INDUSTRIAL VISIT

TO

DELTRON ELECTRICAL

BY

Faculty member

2016-2017

ABOUT COMPANY

Delton Electricals, one of the leading Electrical Power Transformers Exporters across the globe. They are manufacture superior quality Dry-Type Power Transformers, Distribution Transformers and Power Transformers that are widely used in different sectors. We provide cost effective solutions to the problems pertaining to the distribution of power.

There company was established in the year 1980, at Mumbai, Maharashtra. Under the guidance of honorable CEO, **Mr. Deepak Shah** Managing Partner B. Tech (Electrical) from IIT Mumbai, they have been able to mark our presence in the world market as one of the most renowned Dry-Type Power Transformers Manufacturers.

Warehouse

There are backed by a huge warehouse that assists us in meeting small as well as bulk orders within the stipulated timeframe. There warehouse is well furnished with all the essential faculties that assure safe storage of the transformers. Our company never believes in compromising with the quality of our Transformers as we know how to maintain the faith of our clients. They always try to exceed the expectations of clients so that they can maintain cordial relation with them.

TRANSFORMER

INTRODUCTION:

Electrical power transformer is a static device which transforms electrical energy from one circuit to another without any direct electrical connection and with the help of mutual induction between two windings. It transforms power from one circuit to another without changing its frequency but may be in different voltage level.

Types of Transformer

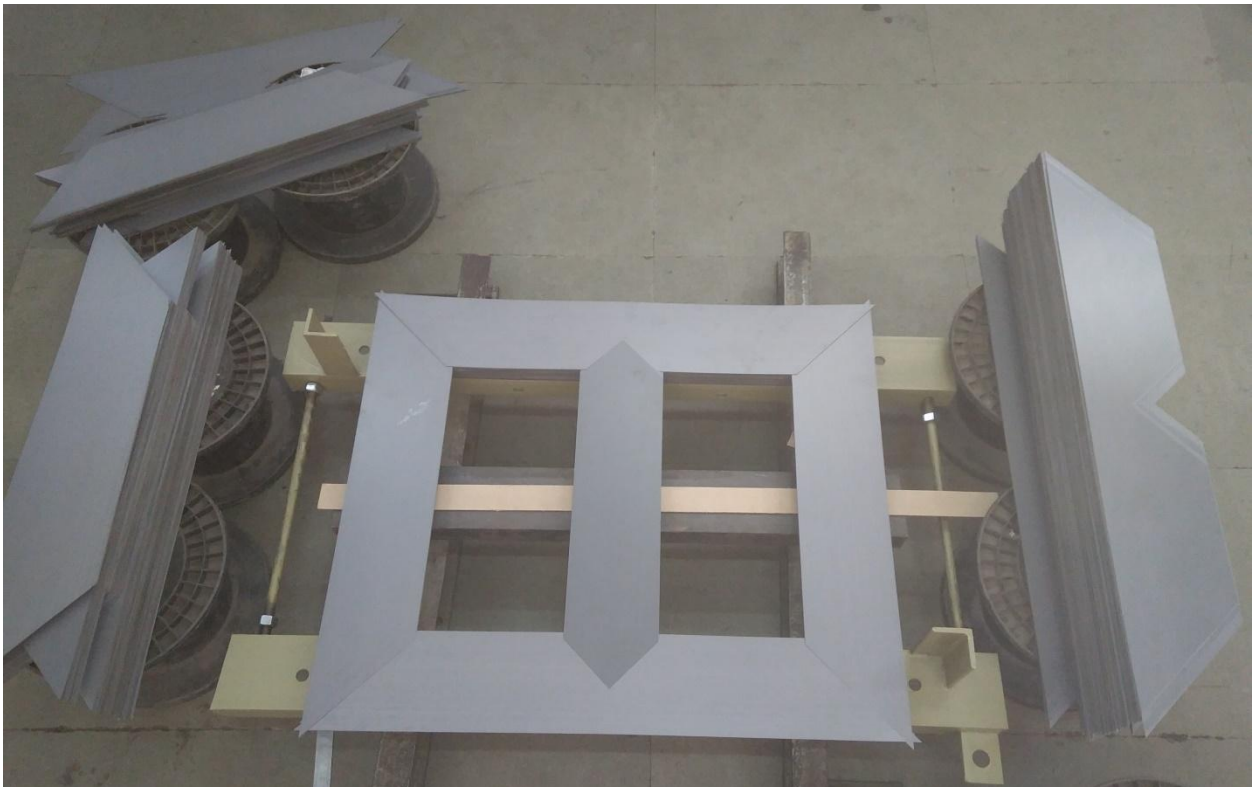
Transformers can be categorized in different ways, depending upon their purpose, use, construction etc. The types of transformer are as follows,

1. Step Up Transformer & Step Down Transformer - Generally used for stepping up and down the voltage level of power in transmission and distribution power system network.
2. Three Phase Transformer & Single Phase Transformer - Former is generally used in three phase power system as it is cost effective than later. But when size matters, it is preferable to use a bank of three single phase transformer as it is easier to transport than one single three phase transformer unit.

