



The Importance of Liquid Insulation in Power Transformers and The Factors That Affect It

Nosirov Asrorbek Ismoiljon ogli

Institute of energy problems of the Academy of Sciences of the Republic of Uzbekistan, Tashkent.

ABSTRACT: This article analyzed the causes of the origin of the main disorders observed in oil force Transformers. In addition, the insulating parts oil and the factors that contribute to the acceleration of paper degradation were studied on the basis of literature analysis. Relying on theoretical data, a scheme of the oil and paper degradation process was created.

KEY WORDS: diagnostics, liquid insulation, power transformer, puncture voltage, oil, mechanical mixture, gas analysis, oil composition, neural network.

I. INTRODUCTION

The oil is an important component that regularly washes the inside of high voltage transformers, actively operates in the hotline exchange jaayon, and isolates all electrical components. Since oil is a liquid that washes all the internal structural elements of a transformer, it allows you to determine and assess the internal state of the transformer: the state of solid insulation, the state of the windings and the magnetic core by observing the physicochemical properties of the oil. In short, oil serves as a means of information. Currently, scientific work aimed at diagnosing the technical condition of power transformers on the basis of liquid insulation is dolzard, there are several diagnostic methods and technologies in the world.

II. SIGNIFICANCE OF THE SYSTEM

Power transformers have liquid (oil) as well as solid (paper) insulation, these two insulation products are inextricably linked with each other. Oil degradation affects paper degradation and vice versa paper degradation affects oil degradation. In addition, two insulating products are degraded at the same time. As a result of deterioration in the technical parameters of insulating products due to degradation, many breakdowns are observed in Transformers.

III. LITERATURE SURVEY

Oil degradation processes

The factors affecting oil degradation are inextricably linked with each other, and are largely influenced by increased temperature. With oil heating, the following processes are observed:

1. Increase in the amount of emulsified water in the oil: as the oil heats up, free water that does not interfere with the oil gradually decomposes and adds to the oil content, causing deterioration of parameters such as the dielectric strength of the oil, dielectric Ruby, flash temperature viscosity and acid number.
2. Increased gas concentration: water molecules in the oil increase the concentration of different gases (hydrogen, methane, ethane, ethylene, acetylene, carbon monoxide and carbon dioxide) due to the chemical reaction these gases cause malfunctions in different internal parts of the transformer (detailed harg method).
3. Degradation of solid insulation: the increase in the concentration of water and gases does not erode the vacuum insulation of the transformer and dramatically reduces the insulating properties of the insulation. Through the Furan diagnostic method, the state of paper insulation and possible disorders of origin are predicted.
4. Partial discharge States: an increase in the concentration of water and gas causes partial discharge States, which leads to the appearance of mechanical impurities.
5. Increased viscosity: processes in the oil result in increased viscosity, which limits the free movement of oil in transformer radiator tubes and causes resin to form in the chull and magnetic core parts. As a result, the cooling function of the oil decreases.

Dependence of oil temperature with increased transformer temperature

The temperature of the transformer increases due to external and internal factors.

1. External temperature: as a result of continuous operation of Transformers, days with a temperature of 40°C are observed in the summer season for 30-40 days. The iron body of the transformer absorbs the temperature and increases the internal temperature.

2. Internal temperature: in the process of energy transformation in the lungs and magnetic cores, the temperature rises. With an increase in the external and internal temperature, the temperature of the transformer housing and oil increases sharply. The increase in temperature accelerates the degradation process of the oil and negatively affects its physicochemical properties.

IV. METHODOLOGY

As a result of the breakdown of the paper insulation of the insulation medium of power transformers, a short circuit process occurs in copper pipes, which, as a result, causes the transformer to be obtained from premature operation. A major influencing agent for paper insulation degradation is liquid insulation. Because liquid insulation is impregnated with permanent paper insulation, it has been found that the physicochemical parameters of these two insulation agents are related to each other in bevosti. Therefore, the assessment of the technical condition of the transformer by diagnosing the physicochemical indicators of liquid insulation is an urgent issue. A number of factors negatively affect the physicochemical indicators of oil.

