer. His has trained at Maschinenfabrik Reinhausen GmbH, Regensburg, Germany and at Bharat Heavy Electricals Limited, Bhopal, India. Sankar is a professional engineer in the province of Ontario, Canada.