

### 1.PURPOSE AND SCOPE

The correct use of syringe results in oil samples is of a much higher quality than other containers particularly for Dissolved Gas Analysis and Moisture measurements. This procedure describes the correct sampling method.

### 2.REFERENCES

- P21-6-24 Oil Sampling From Live Transformers
- P21-3-2 Site Safety Risk assessment
- P21-1-2 Company Safety Rules
- P21-9-43 Polychlorinated biphenyls (PCB's)
- P21-9-44 Handling PCB's
- IEC 60567 Guide for the Sampling of Gases and of Oil-Filled Electrical Equipment and for the Analysis of Free and Dissolved Gases.

### 3.DEFINITIONS

#### The Plunger

The plunger must be kept free from dirt and dust, as this will seize the syringe if the dirt or dust gets between the body and the plunger. If this area is contaminated and operation becomes "gritty", stop sampling with that syringe, and exchange for another syringe.

#### The Body

The body is the most fragile item of the complete syringe, and will break if dropped. The seal between the body and the plunger is a polished surface, which relies on capillary action to ensure sealing.

#### The Valve

The valve is designed with 3 positions. The positioning is indicated by an arrow on the handle, and 3 notches at the pivot point of the handle. Ensure that the valve is firmly attached to the body before starting to take a sample. A 360-degree turn anticlockwise or the opposite to tighten can remove the valve.



Care needs to be taken with the valve and it's operation. If care is not taken it is possible to place the valve in the wrong position once the sample has been taken. This causes air to be sucked into the syringe, or the plunger may completely fall out of the body, breaking the plunger and spilling the sample.

Familiarise yourself with the valve positioning before taking any oil samples.



#### 4. PROCEDURE

##### Tools Needed

Syringes and sample bottles  
Sampling Tubes  
Latex or rubber gloves  
Fittings to connect to the equipment  
Large adjustable spanner  
Medium size pipe wrench  
Thread tape rags and rubbish bags  
Bucket  
Spare 1 litre bottle clearly marked **WASTE OIL**

##### Step 1

Undertake a risk assessment and ensure all necessary safety precautions and regulations are observed. Ensure that proper precautions are observed if the oil contains PCB's or if the PCB level is unknown.

##### Step 2

Ensure that there is a positive pressure of oil from the proposed sampling position. If there is a possibility that this is **NOT** the case, ensure that appropriate precautions are observed.

**If the unit is hermetically sealed do not proceed any further, a different procedure is required. Please contact Mahanga Holdings Ltd office 09 4440663.**

##### Step 3

Establish that there is *enough* oil in the equipment to sample and then clean the immediate sampling area using a lint-free cloth.

##### Step 4

Before removing the sealing bung on the valve, ensure that the valve is closed and place the bucket under the valve to catch any oil, which may be sitting in the valve body. Remove the bung.

##### Step 5

Flush the valve to remove debris, water etc in the valve assembly. The flushing quantity of oil should be proportionate to the volume in the device being sampled. Basically, the larger the unit, the more oil that you can afford to flush.

##### Step 6

Attach the sampling fittings and tube to the equipment. Make sure they are sealed well to prevent air or moisture ingress. Use thread tape to make a good seal. Fill the spare bottle halfway to flush the fittings and tube and remove any trapped air.

Use the oil in the spare bottle to take the sample temperature and record it on the data sheet

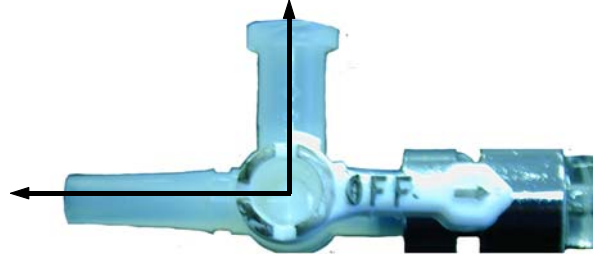
##### Step 7

**In the majority of cases a bottle sample will be required.** Wipe down the outside of the sampling tube with a clean lint free cloth and place tube in the sample bottle. Allow approximately 25mm of oil into the sample bottle.

### Step 8

Push the syringe plunger fully closed, place the valve in the purge position and attach to the sampling tube.

Allow oil to flow from the equipment through the valve into the sample bottle until satisfied that all air is purged from the sampling tube. It is important to follow the next steps without deviation. If a mistake is made, go back to step 8 and repeat.



### Step 9

Hold the syringe horizontal and turn the valve to allow the oil to enter the syringe and the resultant pressure to force the plunger out. Allow about 10mm of oil into the syringe then return the valve to the purge position. Place the tube back into the sample bottle to continue filling.

### Step 10

Hold the syringe vertical and support the plunger with the little finger of the same hand. Turn the valve to the fill position and draw the plunger and oil down to about 15mm past the 50mm mark, ensuring that all the inside of the syringe has been coated with oil. Expel that oil into the waste container.

This step is necessary to assimilate the syringe and prevent leakage between the plunger and the body.



### Step 11

When the sample bottle is half full repeat **Step 9** and allow the oil to fill the syringe approximately 5mm past the 50mm mark.

Let the head pressure push the oil into the syringe.

