



PROCEDURES FOR DRAWING TRANSFORMER OIL SAMPLES

GENERAL

Sampling electrical insulating oil for laboratory analysis requires care to ensure that the sample is representative of the product being sampled. Attention to cleanliness is the key to success.

Before attempting to draw the sample identify the type of cooling liquid in the transformer. Normally, mineral oil not contaminated by PCBs, mineral oil with unknown values of PCBs, vegetable oil (eg. FR3) or silicone fluids will be sampled. If the fluid is other than conventional mineral oil, identify the fluid on the insulating test report under samplers comments.

It is not recommended to draw samples of Askarel type liquids or mineral oils with a PCB contaminant level greater than five hundred ppm. If the transformer has been sampled for PCB fluid contamination, it should contain a label indicating the level of contamination.

Since it is possible that an oil sample can be contaminated with trace amounts of PCB, do not pour waste oil on the ground. If the device is not labeled as a PCB transformer and has never had a PCB determination made, indicate on the data sheet to instruct the laboratory to perform this test. When sampling a unit with no PCB label present, treat the unit as having contaminated fluid. This is to protect the sampler.

PROCEDURE

Establish that there is *enough* oil in the equipment to sample. Furthermore, the apparatus to be sampled should be under positive pressure. For sealed transformers, check the pressure gauge to make sure it does not indicate a negative pressure. The head of oil in the transformer may be enough to overcome a partial vacuum and allow the sample to be taken. To prevent against the possibility of a vacuum drawing air into the transformer, attach a length of tubing filled with clean oil to the sampling valve before cracking the valve open. Carefully observe the direction of oil movement in the tube and close the valve immediately if the oil flow is towards the transformer. Do not allow air to be drawn

into the transformer! Air can only enter the transformer when it is under a vacuum.

The valve through which the sample is to be taken should be flushed by allowing oil to flow to a waste container.