V. EXPERIMENTAL RESULTS

These factors include:

1. Water: the increase in water molecules as well as the addition of oil to the oil content as a result of the temperature rise and decay of water in the precipitate state dramatically reduces the dielectric strength of the oil.
2. Mechanical impurities: the impurities that appear in the oil reduce its quality, that is, increase its viscosity as a result, negatively affect the heat exchange process.
3. Dissolved gases in the transformation: an increase in the concentration of gases (hydrogen, methane, ethane, ethylene, acetylene, carbon monoxide and carbon dioxide) is caused by chemical reactions, and these gases cause malfunctions in different internal parts of the transformer.
4. Partial discharge: these conditions appear significantly with an increase in the concentration of water and gas.
5. Load misallocation: the misallocation in the load of the transformer significantly affects the increase in the temperature of the oil.
6. Sharp warming of the external temperature: in the summer season, the temperature reaches 40°C, heating the transformer housing leads to the fact that the resulting oil warms up more than Meyer.
7. Internal parts heating: as a result of the heating of the lead and magnetic core, the temperature of the oil increases, which negatively affects its physicochemical properties.

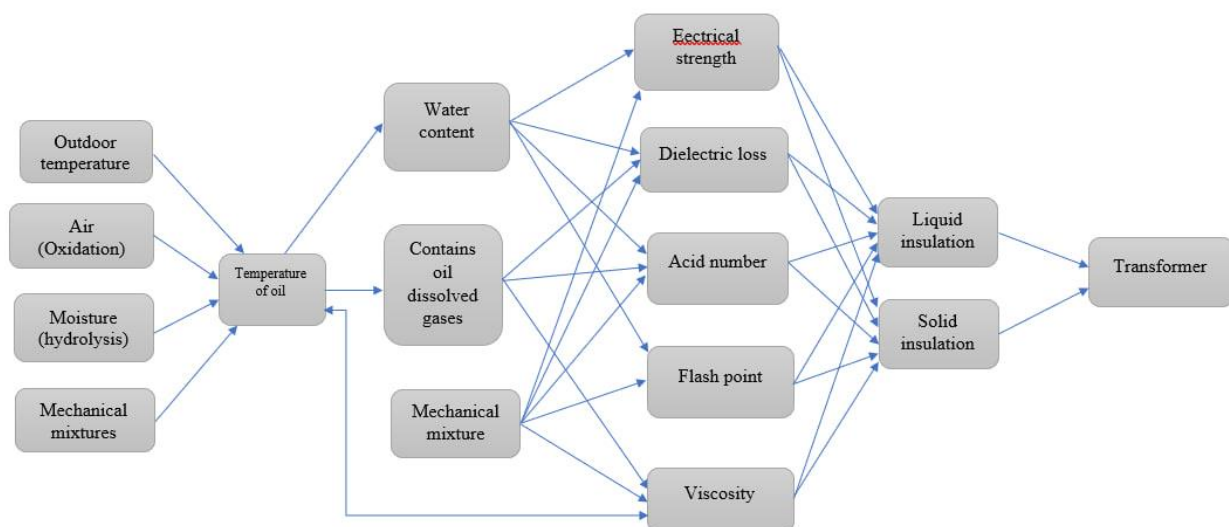


Fig 1. Scheme of factors affecting the insulation media of the transformer

**VI. CONCLUSION AND FUTURE WORK**

Transformer oil plays an important role in high voltage transformers, and the observation of its physicochemical properties is important in assessing the operating state of the transformer. Maintaining the quality and reducing degradation of the oil is necessary to improve the reliability and efficiency of Transformers. Therefore, the research of diagnostic methods based on liquid insulation of the technical condition of Transformers is an urgent issue.

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