3. Electrical Power Transformer, Distribution Transformer & Instrument Transformer - Power transformers are generally used in transmission network for stepping up or down the voltage level. It operates mainly during high or peak loads and has maximum efficiency at or near full load. Distribution transformer steps down the voltage for distribution purpose to domestic or commercial users. It has good voltage regulation and operates 24 hrs a day with maximum efficiency at 50% of full load. Instrument transformers include C.T & P.T which are used to reduce high voltages and current to lesser values which can be measured by conventional instruments.
4. Two Winding Transformer & Auto Transformer - Former is generally used where ratio between high voltage and low voltage is greater than 2. It is cost effective to use later where the ratio between high voltage and low voltage is less than 2.
5. Outdoor Transformer & Indoor Transformer - Transformers that are designed for installing at outdoor are outdoor transformers and transformers designed for installing at indoor are indoor transformers.
6. Oil Cooled & Dry Type Transformer - In oil cooled transformer the cooling medium is transformer oil whereas the dry type transformer is air cooled.
7. Core type, Shell type & Berry type transformer - In core type transformer it has two vertical legs or limbs with two horizontal sections named yoke. Core is rectangular in shape with a common magnetic circuit. Cylindrical coils (HV & LV) are placed on both the limbs. Shell type transformer: It has a central limb and two outer limbs. Both HV, LV coils are placed on the central limb. Double magnetic circuit is present. Berry type transformer: The core looks like spokes of wheels. Tightly fitted metal sheet tanks are used for housing this type of transformer with transformer oil filled inside.

CONSTRUCTION OF TRANSFORMER:

Core:



In an electrical power transformer, there are primary, secondary and may be tertiary windings. The performance of a transformer mainly depends upon the flux linkages between these windings. For efficient flux linking between these windings, one low reluctance magnetic path common to all windings should be provided in the transformer. ow, voltage per turn,

$$E = 4.44\phi_m f = 4.44AB_m f$$

Where B_m is the maximum flux density of the core.

$$= \frac{4.44\pi D^2 B_m f}{4}$$

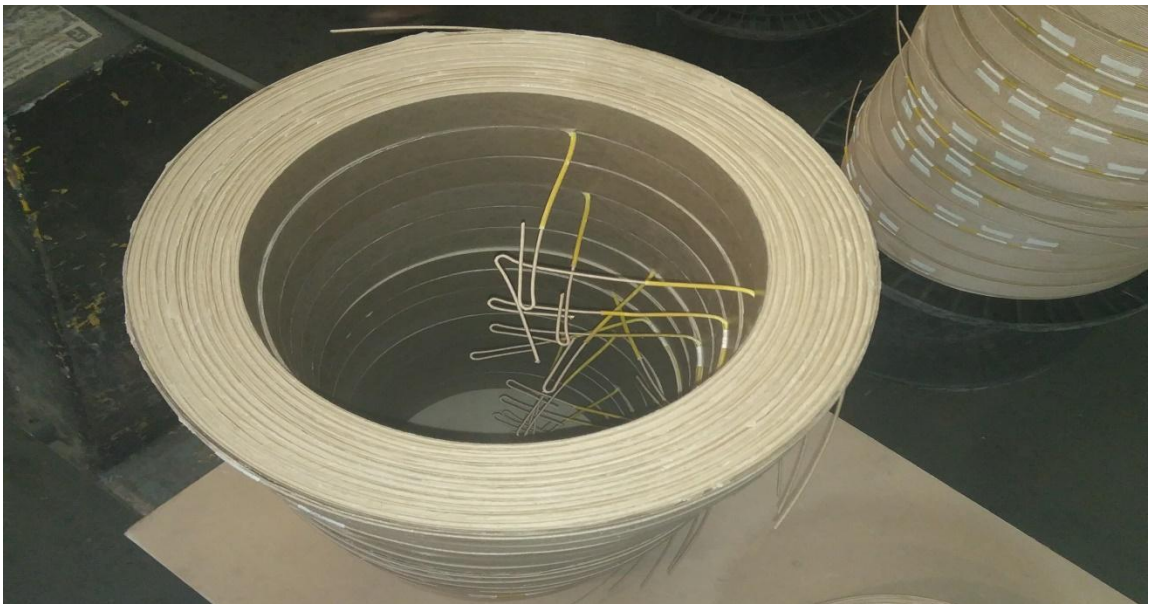
E is proportional to D^2. Therefore voltage per turn is increased with increase in diameter of transformer core. Again if voltage across the winding of transformer is V. Then V = eN, where N is the number of turns in winding. If V is constant, e is inversely proportional to N. And hence, D^2 is inversely proportional to N. So, diameter of the core is increased, the number of turns in the transformer winding reduced. Reduction of number of turns, reduction in height of the core legs in-spite of reduction of core legs height increased in core diameter, results increase in overall diameter of magnetic core of transformer. This increased steel weight ultimately leads to increased core losses in transformer. Increased diameter of the core leads to increase in the main diameter on the winding. In – spite of increased diameter of the winding turns, reduced number of turns in the windings, leads to less copper loss in

