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ELECTRIC DOWNLOAD DIAGRAMS AND SELECTION OF ELECTRIC ENGINE POWER

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ABSTRACT: - In this article, any electrical circuit consists of one or more sources and consumers of electrical energy connected by interconnected wires and is therefore called an electrical circuit, which generates an electric current and ensures its flow They are selected out of power kekb, which is said to be a set of devices that form a closed path.

KEYWORDS: Electric motor , generator, hydraulic turbine, accumulator, torque, diagram, electric drive, phase, rotor, mechanical, photocells, synchronous, ansynchronous , load , mechanism.

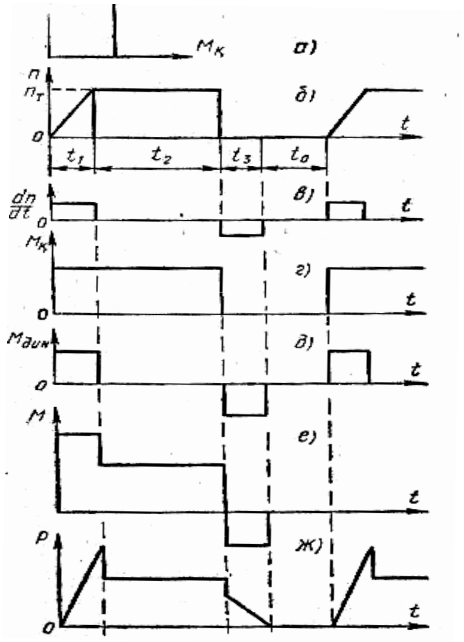
INTRODUCTION

The main condition for the continuous flow of current through the circuit is the presence of a source of electricity in its composition. At the source of electricity, other types of energy are converted into electrical energy. For example, electric car generators convert mechanical energy from steam, gas or hydraulic turbines, galvanic cells and accumulators convert chemical energy, thermocouples and magnetohydrodynamic generators convert heat energy, and various photocells convert light energy into electricity.

The change in torque, current and power of an electric motor over time is called the load diagram of an electric drive and $M(t)$, $I(t)$, $P(t)$ is defined in the following way. This is because the engine $M(t)$ and load diagrams are the same as the actuator $P(t)$ and load $P_{к}(t)$ diagrams only during steady-state operation $M_{к}(t)$. It is time $M = M_{к}$ and $P = P_{к}$ will be.

The load diagram of an electric drive is constructed on the basis of its motion equation. To do this, the nature of the change in the resistance moment of the mechanism and the regularity of the transition process in the electric drive must be known. In many cases , the speed dependence of the engine torque and resistance torques is complicated during the transition process. In these cases, it is not possible to solve the equation of motion analytically, but to solve it graphically or graphoanalytically. Let us consider the load diagram of the calculation and construction sequence in the example of the electric drive of a periodically operated multi-crane crane. This crane uses an asynchronous motor with a phase rotor. To calculate the load diagram, the mechanical characteristics of the drive $n = f(M_{к})$ and the graph of the rotational speed that drives the drive for a period of time $n(t)$, as well as the moment of inertia of the drive $J_{к}$, must be known (Figure 1.1, a, b). one period of the working mechanism consists of the time taken to start the engine $n = 0$ from the speed of the load $n = n_{\max}$ (start time t_1), the time of operation of the drive at constant speed n_T, (t_2) the stopping time (t_3) and the stopping time between the two cycles (t_0).

$n\,(t)$ connection $\frac{dn}{dt}$ graphically (Figure 1.1, c). $n(M_{к})$ and $n\,(t)$ using the links, we construct a load diagram of the work machine $M_{к}(t)$ (Figure 1.1, g). The phase rotor asynchronous motor is selected before the catalog according to the value of this torque or the average value (if the resistance torque is variable) .



The coefficient $K = 1{,}1 \div 1{,}5$ ($1{,}3 \div 1{,}5$ values for heavy start-up conditions) is taken as.

After selecting the motor, its rotor inertia J_p is found. The total moment of inertia of the beam is $J = J_{к} + J_p$ determined.

