MEASUREMENT LEAKAGE CURRENT IN NETWORKS 0,38KV IN LIVESTOCK BUILDINGS

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The purpose of research - to investigate the amount of current leakage for each of the types of equipment: lighting, electro and electric motors. Construct a histogram and verify the distribution of experimental data to the normal distribution of random variables.

Materials and methods of research. After analyzing the scientific literature [1, 2, 3], we can construct the following scheme causes of leakage current in networks with a voltage of 0.38 kV for buildings for agricultural purposes (Fig. 1).

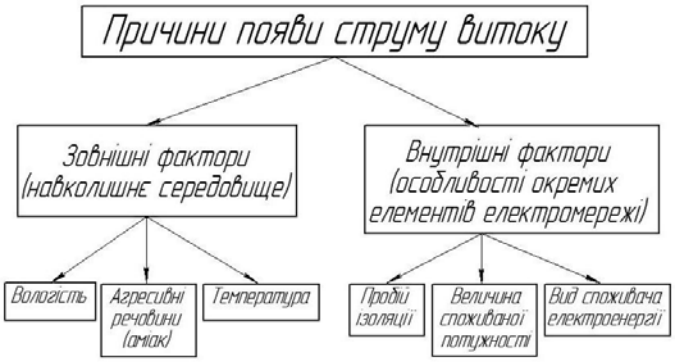

Fig. 1. Causes of leakage current

Gathering information about the distribution of leakage current in the wiring associated with significant costs. Therefore, the task was to obtain the necessary information at minimal cost by experimental design and use of mathematical statistics at processing data. The main here is to determine the minimally required number of measurements studied parameters and statistical testing hypotheses about the distribution law of a random variable.

In conducting the pilot study used a special test equipment - Multifunctional pincers UNI-T UT201, which allow you to record the current 0,001 A and multimeter V & A VA18B, which can be connected to a laptop or PC via USB and thus capture the data and transformer current used to record the differential leakage current to ground. Figure 2 shows their appearance.

Fig.2 Appearance measuring devices

Based on the results it is necessary to study the individual network elements, such as manufacturing equipment, lighting, electro and electric motors. Leakage current measurement circuit is shown in Figure 3.

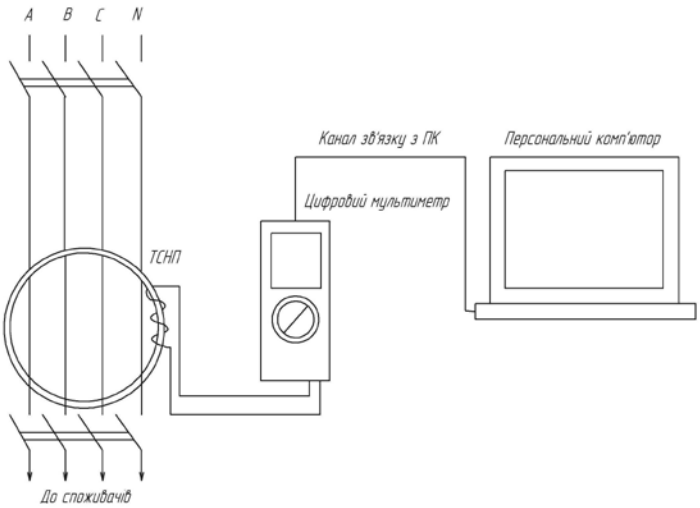

Fig. 3. Scheme leakage current measurement

Mode process equipment as follows:

1) 7.30 - 10.20 held milking cows. There are two main consumer of electric compressors. The first engine is switched at lower pressure in the receiver below the permissible. Switching interval 4 - 7 min., The second engine is running almost all the time.

2) from 9.00 - 10.30 cleaned manure into force the installation of three electric leads. One of them changes its direction of rotation every 7 - 8 minutes.

3) milk cooling is carried out round the clock. In effect cooling compressor motor leads. Periods of switching on and off of the motor depends on the amount of milk set temperature and the temperature in the room.

Power consumers in the barn, milk cooler - 0,4 kW; Compressor (first motor) - 2.2 kW; compressor (second motor) - 3 kW; inclined conveyor - 3 kW; cross conveyor - 1,5 kW; longitudinal conveyor - 4 kW; boiler - 0,35 kW; water heater - 5 kW; fluorescent lamps (36 W) - 58 pcs., total capacity of 2.1 kW; incandescent (75W) - 12 pcs., total capacity of 0.9 kW.

