UDK 62

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IMPROVING PRODUCT QUALITY BY REDUCING THE ENERGY CONSUMPTION OF ELECTRIC DRIVES IN THE SILK INDUSTRY

Annotation: there is an opportunity to apply energy-saving processes and analyze them using models of electric drives used in the silk industry. The development of the silk industry will be achieved through the use of new self-monitoring technologies. This, in turn, requires the production of quality products using energy-efficient methods. It is known that the machines used in the silk industry consume most of the electricity in electric drives, so it is important to control and monitor them in energy-saving modes.

Keywords: silk fibroin; energy-saving; electric drive; weaving looms;

Introduction

The constant monitoring of the energy standards of the silk industry is reflected in its energy consumption, which is related to the consumption of electric drives used in industry. The use of electronic devices in electric drives controls the quality of silk and the process in it. [1,2].

The brush machine used to scrape the cocoons allows to reduce the waste rate by requiring constant quality. Increases work efficiency using Mechanical and Automatic method depending on the application situation. [3]. Based on these methods, it was found that it is possible to control the machines and regulate energy consumption in the silk industry using the analysis of the literature and new modern methods. At the same time, we witness the latest revolutionary form of intelligent textile (electronic textile) production, which involves the integration of the required electrical conductivity properties of electronic devices [4] with softness, biological flexibility, biological

decomposition and cost-effective production. has been shown to be possible [5]. With the help of mathematical modeling of electric drives of existing machines, it is possible to monitor the daily, monthly and annual energy consumption of the enterprise and achieve a reduction of the human factor through constant monitoring.

With the results of the analysis, the continuous development in the modernized smart textile industry requires the integration of devices such as antennas, information processors, light sources and sensors, which require a high degree of autonomy. The presence of energy sources is considered to be the main force directed to the production of assembly and adjustment of intelligent electric drives, which must be combined with these devices under conditions of stability under the influence of various mechanical actions (bending and stretching) and washing procedures. [8,9]. In the process of analyzing the machines we need to look at, we can see that they are obsolete due to energy consumption and lack of control, which affects the economic aspect of the enterprise. It is known that the use of automatic control methods of the central cocoon cleaning machine (Figure 1) and the organization of their equipment on the basis of new technologies can save up to 8-10% of energy.

The energy consumed in preventing the cocoon from breaking and twisting it can be tracked using a matlab program. Analysis of the asynchronous motor installed in the central cocoon cleaning machine without changing the constant values allows to monitor the energy consumption. The energy consumed in the process is not always consistent with the energy consumed, ie the cost of energy and the cost of manual labor must be constantly monitored to make the silk product from 1 kg of cocoon look silky.

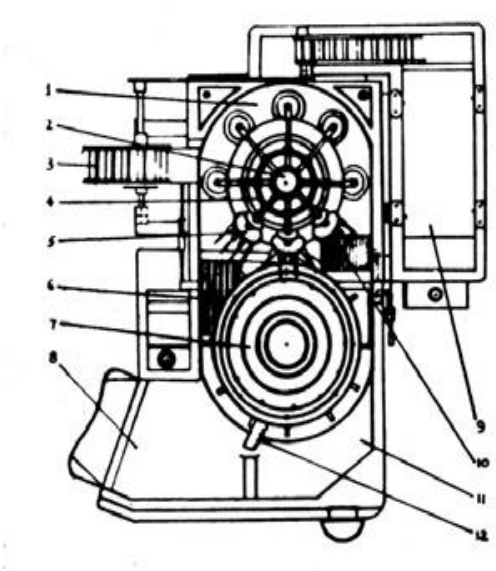


Fig 1. Model analysis of an induction motor mounted on a central cocoon cleaning machine

A view of the model created in the Matlab program. Manifestation of energy consumption characteristics of an induction motor

In the analysis of the existing asynchronous motor in the enterprise, the source of supply of motor parameters is shown in Figure 2. Based on this, it is possible to analyze on the basis of certain parts. As we know, asynchronous motors differ from other types of motors by their speed and energy consumption, which is expressed as follows:

If Tm is positive, the machine acts as an engine.

If Tm is negative, the machine acts as a generator.

In the silk industry, the speed of an asynchronous motor is important when winding a cocoon, so the speed of a motor rotor can be expressed mathematically.

