IEEE/PES Transformers Committee
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Detection and Location of Acoustic Emissions from Partial Discharge

-- Panel Discussion, Monday, March 17, 4:45 p.m. --

by Andreas Garnitschnig, Jack Harley, Hemchandra Shertukde, Steve Skinner, and Barry Ward

1. Abstract

Both electrical (partial discharge) and mechanical sources (such as loose clamping, bolts or insulation parts) generate acoustic emissions in power transformers. The discussion will include when and how acoustic methods are used to detect and locate partial discharge from the viewpoints of the transformer manufacturer, a consultant and developer of acoustic devices, a utility user and a researcher. There will be descriptions of factory and field experiences, acoustic instrumentation, test procedures, and interpretation of results.

2. Learning Objectives

The proper use and interpretation of acoustic emissions is an important tool for a transformer engineer who is trying to determine the condition of a transformer or to decide whether it must be removed from service.

Specific topics that will be addressed by the presenters include:

- Fundamentals of acoustic detection and location techniques for single and multiple sensor applications
- Sensing transducers and internal waveguides
- Integrating acoustic technique results with oil analysis
- Factory and field applications
- Single event and continuous acoustic systems
- Differentiating partial discharge from other sources of acoustic emissions
- Interpretation of signals
- Detection of static electrification
- Transformer design influence on acoustic emissions
- New tools in development

3. Learning Outcomes

Attendees will become acquainted with state of the art methods of detecting, locating and interpreting acoustic emissions from power transformers. Specifically identified outcomes include improved understanding of:

- Analytical techniques useful for condition assessment
- When to use acoustic techniques
- Types of instrumentation available and when to use each
- Avoiding false interpretations
- Sensor installations for transformers of different designs
- Coordination with the transformer manufacturer
- New technologies in development for condition assessment

4. Presenter's Biographies

Andreas Garnitschnig: Andreas Garnitschnig is Manager Technical Services & Monitoring at VA TECH ELIN Transformatoren in Weiz, Austria. He is responsible for all transformer monitoring activities and technical services. Before that, he was an R&D engineer at VA TECH ELIN Transformatoren. His assignment among other things was to check the reliability of monitoring devices suitable for continuous on-line use. Andreas earned his degree in electrical engineering from Technical High School in Klagenfurt, Austria in 1992.

John W. Harley: Jack Harley is Chair of the Working Group on Partial Discharge Tests in Transformers, Task Force Leader of the CIGRE Working Group 12.18 Life Management of Transformers, and founder and former president of J. W. Harley Inc. That company rebuilt specialty mechanical equipment associated with transformers and circuit breakers and manufactured on-line high voltage equipment monitoring systems including data acquisition, software and sensors. Jack received his BSME degree from the University of Pennsylvania and the EMBA degree from Case Western Reserve University.

Dr. Hemchandra M. Shertukde: Dr. Shertukde is co-founder of Diagnostic Devices Inc., in New Britain, CT and since 1988, is a Full Professor of Electrical Engineering at the University of Hartford. His employment experience includes the Tata Engineering and Locomotive Company in Pune, India and Crompton Greaves Limited in Mumbai, India from 1975 to 1983. His special fields of interest include Controls and Signal Processing with applications to diagnostics, and on-line monitoring and health-condition monitoring of electrical apparatus, aircraft fuselage, concrete bridges and submarine structures. He has several journal and proceeding publications in the field of Multi-Target, Multi-Sensor tracking and Signal Processing. Hemchandra graduated with B.Tech (Hons) in Electrical Engineering from Indian Institute of Technology, Kharagpur, in 1975, and with MS and Ph.D. in Electrical Systems Engineering from the University of Connecticut, Storrs, CT, USA in 1985 and 1989 respectively.

Steve Skinner: Steve Skinner is Substation Apparatus Engineering Specialist with Idaho Power Company. He has been with the company for 26 years and in the Substation Engineering group for 15 years. Steve is responsible for field support for the regional technical teams concerning all circuit breakers rated 46 KV and above. In the last seven years, he has installed, commissioned and operated various on-line monitoring systems, which measure the performance of power transformers, circuit breakers, synchronous condensers, and generators. Prior to 1988, Steve spent four years working in the Substation Construction, where he was involved in the structures group and in the control wiring group. After that, he was a supervisor for a regional substation group and was charged with the maintenance and operations of the substations in that area.

Barry H. Ward: Mr. Ward is Project Manager for Power Transformers and High Voltage Instrument Transformers in the Transmission & Substations Business Area of the Science & Technology Development Division of EPRI in Palo Alto, California. Before joining EPRI in 1997, he was employed by AVO International, and Blue Bell in Pennsylvania. He was responsible for the development of portable test and measurement instrumentation for use in the electric utility industry. He is a registered Professional Engineer and is a member of IEEE serving on the PES Transformers Committee. He received his B.S. degree in Electrical Engineering from The University of Bradford, England.