transformer. So, we go on increasing diameter of the transformer core, losses in the transformer core will be increased but at the same time, load loss or copper loss in transformer is reduced. On the other hand, if diameter of the core is decreased, the weight of the steel in the core is reduced; which leads to less core loss of transformer, but in the same time, this leads to increase in number of turns in the winding, means increase in copper weight, which leads to extra copper loss in transformer. So, diameter of the core must be optimized during designing of transformer core, considering both the aspects.

Material for Transformer Core

The main problem with transformer core is, its hysteresis loss and eddy current loss in transformer. Hysteresis loss in transformer mainly depends upon its core materials. It is found that, a small quantity of silicon alloyed with low carbon content steel produces material for transformer core, which has low hysteresis loss and high permeability. Because of increasing demand of power, it is required to further reduce the core losses and for that, another technique is employed on steel, which is known as cold rolling. This technique arranges the orientation of grain in ferromagnetic steel in the direction of rolling. The core steel which has under gone through both the silicon alloying and cold rolling treatments is commonly known as CRGOS or Cold Rolled Grain Oriented Silicon Steel. This material is now universally used for manufacturing transformer core. Although this material has low specific iron loss but still; it has some disadvantages, like, it is susceptible to increase loss due to flux flow in direction other than grain orientation and it also susceptible to impaired performance due to impact of bending and blanking the cutting CRGOS sheet. Both the surfaces of the sheet are provided with an insulating of oxide coating.

WINDING :



Transformer windings form another important part of a transformer construction, because they are the main current-carrying conductors wound around the laminated sections of the core. In a single-phase two winding transformer, two windings would be present as shown. The one which is connected to the voltage source and creates the magnetic flux called the

primary winding, and the second winding called the secondary in which a voltage is induced as a result of mutual induction.

If the secondary output voltage is less than that of the primary input voltage the transformer is known as a “Step-down Transformer”. If the secondary output voltage is greater then the primary input voltage it is called a “Step-up Transformer”.

The type of wire used as the main current carrying conductor in a transformer winding is either copper or aluminium. While aluminium wire is lighter and generally less expensive than copper wire, a larger cross sectional area of conductor must be used to carry the same amount of current as with copper so it is used mainly in larger power transformer applications.

Small kVA power and voltage transformers used in low voltage electrical and electronic circuits tend to use copper conductors as these have a higher mechanical strength and smaller conductor size than equivalent aluminium types. The downside is that when complete with their core, these transformers are much heavier.

Transformer windings and coils can be broadly classified in to concentric coils and sandwiched coils. In core-type transformer construction, the windings are usually arranged concentrically around the core limb as shown above with the higher voltage primary winding being wound over the lower voltage secondary winding.

Sandwiched or “pancake” coils consist of flat conductors wound in a spiral form and are so named due to the arrangement of conductors into discs. Alternate discs are made to spiral from outside towards the centre in an interleaved arrangement with individual coils being stacked together and separated by insulating materials such as paper of plastic sheet. Sandwich coils and windings are more common with shell type core construction.

Helical Windings also known as screw windings are another very common cylindrical coil arrangement used in low voltage high current transformer applications. The windings are made up of large cross sectional rectangular conductors wound on its side with the insulated strands wound in parallel continuously along the length of the cylinder, with suitable spacers inserted between adjacent turns or discs to minimize circulating currents between the parallel strands. The coil progresses outwards as a helix resembling that of a corkscrew.

The insulation used to prevent the conductors shorting together in a transformer is usually a thin layer of varnish or enamel in air cooled transformers. This thin varnish or enamel paint is painted onto the wire before it is wound around the core.

In larger power and distribution transformers the conductors are insulated from each other using oil impregnated paper or cloth. The whole core and windings is immersed and sealed in a protective tank containing transformer oil. The transformer oil acts as an insulator and also as a coolant.