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# DRYING INSULATION OF THE WINDINGS OF TRANSFORMER BY THE INFRARED RADIATION METHOD

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*У статті розглянуто метод сушіння ізоляції обмоток в камерах інфрачервоним випромінюванням.*

*The article deals with the method of drying insulation of windings in cameras by infrared radiation.*

**Problem setting.** Transformer is the most important device in modern energy without which no power plant can operate. During operation, various emergency modes may occur. One of the commonly encountered damages is moisture insulation of the windings of the transformer. To eliminate these problems, the active part of the transformer needs to be dried. But the existing methods can not provide a qualitative and rapid drying of the transformer. Therefore, the search for methods of drying, which will ensure the quality and low cost of the process, is an urgent task.

**Analysis of recent research.** Drying is one of the main technological stages in the elimination of damage to power transformers. The purpose of drying is removal of moisture from solid insulation of transformers to ensure its higher electrical strength. Isolation of windings of transformers can be dried using such methods as losses in own tank and currents of zero sequence. However, the use of these methods is accompanied by inefficient costs, where the energy is used not only for the heating of the active part, but also for the tank of the transformer, the environment, air, etc.

**The purpose of the article.** Analysis of drying the isolation of transformer windings with the help of infrared radiation.

**Basic material research.** The principle of drying is to apply a directed concentrated heat flux, the source of which is the infrared light with a mirror image (Figure 1). The chamber 1 is a compartment enclosed by thin, heat-insulating walls 3, without ceilings. Above this camera is the ventilation air receiver 2, where the transformer 4 is installed. The presence of a stationary camera is not necessary; if there is not enough space in the production room, you can dry the active part in any temporary site, and in the warm dry season - outdoors. Lamps of infrared radiation are mounted in portable sections. Sections are set on both sides of the active part at the distance, which is not closer than 300 mm. At a distance of 300 mm from the lamps to the irradiated surface, the energy density of one lamp is 0.3 W / $cm^2$, and for the group of lamps located in the chess order - 0.4 W / $cm^2$. Thus, for the irradiation of the surface of 1 $m^2$ of the portable section of the lamps, a power of 4 kW is required. Techno-economic data of the drying of active parts of power transformers of various power are given in Table 1.

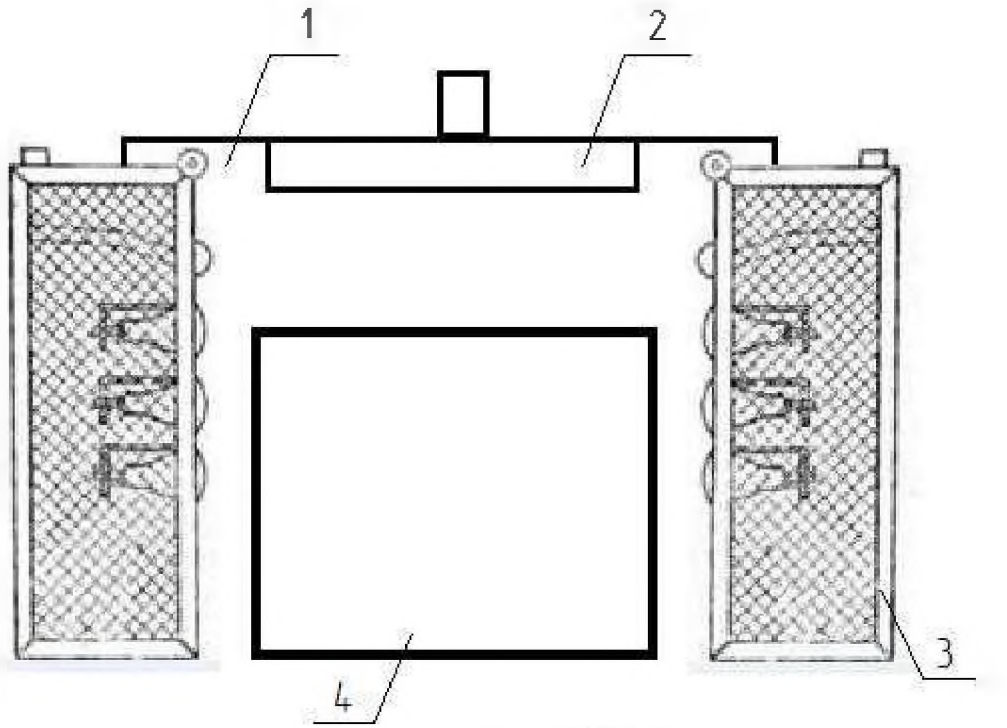


*Fig. 1 Section for portable heater with infrared lamps. 1 - camera; 2 - the ventilation air receiver; 3 - thermal insulation wall; 4 - transformer.*

In addition, as the studies have shown, during this method of drying the flow of energy and time are less, due to the fact that the movement of moisture comes from the inner layers of insulation to the external, as it is heated by infrared rays, in the first place metal wire, and from it - paper isolation.

Table 1 – Techno-economic data on the drying of active parts of transformers of different capacities.

| Power of the transformer | Distance from the lamp to the active part, mm | Number of lamps with power 250 W | Total capacity of installation, W | Approximate drying time, h |
|---|---|---|---|---|
| 100 | 350 | 24 | 6000 | 18 |
| 180 | 320 | 30 | 7500 | 20 |
| 320 | 320 | 42 | 10500 | 22 |
| 560 | 320 | 50 | 12500 | 28 |

**Conclusion.** The method of infrared radiation provides in comparison with other methods a qualitative drying of windings of a transformer and does not require additional equipment and high energy costs.

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