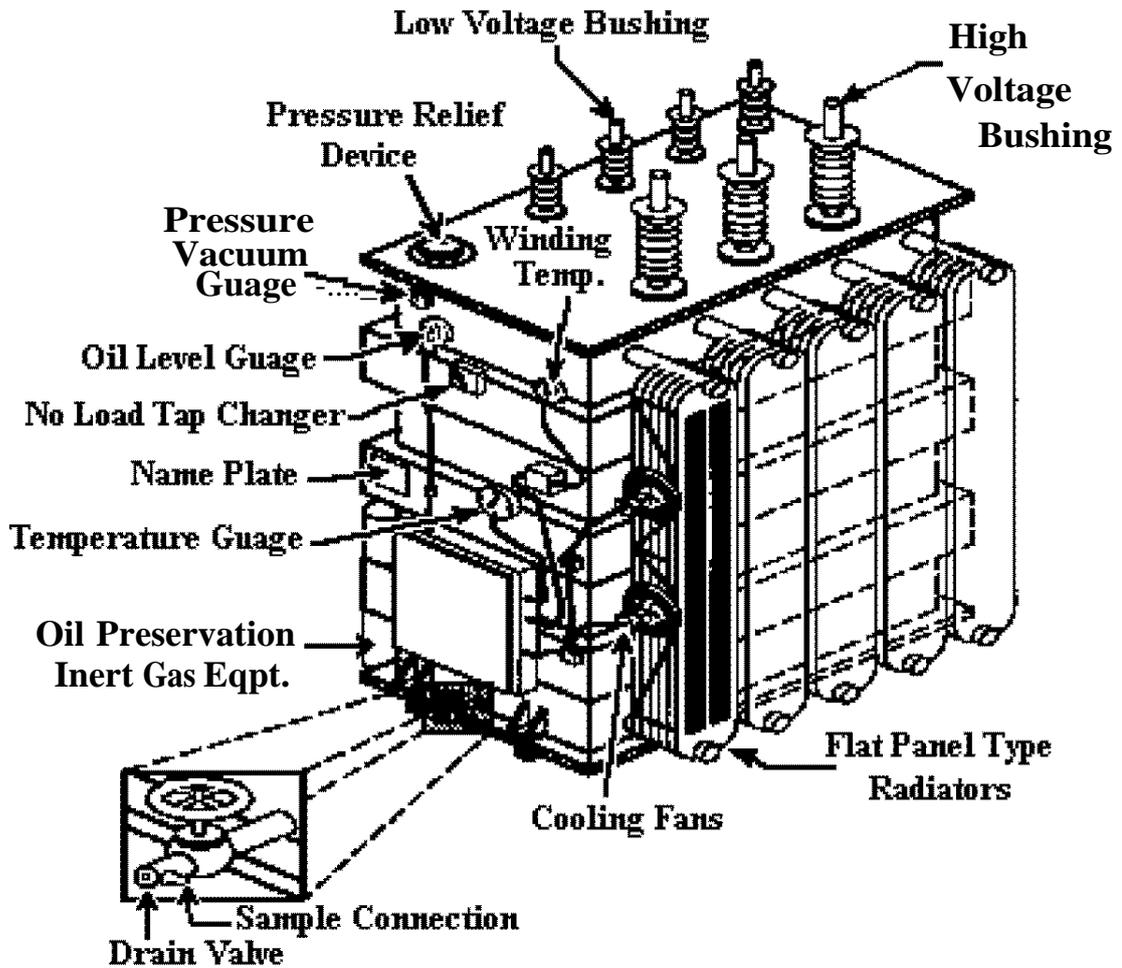


Figure 1

DRAWING THE SAMPLES

I. Bottle Samples (for all tests aside from DGA & Moisture):

After having flushed the valve, rinse the bottle by partially filling and gently swirling and emptying the oil into the waste container. Do not over fill to allow for expansion. Visually examine the fluid for water droplets or foreign particles. If present, re-sampling is required. If the sample is clear, attach the cap securely, identify the sampled unit on the bottle's label, and prepare for shipment. Do not tape the cap.

Recording Temperature:

It is **imperative** to record the temperature of the oil at the time of sampling. This is for the purpose of calculating the relative saturation of moisture in oil as the solubility of moisture in water increases with temperature. It is preferable to record both the transformer temperature (via any gauges if present) and the oil sample temperature (which can be done by putting a thermometer in the bottled sample). Also, for the purpose of moisture dynamics, it is preferable that the transformer to be sampled is under load at the time of sampling.

II. Syringe Samples (for DGA & Moisture):

The plastic stopcock (Figure 2 and Figure 3), which comes with the syringe, must remain firmly affixed to the syringe at all times to prevent leaks and to securely close the syringe for shipment. When obtaining oil samples for gas analysis, it is important that the sample never be subjected to a vacuum, which would tend to degas the oil and lead to inaccurate test results. This means that the syringe should be filled without pulling on the plunger.

It will help to follow the sampling procedure if you remember that the handle of the plastic stopcock points to the closed port of the stopcock (Figure 2 and Figure 3). The stopcock handle hereafter is referred to as the handle.

A. Syringe step by step sample instructions:

1. Attach the syringe to the sampling valve located on the side of the drain valve using a short length of tubing as an adapter. If there is no sampling valve, see step (e) described below.

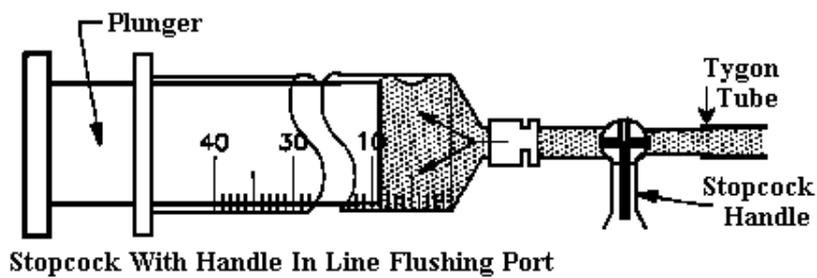
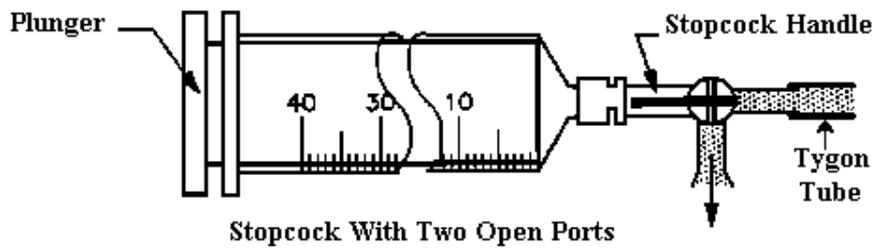


