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Methods for Assessing and Diagnosing the Technical Condition of Transformers

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Abstract: The article analyzes the processes and methods of cooling large and small power transformers used in power supply systems. The modern state of transformers and the issues of energy resource saving in them are considered. Also, systems that protect against explosions in voltage and load modes, short circuits and fires resulting from oil leakage in the housing are studied. A functional scheme of an automated cooling system has been developed by monitoring the technical condition of the transformer. An automated cooling system and device that protects transformers from fire and explosion have been designed and substantiated by a feasibility study. Rules for using an automated cooling system and commissioning the device have been developed. The system for remote monitoring and control of all technological and operational indicators, as well as their schemes, have been improved.

Keywords: Thermal relay; thermal sensor; cooling radiator; radiator freon pipes; fan; pump; freon storage volume (barrel); dielectric oil storage barrels.

ENTRANCE

If we take the world data, we can observe that the consumption of electric energy is increasing day by day. As a result, old and old transformers operating in old cooling systems are currently experiencing a lot of fires and various explosions, short circuits, oil waste, energy losses due to overload, and short circuits in transformer windings. Currently, Russia, Germany, India, and China are working on automated systems to solve such problems and automate the system. Every year, more than a million transformer problems and explosions occur worldwide. Most of these problems occur in transformers from 63 kVA to 1000 kVA in local areas. In substations, fires occur in large substations due to the obsolescence of old-type cooling systems in transformers of 16,000 kVA and above and the inability of the FIK to meet current requirements. Work is underway around the world to introduce new transformer cooling systems, increase their energy efficiency, and protect transformers using energy-saving devices.

RESEARCH METHODS

Electricity energy distribution systems the most important from the elements one power transformers. In the transformer happening short connection and various situations own on time determination emergency of situations appearance of being prevent to get, as well repair works for transformers from the network temporarily cut off him/her technician status assessment and

to him/her diagnostics to do further effective from their paths one is considered. Current at the time transformers technician status evaluation many methods available. Work voltage take to throw demand not doing diagnostics to the methods advantage is given.

The most wide widespread methods are:

- thermal the image check;
- vibration diagnostics;
- transformer body inside oil analysis to do

Now this situations according to transformer diagnostics in the methods We check. Power transformers and autotransformers thermal diagnostics very complicated is a procedure, because in transformers local defects appearance when they are magnet core and natural heat currents with transformer oil structural parts change our observation possible. From now on except for the transformer oil transformer in the address various magnet on the field situations, defects in place temperature distribution flattens. Computer diagnostics the results analysis in doing transformers constructive properties, used wrapping type and magnet at the time cooling system, work conditions and duration, production release technology and other many factors into account to take need. From now on outside, measuring to the mistake transformers array metal parts, that including tank, press rings, screens, pins and others impact does, they have lost fields by provoked whirlpool from the streams additional losses because of heat is released.

Thermal to describe from technology used without power in transformers following problems determination possible:

integral flow transformers short the connection twist;

powered contact management system wrong performance;

magnet of the contour separately components (consoles, supports and others) insulation violation because of in the transformer magnet arc of the fields appearance to be;

transformer cooling in the system defects (oil pumps, filters, fans and others) and his/her efficiency assessment;

to the body oil flowing exit, wrap insulation swelling or shift (long) service deadline was transformers for usual) result transformer in the container of oil internal in circulation changes (oil circulation slowing down departure);

Thermal image or his/her scanner with 7-12 lenses used without, middle phased on the axis, to the transformer possible as much as possible closer was on a tripod installation need. From now on except thermal recording both image and audio and video to provide need.

RESULTS AND DISCUSSION

After setting the thermal imager to the continuous temperature recording mode, thermal images are recorded from the top of the extreme phase (for example, “A”) to phase “C”, with an overlap of approximately 10% of the volume.