The input voltage (abc reference system) determines the dq matching system and the matching system used to convert the output currents (dq matching system) to the abc reference system. We can choose to change the following compatible system:

Rotor;

Clark or ab transformation;

Synchronous;

We can see its condition expression using the following expression.

$$\begin{bmatrix} V_{qs} \\ V_{ds} \end{bmatrix} = \frac{1}{3} \begin{bmatrix} 2\cos\theta & \cos\theta + \sqrt{3}\sin\theta \\ 2\sin\theta & \sin\theta - \sqrt{3}\cos\theta \end{bmatrix} \begin{bmatrix} V_{abs} \\ V_{bcs} \end{bmatrix}$$

$$\begin{bmatrix} V'_{qr} \\ V'_{dr} \end{bmatrix} = \frac{1}{3} \begin{bmatrix} 2\cos\beta & \cos\beta + \sqrt{3}\sin\beta \\ 2\sin\beta & \sin\beta - \sqrt{3}\cos\beta \end{bmatrix} \begin{bmatrix} V'_{abr} \\ V'_{bcr} \end{bmatrix}.$$

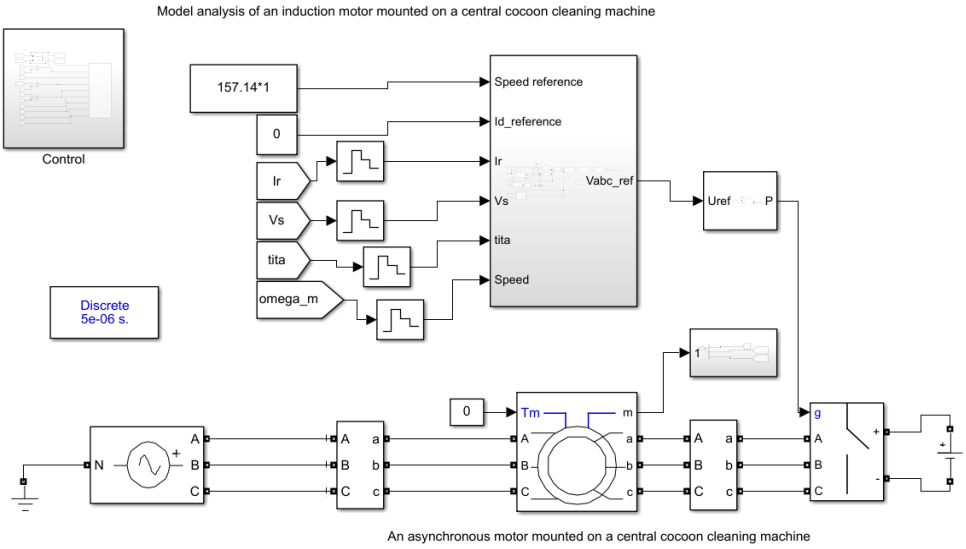


Fig 2. Control of an asynchronous motor available in a silk factory

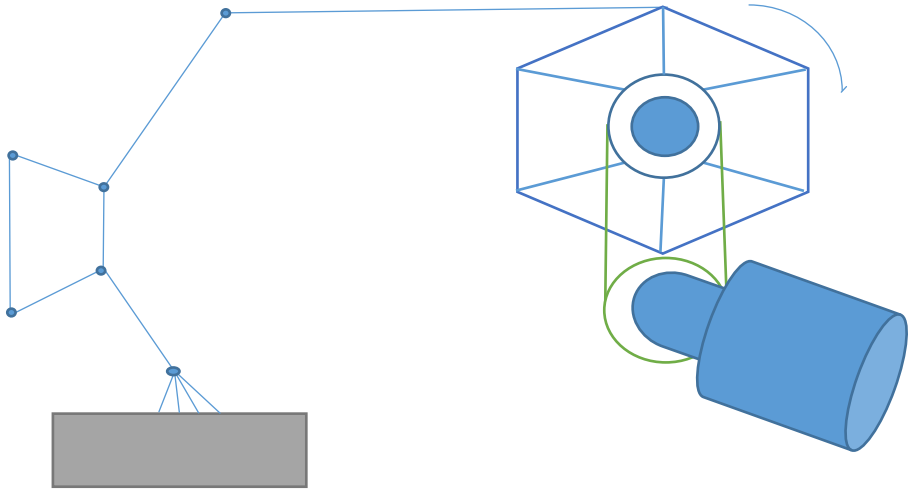


Fig 3. Schematic diagram of a machine with twisted threads

The following sequence of control system automation is proposed according to such an approach to energy efficiency assessment of the silk industry.

Initially, accounting and management methods, corporate standards for the interconnection of modules, and then, immediately - modules for the automation of high-level management. In the first stages of the work it will be possible to enter the generalized analytical data into the system, as well as to obtain from the old automation programs running in the enterprise.

In the next stages of development of the corporate information system, the sections that create the primary documents will be automated. For example, measuring energy parameters, calculating energy balance items, calculating energy saving potential, and so on. These modules connect to the corporate information system through data interfaces, which prevents accidental errors during manual data entry.