Figure 2

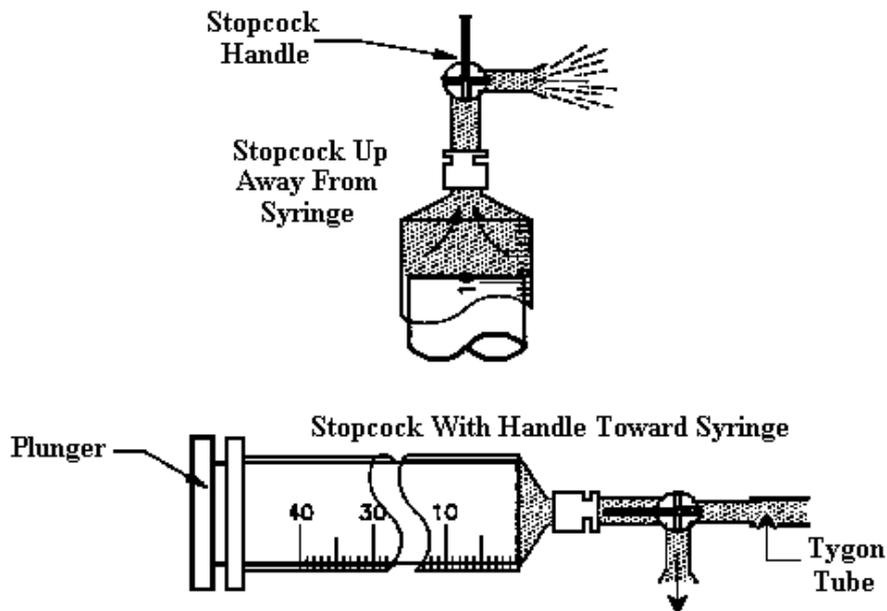


Figure 3

2. Flush the system as follows:
 - a) Move the handle toward the sampling valve,
 - b) Open sampling valve and move the handle towards the syringe allowing the oil to flush the tube and stopcock.
 - c) Move the handle towards the side port, allowing oil pressure to enter the syringe barrel, forcing the plunger out. Until the inside of syringe has been wetted with oil, it may be necessary to pull on the plunger.
 - d) When the oil reaches the 50 cc mark, move the handle towards the sampling valve and eject oil from syringe by pushing in the plunger. Catch this ejected oil in a waste container to avoid spilling it on the ground.

3. Draw the sample by moving the handle towards the side port and allow the oil pressure to fill the syringe. **Do not pull on the plunger!** When the oil reaches the 40 to 45 cc mark, move the handle towards the syringe. Do not over fill since the shipping container was designed to protect the syringe with the plunger extended no further than 50 cc.

4. Examine the sample to see that there are no foreign particles or bubbles present. If the sample is clear, move the handle towards the syringe, close the sampling valve and remove the syringe with the stopcock still firmly attached to the syringe. If the sample was not clear, repeat steps (a) and (b).

If you are unable to obtain a bubble-free sample after two or three attempts, fill the syringe to above the 50 cc mark, move the handle towards the syringe, close the sampling valve and remove the tube (with the syringe still attached) from the sampling valve. Hold the syringe upright and allow bubbles to rise towards the stopcock.

Move the handle towards the side-port and **gently** push the plunger to eject any bubbles. Close the valve (handle toward the stopcock) when the volume reaches 40-45 cc. Remove the tubing from the syringe. Wipe off surface oil and prepare for shipment to the laboratory.

Note: The stopcock must be firmly attached to the syringe and the handle must point to the syringe.

When there isn't a sampling valve, a sample can be obtained by removing the syringe plunger and gravity filling the syringe after having flushed the drain valve and syringe. Remove any bubbles as instructed in step 4. Please note on the test form the fact that the sample was drawn using gravity fill so that proper allowances can be made in the data analysis.

AFTER THE SAMPLE

1. Complete the Sample Data Sheet as thoroughly as possible.
2. Wipe any oil from outer surface of the sample container and place in the shipping container. Place the Sample Data Sheet(s) in a plastic bag and enclose it in the shipping container.
3. Seal the shipping container and affix the gummed address label supplied by Mahanga Holdings Limited. If no label was supplied, please ship the sample to the following address:

Mahanga Holdings Limited
24b William Pickering Drive
Albany, 0632
Auckland
New Zealand
Ph: +64 9 444 0663

FINDINGS:

The results of the test analysis are prepared in a report and emailed to the address shown on the Sample Data Sheet. You will be notified of critical results by telephone.