5.4 Scott (T-T) Connection

Two transformers are used in this type of connection. One of the transformers has center taps on both primary and secondary windings (which is called as main transformer). The other transformer is called as teaser transformer. Scott connection can also be used for three phase to two phase conversion. The connection is made as shown in the figure below.

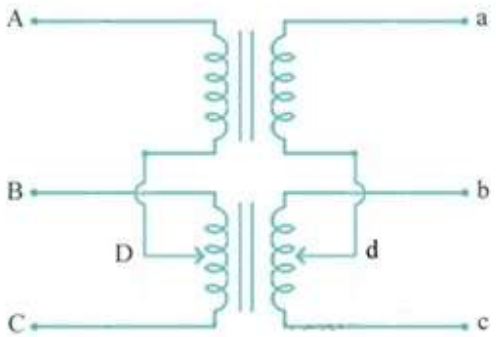

Figure 5.4.1 Scott (T-T) Connection

[Source: "'Electric Machinery Fundamentals" by Stephen J. Chapman*, Page: 170]*

Transformer Phasing: The Dot Notation and Dot Convention

The Dot Notation

Generally, when we study about Transformers, we assume that the primary and secondary voltage and currents are in phase. But, such is not always the case. In Transformer, The phase relation between primary and secondary currents and voltages depends on how each winding is wrapped around the core.

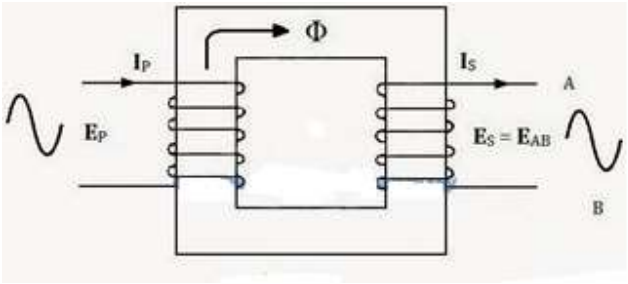

Figure 5.4.2 (a) Primary and Secondary voltage in Phase

[Source: "'Electric Machinery Fundamentals" by Stephen J. Chapman*, Page: 172]*

Refer to fig (1) and (2), you may see that the primary sides of both transformers are identical i.e. primary windings of both transformers wrapped in the same direction around the core.

But in fig (2) you may notice that the secondary winding is wound around the core in the opposite direction from the secondary winding in fig (1).

Consequently, the voltage induced in the Secondary winding in fig (2) is 180° out of phase as compared with the induced voltage in secondary in fig (1) and the direction of secondary current (I_S) is opposite from the primary current (I_P)

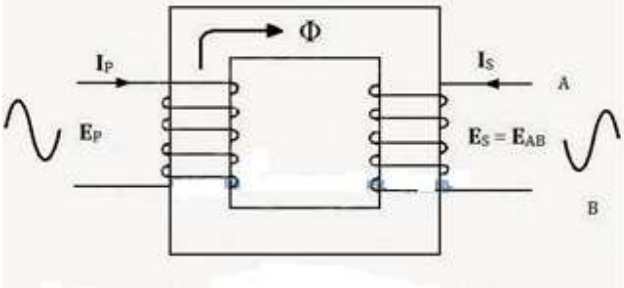

Figure 5.4.3 (b) Primary and Secondary voltage 180° out of Phase

[Source: "'Electric Machinery Fundamentals" by Stephen J. Chapman*, Page: 173]*

So we see that

1. The primary and secondary voltage and current are in phase in fig (1)
2. The primary and secondary voltage and current are 180° out of phase in fig (2)

Dot Convention

To eliminate any confusion in the phase relation between primary and secondary voltage and current, a dot convention has been adopted for transformer schematic diagrams. Dots are placed on the top of primary and secondary terminals as shown in fig (3) and (4)

In fig (3), we see that dots are placed at the top in both primary and secondary terminals. It shows that the primary and secondary current and voltages are in phase. Moreover, the primary and secondary voltages (V_P and V_S) have similar sine wave, also the primary and secondary (I_P and I_S) currents are same in direction.

The story is opposite in fig (4). We can see that one dot is positioned at the top in primary terminal and the other one (dot) is placed at bottom of secondary terminal. It shows that the primary and secondary current and voltages are 180° out of phase. In addition, the primary and secondary voltages (V_P and V_S) sine waves are opposite to each other. Also the primary and secondary currents (I_P and I_S) are opposite in direction.

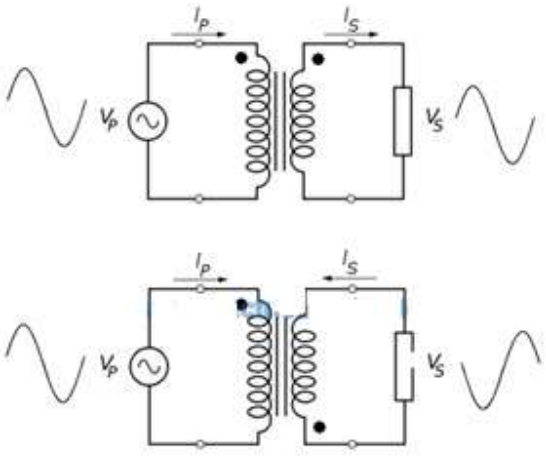

Figure 5.4.4 Phase relation between primary and secondary voltages and currents

[Source: "'Electric Machinery Fundamentals" by Stephen J. Chapman*, Page: 175]*

Applications of Scott connection

The Scott connection of transformer is used in following applications ,

- The Scott connection is used to link a 3-phase system with a 2-phase system with the flow of power in either direction.
- It is used to operate two 1-phase electric furnaces together when the power is drawn from the 3-phase supply.
- It is also used to supply 1-phase loads such as electric trains from the balanced three phase supply.