Technical Analysis of Oil of Transformers Working in Long-Term Operation

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ABSTRACT

The article discusses the influence of transformer oil on energy saving during operation. The properties of transformer oil and changes in their parameters are described. At the same time, the role of transformer oil in the heat exchange process, the equipment in which it can be used, the factors influencing the change in the physical parameters of the composition and composition are described.

Keywords: Liquid dielectric, electricity, heat, oil, transformer, insulation, high voltage, circuit breaker, cable, transformer oil, losses, tgδ.

Today, it is no secret that technology are developing rapidly, and at the same time industrial enterprises, individual entrepreneurs and a number of small and large production enterprises are growing to the present day . From this it can be seen that the demand for electricity is increasing. At the same time, there are many problems with the energy Sox in the production of elerktr energy and its quality supply to consumers. Today, the installed capacity of existing power plants in the Republic of Uzbekistan is:12472.2 MW, the share of thermal power plants is: 10619.0 MW; the share of hydroelectric plants is: 1419.7 MW, and the share of Blockstands is: 433.5 MW. We can see that in the last six years, our population will increase by 13%, and sanot enterprises will increase by 2 times, from 45 thousand to 100 thousand. As a result, the demand for electricity has increased by at least 35 percent and is increasing from year to year. This figure is the current 74 billion kWh of the Republic's annual consumer electricity demand by 2030.110 billion kWh.up to the hour, yeatishi is credited. It does not affect the electric cars that are currently in operation, nor does it affect the living period of the electric cars.

In order to prevent all this, our president, by the end of 2023, new thermal power plants with a capacity of 1500 megawatts will be launched in the city of Shirin of the Syrdarya region, and by the end of 2024 in the Angor district of the Surkhondarya region, with a capacity of 1560 megawatts, and again "Boyovut of the Syrdarya region." signed the decision PQ464 "On measures for the implementation of the investment project for the construction of a steam-gas power plant with a capacity of 1573 MW in the district". It is noted that by 2026, solar and wind power plants with a total capacity of 8,000 megawatts, hydroelectric power plants with a capacity of 868 megawatts, and new thermal power plants with a capacity of 6,008 megawatts will be put into operation in our country. As can be seen from the above, we can see that transformers, switching devices and other devices that have

been turned on before are always with us.

Simply to ensure the long-lasting operation of transformers, that is, to extend the life cycle of the device, it is also necessary to stand transformer oils, insulation of marshmallows and other parts, which are liquid dielectric material inside it. According to modern requirements, the reliability and continuity of electrical networks, power plants and the energy system largely depends on the reliability of electrical transformers and autotransformers. Reliability problems are divided into physical, hardware and informative aspects as follows.

It is known that this is a time-consuming, high-tech and expensive process, and its implementation is related to performing diagnostic operations in accordance with the requirements of industrial documents. It is not necessary to know all the characteristics of each transformer with absolute precision when planning strategic mission objectives. To determine the residual resource, the average data on the reliability of a certain set of transformers that have worked for 12 years is sufficient. In order to positively solve the problems arising in electrical engineering, it is necessary to produce new materials, and at the same time continuously improve the properties of existing materials and improve their quality. This will help to develop high-quality electrical equipment materials based on new technology, to extend the service life of electrical equipment and devices. Among such electrical technical materials, transformer oil plays an important role in long-term operation of transformers.

When transformer oil is poured into the transformer, the air spaces in the insulation covering the wires are filled with oil. As a result, the strength of the transformer increases, and the heat released from the coils and the steel core under the influence of electric voltage is well distributed to the external environment through oil. In this case, the working capacity of the transformer will increase slightly. Transformer oil has the ability to rapidly extinguish an electric arc discharge, as well as to cool the arc channel dramatically [1].

Based on the conditions of construction and use of electrical equipment, liquid dielectrics are subject to requirements such as high electrical strength and relative volume resistance, small dielectric absorption, tolerance to electric and thermal fields, stability of properties during operation, and fire resistance. Transformer oil obtained from oil products is one of the most widely used liquid dielectrics in electrical engineering, and it mainly acts as an electrical insulator and coolant in power transformers. When transformer oil is applied to the transformer, the air spaces in the insulation covering the wires are filled with oil. As a result, the strength of the transformer increases, and the heat released from the coils and the steel core under the influence of electric voltage is well distributed to the external environment through oil. In this case, the working capacity of the transformer will increase slightly.

