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EXPERIMENTAL STUDY OF ELECTROMAGNETIC ACTUATORS WITH NEW COMPOSITE'S CONTACT MATERIALS

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Shows the task, a program for a comprehensive study of electromagnetic starters with new composite materials and contact methods are experimental studies for improving the efficiency and operational reliability of electrical electromagnetic starters farm.

The electromagnetic starter, experimental study, contact material, the reliability index, contact pressure, transition resistance, electric wear. Resistance welding.

During operation in electromagnetic starter switching devices and other elements of design processes irreversible changes in physico-chemical, physical, mechanical and dielectric properties of insulating materials, contact fatigue fracture and wear of construction materials, which ultimately lead to rejection of electromagnetic starters.

Actual safety switching devices operated in livestock production areas (particularly indicators such as reliability and durability uptime probability P (t), lifetime $T_{слγ}$) does not correspond to a given normalized parameters.

The purpose of research - development of measures whose implementation will improve the efficiency and operational reliability of electromagnetic starters with composite materials contact with heterogeneous structure based on copper for electrical farm.

To achieve this goal it is necessary to solve the following problem:

- analyze specific operating conditions in electrical starters livestock and environmental factors, the causes of failures (especially switching devices) and their basic operational reliability;

- to analyze existing contact materials used in electromagnetic actuators, determine possible ways of saving money and conduct laboratory tests on climatic corrosion resistance alternative contact materials based on copper;

- create a mathematical model predicting transition resistance and electrical Rper wear contact details starters depending on environmental factors and the number of switching cycles;

- calculate the depth of penetration, the value of electrical erosion and life of contacts based on improved mathematical model of thermal processes in electromagnetic switching devices starters.

To solve the above problems need to conduct complex investigations, milestones, which are listed in the table. Experimental studies starters actually start from step №2.

Materials and methods research. *The study of physical and mechanical properties of contact materials and performance tests starters*.

The density of the contact material is determined by hydrostatic weighing samples in distilled water [1, 8]. By the end results taken the average of at least five weights with an error does not exceed 3%.

Weighing scales held contacts that provide precision weighing not less than 10^{-4} g Repeated weighing of at least three times and the final result is taken arithmetic average.

Hardness (Microhardness) phase components of composite sintered material, called the apparent hardness, Vickers is determined by using the device PMT-3. Research conducted on three samples of each type of material. Each sample is carried out at least five measurements [6].

Determination of surface roughness contact details by using profilohrafa-profilometer, model 201 (vertical error increase - 5%). This is recorded as a parameter Ra (mean deviation from the midline microscopic profile) and implemented by recording a larger scale asperities on the surface of the electrothermal paper.

Thermal material testing conducted according to [13, 14] and tested for excess temperature switching device and other parts of the starters on the ambient temperature - directly to the actuators passing through all the live pole nominal AC in continuous mode [2, 3].

The average bulk temperature of contact details is determined by a thermocouple with a diameter electrodes (1,0±0,1) mm [9]. Measurement of thermo-emf performed using a multimeter or voltmeter DC. Tests carried out at ambient temperature + (20 ± 5)

°C that can not enter amendments impact on ambient temperature to give the excess temperature switching device. Confidence limits basic error of measurement of the temperature is less than ±1% confidence level at P = 0.95 [15].

Measurement of electrical resistance of samples held by the voltmeter-ammeter direct current using a DC voltmeter. Error of measurement - less than 0.5% [3, 12].

The failure and move contacts starters controlled via riser SIII (GOST 10197-70) by the standard method using electrical indicator.

The contact pressure contact patterns and contact details starter checked in turned position using a dynamometer with 0,245N point value [3].

Reliability is measured by the nature of contact transition resistance changes.

Transition resistance experimental contact pairs is determined by the voltmeter-ammeter [10] using universal voltmeter V7-35 and ammeter with mirror scale Э514 accuracy of 0.5 (GOST 8711-78). Transition resistance measurements made before and after each series of switching cycles at rated current flow. For each pair of 10 measurements made after each recession voltage switching with time delay in the closed state 10 seconds. For starter voltage drop is determined on each pole main circuit.

The test samples contact materials and contacts for electric starters erosion is performed at a frequency 2400-600-off switch on cycles per hour, corresponding technical documentation contact materials [11]. Samples Contacts and still and moving contact details before and after each series switching weighed in the balance with an accuracy of 10.4 g Repeated weighing not less than three times.

Resistance welding contact materials is determined by a special installation by the standard method. The essence of the method is that the switching device when it is switched naytypovym simulated welding contacts - but the short pulse welding current at ionization arc during switching circuit and disconnection of contacts

The device consists of research combined welding power sources, switching devices and explosive machines RMU-2, which determines the amount of effort in the gap between 1 and 1000 Nm of error of 3%.

Check the electrical properties of the actuator is performed at the operational production testing by measuring electrical insulation resistance ohmmeter DC voltage of

500V at F4108-1 with an error ±10% [3]. Samples are taken at the beginning of the study and during the trial.

Test making and breaking capacity starters with new contact materials are held on a laboratory setup mode switching exceptional. Electrical endurance test conducted at nominal current application category AC-3 (normal mode switching).

Conclusions

1. Developed objectives for improving the efficiency and operational reliability of electromagnetic starters with composite materials contact with heterogeneous structure.

2. The stages a comprehensive study of electromagnetic starters, where serial sriblomistki contact details, replace with new composite contact materials based on copper.

3. Based on the regulations developed a method that provides a comprehensive experimental study of electromagnetic starters when replacing contact materials.

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Given task , a program for the integrated study of electromagnetic starters with new composite materials and methods are given for experimental research to improve the efficiency and operational reliability of electromagnetic starters agricultural installations.

Electromagnetic starter, experimental research, contact material, the reliability index, contact pressure, the contact resistance, the electric wear, resistance to welding.