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Electrical Maintenance of Power Transformer and Distribution Transformer

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ABSTRACT

Power Transformers are the important components used in transmission system. As power transmission is effective at higher voltages, it is required to step the operating transmission voltage. Power transformers step up the voltage at the generating station or sending end of transmission line and later step downs the voltage at the the load side or receiving end of transmission line. Distribution transformer further steps down the voltage at the customer side. The level of step down depends upon the type of customer. Hence power transformer is an important component in transmission system and distribution transformer is an important component in distribution system.

KEYWORDS: Power transformer, Distribution transformer, Electrical Maintenance

INTRODUCTION

Transformer operates based on the Faraday's laws of Electro Magnetic Induction[1].

The electromagnetic core is shown in figure 1.

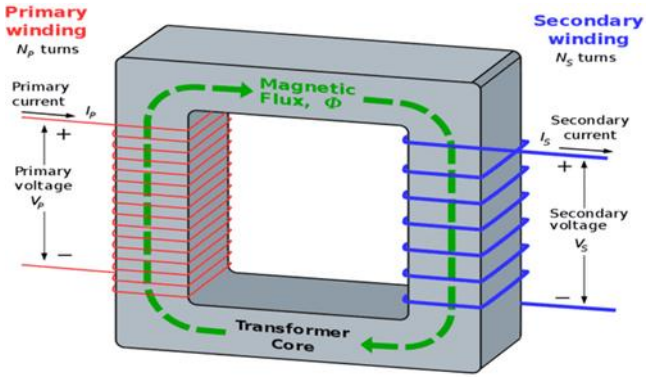

Figure 1: Electromagnetic Core

Turns Ratio and Voltage Transformation: The terms turns ratio and voltage transformation are an index pertaining to performance of transformer[2]. Both terms can further related to the current flowing in primary winding and current flowing in secondary winding. Based on the Volt-Ampere rating of the transformer, the truns ratio can be determined.

Frequency Conservation: It is not possible to change the frequency of the electrical signal by power transformer [3]. This feature of the power transformer helps in maintaining synchronization across the electrical grid.

Magnetic Core: Laminated sheets of magnetic material like iron or steel are used in the manufacture of magnetic core [4]. Magnetic core is responsible for induction of voltage in the windings of transformers[5].

PERFORMANCE AND MAINTENANCE OF POWER TRANSFORMER

The performance of Power Transformer can be determined as follows:

Turns Ratio Test:

You'll need a turns ratio test set, which typically consists of a variable AC power source, a voltage measurement instrument, and a current measurement instrument. Some modern test sets are digital and offer more precise measurements.

Connections: Connect the test set to the transformer. Connect the primary winding to the source side of the test set and the secondary winding to the load side.

Settings: Set the test set to deliver a low-level AC voltage on the primary side. This voltage is usually specified in the transformer's datasheet or as per industry standards.

Measurement: Measure the voltage on the secondary side of the transformer. This is the induced voltage due to the primary winding.

Documentation: Record the test results, including the calculated turns ratio, date of the test, and any anomalies observed during the test

Analysis: If there are significant deviations from the expected turns ratio, further investigation and testing may be required to pinpoint the issue.

The turns ratio test is essential for quality control during transformer manufacturing and for periodic maintenance of transformers in service. It helps identify issues such as shorted turns, open circuits, or incorrect winding configurations that can affect the transformer's performance. Always ensure that qualified personnel perform this test in accordance with safety standards and manufacturer recommendations. The turns ration kit is shown in figure 2.

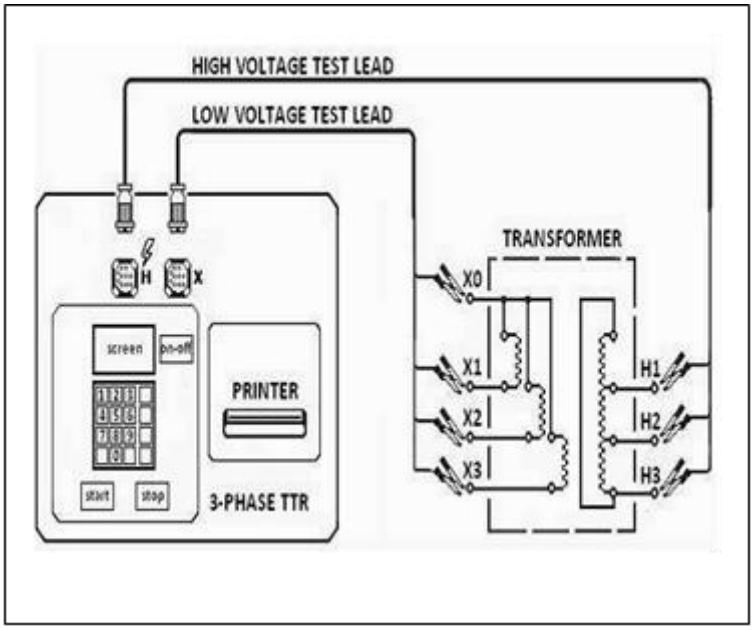

Figure 2: Turns ratio kit

PERFORMANCE AND MAINTENANCE OF DISTRIBUTION TRANSFORMERS

The performance of Distribution Transformers can be verified as follows:

Oil:

Check oil level at frequent intervals. Oil can filled as shown in the figure3.

Figure 3: Filling of oil

Windings:

.The windings are shown in figure 4.

Figure 4: Windings

CONCLUSION

The transformer stands as the backbone within the power system, facilitating the essential task of regulating voltage across various networks ranging from the high voltage lines that stretch across landscapes to the critical low voltage supplies catering to residential and industrial power needs on a global scale. Power and distribution transformers assume pivotal roles, acting as conduits to transmit electricity from generation stations through transmission lines and finally down to distribution lines.

To ensure the seamless flow of electricity from generation to consumption, it becomes imperative to institute regular maintenance and stringent checks for transformers. These examinations are integral to sustaining their optimal functionality, thereby safeguarding an uninterrupted power supply to consumer loads. A meticulous approach to testing methodologies and the meticulous assembly of both power and distribution transformers is paramount, as highlighted and expounded upon within this report.

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2. Handbook on maintenance of electrical substation
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