CAUSES OF FAILURE OF ELECTRICAL DRIVES AND THEIR CONSEQUENCES

Sultonov Ruzimatjon Anvarjon ugli
Fergana Polytechnic Institute
"Electrical engineering, electrical mechanics and electrical technologies"
department associate professor, (PhD)
E-mail: ruzimatjonsultonov@gmail.com

ABSTRACT

The scientific significance of the research results is based on theoretical researches in the field of energy resources use, the regulation of the work processes of textile enterprise machines, modern automatic control theory methods and economical operation modes specific to electric machines, mathematical modeling through artificial neural networks, determining the energy consumption of electric machines, increasing the energy efficiency of the control system. It is explained by the research of the model and the method of increasing the new reliability.

Keywords: weaving machine, neural network, electric motors, reliability, textile machine, methodology, differential and algebraic equations.

INTRODUCTION

Reliability of electrical wiring is determined during the system design process and is implemented in the operational state.

In industrial enterprises, many electric vehicles work under normal conditions, have optimal load and are serviced on time by highly qualified technicians [1]. However, the fact that the electrical system is in a closed state in textile enterprises, the accumulation of dust, heating and erosion of insulation causes a lot of electrical and mechanical failures.

Many electric motors of weaving machines are prone to failure due to operating in conditions different from normal. Usually, they are often installed in long-term operation mode, heavy load, asymmetrical network voltage and in places that do not match the scope of demand. Taking into account the specific characteristics of the operation of electric motors in textile enterprises, the average service life of electric motors in various technological processes is presented in Table 1.1.

Extending the service life of electric motors in various technological processes of weaving machines shows that the specific factors of electrical equipment installation and working conditions significantly affect it. Therefore, it is always necessary to analyze the operational reliability of electrical equipment and take into account its variables [2].

Table 1.1

The average life of the electric motors available in the weaving machine

Technological process	Duration of work			
	Nominal mode		Load mode	
	Year	Hour	Year	Hour
Preparation of thread	2,6…2,7	23652	1,9…2,0	17520
Winding the thread	1,3…1,7	14892	0,8…1,1	9636
Fabric condition	2,1…2,2	19272	1,9…2,0	17520
Water supply	2,3…2,5	21900	1,6…2,0	17520
Ventilation	1,9…2,7	23652	1,0…1,6	14016

Three main prospective directions of energy saving in the textile enterprise are identified and their brief descriptions are given [3].

LITERATURE REVIEW

Using the experimental data of the one-cycle characteristic, the strength and time limitations of the weaving mechanisms on the yarns are determined.

Based on the model, the transfer function of the breaking threads was obtained (1.1):

$$W_{н}(p) = \frac{F(p)}{\varepsilon_k(p)} = \frac{80p^2 + p}{0.08p^2 + 0.009p + 4.167 \cdot 10^{-6}} \quad (1.1)$$

where F is the tension strength of the thread; e_k - deformation of threads when passing through the compensator; p is the differentiation operator.

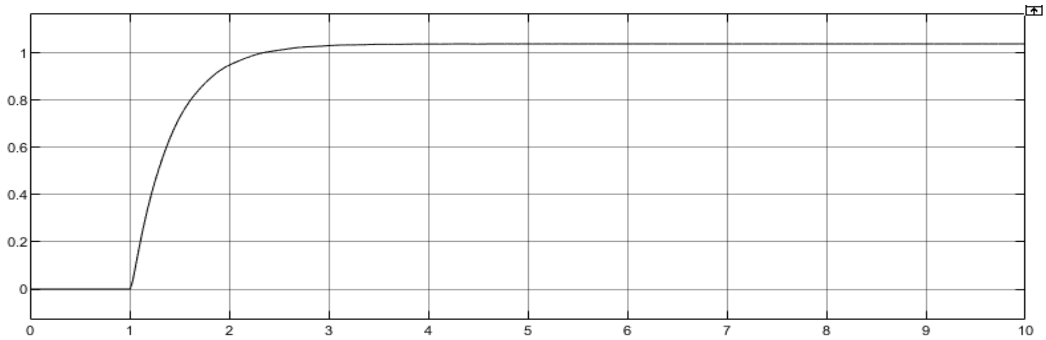

Figure 1.2. The characteristic of expressing the reliability index of the yarn winding
part of the textile machine

Figure 1.2 shows the structural scheme of the transfer function, based on the sequence of expressions, it can be seen that the breaking index of the thread depends on the speed of the electric current (Figure 1.3).

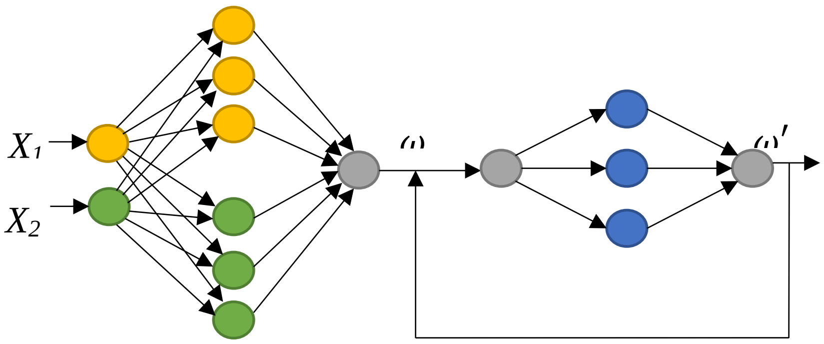

Figure 1.3. A neural network estimation model

The load factor of electric motors operating on the basis of the functional scheme of the weaving machine is also important in determining operational reliability. The load coefficient of electric motors Kz = 0.1...0.6 is 31%; 41% - Kz=0.6...0.8;

20%-Kz=0.8...1.0; 8% will have Kz=1.1. The causes of failure of electric motors can be conditionally divided into operational (50%), technological (35%), structural (15%) [3, 6]. According to the operation, operational failures are divided into failures due to emergency situations (70%) and failures due to insulation wear or aging (30%).

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