The compilation of energy characteristics of devices and aggregates involves the analysis of many energy balances under changing production conditions. Since the calculation of energy balances is usually complex and time consuming, the compilation of normative energy descriptions will need to be carried out in computer programs.

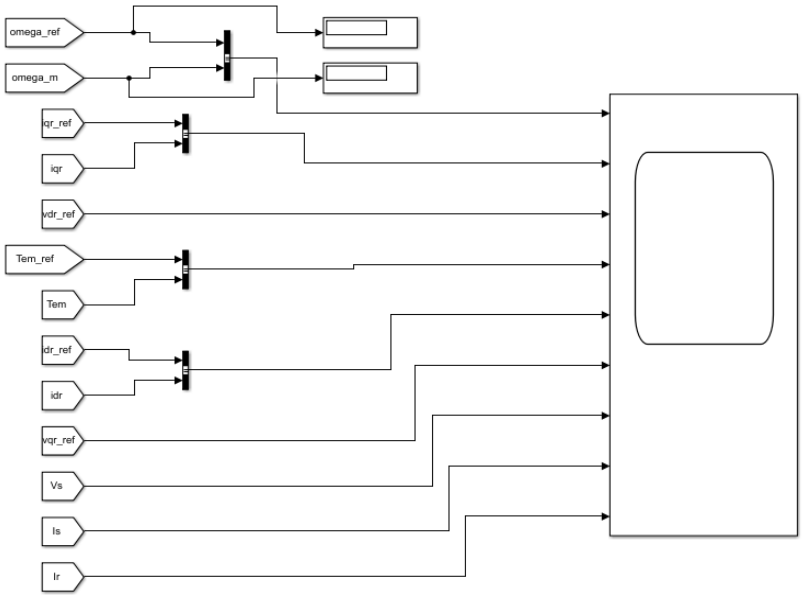
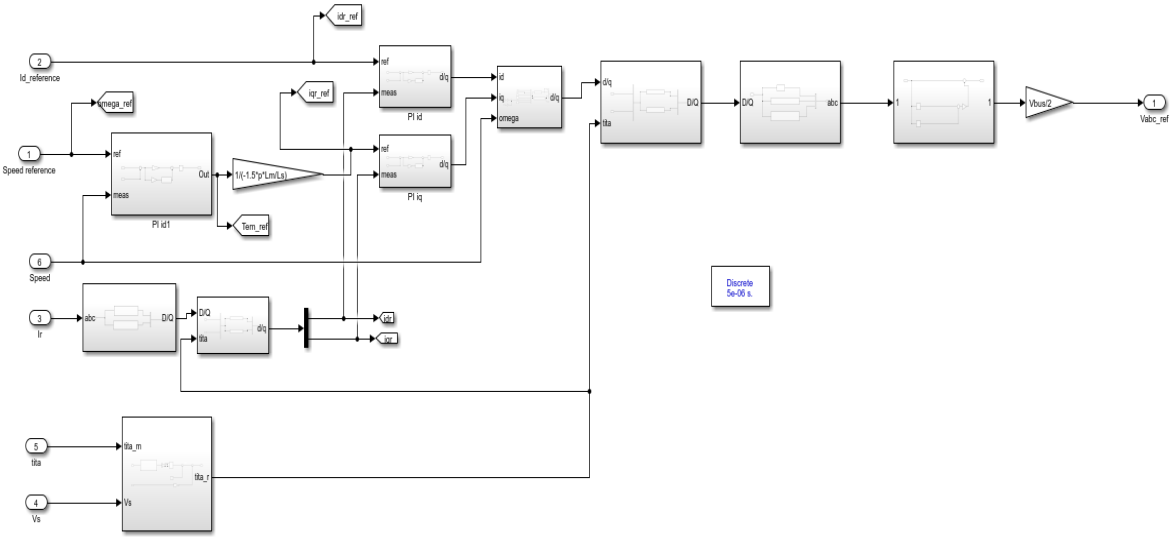
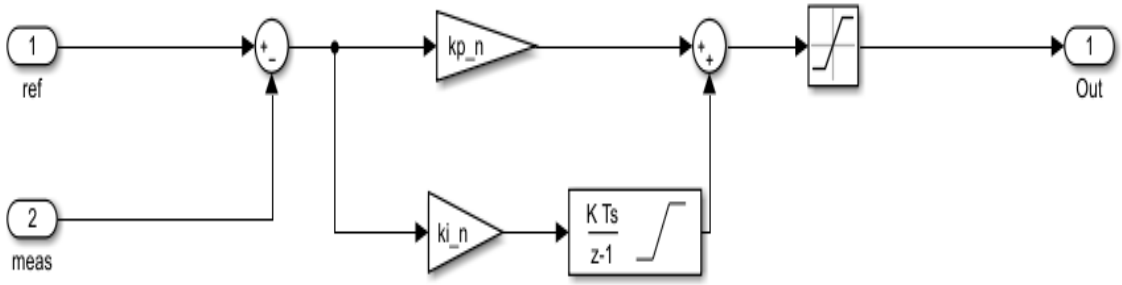


Fig 4. Part of obtaining various energy characteristics using a structured mathematical model

According to the mathematical model, we can analyze the energy consumption and the load characteristics of the induction motor. Based on this, the values obtained from them show an accuracy of up to 3%. Certain sizes vary depending on the size of the business.





