

CASE STUDY

ON

TRANSFORMER TRIPPING AFTER COMMISSIONING & OIL SPALSH OUT

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1. NATURE OF PROBLEM :

Transformer tripped on pressure relief device operation.

2. IDENTIFICATION :

62 MVA, 132 / 11 KV, 3 ϕ , Generating Transformer .

3. CASE HISTORY :

Transformer supplied on 28/01/2011, erection completed on 03.10.2012, Oil filtration & circulation completed and pre commissioning test completed successfully.

An oil sample is taken for BDV, PPM measurement & it came 82 KV & 13PPM which was excellent for 132KV class transformer.

Transformer successfully charged on 0620 Hrs dt. 09.10.2012 & load increases gradually, when the

transformer reaches on load of 41.2MW. It was observed that transformer tripped on pressure relief device at 1358 Hrs on same date.

4. ANALYSIS :

After tripping physical inspection was done & it was observed that oil splash out from PRD. It was also observed that oil spread around the transformer. No gas was observed in gas collecting device. Physically checking all other protection devices, No other protection devices operated.

Data downloaded from SCADA, No abnormality observed. Immediate an oil sample taken & sent to Electrical Research Development Association (ERDA) lab Vadodara. A surprising result came, No gas was detected



Fig 1 – Magnetic oil level gauge (MOLG)

And then low voltage test conducted & the same results found, all the parameters are satisfactory. Finally we drain oil from main tank & internal inspection was done, but nothing observed. Suddenly someone saw that oil level is quite higher in conservator & MOLG's reading shows between 35deg & 3/4 of full.

5. CORRECTION & PREVENTION:

We discussed & concluded that due to excessive amount of oil, overall tank pressure increases & when the transformer reaches near full load its temperature increased by 41 degree. Hence, the level oil gets also expanded, which leads to causes tripping of PRV.

Transformers oil's physical properties & there limits are listed below

SI No.	Physical property	Value
1	Acidity	0.03 mg KOH /g (max)
2	Appearance	oil should be clear, transparent and free from suspended matter or sediments
3	Coefficient of expansion over the normal range of operating temperature	0.00078/°C/L
4	Density at 29.5 °C	0.89 g/cm ³
5	Dielectric dissipation factor @ 90deg c	0.002
6	Electric strength after filtration	60kV
7	Electric strength unfiltered oil	30kV
8	Flash point	140 °C
9	Interfacial tension at 27 °C	0.04 N/m

10	Kinematic viscosity at 27 °C	27cSt
11	Pour point	minus 6 °CA14
12	Presence of oxidation inhibitor	The oil shall not contain antioxidant additives
13	Sludge	0.1 percent of total weight
14	Specific heat	2.06 kJ/kg °C (0.003 8)
15	Specific resistance @ 27 °C	1500 x 1012 ohm-cm
16	Specific resistance @ 90 °C	35 x 1012 ohm-cm
17	Thermal conductivity	0.12 W/m °C
18	Water content > 400KV class	12 PPM
19	Water content < 400KV class	5 PPM

Source –of Indian standard

Total oil in tank = 25146 L

So, we decided to drain excessive oil from conservator(around 4 drums) which is $209 \times 4 = 836$ L and we again charge the transformer on 10.10.2012 & now transformer running successfully on load of 45 MW.

Overall of oil expansion = $(0.00078 \times 41 \times 25146)$
 $= 804.16 \text{ L} = 3.84$
drums

Coefficient of expansion over the normal range of operating temperature = **0.00078/°C/L**

LESION LEARNT:

Oil level should not be more than 35 °C in conservator to prevent tripping.

Temp increases = 41 °C