Sumpner's Test and Load Test on Transformers

1 Aim of the Experiment

The aim of this experiment is to determine the losses in the transformer under loaded conditions. This is approached through two ways — through sumpner's test and an actual load test.

2 Background

In order to determine the losses in the transformer actually, one needs to load it. Efficiency varies with load. For large power transformers, however, it is difficult to load the transformer with actual load since such a load may not be available. Even is available, it is wasteful of power. Sumpner's test is an approach to load the transformer in a virtual manner such that though full load current flows, the voltage sources used supply only the losses. This however, requires two identical transformers.

Further, in this experiment the actual load test is also done.

3 Procedure

3.1 Sumpner's Test

To do this test, use two identical single phase transformers. Both primaries are to be connected to rated voltage supply (say v_p), such that power flowing from v_p is the power supplied to both.

The secondaries are to be connected in series such that their induced voltages are in phase opposition in the series circuit (the net series voltage should add to zero). Once this is ensured, a variable voltage source (v_s) is inserted in this series circuit.

The test consists of finding the powers delivered by v_p and v_s. The power delivered by v_s is to be found at the point where a suitable value of the source v_s causes the desired load current to flow through the secondary. Take readings at 25%, 50%, 75% and 100% of the full load current of the transformers under test.

3.2 Load Test

The load test is done for one transformer. The transformer under test is supplied with the variable ac source at the primary. The primary voltage, current and power are to be measured.

The secondary side is connected to the load box. The load box may be connected such that all three phases are in parallel (so that it becomes effectively a single phase load). The load current and voltage are to be measured.

During the test, the primary voltage is to be maintained constant by adjusting the variable ac output apprpriately as required.

Take care not to exceed the primary side current rating of the transformer under test. Take measurments for varying loads.

4 Calculations

In the Sumpner's test, the power supplied by the source v_p is the sum of the no-load losses of the two transformers under test (why?). The power supplied by the source v_s is the sum of the winding losses of the two transformers (why?). The no-load loss being iron loss, may be considered constant with load.

Compute the efficiency of the transformer unit tested (as a function of load current) using the Sumpner's test results. The load may be assumed to be UPF.

Compare the results obtained with that of the actual load test.

5 Report

In an A4 sheet, write down your name and roll no at the top right corner. Record your readings during Sumpner's and load test. Show the efficiencies computed and answer the questions raised. Neatness of the report is important.