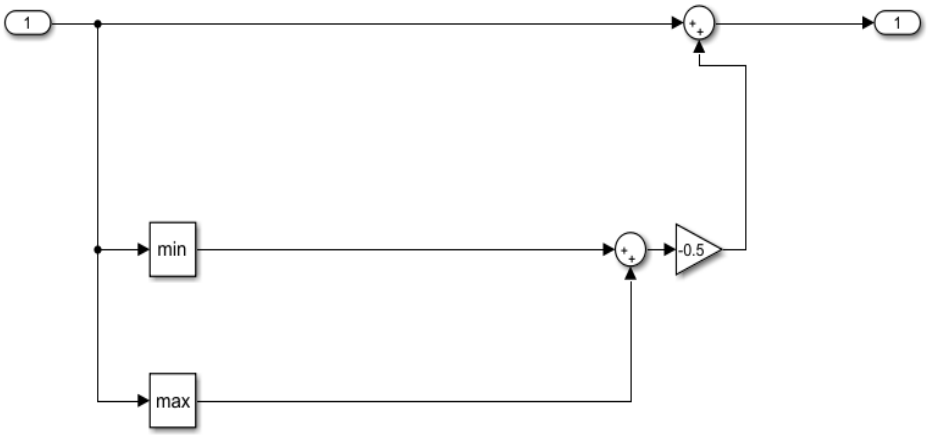


Fig 5. Interior of the model

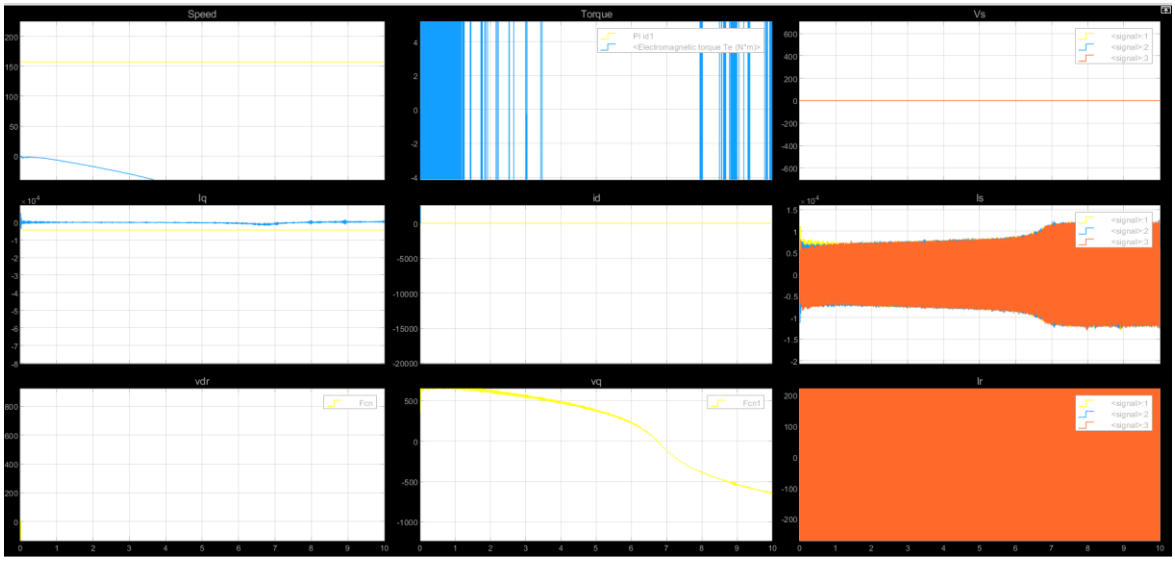


Fig 6. Characteristics obtained using the model

The analysis of the scientific and technical literature devoted to the study of the operating modes of energy-intensive technological equipment showed that at present the issues of the complex effect of the speed modes of the working bodies on productivity, quality indicators of fibrous products, rational consumption of raw materials and energy resources have not been sufficiently studied.

The problem of increasing the efficiency of energy saving by controlling the high-speed modes of the electromechanical system with transporting and winding mechanisms has been posed and solved.

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