Properties of Transformer Oil

**Transformer Oil Description**

Transformer Oil forms a very significant part of the transformer insulation system and has the important functions of acting as an electrical insulation as well as coolant to dissipate heat losses. Transformer Oil will be obtained by fractional distillation and subsequent treatment of crude oil.  Transformer Oil consists of organic compounds namely paraffin’s, naphthenic, aromatics and olefins. All these compounds are hydrocarbons, so Transformer Oil is hydrocarbon mineral oil.

Transformer Oil has following Characteristics:

* Colorless
* Low Density
* Low Viscosity



Transformer Oil Analysis

**Properties Of Transformer Oil**

Transformer Oil Properties are characterized as

* Physical properties
* Electrical properties
* Chemical properties

**Physical Properties**

Different physical properties of Transformer Oil are

**Moisture Content:**

The amount of free and dissolved water present in the oil is its moisture content and is expressed in ppm (parts per million by weight, mg/kg). Presence of oil is harmful since it adversely affects the electrical characteristics of the oil and accelerates the deterioration of the insulating paper. *For good Transformer Oil Moisture Content Should be low.*

**Interfacial Tension:**

Interfacial Tension is the measure of molecular attractive force between the oil and water molecules at their interfacial level. By testing for Interfacial tension we can determine the soluble polar contaminants present in the oil which reduces the molecular attraction force between the oil and water.

**Flash Point:**

It is the temperature at which oil gives so much vapour that this vapour which mixes with the air forms an ignitable mixture and gives momentary flash on application of the flame under prescribed conditions. A minimum flash point is specified in order to prevent the risk of fire that might be result of accidental ignition.*For good Transformer Oil Flash Point should be higher (145 Centigrade).*

**Viscosity:**

It measures the oil resistance to the continuous flow without the effect of the external forces. The oil must be mobile to transfer the heat in a better manner from the core to the transformer radiators where heat is dissipated. *So Viscosity of the transformer oil should be very less.* With the decrease in the temperature of the oil viscosity increases, so it is necessary for transformer oil to have low viscosity at low temperatures.

**Pour Point:**

The temperature at which transformer oil will just flow under the prescribed conditions is known as the pour point. *Pour Point should be low for good transformer oil*, i.e, transformer oil say at -6deg cent starts just flowing, so pour point should be low so that oil can start flow even at low temperatures.

**Electrical properties:**

Different Electrical properties of Transformer Oil are:

**Electrical Breakdown Voltage Strength:**

Break down Voltage of transformer Oil is the Voltage at which breakdown occurs between the two electrodes when the oil is subjected to an electrical field under prescribed condition. Electrical breakdown strength is basic parameter for insulating system design of the transformer. Transformer Oil should have higher breakdown Voltage strength. If the transformer has lower strength it indicates the presence of the contaminating agents like moisture, fibrous materials, carbon particles, precipitable sludge an sediments.

**Resistivity:**

Resistivity is numerically equivalent to the resistance between opposite faces of a centimeter cube of the liquid. Insulation resistance of the windings also depends on the insulation of the oil. For good Transformer Oil resistivity should be high. Lower Resistivity of Transformer Oil indicates the presence of moisture and conductive contaminating agents.

**Dielectric Dissipation Factor:**

Loss angle is an important property of dielectric oil. In ideal dielectric material the phase angle between the voltage and current is 90.However due to impurities, certain leakage current flows through the dielectric and actual phase angle is slightly less than 90. As an angle δ is very low so tan δ is also low.

Dielectric Dissipation Factor is the sine of the loss angle δ (approximately equal to the tangent of the loss angle for dielectrics). It is an important parameter to find the insulation quality of the transformer oil. Dielectric Dissipation value should be low for good Transformer Oil. Higher Dielectric Dissipation Factor indicates the presence of moisture and contaminating agents.

**Chemical Properties:**

Different Chemical Properties Of Transformer Oil are

**Neutralization value:**

It is the measure to determine the free organic and inorganic acids present in the oil expressed in terms of milligrams of KOH required neutralizing the total free acids in one gram of oil. Oxidation in the transformer oil is due to reaction between the hydrocarbons present in the oil and air. Copper present in the copper acts as catalyst to this reaction. The products of oxidation are injurious to the insulation system of the transformer and corrode the transformer components. So measurement of the total acidity is the tool to determine the capability of oil for non formation of acids during the life. *For good transformer oil Total acidity should be low*.

**Oxidation Stability:**

Oxidation Stability is the measure of neutralization value and sludge after oil is aged by simulating the actual service conditions of the