

Operation and Maintenance of Self-Cooled Transformers

INSTRUCTIONS

OPERATION

General—Entrapped air is a potential source of trouble in all transformers. In general therefore it is desirable to fill transformers with oil under full vacuum. This is done for transformers shipped in oil from the factory except in a very few cases where it is not considered as essential.

The filling of transformers with oil in the field should be done under a full vacuum provided the transformer tanks are designed for this condition. If the transformer tanks have not been designed for full vacuum and it is imperative to get the maximum impulse strength immediately the transformers should be filled with oil under full vacuum by placing them in an auxiliary tank. Transformers with round wire coils should always be filled with oil under full vacuum, because of the higher stress across coil groups. For definite information on tank strengths the factory should be consulted.

In those cases where the transformers are not filled under full vacuum, full voltage should not be applied to the windings for several hours after the oil has been put into the case. This time is necessary to allow the air bubbles to escape.

When the voltage is first applied to the transformer, it should, if possible, be brought up slowly to its full value so that any wrong connection or other trouble may be disclosed before damage can result. After full voltage has been applied successfully, the transformer should preferably be operated in that way for a few hours without load. It should be kept under observation during this time and also during the first few hours that it delivers load. After four or five days' service it is advisable to test the oil again for moisture.

Oil Sampling—There is always a chance that moisture may get into the oil after the transformer is installed so that sample of oil should be drawn from the bottom of the tank at least once in every three months and tested for dielectric strength as described in the Instruction Booklet on Oil. Customers who do not have facilities for testing oil can send samples to the Westinghouse Electric & Manufacturing Company at East Pittsburgh, Pa. Bottles and containers as illustrated in Fig. 1 can be supplied by any of our district offices in lots of six, for this purpose, at a nominal charge. These bottles are vacuum dried and sealed. A container is provided allowing shipment by Parcel Post, which is usually very desirable.

Customers who are not equipped to make their own tests are urged to avail themselves of this service.

Temperature Readings—Thermometers should be read daily or more often. If, at rated load or less, the oil temperature reaches 80°C. for an oil-immersed, self-cooled or self-cooled air blast transformer it is advisable to check operating conditions.

Oil-immersed, self-cooled transformers or self-cooled air blast transformers should not be operated for long periods of time at oil temperatures in excess of 80°C. on account of increased rate of deterioration of the insulations. The oil temperature in these transformers should not be allowed to exceed 90°C. even for short periods of time.

MAINTENANCE

Inspection—Transformers require less care and attention than almost any other kind of electrical power apparatus. This, however, is not a reason for neglecting them. The conditions under which they operate will determine to some extent the frequency with which they should be inspected. A regular program of inspection should be established and rigidly carried out.

The oil should be tested for dielectric strength and the presence of sludge. If there is an indication of moisture or sludge formation, the oil should be tested further and treated as described in the Instruction Booklet on Oil. If tests show the oil to be in bad condition an inspection should be made on the inside of the tank for possible cause of the trouble. However, if the oil tests satisfactorily the case should not be opened but a careful inspection of all accessories should be made to see that they are functioning properly. Transformers equipped with the Inertiaire device cannot have sludge formation since oxygen is excluded. The record of deoxidizing compound, or nitrogen gas consumption should be studied and if excessive the case should be tested for leaks as described in the Instruction Booklet for Inertiaire Equipment.

Any increase in operating temperature at normal load should be investigated and if the cause cannot be determined the transformer should be taken out of service and given a thorough inspection.

Any symptoms such as unusual noises, high or low oil levels, rupturing of relief diaphragm, etc. should be investigated at once.

Transformers which have been subjected to unusually severe operating conditions such as overloads, frequent short circuits, or special units such as furnace transformers should be inspected internally at least once a year. This can usually be done adequately by lowering the oil level and inspecting with a light through the manhole.

Repainting—It is desirable to repaint the transformer at intervals to maintain the finish in good condition. Local climatic conditions cover such a wide range that definite recommendations as to frequency of repainting are not possible. Repainting by flowing is preferable because it tends to wash off foreign material and produces a uniform coating. See Leaflet "Standard Finish for Transformers."

Equipment has been developed for flow coating, cleaning and handling transformers and parts in the field. The customer should write to the Company for details.

Spare Transformers—A spare transformer should be given the same routine checks as are given to transformers continuously in service. The internal parts should be kept free from the condensation and accumulation of moisture. To obtain the maximum advantage from the spare unit it should be kept ready for instant service.

REPAIRING

With proper care, modern transformers seldom give trouble; but, nevertheless, repairs are occasionally necessary.

No general instructions will be given here for repairs of transformers. The customer should write to the Company, describing the nature of the trouble and the extent and character of the damage, and information and instructions for repair will be promptly and freely given.

RENEWAL PARTS

Renewal parts are covered in R.P. Booklet #150 which may be obtained on request if not already available.

In writing with reference to any transformer, always give the full name plate reading, as this furnishes accurate information for identification.

All coils and leads are numbered, round fibre tags being used for this purpose. In referring to coils or leads, always give the number, being careful not to confuse coil tags and lead tags.



FIG. 1—OIL TESTING SERVICE

Westinghouse Electric & Manufacturing Company

Sharon, Pa.

Westinghouse Press
Printed in U.S.A. (Rep. 1-43)

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