Transformer oil has the ability to rapidly extinguish an arc discharge and to cool the arc channel dramatically. Transformer oil is used in reactors, rheostats, contactors, high-voltage circuit breakers, cables and other electrical equipment [2-4].

Oil-derived transformer oil is made up of complex compounds such as paraffin, naphthalene, aromatic hydrocarbon, which also contains additives such as sulfur, oxygen and nitrogen. Harmful additives in the oil are eliminated by oil refining. Transformer oil purification is done using acid, through methods such as selective or adsorption. The color of this oil is light yellow, with a density of 861-895 kg/m3, a solidification temperature of -45°C, a flash (flare) temperature of 135-140°c, a refractive coefficient of 1.47 - 1.49, a kinematic viscosity (17.6÷26.6)•10-6 m2/s and a surface tension force of 40-45 kN/m. Since transformer oil is a flammable liquid, the safety of the technique must be followed during its use. The dielectric absorption of this liquid is 2.2-2.3, the tangent of the dielectric wasting angle is 0.001-0.02 .

Too little (0.05%) water in transformer oil also sharply (5-10 times) lowers its electrical strength. This is mainly explained by the fact that the dielectric absorption of water is large (e.g. g≈81) and the specific volumetric resistance is small (e.g.=103÷104 Om•m).

Mechanical additives in oil (fiber, particle, etc. k.), which also reduces the electrical strength of the fluid. If the transformer oil is cleaned of these additives and then dried, it will restore its original electrical strength. Transformer oil being used in electrical equipment is subjected to a strong electric field, heat, oxygen and oxidizing agents, resulting in its wear and tear [5,6].

This process is accelerated by light, powered light, and active catalysts. In the process of wear, the color of the transformer oil is woven and thickened, the value of the TG nozzle is enlarged. Through filtration, regeneration and other methods, transformer oil wear is obtained.

In the absence of a dipole-molecular mixture in the composition of a non-polar dielectric according to the physical nature of transformer oil, waste occurs only in electrical conduction. The comparative resistance of pure non-polarized liquids, as well as the dielectric waste, will also be very small.

Some remote areas are facing a number of problems in the quality supply of electricity, in some areas, the number of consumers is high, the consumption capacity is greater than the transformer capacity, which leads to the operation of the transformer with excessive voltage, which is less in turn, the transformer heats up, destroys the insulation of the transformer, and the release of various sediments leads to the breakdown of the dielectric property of the transformer oil, and may eventually lead to the failure of the transformer. That's why we checked and analyzed transformer oil brand TM-35 working in a remote area in laboratory conditions.

This experiment is carried out using a device of The Tangent-3m type. The device is an electronic device, from which it is very convenient to carry out an experimental test, because the experiments being tested are clearly and clearly manifested. At the same time, the results obtained are placed in the device's memory.

Device measurements are made on gost 6581-75 and IEC 60247 network frequency f=50 Hz. It can be further noted that it will also be possible to build graphs based on the results obtained in the process of connecting the device to the media. This serves to ensure that the work is quick, easy and smooth [7-9].

The results obtained are entered into tables and graphs are drawn to match these results.

1- table

№	Name of the oil being tested	U, V	C_0, pF	ε_r	P_r	t, ^oC	tgδ
1	TM - 35 for pure oil	1957	8,4034	2,197	401	23	-0,00969
2		1966	8,4034	2,194	401	25	-0,00960
3		1964	8,4034	2,193	401	30	-0,00949
4		1961	8,4034	2,194	401	35	-0,00933
5		1963	8,4034	2.196	401	40	-0.00913
6		1965	8,4034	2.198	401	45	-0.00889
7		1966	8,4034	2.202	401	50	-0.00854
1	TM - 35 for working oil	1993	8,3442	2,242	201	19	0,00123
2		1993	8,3442	2,245	201	30	0,00180
3		1987	8,3442	2,244	201	35	0,00213
4		1985	8,3442	2,247	201	36	0,00224

5		1984	8,3442	2.247	201	40	0,00267
6		1987	8,3442	2.253	201	45	0,00334
7		1987	8,3442	2.256	201	50	0,00413
1	TM - 35 for unsuitable oil	1987	8,2014	2,133	301	23	0,00681
2		1987	8,2014	2,133	301	26	0,00777
3		1987	8,2014	2,132	301	30	0,00969
4		1987	8,2014	2,133	301	35	0,01085
5		1985	8,2014	2.178	301	40	0,00151
6		1979	8,2014	2.180	301	45	0,00157
7		1978	8,2014	2.185	301	50	0,00178

