



## QUALITROL CASE STUDY:

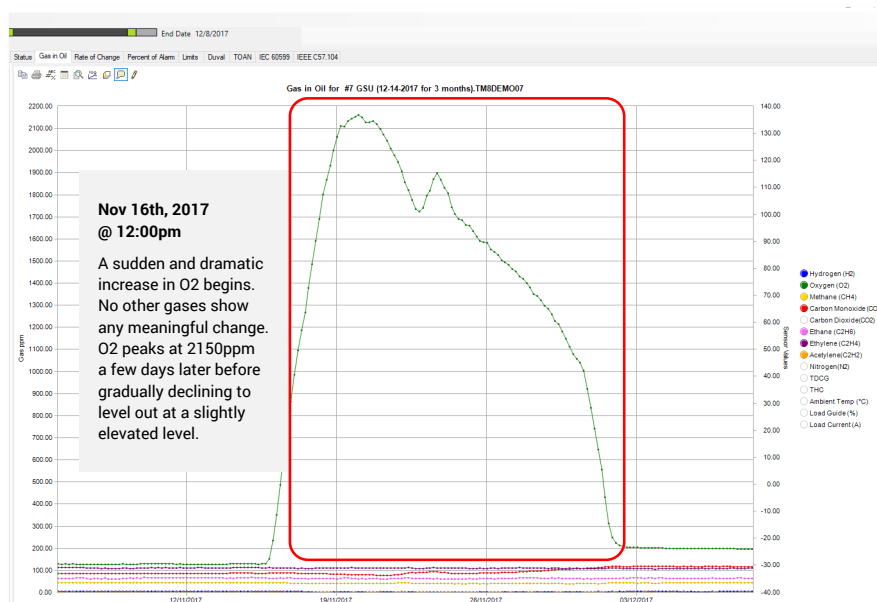
# SERVERON™

## 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 (O<sub>2</sub>), which had been stable at 130ppm for an extended period. Over the course of the following 3 days O<sub>2</sub> 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 O<sub>2</sub> concentrations using Serveron TM View software, no fault is detected using any of the established diagnostic methods.**





## OUTCOME

The sudden O<sub>2</sub> increase, with no associated change in any other gas indicated that the O<sub>2</sub> 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.

O<sub>2</sub> 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 O<sub>2</sub> it was possible to detect this incident with Serveron TM8 online Gas Chromatography Monitor, deduce the cause and implement corrective action. If O<sub>2</sub> was not monitored this process could have occurred many times without being detected, drawing a lot of moisture into the transformer.

*"N<sub>2</sub> pressure does not prevent entrance of water--only a good gasket seal does."*



## NOTE

While this incident occurred on a N<sub>2</sub> 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 N<sub>2</sub> 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.