

THE IMPORTANCE OF POWER TRANSFORMERS IN THE RAILWAY ELECTRICAL NETWORK AND THE IMPROVEMENT OF OPERATIONAL CHARACTERISTICS THROUGH OIL CLEANING

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ABSTRACT

In the article, the main function of the power transformer in the railway power network was studied, improving the operational characteristics of the transformer by cleaning the oil and ensuring that the transformer works in a constant state of adjustment, the smooth operation of automatic and telemechanics electrical devices, and the improvement of work efficiency were analyzed.

Key words. *Substation, transformer, transformer oil, dielectric, electrical strength, experiment, electric field, solid insulation, automation, telemechanika.*

АННОТАЦИЯ

В статье изучена основная функция силового трансформатора в железнодорожной электросети, улучшение эксплуатационных характеристик трансформатора за счет очистки от масла и обеспечения работы трансформатора в состоянии постоянной наладки, бесперебойной работы автоматики и телемеханики. были проанализированы электрические устройства и повышение эффективности работы.

Ключевые слова. *Подстанция, трансформатор, трансформаторное масло, диэлектрик, электрическая прочность, эксперимент, электрическое поле, твердая изоляция, автоматика, телемеханика.*

INTRODUCTION

Transformers are one of the most widely used devices in the power and manufacturing industries. They are used for long-distance transmission and distribution of electricity. The main task of the transformer is to reduce the high voltage to the required amount, or vice versa, to increase the low voltage to the required amount. Power transformers are used as the main power supply device in the supply of electrical power to railway traction networks, automation and telemechanics communication networks. These power transformers are mainly used in the field of railway automation and telemechanics as the main device that supplies

electricity in the operation of relays, signaling devices, crossing traffic lights, rail chain and barrier devices[10].

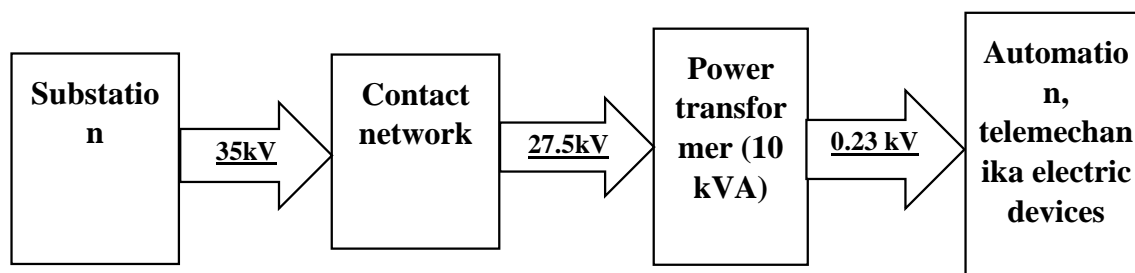


Figure 1. The principle scheme of the power transformer in the process of operation

Automatic operation of power transformers in a constant state of adjustment increases the smooth operation and productivity of telemechanics electrical devices. Therefore, these power transformers are complex electrical equipment, which requires constant attention from a specialist and with regular inspection, after 10-12 years of operation, the transformer will need to be repaired.

Failure of power transformers operating under long-term operating conditions in railway automation and telemechanics networks is caused by the following factors. The main of these factors is the appearance of mechanical (solid) mixture and water in the oil in the working transformer under the influence of the external environment. In the power transformer, it is used for insulation, providing about 80% electrical stability, and also for transferring heat from the active parts of power transformers (coils, etc.) to the cooling system.

The main operating characteristics of transformer oil are determined in accordance with the regulatory document [2]. Therefore, in order to increase the service life of power transformers, it is necessary to carry out diagnostic inspections, and based on its technical condition, it is necessary to carry out a timely inspection of the condition of the coils, insulation materials and oil. If the oil of the transformer is damaged, it is advisable to regenerate the oil in time [3].

Economic savings can be achieved by repurifying the transformer's own oil rather than pouring new oil into it. If the properties of the used oil are successfully restored, then the reclaimed oil is returned to the transformer tank. If the properties of the oil are not restored, then the oil is sent for disposal, and this process is schematized as follows (Fig. 2) [6].

DISCUSSION AND RESULTS

As a result of the presence of water, dust or waste from the external environment as a result of long-term operation, the insulation and energy stability of the used

transformer oil will decrease. Used oil contains small mechanical particles, insoluble compounds and various sediments. These impurities are also caused by rusting, oiling, or opening of the transformer tank. This leads to the failure of the transformer, the suspension of the operation of the electric vehicle and railway traction networks.

