CALCULATING THE MECHANICAL CHARACTERISTICS OF AN INDUCTION MOTOR AND ADJUSTING THE SPEED

Mirzayev Uchqun, Istamov Og'abek
Senior Lecturer, student. Jizzakh polytechnic institute
Uzbekistan, Jizzakh city
E-mail: uchqun8822@gmail.com

ABSTRACT

This paper analyzes data on methods for calculating the mechanical characteristics of asynchronous machines.

Keywords: induction motor; starting current; stator winding

Introduction

Basic requirements when starting an induction motor. Starting the engine should be as easy as possible and without accessories, the starting torque should be large enough and the starting current should be as small as possible.

The following methods are used in practice when starting three-phase asynchronous motors. Connect the stator windings directly to the mains, supply a reduced voltage to the stator winding and start by connecting a rheostat to the rotor winding (the latter in phase rotor motors).

The following methods are used in practice when starting three-phase asynchronous motors. Connect the stator windings directly to the mains, supply a reduced voltage to the stator winding and start by connecting a rheostat to the rotor winding (the latter in phase rotor motors).

Launch directly by connecting to the network. Small and medium power short-circuited rotor asynchronous motors are started in this way. In this case, the stator winding of the motor is connected to the mains with sufficient power by means of a magnetic starter or a simple connector, and its speed increases according to the natural mechanical characteristics.

Launch directly by connecting to the network. Small and medium power short-circuited rotor asynchronous motors are started in this way. In this case, the stator winding of the motor is connected to the mains with sufficient power by means of a magnetic starter or a simple connector, and its speed increases according to the natural mechanical characteristics.

Even if the starting current I is much larger , it will not be dangerous for the engine, because the start-up will take place in a short time.

current is 5-7 times greater than the rated current and the starting torque is not very large.

Materials and methods

Repair technology of asynchronous motors.

Operation and storage of the machine, the insulation of the package is gradually eroded as a result of heat, mechanical effects during vibration, centrifugal and electrodynamic forces, the effects of moisture and aggressive environments. An insignificant change in the structural and chemical composition of the insulation is called wear, and the process of deterioration of the insulation composition during wear is called deterioration.

In asynchronous motors , the stator often fails. This is the cause of 85-95% machine failure. The reason for the failure of the winding is the short circuit of the coil. Under the influence of vibration, the lacquer gradually begins to erode, the conductors in close proximity to each other erode the wet insulation, and the coils touching each other form a short-circuit contour.

The resistance of the short-circuited circuit is not large, so the current rises to a certain value and heats the coil, causing the insulation to darken. Often the exit points of the package fail. They are not usually tightened tightly and therefore bend and move frequently under the influence of vibration. The exit points insulation should be elastic enough.

three-phase asynchronous motor phase s dampers.

A three-phase asynchronous electric motor generates rated power at its rated shaft at a nominal rotational frequency only if all three of its coils are properly connected. When the windings of a three-phase motor are properly connected in the star mode, the beginning of all windings is connected to the mains S1, S2 and SZ, and the end S4, S5 and S6 to the common zero point. incorrect, for example, if the end is connected to the mains and the head to the zero point, the motor will not run normally.

Natural mechanical characteristics of an induction motor and static characteristics of a working machine. Asynchronous motors (AD) are devices that convert electrical energy into mechanical energy. It is widely used in all sectors of industry, agriculture and the national economy due to its simplicity of construction, low cost, reliability in operation. AD generators like any electric machine

in mode . Overall AD operation in generator mode

not economically and technically feasible, but in recent years
scientific research, as a generator of asynchronous machines
a number of advantages. At present, asynchronous machines are mainly used as three-phase motors.

Discussion

Asynchronous motors frequency frequency adjustment

Academician M. P. Kostenko was the first to establish the theory of frequency control. The theory of frequency control of asynchronous motors in Uzbekistan was developed by academician MZ Homudkhonov . The essence of the principle is to control the power $P_{em} = M_{em}$ • w and its components in speed control. Let us dwell on one of them: the law of voltage control must also be formed when the frequency is given. This principle is easy to implement , based on the ratio uw $_0$ = 2p f_1 / p , where: f_1 is the frequency of the supply source supplying the stator. Therefore, when changing the stator current frequency, the rotor rotation speed can be adjusted smoothly over a wide range. This method of speed adjustment is mainly characterized by sliding losses D $P = P_p S$. These wastes also vary over a large range of frequency variations. Reliable and economical static converters have now been developed to adjust the speed of AC motors.

Laws of optimal control of frequency converter-asynchronous motor (*C hO '- AD) systems.* The main output coordinate of a strong drive is the electromagnetic moment. In frequency control, its value depends on the frequency and voltage of the alternating current supplied to the stator. Therefore, the presence of two unrelated control channels allows for optimal control in the *ChO ' - AD system.* The existence of two unconnected control channels of this law allows for optimal control in the *ChO ' - AD system.* This law was created by M. P. Kostenko and is based on the following. Suppose that when adjusting the driving speed, the load capacity of the engine l $_m = M_k$ • M^{-1} $_{is}$ kept constant. In this case, the following approximate equation can be written without taking into account the active voltage drop in the stator winding:

$$\left(\frac{\Phi_1}{\Phi_2}\right)^2 = \frac{M_1}{M_2}; \qquad \frac{U_1}{U_2} » \frac{f_1\Phi_1}{f_2\Phi_2}.$$

From:

$$\frac{U_1}{U_{nom}} = \frac{f_1}{f_{nom}} - \sqrt{\frac{M_1}{M_{nom}}} \quad \text{yoki} \quad g = a\sqrt{m}$$

absolute or relative units represents a mathematical expression of the optimal law of frequency control when l $_m$ = const. by controlling the engine according to the expression , the power factor and the absolute slip of the drive can be maintained unchanged. His FIK, on the other hand, does not depend on a change in speed . This is where the optimality criterion of frequency control finds its expression.

