

УДК 621.314

Anastasiia Fylymonenko¹, Yuliya Sobol²

¹student of group E-410ma, National University «Zaporizhzhia Polytechnic»

²PhD (Philology), assistant prof. National University «Zaporizhzhia Polytechnic»

FIBER OPTIC 110 KV CURRENT TRANSFORMERS

Nowadays all the industries are modernized, and high voltage technology is no exception. Very often we can observe a situation when an old equipment does not satisfy new requirements, causes glitches and deterioration in nearby related equipment deterior. Thus, there is an urgency in quick replacement of old facilities. All

analogue measurements methods are from the past century, today there are a lot of new ones, that come to the fore and replace everything old.

The implementation of new technologies into high voltage electrical complexes are gradually taking place. As a result, new measurement methods performed with digital fiber optic transformers have emerged. With the help of fiber-optic transformers, it is possible to discover modern and perspective measurement methods based on the Faraday's effect. This effect consists in the rotation plane of light polarization under the influence of the external magnetic field. Measuring the angle of rotation plane of light polarization, it can determine magnetic induction or current.

Besides sensors, special attention in the FOCT is given to the insulation. The issue of insulation is still relevant, since only due to the choice of high-quality material, the correct shape of the ribs, the FOCT acquires such features as flexibility, insensitivity to external influences and ease of installation.

The Canadian company NXT Phase is one of the first creators of this type of device. Since 2002, the devices of this company have been tested on existing high-voltage power lines in different countries. In Russia, the best practical results on the creation of domestic devices of this type have been obtained at the company Profotek CJSC. The design of such type of transformer is based on the current locations of the sensors on the support insulator, and it consists of a measuring element, a sensitive optical fiber in a quartz tube and current-carrying bus. A linearly polarized light signal is supplied from the electro-optical unit, which enters the electron-optical unit through the optical fiber.

The principle of operation of the FOCT of the Canadian manufacturer NXT Phase is the same as that of the Russian one. It is worth noting that NXT Phase offers a new design of the FOCT with a breakable optical loop NXCT-F3. Such optical current transformers can be used in information-measuring systems of technical and commercial metering and quality control of electrical energy.

The transformer has a measuring sensor made in the form of multitrans fiber optic loop covering a high voltage input, a generator bus, or a current conductor. Design features allow to install the transformer in those places where the installation of traditional transformers is extremely difficult or simply impossible. The measuring loop of the sensor is a polarization-preserving optical fiber connected to a standard NXCT, electronics kit with a standard set of output interfaces. This is an ideal solution that allows, in a short time and with a minimum amount of preparatory work, to organize the deployment of a measuring or verification complex.

The insulation is an essential element in the design of electrical appliances and has a significant impact on both its design and operational reliability, especially in ultra-high voltage devices. It is known that the trouble proof operation of networks, the service life of high-voltage equipment, the safety of maintenance directly depends on the quality of the insulators, and especially on their material, reliability,

type and number of ribs. If to analyze the current state of the high-voltage equipment parks, one can be sure that they are in poor condition.

In modern apparatus engineering, the use of polymer insulation is increasing. And this is due to the high level of electrical and mechanical strength (achieved by reinforcing them with fiberglass). Polymer insulators in outdoor FOCT are made of epoxy compounds based on cycloaliphatic resins, silicone rubber, polyester resins with mineral filler and fluoroplastic additive. Outside, they are coated with a protective coating to protect against ultraviolet radiation and chemical attack, as well as waterproof varnishes for reducing hygroscopicity. The use of polymer insulators on power lines can significantly reduce the mass of insulators, and accordingly the mass of the entire transformer. They allow to replace whole garlands of porcelain insulators, since they are much lighter.

The advantages of polymer insulators is a higher electrical resistance during pollution, compared to similar porcelain insulators with an equal leakage path, this advantage is even more evident due to the use of the hydrophobicity of the material. The other important advantages of polymer insulators are:

1. flexibility, that allows to install optical transformers in vertical, horizontal and tilted positions, that does not affect the accuracy of measurements;
2. compactness that allows them to be installed in conditions that are unacceptable for analog transformers;
3. insensitivity to external electromagnetic fields that does not require analysis of the relative position of the tires;
4. light weight that allows installation without the use of cranes.