

ADVANCES IN DISSOLVED GAS ANALYSIS

- Dr Dan Martin, CPEng, ETEL Innovation Project Engineer

In New Zealand and Australia dissolved gas analysis (DGA) is commonly used to check a transformer according to IEC 60599. Measurement values are compared to the 90th percentile levels of gas concentration, which indicate typical operation. A key update to DGA has been the IEEE C57.14 standard released in 2019, significant because there is a more complete discussion about uncertainty and what to do next.

For the IEEE standard, levels have been extracted from a database of 1.5 million measurements, where the IEEE had concluded “insulating liquid volume, rating, and voltage class, did not produce significant differences”, while age and sealing did.

A challenge is dealing with the statistical randomness inherent in measurement, as this standard states “it is reasonable to expect that about 40% of all DGA results will need further review”. Obviously, 40% of the transformer fleet does not have a fault. Therefore, it is essential to understand other causes of gas.

If a high dissolved gas concentration is measured, then ETEL will usually recommend to repeat and perform periodic sampling to establish trend, helping to remove sampling uncertainty and measurement errors. For example, some laboratories report their measurement accuracy to be between ± 15 and $\pm 20\%$. If the gas is measured to be higher than the 90th percentile limits, the next step is to track the rate of rise and compare with those in standards. For a rise to be significant it has to be greater than 40%, because one measurement could be -20% and the next +20%.

The causes of gases involve heat or electrical energy. Some gases, such as methane, ethane and hydrogen are generated even at normal transformer operating

temperatures. Low levels of hydrogen are sometimes generated by chemical reactions between oil and galvanised steel. A difficulty is that dissolved hydrogen is also a marker for partial discharge and false-positives can result from interpretation techniques in the IEC standard.

CIGRE has extensively studied this area for their brochure ‘Advances in DGA Interpretation’, and propose methods to detect a false-positive using different gas ratios such as in Duval triangle 4 or the pentagon. Consequently, a recommendation from ETEL is for the user to become familiar with this brochure, a copy of which can be found on the CIGRE website - <https://e-cigre.org/publication/771-advances-in-dga-interpretation>

Sometimes, dissolved gas levels can be elevated from over stressing the transformer, for instance by surges from switching transients, or by high current harmonics heating the insulation further.

ETEL would be pleased to assist with the interpretation of DGA and discussion of a resolution plan.



ETEL AND ISO14001 ENVIRONMENTAL MANAGEMENT

Pandemic aside, the environmental movement (climate change, emissions, waste and conservation included) is probably one of the biggest challenges facing businesses planning for the longer term. ETEL is no different and is preparing to meet this next great business trend head-on.

ETEL's Rosebank Road manufacturing facility currently holds Quality and Health & Safety ISO accreditations in our Integrated Management System (IMS) and following the launch of our new company vision statement 'Better ways to connect people to power' our teams have begun gearing up to add ISO14001 to our IMS. The standard puts an emphasis on identifying and managing our environmental risks and reducing the amount of waste products and emission we produce.

ETEL's new vision is inherently focused on how we interact with our people and our community. As a manufacturing business and an integral part of the New Zealand electrical

industry we have a responsibility to ensure our business processes consider all stakeholders, including our future generations.

Achieving our ISO14001 accreditation will ensure that we are operating in a way which is both environmentally responsible to our customers and community and allows our workers to know they are part of a business doing its part to protect our future.

Work has already been completed to identify gaps and improvement opportunities at our Rosebank Road site. There is a bit of work to do but ETEL is confident we have the resources and expertise in place to achieve ISO14001 and remain an environmentally responsible supplier.

We look forward to continuing to update you on our commitment to being responsible to our environment over the coming months.



TRANSFORMER SERVICES AND SUPPORT

The ETEL transformer service team have been busy refurbishing transformers of all shapes and sizes, from any manufacturer and age to help you get the most out of your asset.

Mid-life servicing on your transformer (insulation drying, tank repainting, parts replacement and oil conditioning) will optimise its useful life and help to prevent unplanned outages in your electricity network and supply.

The service team is expanding its servicing capabilities to provide on site inspections, testing and refurbishing options in the greater Auckland region and further afield in New Zealand. An assessment will identify any issues with the integrity of the transformer tank, internal insulation, oil,

ancillary components, and protection devices. Any issues of which could contribute to accelerated transformer aging or early failure.

In-service data logging to assess your transformer's health and power quality is being developed with the team, where we can monitor your transformer in real time and apply ETEL's specialist transformer knowledge to advise and inform you of how your transformer is operating and identify and potential maintenance you can plan for and minimise supply interruption.

For more information on what the ETEL Service team can offer visit www.etelservices.co.nz

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