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INVESTIGATION OF ELECTROMAGNETIC CURRENT TRANSFORMER PERFORMANCE CHARACTERISTICS FOR MEASURING AND CONTROLLING THE REACTIVE POWER DISSIPATION OF A SHORT-CIRCUITED ROTOR SYNCHRONOUS MOTOR

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Abstract:

Objective. We know that we have been using asynchronous motors, which are widely used in the industry and production of the world and in our country, and despite a number of advantages of this type of motor, there are also enough disadvantages. In order to eliminate these shortcomings, the aim of the article is to reduce the rapid burning of the asynchronous motor by adding an additional sensitive element to the stator slot of the asynchronous motor. and in order to prevent premature failure, the recommended method is effective enough to increase energy consumption and service life. It is known that the main reasons for the failure of the motor are the asymmetry of the electrical parameters in the motor, the increase in temperature and the reduction of energy consumption. In order to prevent the negative consequences of the motor, current transformers serve to further increase the efficiency of the device and to detect and protect the motor's bad condition in advance.

Results. The values based on the results obtained by the voltage signal from the stator of the asynchronous motor were calculated, and the results were compared with the previous scientific works of our Republic and international scientists, studied by the authors and presented in the review of the literature.

Conclusion. Today, there are various methods of controlling and controlling electric motors. The method we recommended and tested in practice is the most modern, high-precision, fast and compact, and gives positive results in controlling and controlling motors used in the industrial production and national economy of our country.

Keywords: Magnetic driving force, voltage, current, output voltage, contact, circuit, converter, asymmetry

Introduction. Today, the demand for electricity is day-to-day energy production, which means the production of renewable energy sources, construction modernization and the provision of quality and uninterrupted electricity generation. is required. part is one of the most issues.

It is seen that the power of our republic in this country, which has industrial production and production capacity, is produced by renewable energy sources. We know that power transformers and induction motors consume electricity. Based on induction motors, it is important to control the main power consumption. To do this, the reactive power of the aschron motor is controlled, the reactive energy path, safety and control, the production and control of various current converters, a series of devices and production of re-power and counting signals, such as current transformers, magnetic - galvanic converters, thermocouples, pyrometers, hall sensors, analyzers, contact and non-contact current converters, etc.

Analyzes of current constructors and sensors were performed and results were obtained.

1. Communication converters - due to their relatively large mass and power consumption and past operational reliability, compared to the absence of power to power sources, they are used as current converters for asynchronous motor reactive power and control systems. This creates a number of dangers and inconveniences.

2. Magneto-galvanic converters - the power consumption of our main consumer asynchronous motor cannot be fully operated.

3. Electromechanical measuring sensors - the errors are high power consumption and uneven shape, the current transformer is connected in series to the consumer, there is a common size.

4. The output current values of current transformers are 1 A and 5 A. Current transformers have three main parts - the primary winding, the magnetic circuit and the secondary winding. They are signal conversion, and file errors are checked for accuracy based on the direct origin of the recording.

Method. The main part. Based on the above analysis, we propose a current-to-voltage converter to monitor and control the active and reactive power consumption of asynchronous motors, which are the main consumers of renewable energy sources, and is shown in Figure 1.

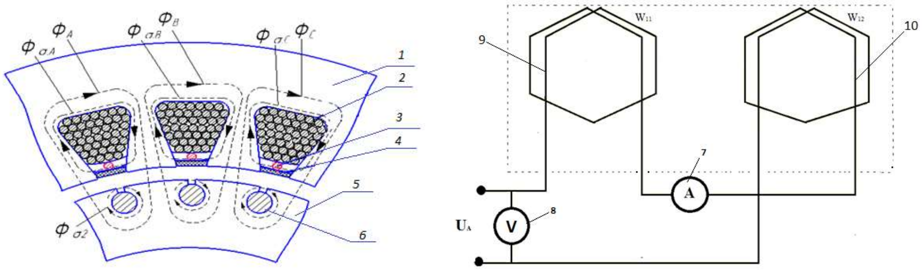

Figure 1

In the figure, we have placed a sensor element between the stator blades of an asynchronous motor that consumes alternating current, and we have given a diagram of its internal view and a schematic view of the sensor element. 1 - fixed part - stator, 2 - stator windings, 3 - measuring sensitive element, 4 - insulating wedge, 5 - rotating part of the rotor, 6 - rotor windings, 7 - ammeter, 8 - voltmeter, 9-10 - sensitive element .

As can be seen from this figure, the primary current IA of one phase of the stator winding of an asynchronous motor is converted into the secondary voltage Ua in the measuring circuit W1, which consists of two independent circuits W11 and W12, and transmits the received signal. controller, to the controller We transfer the information and allow the controller to process the data. When the asynchronous motor is connected to the network, the output voltage Ua is determined by the voltage of one independent measuring circuit W11 as follows:

$$U_{a\Sigma} = U_a = U_1 = \left(4{,}44 \cdot f \cdot W_{c1} \cdot \frac{I_A}{R_\mu}\right) W_{11}$$

Here f is a set of frequencies.

W_{A1} - the number of turns of the stator windings of phase A of the asynchronous motor

W_{11}-W_{22} -induction motor measuring tapes.

W_{22} - as a result of the current passing through the coil, the main F1 and stray magnetic fluxes Fc1 are formed.

$$\Phi_1 = \frac{1}{4.44 f W_{11}} U_1$$

$$\Phi_{\sigma 1} = \frac{L_{\sigma 1.8} I_1}{W_{11}}$$

The main and shunt magnetic fluxes cross the gauge lobes, creating an EMF in the coil, and we can look at its formula to find E1.

$$E_1 = \sqrt{2}\pi f w_{11} \frac{1}{\sqrt{2}\pi f w_1} (I_1 - Z_1 I_1) = \frac{U_1 - Z_1 I_1}{k_w}$$

In the figure below, we can see the situation where we obtained the output signal of our sensing element when changing the loads on phases 1 and 3 of our 250 kVA asynchronous motor under modern laboratory conditions.

