



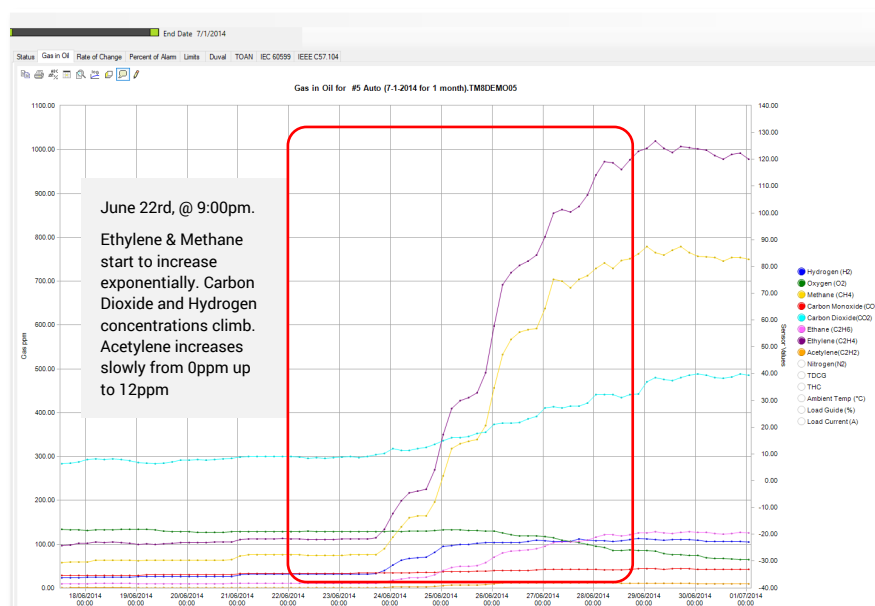
QUALITROL CASE STUDY:

SERVERON™

HOUR BY HOUR CHANGES: CATCHING A DEVELOPING FAULT

A Qualitrol Serveron TM8 multi-gas DGA monitor was being used to monitor a single-phase 336 MVA, 500/230 kV auto-transformer. This transformer was placed into service in 1979. The transformer is known to have gassed in the past and so base levels of hydrocarbon gases are as high as 100ppm.

At 1:00am on June 23, 2014, the TM8 alarmed for Rate-of-Change increases in concentration of Ethylene (C_2H_4) and Methane (CH_4) both of which had been elevated but stable for several months. Over the next 5 days the operator kept the transformer under load for operational purposes and carefully monitored all gases. When Acetylene (C_2H_2) climbed to an actionable level (10ppm) the transformer was taken off-load.



Reviewing the load data around the time of the increasing gas generation rate it was observed that the transformer had been heavily loaded at the time, also that increasing load correlated well with increasing gas production. Reviewing the DGA data with Serveron TM View software, Duval Triangle 1 indicated high temperature overheating (Figure 1) while Triangle 5 indicated medium to high temperature hot spots (Figure 2).

However, this diagnosis would have been the same before the exponential increase in gases occurred as can also be seen from the Duval diagnosis. The key to managing this situation was that the user could see the gas levels increasing dramatically over a short period of time and knew when to take the transformer offline before run-away conditions developed. This is something that periodic off-line testing could not provide for.

“SERVERON TM8 On-line DGA can identify “incremental” changes in important gases in the presence of high accumulated PPMs of gases: not possible with lab DGA.”

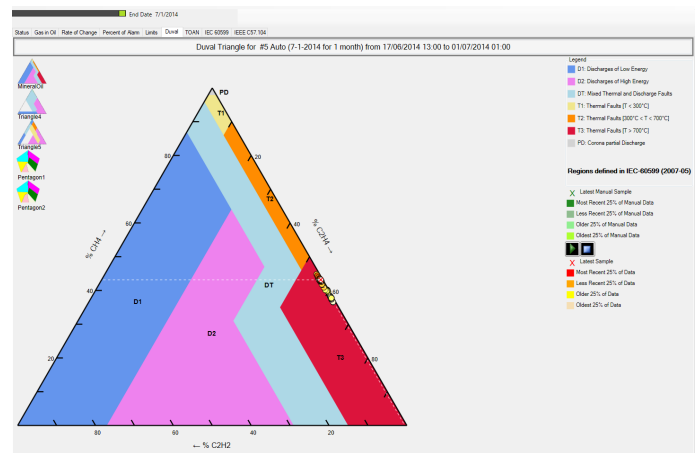


Figure 1: TRIANGLE 1. Thermal Fault >700oC

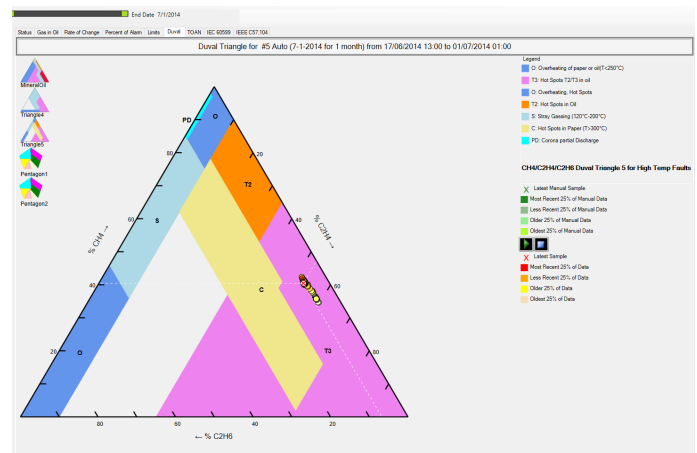


Figure 2. TRIANGLE 5 Hot Spots T2/T3 in oil

OUTCOME

The transformer was taken to a repair shop where maintenance personnel found carbon deposits in damaged insulation that is used to isolate the core and coil assembly from the tank. Repairs were undertaken and the transformer was put back into service. Despite the repairs the transformer continues to gas at a slow rate and is scheduled for replacement over the next few years.

In this case the transformer was known to have gassing issues but was needed for operational purposes. Despite its known issues it was used safely because its gassing could be monitored on an hour by hour basis. This transformer will continue to be available as a spare together with online DGA until it can be replaced.

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.