When the loading moment does not change :

g = a or U / f = const.

When power P = const constant :

$$g = \sqrt{a}.$$

Often the load depends on the speed or m = a ^{n} . The equation looks like this:

$$\frac{U_1}{U_{nom}} = \left(\frac{f_1}{f_{nom}}\right)^{1+0,5n} \text{ yoki } g = a^{1+0,5n}$$

In particular, in the "fan" load g = a ^{2} .

The mechanical characteristics of the drive, which theoretically keep the engine overload constant at all given loads, are shown in the figure. As can be seen from the dotted lines in the graphs , calculating the voltage according to the formula does not maintain the motor overload (especially when there is a constant static resistance torque).

seen from the dotted lines in the graphs , calculating the voltage according to the formula does not maintain the motor overload (especially when there is a constant static resistance torque). The optimal law that compensates for the voltage drop in the stator at constant overload in frequency control is as follows :

$$\frac{|U_1 - I_1 Z_1|}{U_{nom}} = a\sqrt{m}$$

The mechanical characteristics calculated by this formula *are* shown by the continuous lines.

Conclusion

In addition to the optimal laws of frequency control, other laws also apply when the overload is constant (constant magnetic flux of the machine, low loss, etc.). In this case, the asynchronous drive has the following features.

1. The stator rotor currents and current (excluding waste in steel) remain constant. Therefore, when changing, the mechanical characteristics shift parallel to the vertical.

2. When operating at maximum current, the motor will have a greater stiffness and greater critical torque than the natural characteristic in the working part of the mechanical characteristic.

becomes overvalued , which leads to an increase in losses and the non-optimality of this control law at a changing moment. Generating a torque proportional to the product of the current in the rotor required to be driven at minimum waste, when the variable and constant losses associated with the excitation of the machine are equal is done. Such management ensures that the drive is FIC optimal and that losses are kept to a minimum .

Frequency converters often have a description of the current source rather than a description of the voltage sources . In such a system, the current consumed by the converter is determined only by the control signal and does not depend on the operating mode and parameters of the motor . In closed systems with frequency control, the speed adjustment range is expanded to 50: 1. Asynchronous drives operating on the principles of frequency-current and vector control have the ability to expand the speed adjustment range to 1000: 1.

References:

1. Malkiat Singh, Gurpreet Singh, Harmandeep Singh, Energy Audit: A Case Study To Reduce Lighting Cost, Asian Journal of Computer Science and Information Technology 2: 5 (2012) 119 – 122.

2. KongaraAjay, G. Sudhakar, K. Sasank, T .Guru Krishna, A Case Study on Energy Conservation & Audit for Household Applications, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, 3(4), April 2014.

3. Gousia Sultana, Harsha.H.U, Electrical Energy Audit a Case Study, IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE) e-ISSN: 2278-1676, pISSN: 2320-3331, 10(3) Ver. III (May – Jun. 2015), PP 01-06.

4. R M Holmukhe, K. D. Deshpande, Energy Audit in Industry -A case study of Centrifugal Pumps, I·COST Electronic &comll1unicmion proceedings 13·15 Jan2011.

5. Gui-Bing Hong, Chih-Ming Ma, Hua-Wei Chen, Kai-Jen Chuang, Chang-Tang Chang, Te-Li Su, Energy flow analysis in pulp and paper industry, Elsevier, G.- B. Hong et al. / Energy 36 (2011) 3063-3068.

6. P. N. Korovesis ; G. A. Vokas ; I. F. Gonos ; F. V. Topalis, IEEE Transactions on Power Delivery, 19(4)

7. Nissanga Nishad Rasanajan Mendis; Univ. of Moratuwa, Katubedda; Nisal Perera, Information and Automation, 2006. ICIA 2006. International Conference on15-17 Dec. 2006.

8. Mirzaev, Uchkun, Mathematical Description of Asynchronous Motors (April 15, 2020). International Journal of Academic and Applied Research (IJAAR), 2020, Available at SSRN: https://ssrn.com/abstract=3593185 or http://dx.doi.org/10.2139/ssrn.3593185

9. Mirzaev, Uchkun, Choice For Electric Power Unit Smoke Exhausts №1 Tolimarjon Thermal Electric Power Plant (April 30, 2020). International Journal of Engineering and Information Systems (IJEAIS), 2020, Available at SSRN: https://ssrn.com/abstract=3593125

10. Mirzayev Uchqun, Tulakov Jahongir. The Research of the V-I Characteristics of Solar Panel Using a Computerized Measuring Bench “EPH 2 Advanced Photovoltaics Trainer”. Automation, Control and Intelligent Systems. 2019; 7(3): 79-83. doi: 10.11648/j.acis.20190703.11 ISSN: 2328-5583 (Print); ISSN: 2328-5591

11. Mirzaev, Uchkun, Experiment of Open-circuit Voltage in 'EPH 2 Advanced Photovoltaics Trainer' Laboratory and Types of PV Cell (April 30, 2020). International Journal of Engineering and Information Systems (IJEAIS) Vol. 4, Issue 4, April – 2020, Pages: 41-46; ISSN: 2643-640X, Available at SSRN: https://ssrn.com/abstract=3623014