IEEE/PES Transformers Committee
Fall 2011 Meeting
Boston, Massachusetts USA

"Use of Furans as a Diagnostic Tool to Estimate Insulation Life"

-- Technical Presentation --
Tuesday, November 1, 2011
4:45 to 6:00 pm

By Luiz Cheim, Donald Platts, Thomas Prevost, Shuzhen Xu

1. Abstract

Furans are one of several chemical compounds that are produced as the paper insulation in a transformer ages and degrades. The topic on furan analysis has been extensively studied and many technical papers have been written on the formation of furanic compounds, which are dissolved in oil, and analyzed through normal transformer oil sampling. This tutorial will present the major finding of a literature review conducted by the furan analysis task force including the history and the development of furan testing, the known technical information and recommendations for analysis of furan test results. It will also discuss the technical base for continued gathering and evaluation of furan data for liquid power transformers.

2. Learning Objectives

This tutorial consists of:

- History of furan analysis
- How furans are formed including paper insulation degradation background and the furan chemistry
- The stability of furan especially the issue in thermally-upgraded insulation paper
- The correlation between the DP of the paper insulation and the furan in the oil
- The statistical analysis of furan data and the outcomes that has been conducted by the industry
- Technical issues and limitations
- Recommendations on how to use results from furan testing from the task force
- Recommendations for data collection from the task force

3. Learning Outcomes

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

- What impacts the furan production
- What impacts the correlation between the DP and the furan
- The use of furan analysis technique for transformers with kraft paper insulation and thermally upgraded paper
- What should be aware when using furan analysis in real applications

4. Presenters' Biographies

Thomas A. Prevost: Tom is Primary Manager for OMICRON electronics USA. Prior to joining the OMICRON team, Tom worked for twenty-five years at Weidmann Electrical Technologies, a manufacturer of insulation materials and provider of diagnostic services for the transformer industry. Early in his career Tom worked at Tampa Electric Company as an engineer in distribution and production. Tom received his BSEE from Virginia Polytechnic Institute. Tom is a senior member of IEEE. He is vice-chair of the P2030 "Smart Grid" working group. He is the past-chair of the IEEE/PES Transformers Committee. He is a member-at-large of the IEEE/PES Board of Governors. Tom is also active in ASTM committee D27 on Insulating Fluids and IEC TC10 on Insulating Fluids.

Shuzhen Xu: Shuzhen works as a Senior Research Specialist at FM Global. Her responsibility includes risk and reliability assessment for high voltage equipment such as transformers, generators and industrial motors. She has more than 7 years experience in failure root cause analysis, diagnostic testing data analysis, condition evaluation and reliability assessment for HV equipment. She published numerous technical papers on the subject of HV equipment reliability assessment. Shuzhen is an active member of IEEE/PES Transformers Committee and is the chair of the task force on furan analysis for liquid power transformers. She received her Ph.D degree from Shanghai Jiaotong University in China.

Donald W. Platts: Don is presently a Senior Staff Engineer - Transmission and Substation Standards Engineering with PPL Electric Utilities. He is responsible for most engineering activities involving transformers: from preliminary studies and selection; purchase projects including writing specifications, performing inspections, and witnessing testing; maintenance and operation support; DGA Analysis; loading studies; failure analysis; and equipment repair processes. His experience with PPL includes 21 years in various Engineering groups - Standards Engineering, System Maintenance Engineering, and Substation Component Engineering, etc. For 16 years prior to that, he worked in the Substation Engineering design group. He is an active member of the IEEE/PES Transformers Committee where he presently serves as the Secretary of the Committee. He has a BSEE degree from Lafayette College, and is a Registered Professional Engineer in Pennsylvania.

Luiz Cheim: Luiz joined ABB TRES North America in August 2009 as a Consulting R&D Engineer to support the Transformer Condition Assessment program through advanced DGA, Transformer Aging Analytical Tools as well as Online Monitoring and Diagnostic systems. Luiz is part of an ABB global R&D organization that works on the development of those tools in order to support our customer's effort in maintaining their critical assets through the new Smart Grid Initiatives. Before joining ABB Luiz had 10 years experience with Siemens Transformers, and 18 years experience with the Center for Electric Power Research (CEPEL) in Rio de Janeiro, Brazil. Luiz has been an active member of Cigre Paris since 1984, acting as Chairman of the Study Committee A2-Transformers in Brazil from 2000-2006. Luiz is an active member of the IEEE Transformer Committee and holds a PhD in Electrical Electronic Engineering from the University of Nottingham, UK as well as a MSc and a BSc in EEE from the Federal University of Rio de Janeiro, Brazil.