Methods for On-line Dissolved Gas Analysis of Electrical Insulating Fluids

Requirements for laboratory or online dissolved gas analysis (DGA) of electrical insulating fluids are determined to a large degree by the desired content and accuracy of asset diagnostic information and subsequent condition-based maintenance (CBM) decisions. The selection of DGA extraction and sensing technologies directly influences the accuracy of resulting diagnostic indicators and decisions, such as whether to take a transformer off line for maintenance. High-impact assets such as generator step-up units (GSU) or transformers over 100 MVA require higher levels of DGA and other diagnostic tool performance than less critical, smaller assets.

The various laboratory and on-line DGA extraction and gas sensing technologies fit into a range of deployment scenarios that can be described by a number of factors, including:

- Selection of monitored gases
- Required accuracy, precision, reliability, and frequency of analysis
- Physical and communication access
- Supply and maintenance requirements

Equipment, procedures, and analytical performance expectations for laboratory DGA are described in published standards from IEC, ASTM, and IEEE. There are only a few choices for laboratory equipment within these mandates, related primarily to the gas extraction system. In contrast, available choices for online DGA monitoring span multiple extraction and gas sensing methods, but there are no consensus standards for instrument selection, methodology, or performance requirements. Instead, there exists a number of guidelines and technical reports that present DGA experiences and recommendations of experts and stakeholders (see references 1 and 2, for example). The material is very useful for understanding current DGA practice and performance expectations, but it does not consider the detailed characteristics of the analytical methods and their effects on data quality.

[1] "DGA in Non-Mineral Oils and Load Tap Changers and Improved DGA Diagnosis Criteria," Cigré Technical Bulletin 443, December 2010. "

[2] Guide on Transformer Intelligent Condition Monitoring (TICM) Systems," Cigré Technical Bulletin 630, September, 2015.