

## Section 3.7

- Liquid samples from the transformer should be taken from a sampling valve at the bottom of the tank in accordance with the requirements of ASTM D923. Test samples should be taken only after the liquid has settled for some time, varying from eight hours for a drum to several days for bulk fluid containers. (Note: not sure the reasoning ) Water in cold insulating liquid is much slower in settling.

## 3.8.3 Energization under cold conditions

- IEEE Std C57. 12.00 considers energization at temperatures below  $-20\text{ }^{\circ}\text{C}$  ( $-4\text{ }^{\circ}\text{F}$ ) as unusual service. (needs to address the poor viscosity of natural ester fluid in cold temperature under  $15\text{ deg C}$  )

## 4.9.3 Method 3 Hot Air

- **CAUTION**
- When drying liquid-soaked insulation with hot air, care should be taken to avoid open flames near the transformer particularly near the air exhaust where liquid vapors will be concentrated. The flash point of conventional transformer oil is approximately 145 °C (293 °F). Fire extinguishers, preferably the carbon dioxide type (*Is CO2 still being used??*), should be located near the transformer before beginning the drying.

## 4.9.5 Completion of Drying

- Power factor tests may be used instead or in addition to insulation resistance tests for determining the progress of the drying. Power factor will increase as the temperature increases, then decrease as moisture is extracted and flatten out as the drying nears completion.
- **(NOTE: The entire section has to be rewritten. Electrical testing is not recommended when transformer is under vacuum.**

- **3.9.1 Routine DGA testing**

- Critical transformers should have oil samples taken from the main tank and other critical compartments for dissolved gas-in-oil (DGA) and moisture content testing frequently for the first few weeks of operation to make sure that no abnormal amount of gas or moisture is being developed. The DGA and moisture content testing should be carried out after the **first day, first week, onr month ,three months, six months**, and subsequently at one to three year intervals, depending on the criticality and loading condition.. If at any time the oil samples should test outside of acceptable values specified in IEEE Std C57. 104 or IEEE Std C57. 106, the reason for the unacceptable values should be investigated

## 4.8.5 Vacuum Filling

- The dielectric liquid should be introduced from a point opposite the vacuum pump above the core and coils in a manner such that it will not stream on the paper insulation. (Not exactly sure what this means, if fear of static electrification, need to provide explanation)

## 4.9.1 Method 1 Circulation of Hot Oil

- The rate of drying can be increased by application of vacuum to the surface of the oil. It is preferable to maintain a vacuum on the order of 1 mmHg (133 Pa) above the oil during the above heating cycle, although a low positive gauge pressure 7–14 kPa (1–2 lbf/in<sup>2</sup>) of dry gas can be used at this stage if desired. (What is the purpose of using dry air??)

## 4.13.1.4

- Furan—Testing of the Furan content of oil to track the paper degradation  
(also Methanol??)



## **C.1 Recommended minimum equipment ratings (for new transformers)**

### **C.1.1 Oil-processing equipment (preferably an integrated trailer unit)**

- Also Vacuum pumps, dry air system

Suggest that this section be updated  
Baron USA??

## C.2 Determination of insulation dryness

- Baron USA apparently uses some algorithm (using pumping speed, temperature, vacuum level etc) to determine dryness.  
Perhaps Baron can provide a write-up?

- **Cold weather dew point testing**
- Special considerations are required for the testing of dew point in cold weather conditions
- This section needs expanding

- **C.2.1 .2 Cold trap technique**

- **This section needs updating**



This guide discusses the following two sizes of transformers:

501 kVA to below 10 MVA, or with primary windings less than 69 kV

10 MVA and above, or with high-voltage windings of 69 kV and above

- **NOTE 1**— For transformers with primary voltages that are less than 69 kV and larger than 10 MVA, users should follow Clause 4.1 (Note: This is in contrary to what is specified in the Guide)