RAMA UNIVERSITY

www.ramauniversity.ac.in

FACULTY OF ENGINEERING & TECHNOLOGY

Electrical Machine-1

Amit Kumar Singh

SINGLE PHASE TRANSFORMER

Types of Transformer

There are various types of transformer used in the electrical power system

1. Step up and Stepdown Transformer
2. Power Transformer
3. Distribution Transformer
4. Uses of Distribution Transformer
5. Instrument Transformer
6. Current Transformer
7. Potential Transformer
8. Single Phase Transformer
9. Three Phase Transformer

SINGLE PHASE TRANSFORMER

Rating and Specifications of single phase transformer

Specification of a transformer includes:-

kVA Rating : Or you can say maximum power rating upto which the transformer can work at unity power factor.

Primary Voltage: Rated Voltage on primary side.

Secondary Voltage: Rated Voltage on secondary side.

Full load current: Rated full load current on both HV/LV side.

Number of phase: Denoted by φ. 3-φ/1-φ

Vector: Special Transformers having Y-∆/∆-Y or ∆-∆/Y-Y or zigzag connection are stated here. Something like “Dyn11” whuch means primary is Delta connected, secondary is Star connected with a neutral point “n” and 11 denotes phase shift i.e, secondary lags primary by 30°. Moreover “D” in caps means it is HIGH VOLTAGE SIDE and “y” in small means low voltage side.

Primary/Secondary Taps: Most of the transformers have a range of voltage tapping on High/Low voltage side. It is specified here by writing all the voltages of individual taps. Most of the transformers have tappings on high voltage side.

Cooling: To specify the type if cooling used for the transformer. It can be Oil cooled/Air Natural/ Air Forced/Water forced/Directed. Indicated as ONAN(Oil Natural Air Natural which means the transformer is cooled by oil naturally and the oil is cooled by Air naturally). Similarly ONAF means Transformer is cooled by Oil Naturally and Oil is cooled by Forced Air from air pumps.

Insulation/Temp. Rise Limit class: To specify class of insulation. Class of insulation implies the max permissible temperature rise allowed for any machine. Based on that the insulation of the machine is done. Maximum permissible temperature rise is very important because if operated beyond this point any machine will burn out.

To know more about insulation classes and what each of them mean, you can watch this video

SINGLE PHASE TRANSFORMER

•**Frequency:** Operating Frequency in cycles/sec or Hz.

•**Impedance (%**Z0Z0**):** Calculated as

Z0=VscVNL×100%Z0=VscVNL×100%

Where Vsc=Vsc=Voltage on High Voltage side during short circuit test and VNLVNL is no load or open circuit voltage on HV side. Basically it just shows how much percentage of the rated no-load voltage is the voltage on short circuit test. During short circuit the rated current flows and the only Voltage drop happens because of the transformer self impedance. So, what percentage of Voltage drop at short circuit happens (i.e, maximum voltage drop at the transformer impedance) .

•**Dimensions:** Length×Breadth×Height

•**Terminals:** Used to indicate primary/secondary terminal position. Some Transformers have terminals on the side and some have on the top. This is important to indicate so that proper wiring can be done. Some applications require terminals on the top while some require terminals to be brought out from the left/right side. This is specified by the customer/vendor as required.

•**Serial number:** Every machine has a unique serial number to identify it. This becomes important in case we want to know the test report of a given transformer to analyze it, if it develops some fault.

•**Weight:** Weight in Kilograms. Weight of core, winding and oil for insulation is shown separately.