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Case Study – Unlocking Transformer Secrets: Diagnostic Testing Uncovers Hidden Damage

Power transformers are the workhorses of the industries, silently stepping down high voltage electricity for our businesses and homes. However, undetected internal damage can lead to catastrophic failures, causing power outages and equipment destruction. Routine alongwith diagnostic testing is essential to unlock the secrets within your transformers and prevent such disasters.

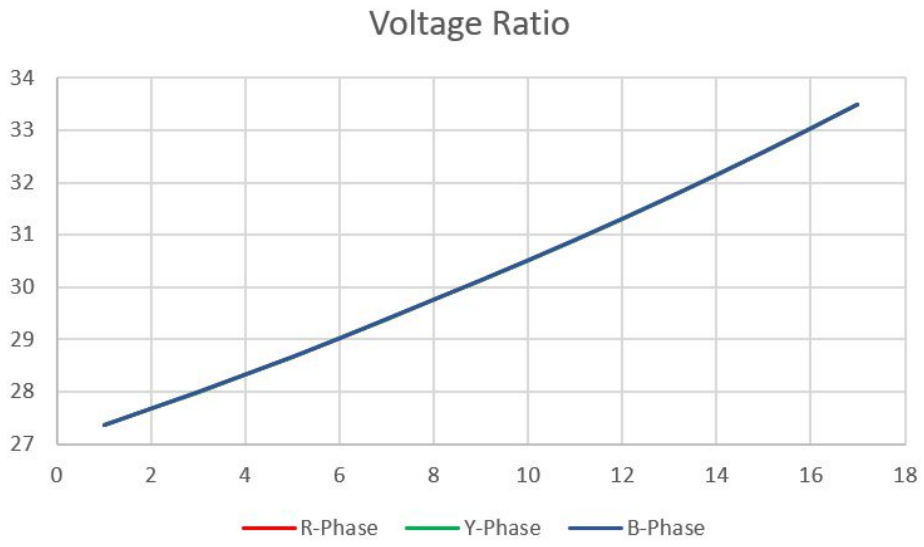
Background

A critical facility and one of our long-standing costumers, relying on a stable power supply from Grid, wanted to go for Regular testing of transformers, we advised them to go for diagnostic tests also alongwith routine. They agreed and during their annual shutdown, our team went and below were the results.

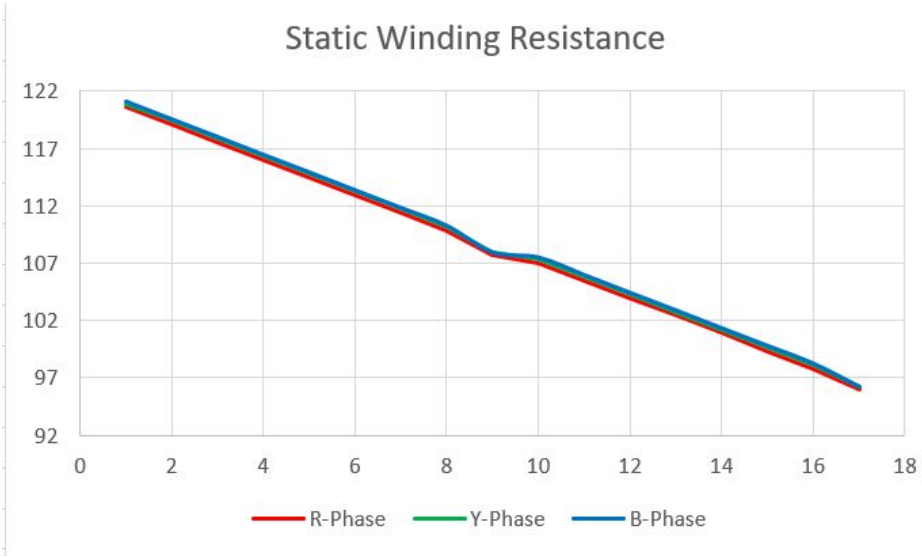
Findings- at Site:

Details of Transformer under Test : **Rating : 31.5 MVA, Voltage : 33 / 11.5 kV**
Tap Changer : OLTC, Year of Mfg. : 2008

- Transformer was required to Carry out the Routine alongwith Diagnostic Testing.
- Various Testing including Diagnostic Testing of equipments was carried out.
- All Results were showing satisfactory results except one test.
- Just few images of healthy test of Voltage ratio and Static winding resistance.

