Lecture No. 28

"Three Phase Transformers"

Three Phase Transformers

Three phase transformers are used throughout industry to change values of three phase voltage and current. Since three phase power is the most common way in which power is produced, transmitted, an used, an understanding of how three phase transformer connections are made is essential. In this section it will discuss different types of three phase transformers connections, and present examples of how values of voltage and current for these connections are computed.

Three Phase Transformer Construction:

A three phase transformer is constructed by winding three single phase transformers on a single core. These transformers are put into an enclosure which is then filled with dielectric oil. The dielectric oil performs several functions. Since it is a dielectric, a nonconductor of electricity, it provides electrical insulation between the windings and the case. It is also used to help provide cooling and to prevent the formation of moisture, which can deteriorate the winding insulation.
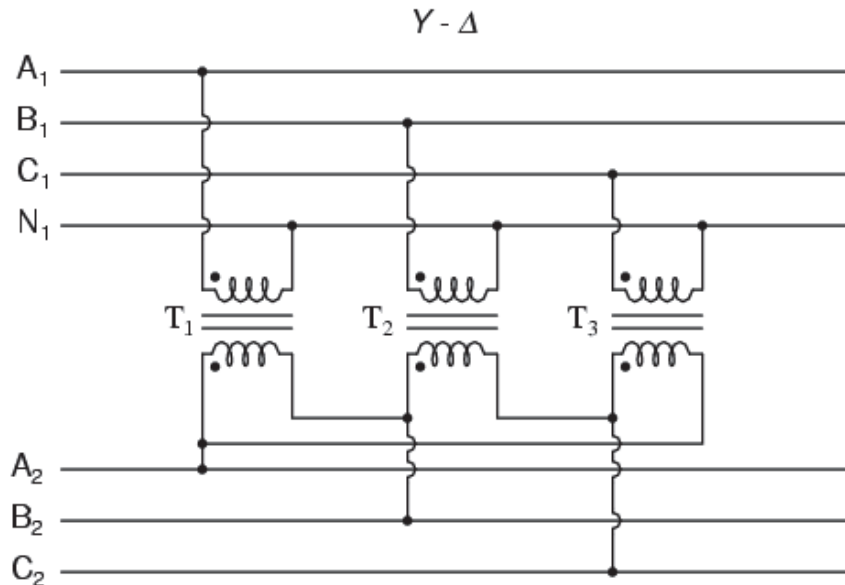
Three-Phase Transformer Connections:

There are only 4 possible transformer combinations:

1- Delta to Delta connection - use: industrial applications .

2- Delta to star connection - use : most common; commercial and

   Industrial .

3- Star to Delta   connection - use : high voltage transmissions .
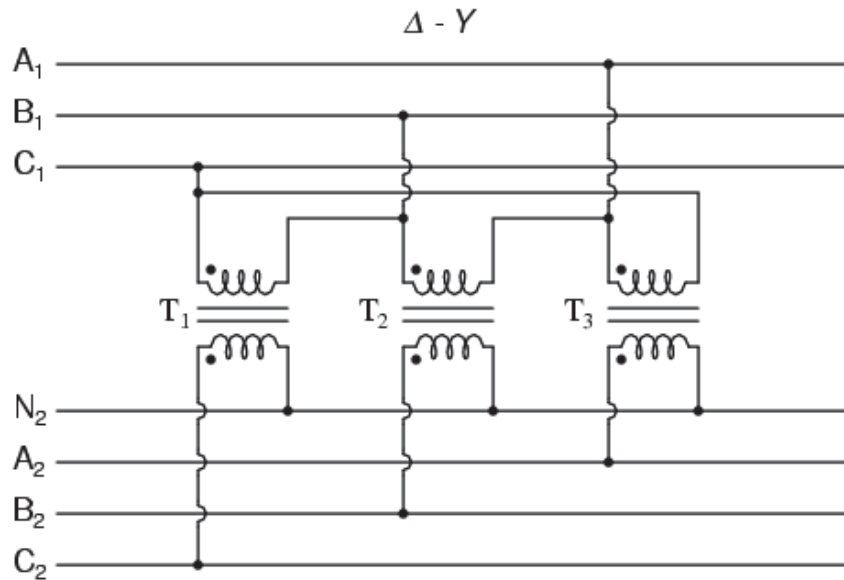
4- Star to star connection .

Y-Δ configuration:

Phase wiring for "Y-Δ" transformer

Star-Delta (Y-Δ) Connections . Such connections are used principally where the voltage is to be stepped down, as for example, at the end of a transmission line. The neutral of the primary winding is earthed. In this system, line voltage ratio is $1/\sqrt{3}$.

Δ-Y configuration :

Phase wiring for "Δ-Y" transformer.

Delta-Star (Δ - Y) Connections. Such connections are used where it is necessary to step-up the voltage, as for example, at the beginning of a h.t transmission line. In this case neutral point is stable and will not float in case of unbalanced loading. There is no distortion of flux because existence of a Δ -connection allows a path for the third-harmonic components. The line voltage ratio is √3 times of transformer turn-ratio and the secondary voltage leads the primary one by 30°. In recent years, this arrangement has become very popular for distribution system as it provides 3- Ø, 4-wire system.