



QUALITROL CASE STUDY:

SERVERON™

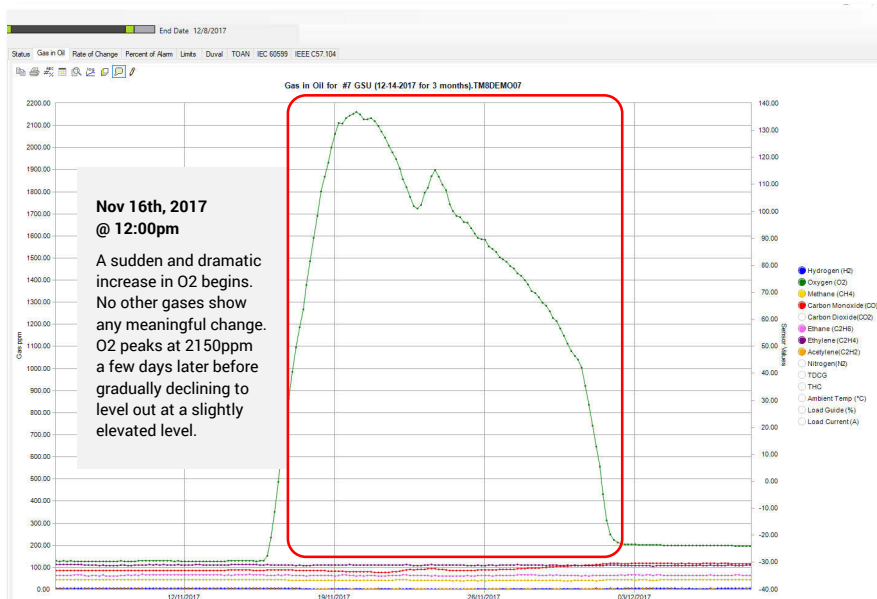
THE IMPORTANCE OF MEASURING OXYGEN IN DGA



QUALITROL CASE STUDY:

A Qualitrol Serveron TM8 mutli-gas DGA device was monitoring an old (30+ years) 3-phase 230kV shell-form nitrogen (N) blanketed GSU. At midday on November 16, 2017, the TM8 alarmed for increasing concentration of Oxygen (O2), which had been stable at 130ppm for an extended period. Over the course of the following 3 days O2 concentration continued to increase, peaking at 2,150ppm before gradually declining back to a stable 200ppm.

Reviewing the data around the time of the increase in O2 concentrations using Serveron TM View software, no fault is detected using any of the established diagnostic methods.



OUTCOME

The sudden O₂ increase, with no associated change in any other gas indicated that the O₂ originated from the atmosphere. Qualitrol experts suggested that the transformer may have had an atmospheric air injection and requested the operator to investigate. Upon a physical examination of the transformer it was noticed that there was a leaky manhole cover gasket and that the pressure of the nitrogen blanket was close to atmosphere. It was determined that a partial vacuum occurred in the transformer during a cool down that resulted in atmospheric air being sucked into the transformer.

O₂ can facilitate oxidation in the transformer and thus shorten the life of the paper. However, the big concern with a transformer sucking atmospheric air in is that inevitably, it also brings moisture into the transformer.

While none of the modern diagnosis methods explained this sudden increase in O₂ it was possible to detect this incident with Serveron TM8 online Gas Chromatography Monitor, deduce the cause and implement corrective action. If O₂ was not monitored this process could have occurred many times without being detected, drawing a lot of moisture into the transformer.

"N₂ pressure does not prevent entrance of water--only a good gasket seal does."



NOTE

While this incident occurred on a N₂ blanketed transformer the same vacuum conditions can occur within an operational constant oil preservation system (COPS) transformer. This can occur during cool-down if breather piping to the atmosphere is too narrow or is restricted and air cannot enter fast enough to avoid a vacuum in the main tank. A vacuum can then suck air past a gasket that does not show an oil leak. Another obscure fact is that degassed oil is effectively a vacuum to the atmosphere and in a sealed system can create a vacuum in the gas phase. It's important to give the oil time to reach equilibrium with the N₂ blanket during filling / refilling to avoid this situation.

Dates, times and other details may have been changed to maintain the anonymity of the owner / operator in this case study. All DGA data, timelines and technical specification are factually accurate.