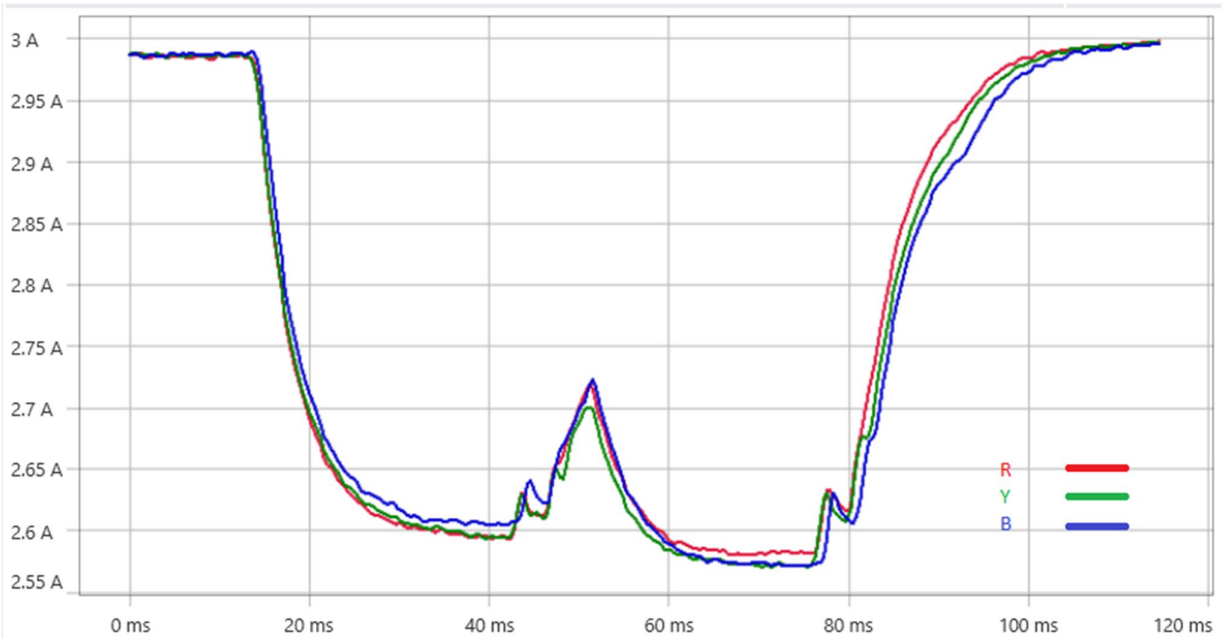


Test Results X – Axis OLTC Tap Position, Y Axis – Voltage Ratio

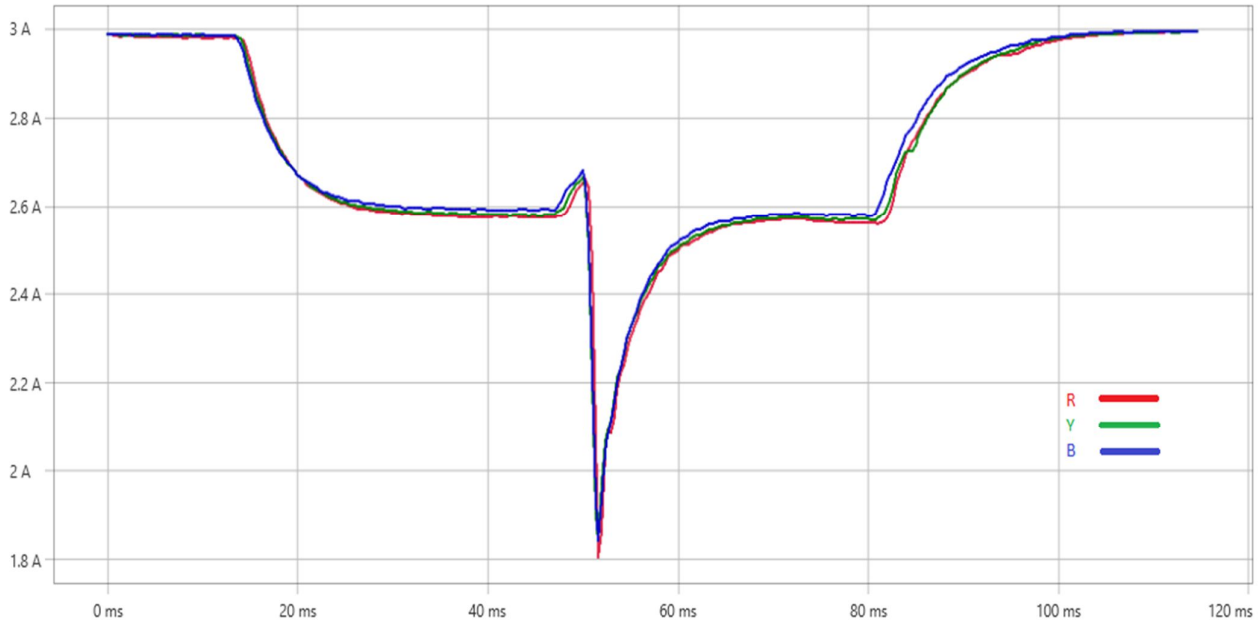


X – Axis OLTC Tap Position, Y Axis – Winding Resistance in milli ohms

The test that didn't show proper result was the Dynamic resistance measurement of OLTC , Below are the graphs that shows healthy and unhealthy test results :