Figure 2

In the picture, we can see the laboratory stand and measuring equipment of a consumer asynchronous motor device from an alternative energy store.

In our experimental current transformer, the primary current changes and the current control of the induction motor are generated by the magnetic flux of the stator coils based on the magnetic flux, two independent sense coil loops control the stray magnetic flux between the phases through the controller. contacts. They are connected separately, and as a result, below we can see the static characteristic of the output voltage of the measuring sensitive loops.

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Results. We can see the theoretical form of the static description of the output currents and the output signal of the induction motor obtained in the experiment.

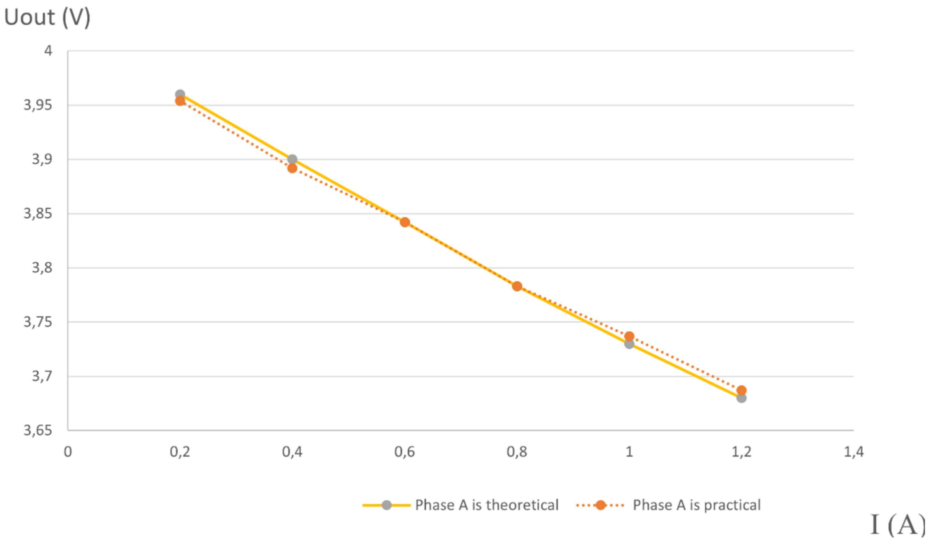

Figure 3.1

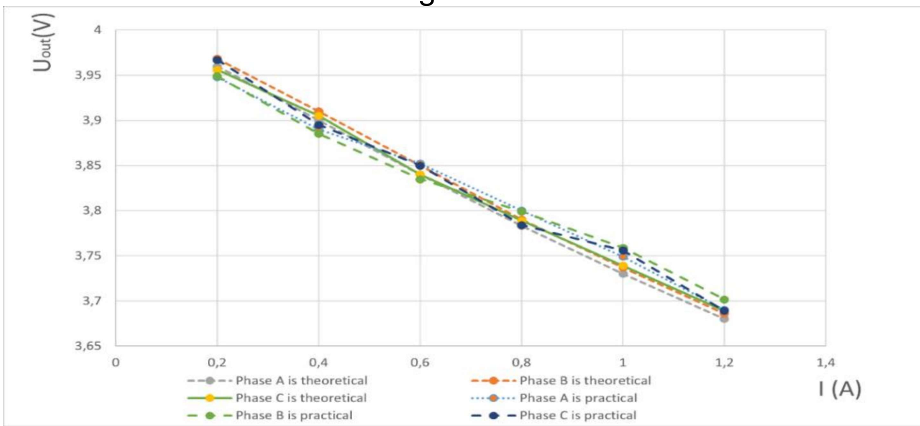

Figure 3.2

3.1,3.2- The figure shows the static characteristic of the output voltage in one phase and three phases of the current transformer placed between the stator wedges and the insulating wedge of the asynchronous motor, the output characteristic is close to a straight line.

$$\Delta U_{A\ out} = \frac{U_{pract} - U_{theor.}}{U_{pract}} = \frac{3{,}85 - 3{,}84}{3{,}85} 100\% = 0{,}2\%$$

Below we can see the theoretical values and practical results of the appearance of the output signals obtained in the caysilab program for the static description of the induction motor.

$$\Delta U_{nosim\ katt} = \frac{\Delta U_{Achiq} + \Delta U_{Bchiq} + \Delta U_{Cchiq}}{U_{amaliy}} = \frac{0{,}2 + 0{,}5 + 0{,}04}{3} 100\% = 0{,}7\%$$

Discussions. From the obtained results, it can be seen that the recommended current converter is better than the previous ones due to its higher accuracy class, reliability, compact form, and full and fast delivery of information.

Conclusion. The power losses of currently used motors are increased during overloading or after overhaul. Taking into account that certain asynchronous motors are the most common motors, their control and management are urgent problems, and the proposed method is effective, and our current The static characteristic of our transformer is linear, so we recommend it for its simplicity, precision, compactness and other characteristics, and it is suitable for the environment of our country.

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EVALUATION AND DEVELOPMENT OF DIAGNOSTICS OF THE CRANKSHAFT OF DIESEL LOCOMOTIVES

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Abtract. A significant increase in the efficiency of the equipment used is achieved through the introduction of modern methods and means of technical diagnostics. Technical diagnostics makes it

CONTENTS

PRIMARY PROCESSING OF COTTON, TEXTILE AND LIGHT INDUSTRY

GROWING, STORAGE, PROCESSING AND AGRICULTURAL PRODUCTS AND FOOD TECHNOLOGIES