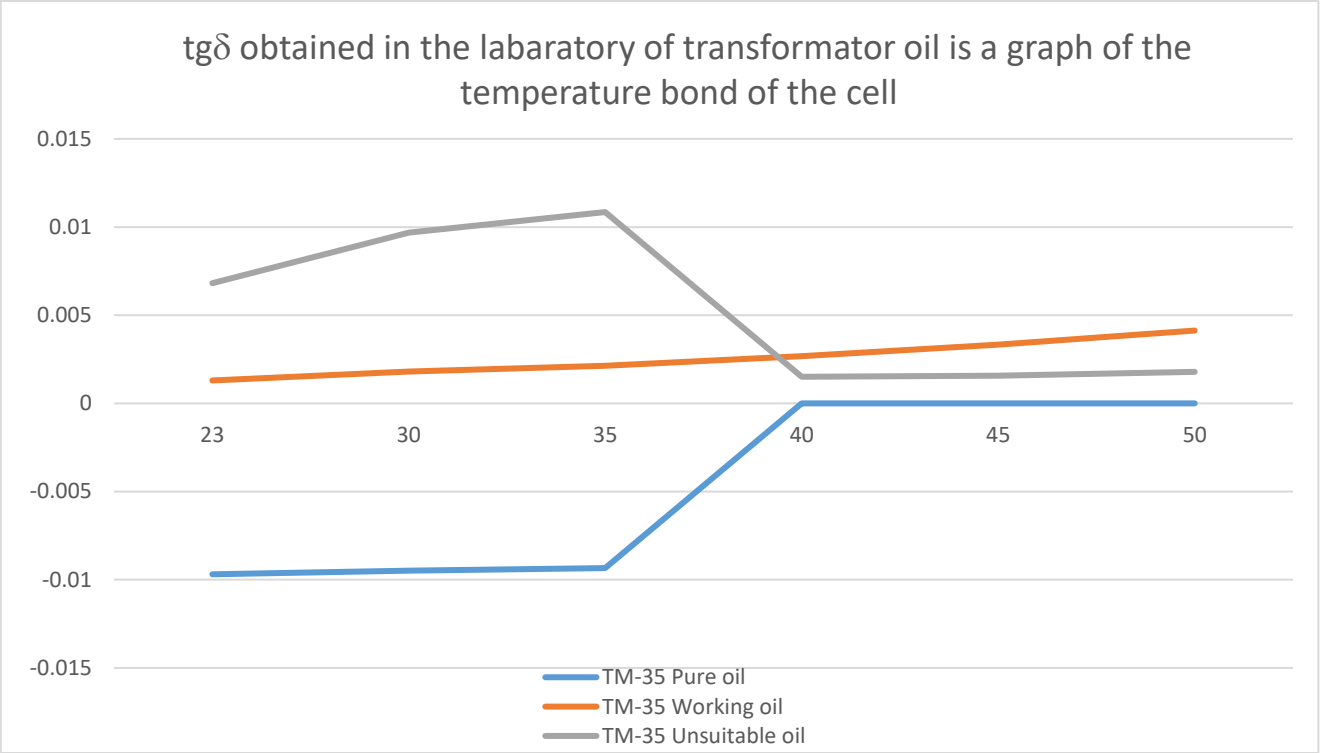

Figure 1. TM obtained under laboratory conditions is a temperature dependence graph of TG of 35 oil

Based on the results of the oil obtained in the experiment, it becomes possible to see differences between the dielectric absorbency of a quality transformer oil under normal conditions and the oil in the explutation process when comparing the tangent of the dielectric waste angle.

In conclusion, it can be said that insulating oils produced from an oil product, that is, changes in the dielectric properties of transformer oils, do not affect not only electrical devices, but also the qualitative transmission of electricity, preventing electric cars and jichos from serving us in the long term. A change in the dielectricity property of transformer oil causes an increase in moisture in the composition to cause the uncontrolled electric mashimas to fail if each specified time is not controlled. It is not a secret to us that if it is to cause a great economic loss for this enterprise, it is a matter of fact that our electric cars will cost a while. As such, it is necessary to undergo a labaratory examination at each specified time in order for the electrical equipment to have a long life, and measures are taken in accordance with the results of the labaratory.

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