Then we find the amount of dynamic moment $M_{дин} = \frac{J}{9{,}55}\frac{dn}{dt}$. $M_{дин}(t)$ The shape of the graph link is similar (Figure 13.4, d). dn/dt

Since the torque of the motor is an algebraic sum of the dynamic moments of the resistance and the resistance torque, we combine the time values of the graph $M_к(t)$ and M$_{din}$(t) the ordinate to form the load diagram of the working mechanism $M\ (t)$ (1.1.- picture).

The power graph on the motor axis is $P(t)$ $P=\frac{2\pi}{60}M\cdot n\cdot 10^{-3}$, obtained by multiplying the corresponding ordinates of the speed graphs by the torque according to the formula kW (Fig. 1.1, j).

purpose and function of the choice of power of electric motors .

The correct choice of motor power is of great importance, as it ensures a minimum initial value of electric drive power and less energy waste occurring during their operation. In all cases, the rated operating modes of the motors must be selected in accordance with the modes of the working mechanisms.

Selection of engine power for long-term operation

The loading of the various mechanisms used in most sectors of the economy may be unchanged or less variable over a long period of time. If the constant power consumed by such mechanisms is (P) known, then the power of the motor is selected directly from the catalog. In this case, if the motor power $(P_{ном})$ is not a load-powered motor, then the next nearest larger-powered motor is selected, ie $P_{ном} < P$ should be. If the power of the mechanism is not known in advance, then the choice of motor poses some difficulties (the power of motors designed for pumps, fans, compressors) is calculated using theoretical calculations or empirical formulas, or by constructing a load diagram determined. For example, the following formula can be used for pumps:

$$P_н=\frac{QH\gamma K_Э}{102\eta_н\eta_у}\ кВт \qquad (1.1)$$

where Q is the working capacity of the pump, m ^{3}/ s; H -full pressure, m; γ - specific gravity of the pumped liquid, kg / m ^{3}; $K_Э$ - reserve ratio; ($P_н \le 50$ in kW $K_Э=1{,}2$; from 50 to 360 kW $K_Э=1{,}15$; for motors above 350 kW $K_Э=1{,}1$); $\eta_н, \eta_у$ -Useful operating coefficients of the pump and the transmission between the pump and the motor.

Research result . Ko ' p floor to homes water giving from the center escape pump for rotors short connected asynchronous engine power selection Demand is done . It is known that: $Q=0{,}05$ m ^{3} / s rated water pressure $H=25$m; $\eta_н=0{,}5$; $\eta_у=1$; operating mode of the pump - long-term; $\gamma=1000$kg / m ^{3}; the rotation speed of the pump is $n_н=1450$rpm.

the scientific result (1.1), we calculate the power required by the pump:

$$P_н=\frac{QH\gamma K_Э}{102\eta_н\eta_у}=\frac{0{,}05\cdot 25\cdot 1000\cdot 1{,}3}{102\cdot 0{,}5\cdot 1}=24{,}5\ кВт\ .$$

From the catalog we choose the closest in terms of power, the rotor short-circuited asynchronous motor, the nominal technical characteristics of which are as follows: type A; $P_н=25кВт$; $n_н=1450$ayl / min; $\eta_{ном}=0{,}9$; $cos\varphi=0{,}8$.

The following formula can be used for the fan;

$$P_н=\frac{QH\,K_Э}{102\eta_в\eta_у}\ кВт\ , \qquad (1.2)$$

where Q -fan efficiency of the fan, m ^{3}/ s; H - full pressure, mm water column; $K_Э$ - reserve ratio; (in $P_в \le 2$ kW $K_Э=1{,}5$; up to 5 kW $K_Э=1{,}25$; above 5 kW $K_Э=1{,}1\div 1{,}15$); $\eta_в, \eta_у$ - Useful efficiency of the fan and transmission.