**DO NOT FILL THE SYRINGE BY PULLING ON THE PLUNGER.**

You will note that there is an air bubble in the oil - **Do not remove that bubble at this stage.**

Return the valve to the purge position and carefully remove the syringe from the tube and return it to the sample

bottle to continue filling. Clean any surplus oil from the outside of the syringe. Put the syringe in its box and lean it upright at an angle against solid support out of direct sunlight.

### Step 12

Allow the bottle to fill to the top shoulder, close the equipment valve and seal the bottle with its cap. Seal the bottle as soon as the sample has been taken. Exposure to air can adversely affect the sample.

**Place the bottle out of direct sunlight.**

Drain any remaining oil from the equipment valve and sampling fittings, remove fittings from equipment, clean equipment drain valve and replace bung.

### Step 13

Remove the syringe from the box and hold vertical, once again support the plunger with the little finger and turn the valve to the fill position. Eject the air bubble from the syringe and close the valve. **(see Note 1).**

Try not to move the syringe away from the vertical position and closely survey the oil sample for further trapped air bubbles. Eject any larger bubbles in the same manner as above.

Close the plunger to the 50mm mark, close the valve and clean any oil from the outside of the syringe and pack in its box.

**Note 1:** There will be times that you will see lots of what look like tiny air bubbles rising in the oil after you eject the main air bubble. Provided the above procedures have been carried out correctly, 5 to 10 minutes have passed between taking the sample and ejecting the air bubble. Do not try to eject these bubbles as they are more likely to be gas migrating from the oil as it cools.

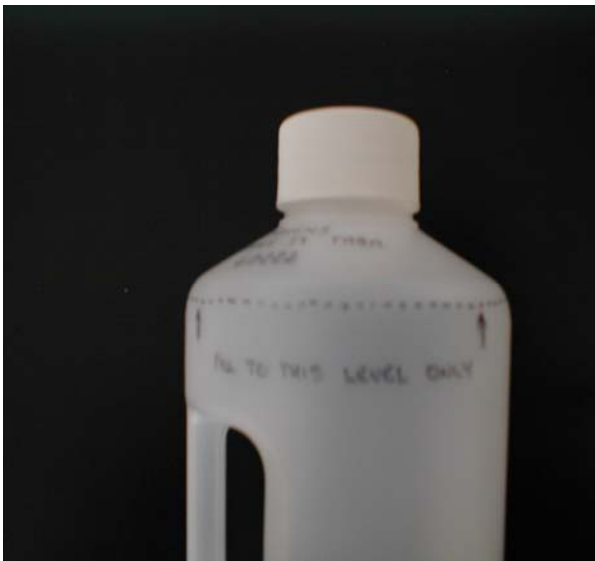
If you later check your samples and see a bubble in the syringe, do **NOT** assume that this is air which you missed expelling. Nine chances out of ten it will be gasses that have migrated from the oil forming this bubble. This bubble holds important information. **Do not expel this bubble under any circumstances.**

#### Step 14

Label the bottle as per the photo below with your company's name, the location and designation of the equipment, TASA for tapchanger, TCA for transformer or BOA for circuit breaker and the syringe number. Please label the bottle both on the lid and on top of the shoulder with indelible ink.

Complete the Data Information sheet including nameplate and other critical information. It is important that all information is recorded accurately. Incorrect information can result in a mis-diagnosis.

Package the syringe, bottle and paperwork and send to MHL Ltd with all the paperwork completed.



## Some Important Notes

- If there are any questions or doubt about any sampling procedure please contact **Tony Lewis** of **Mahanga Holdings Ltd** on 021 464103 or 09 4440663.
- Use a new sampling tube for each sample. Cross contamination is always an issue.
- Keep the flow of oil into the bottles and syringes slow.
- An average sample time is about 20 minutes. If it is taking less time, you are probably not doing it correctly.
- Complete the paperwork as you take the sample. This will minimise the risk of mixing up samples if you wait until all the samples are taken before you do the paperwork or if you do all the paperwork first.
- Keep a close track on the syringes and bottles. Take careful note of the syringe number and record it onto the plastic bottle as well as the associated paperwork.
- Keep a copy of the paperwork in case there is a spillage during shipping and the originals are destroyed.
- Never remove bubbles from the syringes except at the initial sampling time.
- Record the top oil temperature of the equipment and if possible the oil sample temperature when taken.
- For transformers the following information is critical:
  - Nameplate information
  - Free breathing or sealed
  - If a silica gel breather is fitted
  - If a conservator oil preservation system is fitted (such as an oil bladder/bag)
  - If an On Load Tap Changer (OLTC) is fitted
- If the oil in the transformer is common with the oil in the OLTC
- If there is a common head space between the transformer oil and OLTC oil
- If the OLTC selector and diverter compartments are common or separate

## 5.SUPPORTING DOCUMENTATION

Work Site Safety & Risk Assessment Form 230-1630P

Transformer Condition Assessment Sampling Forms

Tapchanger Activity Signature Analysis Sampling Forms

Breaker Oil Analysis Sampling Forms

*(Above mentioned forms available from [www.tjh2b.com.au](http://www.tjh2b.com.au))*