

EXP. No (5)

Determine Dielectric Strength of Transformer Oil

Introduction:

The oil is poured in a container known as test-cell which has internal dimensions of 55 mm x 90 mm x 100 mm high. The electrodes are polished spheres of 12.7 to 13 mm diameter, preferably of brass, arranged horizontally with their axes not less than 40 mm above the bottom of the cell. For the test, the distance between the spheres shall be 2.5 mm.

A suitable gauge is used to adjust the gap. While preparing the oil sample, the test cell should be thoroughly cleaned and the moisture and suspended particles should be avoided.

Fig (1) shows an experimental set-up for finding out the dielectric strength of the given sample of oil. The voltmeter is connected on to the primary side of the high voltage transformer but calibrated on the high voltage side.

The gap between the spheres is adjusted to 2.5 mm with the help of a gauge and the spheres are immersed in oil to a depth as mentioned earlier. The voltage is increased gradually and continuously till a flash over of the gap is seen. Note down this voltage. This voltage is known as rapidly applied voltage. The breakdown of the gap has taken place mainly due to field effect. The thermal effect is minimal as the time of application is short.

Next bring the voltage back to zero and start with 40% of the rapidly applied voltage and wait for one minute. See if the gap has broken. If not, increase the voltage every time by 20% of the rapidly applied voltage and wait for one minute till the flash over is seen. Note down this voltage

Start again with zero voltage and increase the voltage to a value just obtained in the previous step and wait for minute. It is expected that the breakdown will take place. A few trials around this point will give us the breakdown value of the dielectric strength the acceptable value is 33 kV for 2.5 mm for one minute. In fact these days transformer oils with 65 kV for 2.5 mm 1 minute value are available. If it is less than 30 kV, the oil should be sent for reconditioning. It is to be noted that if the electrodes are immersed vertically in the oil, the dielectric strength measured may turn out to be lower than what we obtained by placing the electrodes in horizontal position which is the normal

configuration. It is due to the fact that when oil decomposes carbon particles being lighter rise up and if the electrodes are in vertical configuration, these will bridge the gap and the breakdown will take place at a relatively lower value.

Apparatus:

Transformer oil test kit, Transformer oil.

Procedure:

1-Study the enclosed instruction on Transformer oil testing.

2-Switch on the test kit.

3-Slowly raise the voltage, and keep it at 33 kV for one minute. At the end,

Record whether the oil sample withstood 33 kV for one minute. If it fails earlier, note the time it stood, 33 kV. If it fails at a voltage lower than 33 kV, record that voltage as breakdown voltage.

4-Then raise the voltage till such time there is a breakdown, and record the breakdown voltage. All the time take care not to exceed the maximum voltage of 60kV.

5-Remove the suspended particles due to breakdown with the help of glass tube provided.

6-Wait for 5 minutes.

7-Repeat step 3 to 6, five times given a total of six observations.

8-Switch off the test kit.

Precaution:

1-Transformer oil should be free from moisture content.

2-Gap should be premises.

3-Nobody should go near the H.T. bushing when the test is being conducted.

4-Ignore the first one or two readings, as the air between the electrodes may not ionize.

5-The equipment must be grounded firmly.

6-The electrodes must be cleaned properly before and after use.

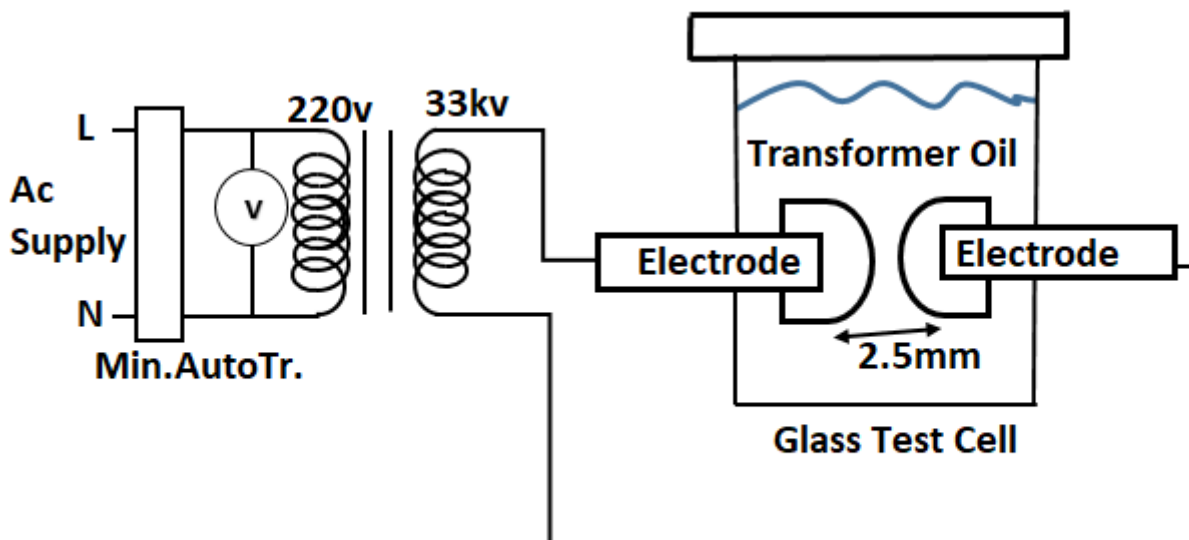
7-Do not touch the equipment without grounding it with the grounding rod.

8-Before starting the experiment, make sure the electrodes are properly aligned and zero reading is adjusted.

Report:

1-Why is Transformer oil testing important?

2-What are Transformer oil types?



Fig(1)BDV or Dielectric Strength Test of Transformer Oil