The following formula can be used for a compressor:

$$P_{\text{к}} = \frac{QA}{102\eta_{\text{к}}\eta_{\text{у}}}\ \text{кВт}, \qquad (1.3)$$

where Q-compressor efficiency, m ^{3}/ s; $A-1$ m ^{3} is the work required to compress the air from 1 atmospheric pressure to the $\eta_{\text{к}},\eta_{\text{у}}$ desired pressure,; $\text{кГ}\cdot\text{м}$ - Useful efficiency of the compressor and transmission in the case of moss.

$$P_{Э} = \sqrt{\frac{P_1^2 t_1 + P_2^2 t_2 + \text{K} + P_n^2 t_n}{t_1 + t_2 + \text{K} + t_n}}\,. \qquad (1.4)$$

because $M = M\,\omega$ and $\omega = const$ when, the power moment is proportional to the current.

If $M_{\text{ном}} \geq M_{э}$ or $P_{\text{ном}} \geq P_{э}$, according to the formula, the selected engine fulfills the heating condition.

Selection of engine power for short-term operation

The load diagram of the short-run mode is shown. According to this diagram, using the formula (13.23), the equivalent moment is calculated. This $t_1 + t_2 + \text{K} + t_{\text{п}} + t_{\text{к}}$ is called and is called short-term run time.

From the catalog , a motor with $t_{\text{к}}$ a rated torque equal to or greater than the rated torque, designed for time operation, is then $M_{\text{ном}} \geq M_{э}$ selected. The electric motor should be checked for instantaneous overload: the load $I_{\max}/I_{э}$ ratio should be less than or equal to the allowable value of the motor ratio. $I_{\max}/I_{\text{ном}}$

Scientific justification for selecting motor power for repetitive short-term operation

Cranes, elevators, excavators, engines of several metalworking machines, etc. operate in a repetitive short-term mode of operation. Their load diagram is shown in Figure 1.1. For mechanisms operating in a repetitive short-term mode, the motor power can be selected using the equivalent current, power and torque formulas given above. Based on the graph above , the equivalent power is determined by the following formula:

$$P_{Э} = \sqrt{\frac{P_1^2 t_1 + P_2^2 t_2 + P_3^2 t_3}{t_1 + t_2 + t_3}}\,. \qquad (1.5)$$

nominal power of the engine is found in the catalog for the detected equivalent power and the given UD. $P_{э}$ If the calculated UD does not meet the nearest standard, then the actual equivalent power is recalculated to the $(P_{эх})$ standard $УД_{\text{ст}}$:

$$P_{\text{э.ст}} = P_{\text{э.}x}\sqrt{\frac{УД_x}{УД_{\text{ст}}}}\,. \qquad (1.6)$$

For example Determine the rated power of the engine of the mechanism operating on the graph in Figure 1.1 :

$$P_{Э} = \sqrt{\frac{5{,}5^2 \cdot 0{,}5 + 5^2 \cdot 1{,}5 + 4^2 \cdot 1}{0{,}5 + 1{,}5 + 1}} = 4{,}78\ \text{кВт}$$

$$\text{УД} = \frac{0{,}5 + 1{,}5 + 1}{0{,}5 + 1{,}5 + 1 + 2} \cdot 100\% = 60\%\,.$$

$\text{УД} = 60\%$ The nominal power of an alternating current or asynchronous motor with parallel excitation is typed from the catalog for $P_{\text{ном}} \geq P_{э} = 4{,}78\ \text{кВт}$. [A.5]

CONCLUSION

Open motors have no protective equipment and are used in dry rooms free of dust, contaminants and other contaminants .

Protected motors are divided into:

- protected from accidental contact with live parts and falling of foreign objects into the motor (there are nets covering the open areas of the motor);

- Protected from water drops (there is an umbrella in addition to the net).

Indoor engines can be used in dusty, gaseous, dusty rooms. They are provided with a cover and a special sealant. Such engines do not contain dust, gas and other compounds from the outside. The hermetically sealed engine does not absorb moisture even if it is immersed in water for a long time.

Explosion-proof engines are installed in rooms where there is a risk of fire and explosion, hazardous gas or steam. Their body is so strong that the flame created inside the engine as a result of the explosion does not go out - into the environment where there is a risk of explosion.

In addition, motors can be divided into several types depending on their cooling, tightening, and other similar characteristics.

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