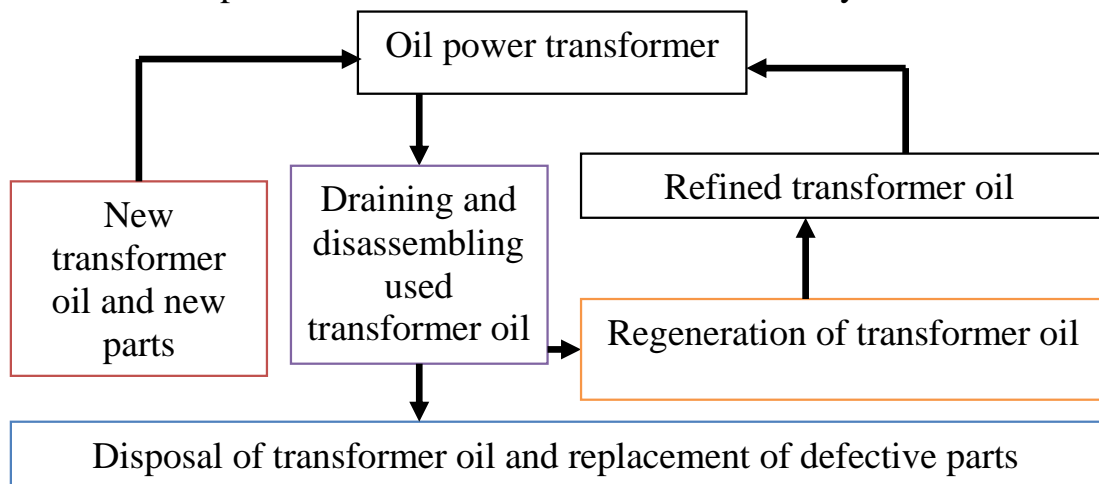


Figure 2. Transformer oil purification (or disposal) processes

Currently, there are more than 520 railroad crossings on the railways of Uzbekistan, of which about 300 are unprotected and more than 220 are guarded. About 150 of the guarded railways are equipped with a railway crossing blocking device (UZP). There are about 80 guarded railway crossings, including high-speed sections. KTP transformers are placed in protected premises[2].

Therefore, taking into account the above processes, timely technical inspection and repair of power transformers is required in order for them to work in a constant condition. Therefore, the requirements for improving the efficiency of railway automation and telemechanics electric devices and increasing their productivity are achieved by improving the FIK of power transformers.

Considering the above circumstances, we would like to offer a combined type of mobile device for cleaning transformer oil. The cost-effectiveness of this device is effective in reducing the cost of taking the transformer out of operation to the service point and requiring additional funds, such as calling a special machine, involving an additional assembly, and having a machine (lifting crane) to remove the transformer from its place. is considered The main task of the device is to make it possible to restore the operational characteristics of transformer oil with reduced electrical strength through two main factors. These factors in the oil: it removes moisture and large mechanical waste. The advantage of the device is that it can work with low-power electricity. The device consists of the following parts: a high-voltage

transformer, a control unit for the conduction current, a cylindrical metal container, at the bottom of which there are valves for draining the oil. Also, one spiral electrode is selected and it is placed in a cylindrical container, and the second electrode is the same container, which is characterized by the fact that the spiral electrode and the cylindrical metal container are located inside. Cylindrical metal container and spiral electrode shoulders are connected to the electric source [11].

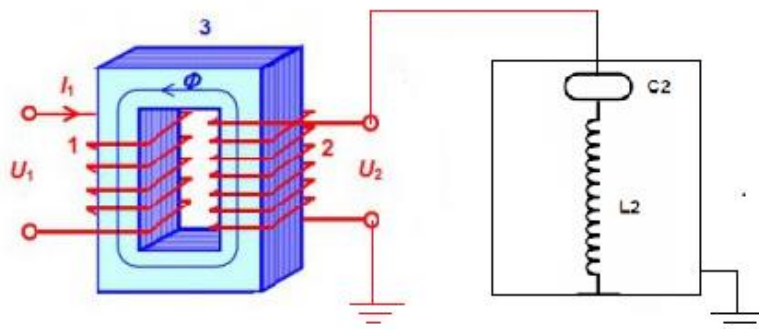


Figure 2. The process of cleaning out oil from a transformer.

1- metal container, 2- spiral-shaped electrode, 3- high-quality transformer,

CONCLUSION

With the help of this oil purifier, it is possible to achieve the highest efficiency and the lowest cost of cleaning from water and mechanical impurities. The advantage of this device is that by electric field cleaning of transformer oil, low energy consumption and high efficiency are achieved, operational characteristics of transformer oil are improved.

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