

**MANUFACTURING AND ENHANCING THE DESIGN PARAMETERS OF THREE
PHASE DISTRIBUTION TRANSFORMER**

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ABSTRACT

The purpose of this project is to present how a three phase distribution transformer is manufactured and tested in industries and also discuss how its design parameters can be enhanced. Currently in transformer manufacturing industry or in any industry there are some problems which industries come across. Every industry wants an efficient product with comparatively low cost. While working on this industrial Project we ourselves took part in the manufacturing process of transformer in industry and also came across the problems that currently industries are facing and tried to find out the solution for them. In transformers various tests are done to check out the losses and many other parameters. Also we came across the test which are performed on transformer, the test like open circuit test, short circuit, ratio test, impulse test, oil and winding test, insulation test, polarity test etc.

Keywords: *Transformer manufacturing, Improvement in design parameter, Testing of transformer.*

1. INTRODUCTION

The objective of the project is to study process of manufacturing and testing of transformer and also find out the problems which currently industries are facing and also solution for same. The Project aims to improvement in performance of distribution transformer by enhancing its design parameters. Transformer manufacturing contains Couple of process, to study this process thoroughly Under observation of professionals, firstly getting trained, then took part in the manufacturing process to find out problems industries face. After transformer is manufactured some tests are also performed on transformer. Test like open circuit test, short circuit, ratio test, Impulse test, oil and winding test, insulation test, polarity test etc. This tests are done before the delivery of transformer and to check Whether it giving the losses in desired limit. And as per the test results. They determine the performance of transformer and also assign star Rating to them.

2. PROBLEMS WE FOUND AND SOLUTION FOR THEM

Problem: Handling Of Core

Solution: Handle core with proper care As Explained poor handling leads to increase of losses, hence the suggestion to company professionals that they have to handle the core with care otherwise it will leads to increase in small amount of losses. Actually core is made up of CRGO or HRGO material, In this type of manufacturing core is oriented with required orientation but when core bended or broke that will leads to disturb to orientation and hence flux flow also gets disturbed hence It is need to handle core material with care.

3. CONSTRUCTION OF 3 PHASE DISTRIBUTION TRANSFORMER

There are two types of transformers:-

- 1) Core Type Transformer
- 2) Shell Type Transformer

1) Core type

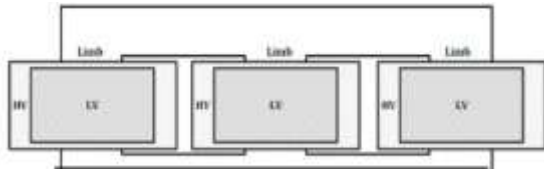


Fig:- Core type transformer

- All types of carries equal flux.
- Laminated core is build to form rectangular frame.
- Winding has poor mechanical strength because they are not supported or braced.
- Beyond one level it is not possible to reduce leakage because high voltage and low voltage winding cannot be subdivided to great extent.
- Limbs are surrounded by the windings so cooling is better in winding then limb.
- Permits easier assemble of parts and insulation of winding.
- Easy to dismantle for maintenance or repair. Much simpler in design.

2) Shell Type Transformer

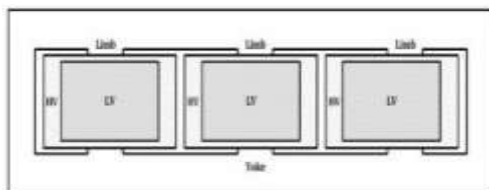


Fig:- Shell type transformer

- Windings are surrounded by the limbs.
- Separate flux return paths is essential.
- Central limb carries whole flux and side limb carries half of the total flux.
- Laminated core is built to form rectangular frame.
- Winding has excessive mechanical strength because they are supported or braced.
- It is possible to reduce leakage because high voltage and low voltage winding can be subdivided by using sandwich coil.
- Windings are surrounded by the limbs so cooling is better in core than winding.

4. TRANSFORMER TANK

Tank bodies of most of the transformers are made from rolled steel plates which are fabricated to form the container. Small tanks are welded from steel plates while larger ones are assembled from boiler plates. The tanks are providing with lifting lugs. Small transformers have cooling tubes. Such transformers have plain tanks with provision for pipe and valves to direct and control the oil flow. While designing tanks for transformers, a large number of factors have to be considered. These factors include keeping the weight, stray load losses and cost a minimum, and it is obvious that these are requirements contradictory. The tank should be strong enough to withstand stresses produced by jacking and lifting. The size of the tank be large enough to assume cores, windings, internal connections and also must give the essential clearance between the windings and the walls.



Fig:- Transformer Tank



Fig:- Conservator Tank

Aluminium is increasingly being used for transformer tanks as a means of reducing weight. The use of aluminium in place of steel reduces the stray magnetic fields and consequently the stray load loss. However, aluminium tanks are costlier. Also the use of aluminium necessitates special lifting arrangements in order prevent stressing of tank. However, usually aluminium tanks are made of cast aluminium parts moulded on a shallow mild steel tray. The mild steel tray is arranged to carry the main lifting and jacking members. Where mild steel tanks are used for units with high leakage flux, electromagnetic screens or shunts are used to reduce eddy current losses.

5. TRANSFORMER BUSHING

Unlike a solid type construction, in a capacitance-graded transformer bushing, conducting layers are inserted at predetermined radial intervals within the insulation that separates the center conductor from the insulator (housing) of the bushing. These multiple conductive inserts create capacitive elements linking the center conductor of the bushing to ground. Their purpose is to control the voltage field around the center conductor so that the voltage distributes more uniformly across the surrounding insulation system in the bushing. In solid type bushings, electrical grade mineral oil is often used between the conductor and the insulator, which may be contained within the bushing or shared with the transformer. Typical insulation used in a capacitance-graded bushing is oil-impregnated paper (OIP), resin-impregnated paper (RIP), and resin bonded paper (RBT). Capacitance-graded bushings also use mineral oil, usually



Fig:- Transformer bushing

Transformer bushing failures are often credited as one of the top causes of transformer failures so the condition of the bushings is of high interest to transformer asset owners. Typical bushing failure modes include moisture ingress, electrical flashover, lightning strike, short-circuited capacitance-graded layer(s), bushing misapplication, corrosive Sulphur, broken connection between ground sleeve and flange, and a broken tap connection.

7. BREATHER

When the temperature changes occur in transformer insulating oil, the oil expands or contracts and there an exchange of air also occurs when transformer is fully loaded. When transformer gets cooled, the oil level goes down and air gets absorbed within. This process is called breathing and the apparatus that pass through the air is called breather. Actually, silica gel breather controls the level of moisture, entering electrical equipment during the change in volume of the cooling medium and/or airspace caused by temperature increasing.



Fig:- Transformer Breather

6. CONSERVATOR TANK

This is a cylindrical tank mounted on supporting structure on the roof of the transformer's main tank. When transformer is loaded, the temperature of oil increases and consequently the volume of oil in the transformer gets increased. Again; when ambient temperature is increased, the volume of oil is also increased. The conservator tank of a transformer provides adequate space for expansion of oil. Conservator tank of transformer also acts as a reservoir of oil.

CONCLUSION

Hence we studied the whole process of manufacturing of transformer. While studying in industry we got the problem that currently industry facing and we tried to figure out the solution.

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