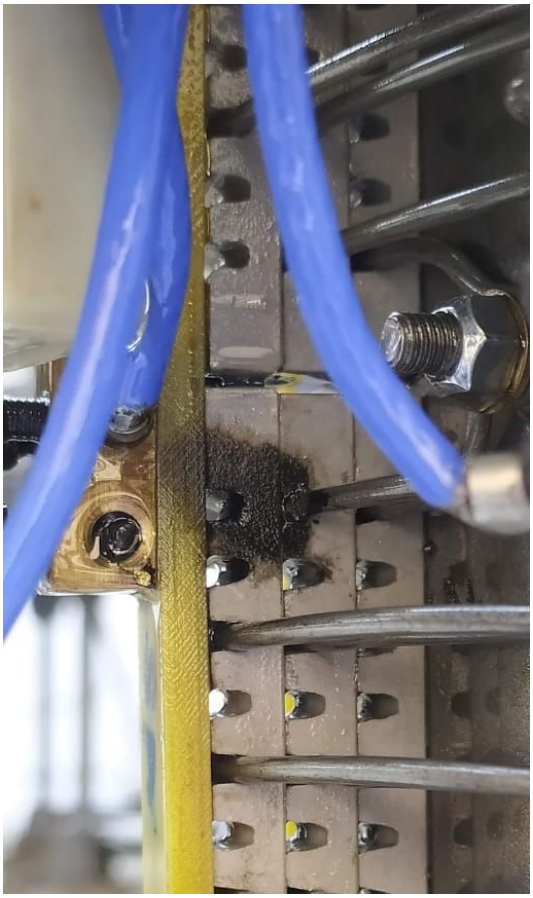


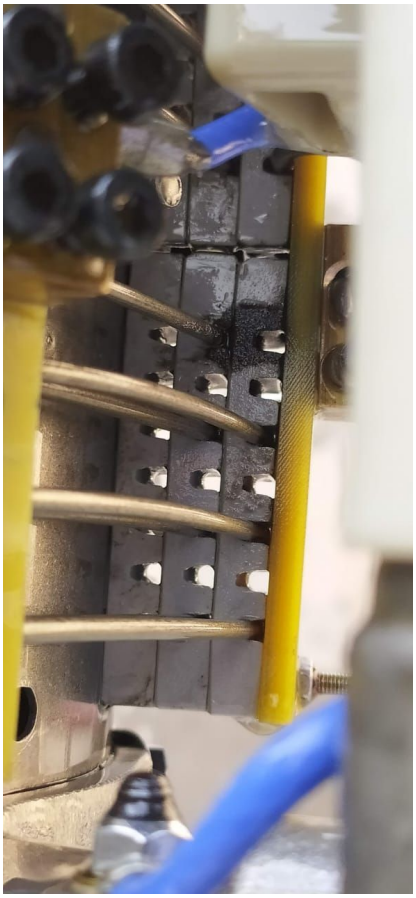
Above is the image of Healthy DRM test results of OLTC
X – Timing, Y Axis – Applied current in OLTC



Above is the image of Unhealthy DRM test results of OLTC

- Dynamic Resistance Measurement showed bad contacts and transition Resistor.
- This Pattern was observed while Moving upwards and Downwards.
- Again, a Single Tap position was used two times during up or down sequence.
- This indicated that there were some problems in OLTC itself.
- OLTC was opened and Contacts were observed.
- Transition resistance showed sparking.
- Pitting was also observed on Moving contacts.





Above are the images of unhealthy OLTC moving contacts and transition resistor

Root Cause :

Below can be considered as a few of the root-cause for the said case.

- **Continuous operation:** When the grid voltage is not stable OLTC keeps on operating manier times to maintain the same and can say work Overtime, the OLTC's contacts can wear down, loosen, or become misaligned, leading to increased resistance during tap changes.
- **Overheating:** Excessive heat within the transformer can degrade the contact surfaces of the OLTC, increasing resistance and potentially causing arcing.
- There can be few others too, but that can be confirmed on case to case basis.

Precautionary measures taken after this test:

Armed with this crucial information, the Maintenance team was able to take proactive actions for the Overhauling of OLTC. By proactively addressing the hidden issues within the OLTC, they prevented a potential catastrophe. This ensured continued operation, and avoided the high costs associated with an outage.

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Conclusion that can be drawn from this incident:

This case study demonstrates the power of Diagnostic testing in safeguarding transformers or any other MV / EHV equipments. This specialized test unlocks the secrets within OLTCs, revealing hidden problems before they escalate into costly failures. By incorporating diagnostic with your routine testing, you gain valuable insights into the health of your transformers, allowing for informed decisions and a reliable power supply.

We, as an Electrical asset consultant and service provider always suggest what is best to run your industries smoothly and without hiccups of maloperation and breakdown.

And if you are looking for a dedicated agency that understands the direct link between your assets and your revenue, call/write to us, we will be happy to assist you.

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