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Operation and Maintenance Manual of Distribution Transformers

If a transformer is to give long and trouble free service, it should receive a reasonable amount of attention and preventive maintenance.

Overloading of transformer should be avoided.

For satisfactory operation of the transformers in parallel. they should have identical phase displacement, voltage ratio and percentage impedance. The following conditions must be fulfilled:

a) Check that the no load voltage ratio of the transformers is the same.

b) Check that the percentage impedances of the transformers are the same.

c) Check that the polarity and phase sequence are the same.

d) Check that the rated output of the smallest transformer in the group is not less than 33% of the rated output of the largest transformer in the group.

e) Check that the tap positions are the same.

f) Check that on independent operation the voltages and currents of the transformers are balanced. Satisfactory parallel operation can be achieved, if all the above conditions are satisfied.

Recommended maintenance schedule for the Distribution Transformers upto the capacity of 1000KVA is enclosed herewith.

Recommended Maintenance Schedule for Distribution Transformers of capacities upto 1000 KVA

S. No.	Inspection Frequency	Items to be Inspected	Inspection Notes	Action required, if inspection show un-satisfactory conditions
1.	Hourly	Load (ampers)	Check against rated figures	Note: An improper tap position
2.	Hourly	Voltage	Check against rated figures	can cause excessive core loss
3.	Hourly	Temperature	Check oil temperature and ambient temperature	Shut down the transformer and investigate, if oil temperature is persistently higher than normal.
4.	Daily	Dehydrating breather	Check that air passages are clear. Check colour of active agent.	If silicagel is pink, change by spare charge. The old charge may be reactivated for use again.
5.	Manthly	oil level in transformer	Check transformer oil level	If low, top-up with dry oil Examine transformer for leaks.
6.	Manthly	Connections	Check tightness	If loose, tighten
7.	Quarterly	Bushings	Examine for cracks and dirt deposits	Clean or replace
8.	Half Yearly	Non Conservator transformer	Check for moisture under cover	Improve ventiliation, check oil.
9.		Cable hoxes and gasket joints	Inspect	Take suitable action;replace gasket, if necessary.
10.	Yearly	Oil in transformer	Check for dielectric strength and water content. Check for acidity and sludge.	Take suitable action to restore quality and quantity of oil.
11.	Yearly	Earth resistance		Take suitable action if earth resistance is high.
12.	Yearly	Relays, alarms, their circuts etc.	Examine relay and alarm contacts, their operation, fuses etc, Check relay accuracy etc	Clean the components and replace contacts and fuses, if necessary Change the settings, if necessary
13.	Yearly	Temperature Indicatiion	Pockets holding thermometers should be checked.	Oil to be replenished, if required.
14.	Yearly	Paint work	Should be inspected.	Any painting or retouching should be done, if necessary.
15.	2 Yearly		Internal inspection above core	Filter oil regardless of condition and replace about 20% of old oil by fresh oil
16.	5 Yearly		Overall inspection including lifting of core and coils.	Wash by clean dry oil.

MAINTENANCE SCHEDULE

TABLE II

RECOMMENDED MAINTENANCE SCHDULE FOR TRANSFORMER OF CAPACITIES OF 1000 kVA AND ABOVE

Sl. No.	*Inspection Frequency*	*Items to be Inspected*	*Inspection Notes*	*Action required inspection shows unsatisfactory conditions*
(1)	(2)	(3)	(4)	(5)
1.	Hourly	(i) Ambient temparature (ii) Winding temparature (iii) Oil temperature	Check that temperature rise is reasonable	Shut down the transformer and in vestigate if either is peristently higher than normal
		(iv) Load (amperes)	Check against rated fegures	—
		(v) Voltage		
2.	Daily	(i) Oil level in tansfomer	Check against transformer oil level	If low, top up with dry oil, examine tranformer for leaks
		(ii) Oil level in bushing	—	———
		(iii) Leakage of water into cooler		
		(iv) Relief diaphragm	—	Replace if cracked or broken
		(v) Dehydrating breather	Check that air-passage are free. Cheek colour of active agent	If silicagel is pink, change by spare charge. The old charge may be reactivated for use again
3.	Quarterly	(i) Bushing	Examine for cracks and dirt deposits	Clean or replace.
		(ii) Oil in transformer	Check for dielectric strength and water content	Take suitable action to restore quality of oil
		(iii) Cooler fan bearings motors and operating mechanisms	Lubricate bearings Check gear box. Examine contacts. Check mamual control and interlocks	Replace burnt of worn contacts or other parts
		(iv) OLTC	Check oil in OLTC driving mechanisms	
		(v) Indoor transformers	Check ventilation	
4.	Half Yearely	Oil cooler	Test for pressure	
5.	Yearly (or earlier if, the transformer can conveniently be taken out for checking)	(i) Oil in transformer	Check for acidity and sludge	Filter or replace
		(ii) Oil filled bushings	Test Oil	Filter or replace
		(iii) Gasket Joints	—	Tighten the bolts evenly to avoid uneven pressure
		(iv) Cable boxes	Check for sealing arrangement for filling holes. Examine compound for cracks	Replace gasket, if leaking

Sl. No.	*Inspection Frequency*	*Items to be Inspected*	*Inspection Notes*	*Action required inspection shows unsatisfactory conditions*
(1)	(2)	(3)	(4)	(5)
		(v) Surge diverter and gaps	Examine for cracks and dirt deposits	Clean or replace
		(vi) Relays, alarms, their circuits, etc.	Examine relay and alarm contacts, their operation fuses, etc. Check relay accuracy, etc.	Clean the components and replace contacts and fuses, If nesessary. Change the setting. if necessary
		(viii)Earth resistance	___	Take Suitable action: if earth resistance is high.
6.	(a) 5 yearly	1000 to 3000 kVA	Overall inspection including lifiting of core and coils	Wash by hosing down with clean dry oil
	(b) 7 - 10 yearly	Above 3000 kVA	__do__	__do__

Note: (1) With respect to on-load tapchangers, the manufacture's recommendation should be followed.

(2) The silicagel may be reactivated by reactivated by heating it to 150 to 200 ^{0}C

(3) Every time the drying medium is changed, oil seal should also be chaged.

(4) No work should be done on any tranformer unless it is disconnected from all external circuits and the tank and all windings have been solidly earthed.

(5) In case of anytings abnormal occurring during service, maker's advice should be obtained, giving him complete particulars as to the nature and the extent of occurrence, together with the name plate particulars in order to assist identification.