Results. The experimental measurement results for each load in the form of histograms shown in Fig. 4, Fig. 5 and Figure 6.

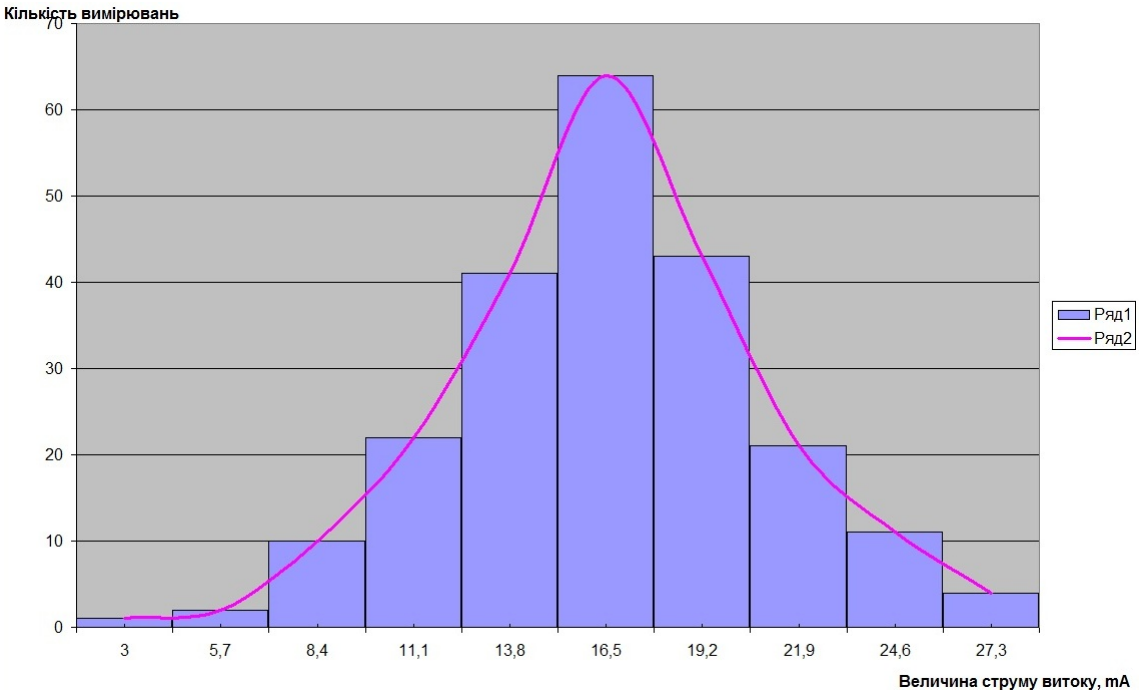

Figure 4. Histograms leakage current motor

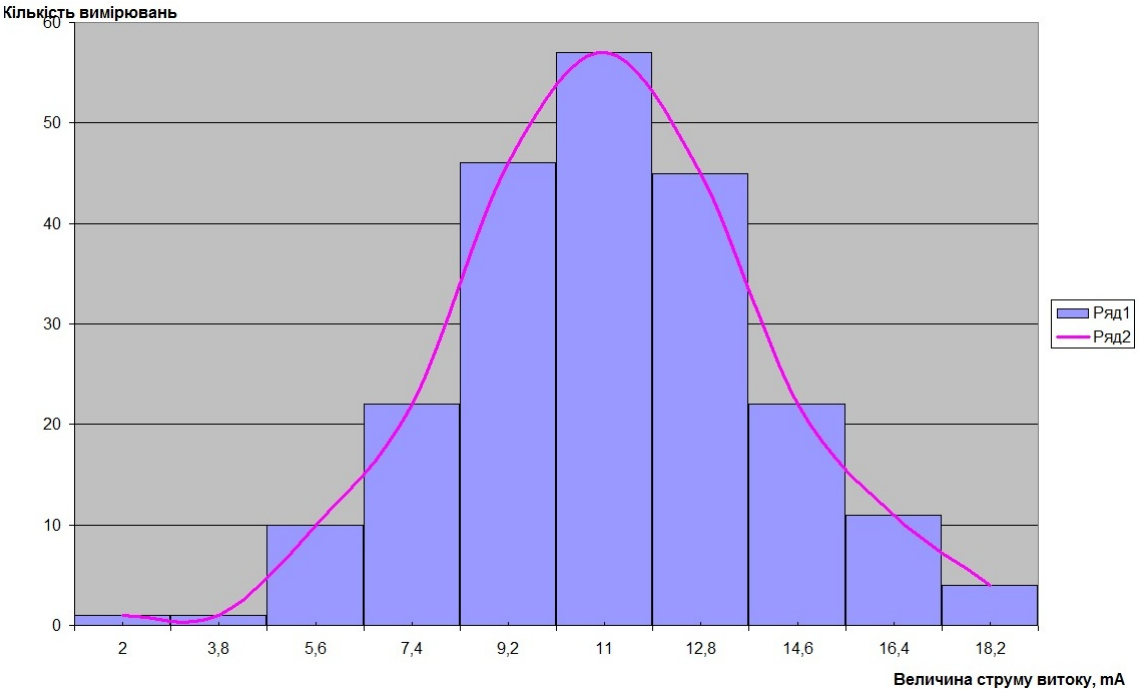

Figure 5. Histograms leakage current water heater

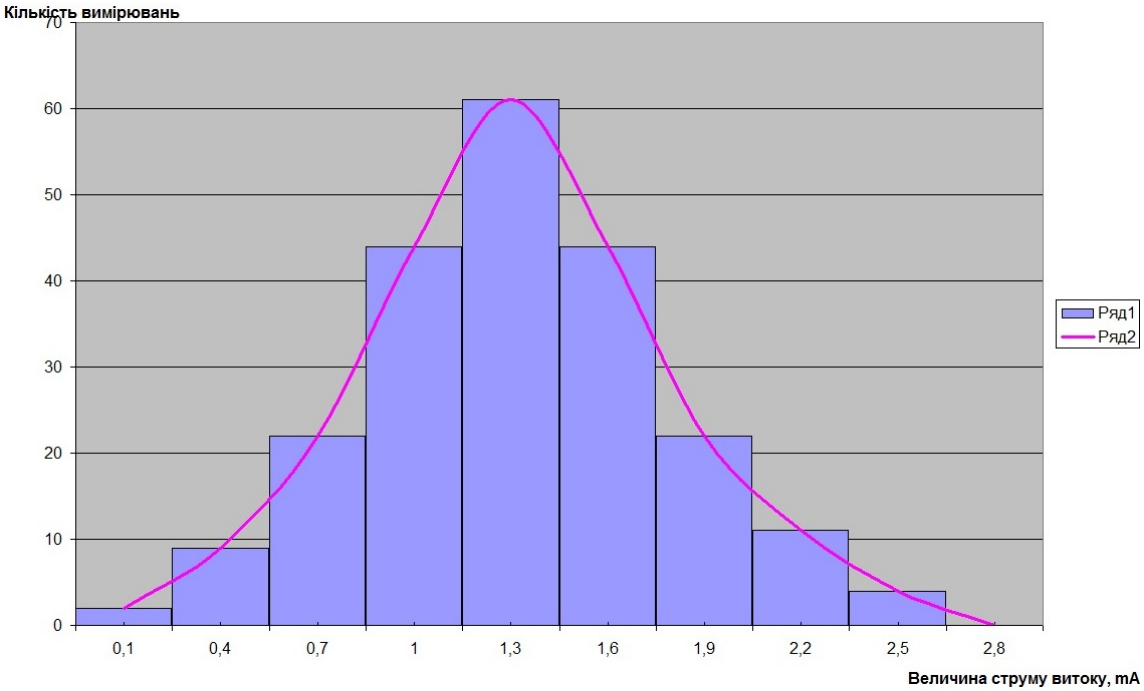

Figure 6. Histograms leakage current lighting system

In the analysis of experimental data using bar graphs, allowing you to visually compare the graphics of theoretical and empirical distribution of the random variable.

Assessment of normal distribution leakage current when using the histogram graph lets you visually compare with the image of a random variable curve normally distributed.

Conclusion

After analyzing the data histogram can be argued that the leakage current distribution is close to normal distribution of random variables, which allows you to use parametric statistical methods for constructing empirical relationships.

The data histogram shows that most so-called "background" there is leakage current in motors. Its value is approximately 30 mA.