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Information About Transformer Oils

Zokirova Irodakhon Zakrullaevna,

Lecturers Of The Department Of Electrical Engineering, Electromechanics And Electrotechnology, Andijan Machine-Building Institute, Uzbekistan

Nuriddinov Nasimjon Akhadkhonovich,

Lecturers Of The Department Of Electrical Engineering, Electromechanics And Electrotechnology, Andijan Machine-Building Institute, Uzbekistan

Nuregdiyev Mamatyusuf Mamatkarimovich

Lecturers Of The Department Of Electrical Engineering, Electromechanics And Electrotechnology, Andijan Machine-Building Institute, Uzbekistan

ABSTRACT

The development of the electric power industry and electrical machine building is associated with the use of a wide range of electrical insulating materials. The intensive development of science and technology requires the complication and improvement of the conditions set for electrical insulation. Based on the above, in order to increase the operating time of all oil electrical equipment working in the power system and have detailed information about the transformer oils to be poured and the requirements for them. The main task is to determine the requirements of standards for electrical insulating materials and compliance with technical conditions and it is advised to check by testing on the basis of regulatory documents of the quality indicators filled in them and to maintain constant control of oil equipment during operation.

KEYWORDS

Oil lubrication device, Transformer oil, Oil quality, Regulations, Norms, GOST

INTRODUCTION

Transformer oils mainly perform the role of insulation in electrical installations: power transformers, on-load tap-changers, power transformers, measuring transformers and oil switches.

Transformer oils are classified according to their condition into the following:

- Fresh, coming from the manufacturer with possible deviations from the standard indicators for breakdown voltage, moisture content and gas content;
- Clean, dry, processed (cleaned, dried) from the "fresh" state, corresponding to all standardized indicators, prepared for pouring into equipment;

- Regenerated, used, cleaned by physical, chemical or physicochemical methods, restored to the requirements of regulatory and technical documentation and suitable for further use;
- Operational, flooded equipment, the indicators of which correspond to the standards for operational oil;
- -Spent, i.e. the quality that has lost in the process of operation according to the standardized indicators established by the normative and technical documentation and merged from the equipment.

MATERIALS AND METHODS

In operation, it must have operational control of transformer oil and requirements for its quality. The scope of in-service monitoring includes reduced or complete oil analysis. An abbreviated oil analysis includes the determination of the following quality indicators:

- Appearance and color;
- The presence of mechanical impurities and free water (visual);
- Breakdown voltage;
- Acid number;
- flash point;
- Reactions of water extract

A complete oil analysis, in addition to the tests included in the abbreviated analysis, includes the determination of the following indicators:

- The tangent of the angle of dielectric losses at 90 °C;
- The quantitative content of mechanical impurities;
- Class of cleanliness;
- Quantitative water content;
- Gas content;
- The presence of dissolved sludge;

- The content of the antioxidant additive ionol-agidol;
- Stability against oxidation.

Results And Discussions

Determination of these indicators, in general, is necessary to determine the type of oil and its chemical composition in order to assess the performance properties.

- The color of transformer oil is determined when viewed in transmitted light and is expressed as a numerical rating based on comparison with a range of color standards.
- Breakdown voltage is the most important indicator of oil quality, which characterizes the ability of a liquid dielectric to withstand electrostatic voltage without breakdown, that is, it determines the trouble-free operation of the equipment insulation system.
- When the breakdown voltage approaches the limit value, the quantitative moisture content of the oil should be determined. The moisture content also allows you to determine the cause of the deterioration of the characteristics of solid insulation.
- Acid number is the main indicator characterizing the degree of oil aging.
- The tangent of the angle of dielectric loss is an indicator of the oil sensitive to the presence of various contaminants in the oil.
- The gas content mainly characterizes the effectiveness of the film protection of transformers.
- A decrease in the flash point of transformer oil indicates the presence of defects in the equipment, leading to decomposition of the oil and the formation of flammable volatile fractions.

- Determining the presence of dissolved sludge is an important test, as it allows you to identify the presence of deep aging products dissolved in oil, which can precipitate as a sediment on the active part of electrical equipment.

The ionol content of the operating oil and the oxidation stability are the most accurate indicators of oil life.

The frequency and scope of testing the quality of transformer oil from power transformers during operation should be as follows:

- Oil analysis from power transformers with a voltage of 110-500 kV is carried out once every 2 years
- -from transformers up to 35 kV inclusive 1 time in 4 years

The frequency of testing oil from instrument transformers should be as follows:

- From transformers up to 35 kV, oil may not be tested during operation;
- From current transformers 110-500 kV oil is tested once every 2 years
- Oil from 500 kV voltage transformers is tested 1 time 2 years
- The oil from transformers with a capacity of 630 kVA and below is not checked during operation.

For the analysis of transformer oil, oils must be taken from the equipment. When sampling operating oil, the following basic rules must be observed:

- Sampling should be performed by a qualified specialist;
- Oil sampling should not be carried out in bad weather with a high risk of contamination from the environment into the oil sample; if urgent sampling is

required in adverse conditions, additional precautions should be taken;

- Use only specially prepared dry and clean dishes - glass bottles;
- Rain a sufficient amount of oil to remove any contamination that may be found on the sample inlet pipe;
- Rinse the sample with the selected oil;
- To ensure that each vessel is filled at least 95% of its capacity;
- Immediately after filling, the vessel with the sample is sealed with a stopper;
- After sampling, restore the original state of the sample-sampling point;
- Check the correctness and completeness of labeling
- Store samples in a dark place if samples are taken in transparent bottles.

CONCLUSION

To conclude, sampling of equipment should be carried out during normal operation of the equipment or immediately after it is turned off. After delivery of samples to the laboratory, it is not recommended to open the bottle immediately, but rather wait until the sample reaches room temperature.

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