After reaching the surface of the “C” phase tank, the scanner lens moves down and then the shooting continues in the opposite direction at intervals, and in this way the shooting process continues until the entire surface is recorded, including the oil pumps, oil lines and other components located below it. The tank perimeter along entrance possible was whole surface thermographic photo is obtained (Figure 1.1)

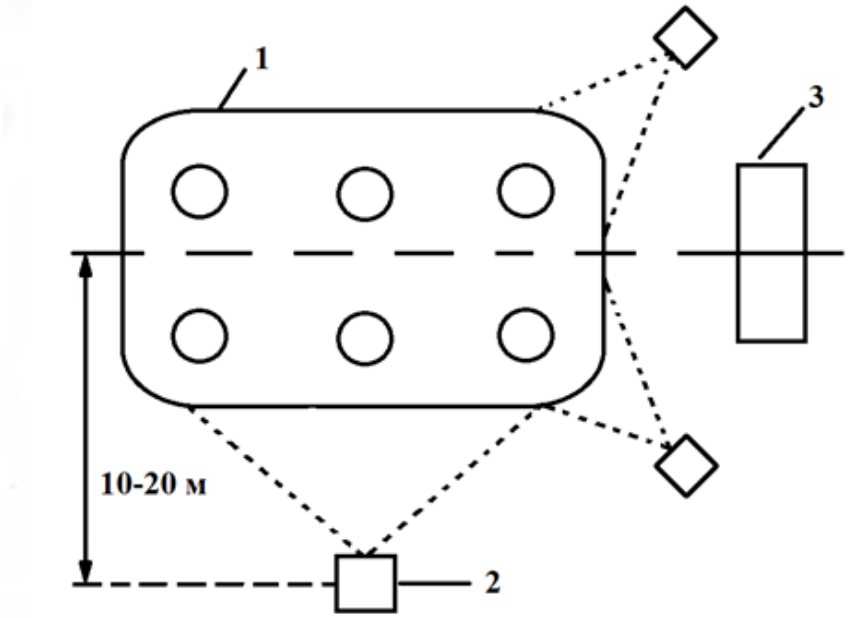

Figure 1.1. Thermographic research technique

All shooting at points thermal image (2) from transformer (I) one kind in the distance to be At least 4 studies are needed. point provide necessary, but research of points maximum number cooling system type and his/her located to the place For example, external cooling When using the system (3), the research points up to 6 pieces rises.

Later, the shooting results only to the expanded " thermal " plan The plan is raised heating to the temperature has was places transformer for technician documents with is compared, this wrapping cranes, coils, oil circulation zones, magnetic outline and his/her elements and others' structural location describes. With this together, cooling systems performance record is being and their every one by created oil rotation zone is evaluated. Oil flows shift because of transformer of the container on the surface anomalous heat zones appearance to be attention focus necessary

Transformer cooling system whole transformer to work noticeable impact indicating important functional unity is, it is control to do the most difficult and responsible ICT devices using transformer cooling in the system malfunction determination for operator is higher to the qualification has to be need. Current at the time transformer cooling system performance effective to evaluate opportunity giving two approach working was released. One kind load under, one kind environment under the circumstances working one kind kind of of equipment average temperature evaluation. Experience this shows that a under different loads and one kind under the circumstances working one kind transformers 2 ° C above the average tank temperature more than difference cooling system wrong of operation sign to be possible. Cooling from the system oil introduction and exit pipes temperature observation and standard factory tests information with comparison. Thermal tests the results analysis to do and thermal the image check according to many experiments cooling system every one type typical was oil input-output at temperature average the difference to determine opportunity This gives from 1-1.5 ° C more than deviation already refrigerator wrong performance is a symbol.

CONCLUSION

Transformer technician status evaluation and diagnostics monitor to do As a result, electricity energy distribution systems the most important from the elements one power transformers. In the transformer happening short connection and various situations own on time determination emergency of situations appearance of being prevent to get, as well repair works for transformers from the network temporarily cut off him/her technician status assessment and to him/her diagnostics to do further effective from their paths one is considered. Current at the time

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