TechTalk

When to Apply Online Dissolved Gas Analysis Monitoring

Compiled by Tom Dalton | March 2022

The scope

When is it appropriate to apply online dissolved gas analysis monitoring (DGA)? It depends on the risk. In this TechTalk we will explore how to decide whether or not to apply online DGA.

Transformers are installed to transform voltages from high to low voltage or vice versa using mutual inductance. Large transformers use oil or insulating fluid for insulation and cooling. While in service the transformer may experience stress that will cause the oil to breakdown and produce gases. These gases can be produced rapidly (within seconds, minutes, hours or days) and become evident with DGA. The amount of the gases and their associated thermal indication will assist in the detection of a developing fault, its progression and diagnosis. In most cases a transformer owner will take regular samples, typically one a year. The question to consider is: Is it fast enough to detect a pending problem and will one be able to react in time to prevent total failure? In most cases, it will be no, so when does it become important to monitor a transformer with online technology?

Risk determination

With a transformer in service there are a number of key things to remember which can be broken down in to two main schools of thought. Network and condition risk.

Network risk

Items such as safety and environmental issues are high on the priority list and must be addressed first. If the loss of power due to a transformer's failure to deliver power affects human life, the risk will be high. In addition, a catastrophic failure where human life is threatened, the risk will also be high. The following should be taken into account in decision-making:

- Environmental impact
- Load dependency or production loss
- Financial impact
- Network contingency (N-1 more than one transformer supplies the same load)
- Alternative network feeds (minor switching alternatives)
- Strategic spare
- Replacement or repair window (> 6 months)
- Age of the unit/s

Condition risk

Analysis	Term (how quickly the condition develops)
Dissolved gas analysis (gassing factor – single value weighted factor) and production rate	Short
Moisture-in-paper	Short to medium
Dielectric strength	Medium
Polar contaminates (sludge, acidity and paper age)	Long
Frequency domain spectroscopy – variable frequency tan delta assessment	Long

With a reasonably high risk, the DGA analysis becomes important and it is in this case that online monitoring becomes necessary. A good gauge as to when to apply online monitoring is when the financial risk (losses per day) of losing power are greater than the price of an online monitoring unit.

Focused online

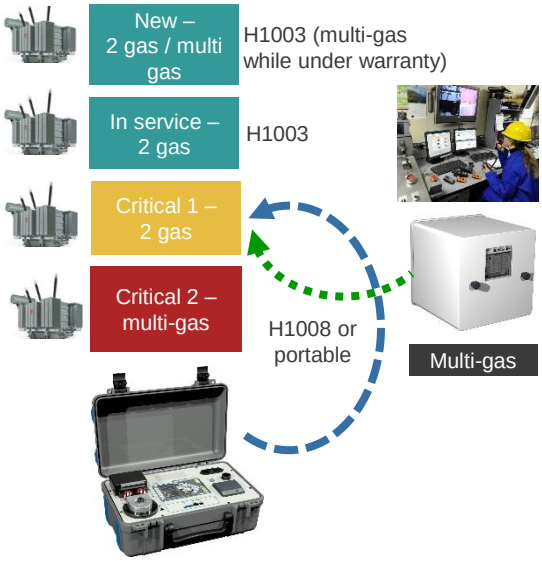
Online monitors for a transformer will increase in price depending on the number of gases that are measured. The following method will assist in what to apply to your network. There are three values to consider:

- Ability to detect – Protection value
- Ability to monitor – Monitoring value
- Ability to diagnose – Diagnostic value

In most cases a protection value is all that is needed - a red flag.

Once the red flag is raised, the ability to monitor becomes necessary. In both of these cases a 1 to 2 gas monitor is sufficient.

When diagnosis is necessary, only then is a multi-gas unit necessary.



When needed an online multi-gas monitor for problematic / concerning fault gases evolution (temp / perm) replaces the 2 gas unit. Most monitors can be swapped out quickly in the case of a troublesome transformer unit.

An alternative is to have regular samples drawn and a portable analyser is employed for investigative analysis.