

## New Transformer Procurement Engineering Best Practices

### Overview:

This interactive 3-day seminar covers new transformer specifications, how to prequalify new and existing transformer manufacturers, factory inspections during manufacturing process, factory acceptance testing, transportation and installation and commissioning. Large power transformers represent a significant capital investment for any utility, industrial company or other end user. Ensuring that a good quality product is manufactured and delivered successfully should begin early in the procurement process.

According to the Institute of Asset Management, while only 5-15% of an asset's life-cycle costs are incurred at the procurement phase, more than 80% of those life-cycle costs have been committed, so good procurement processes are critical to having an effective asset management strategy. The significant majority of critical transformers receive some sort of additional surveillance by the end user. Doble has performed transformer procurement consulting services for hundreds of clients purchasing transformers from more than 50 different manufacturing factories in over 20 countries globally. Learn from Doble's extensive global experience.

### Learning Outcomes:

Upon completion of this course, the participant will be able to:

- Prepare a transformer specification, which scrutinizes the most critical aspects of the transformer design and construction for a customer's specified application.
- Perform factory qualification audits, which are essential to confirm a manufacturer's ability to meet a purchaser's requirements and expectations.
- Understand importance of factory witness inspections to provide independent verification to manufacturer's design and manufacturing processes.
- Acquire knowledge essential for witnessing factory tests, preparation of test specification and reviewing certified test reports.
- Understand transportation considerations, installation and commissioning testing.

### Course Audience:

Electrical engineers working in operations, maintenance, engineering, or other service field in which knowledge of asset design, insulating fluid analysis or electrical testing methods and evaluation is required part of his job responsibility.

### Duration:

3 Days

### Class Size:

15 Maximun

### Credits:

Up to 2.4 CEUs or 24 Professional Development Hours

# COURSE OUTLINE

The course program contains the following training outline:

- **Transformer Design & Construction**

- o Transformer theory and applications
- o Transformer design
- o Materials/Major components
- o Transformer manufacturing and construction

- **Transformer Specifications**

A clear, well-defined specification eliminates variances of interpretation by vendors and results in a proposal and product that meets the customers' intentions and specifications. Many specifications refer to IEEE or IEC Standards for definition, so it is critical to know what the current revision of these standards require. Discussed topics: core/winding arrangement; type of winding & conductors; transformer losses; short circuit forces and stresses, thermal design.

- **Transformer Vendor Prequalification**

An effective procurement system utilizes the preapproval process to identify suitable power transformer vendors and a design review to establish an agreed upon design and procurement process. This preapproval approval process should include factory qualification audits, which are essential to confirm a manufacturer's ability to meet a purchaser's requirements and expectations. Discussed topics include: Manufacturer engineering capabilities; engineering tool; factory logistics; detailed manufacturing process and equipment; testing capability and the facilities; storage, packaging and shipping area; quality management at the facility, including procurement, materials used in construction of transformers and document control; facility certifications.

- **Factory Manufacturing Witness Inspection**

Factory inspections are designed to augment the manufacturer's existing Quality Assurance or Quality Control processes at the factory. Factory inspections are not performed to replace or circumvent the internal processes established by the manufacturer, but rather these inspections are inserted into the normal and expected quality program to provide an independent verification and to establish that the supplier's quality system is functioning as designed. Discussed topics include: coils and core inspection; post-processing inspection; pre-tanking inspection.

## Presenter(s):

### • Jason Varnell – Transformer Consulting Engineer

Mr. Varnell is a Principal Transformer Engineer with 10 years of experience in the manufacturing and electrical/mechanical designs of core type power transformers. This experience includes core form designs up to 230 kV, 900 kV BIL, up to 112 MVA as used in power plants and substations. Before joining Doble Engineering, he was employed by both SPX Transformer Solutions (formerly known as Waukesha Electric Systems) in Goldsboro, NC and ABB in South Boston, VA. While at SPX Transformer Solutions, Jason consistently developed into higher responsibility roles such as Senior Design Engineer and Lead Design Engineer. As Lead Design Engineer he provided technical training and management to a team of electrical design engineers that reported directly to him. His design experience includes the completion of several hundred different designs and numerous different types of transformer such as Autotransformers, Generator Step-Up, Unit Auxiliary, Dual Voltage (even and uneven), Dual Phase Displacement, Delta-ZigZag, Delta-Wye, Delta-Delta, and Wye-Wye. Jason is an active member of the IEEE Transformer Committee by serving as an officer on several Working-Groups. He has pervasive experience presenting at technical seminars on transformer topics such as Transformer Design, Specification Requirements, Magnetic Circuits, Short-Circuit Withstand, Dielectric Design, Thermal Design, and Tap Changers. C57.12.90. Jason received a bachelor's degree in Electrical Engineering (Honors) from the North Carolina State University with an emphasis in Power Systems and Power System Protection.

### • Dom Corsi – Senior Principal/ Transformer Consulting Engineer

Mr. Corsi has 27 years of experience in the manufacturing and electrical design of large power transformers. This experience includes both core and shell form designs. Mr. Corsi joined Doble in 2004 as a Transformer Consulting Engineer for Doble Global Power Services. In the last 12 years, he has concentrated on transformer procurement consulting, condition assessment, and forensics. Additionally, he has designed transformers up to 400 kV and 570 MVA and reviewed or supervised transformer designs to 525 kV and 1100 MVA. His main interests are in the fields of power transformer design, and power transformer applications. A frequent presenter, Dom Corsi trains participants on many transformer related topics including Transformer Repair, Remanufacturing and Replacement, Transformer Design Review, Transformer Factory Inspections.

### • Simon Ryder – Senior Principal/ Transformer Consulting Engineer

Mr Ryder graduated from Oxford University in 1996 with a MEng in Engineering Science. From 1997 to 2003 worked for GEC Alstom T&D at Stafford, England and St Ouen, France, as Design and Development Engineers and Research Programme Manager. In 2003 joined Doble PowerTest Ltd, and has worked on condition assessment and failure analysis of transformers, including independent expert work, and more recently various procurement aspects, including factory capability assessment, tender evaluations, design reviews and progress inspections. Simon is currently chairman of Cigre SC A2 on Transformers which focuses on transformer design and manufacture, application of material, utilization (maintenance and operation, condition monitoring, life management, repair and refurbishment, disposal, safety and environmental aspects, quality assurance and testing.



### Division of Responsibilities:

If the course is hosted at a customer location, to ensure smooth training course delivery, Doble requests the following division of responsibilities:

Doble will provide:

- Confirmed training dates upon receipt of a purchase order.
- Technical agenda for program.
- One experienced instructor including their travel/living expenses.
- Training manual (soft copy) to each participant

Customer will provide:

- Confirmed training schedule at least 60 days in advance.
- Training coordinator through whom all contractor requests will be coordinated.
- Training facility for up to 20 participants, AV equipment, whiteboard and pens.
- Printing hard copy training material as required.

