EFFECT OF FREQUENCY CURRENT ON TECHNOLOGICAL AND ENERGY CHARACTERISTICS OF BUCKET CONVEYORS

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In dismissing frequencies changing the angular velocity of the engine, which in turn causes a change in technology and energy characteristics of working machines.

The purpose of research - to establish the impact of rejection frequencies for technological and energy characteristics of bucket conveyors.

Materials and methods research. The analysis of the angular velocity of asynchronous electric rejecting frequencies conducted using the theory of the electric relating to the electromechanical properties of electric motors, power transmission characteristics of working machinery, electric power and steady application of mathematical modeling.

In experimental studies on the frequency of current change frequency converter firm "Mitsubishi" and determine the angular velocity, productivity, time static resistance elevator -20 and calculated relative power consumption.

Results. In bucket conveyors moment of static resistance decreases with increasing angular velocity (x = -1). The dependence of the angular velocity of frequencies by the equation:

$$f_* = \frac{M_0 + (M_{сн} - M_0)/\omega_* + \beta_д \omega_н \omega_*}{\beta_д \omega_{0н}}. \quad (1)$$

If we neglect the initial moment $M_0 = 0$, we obtain:

$$f_* = \frac{M_{сн}\omega_*^x + \beta_д \omega_н \omega_*}{\beta_д \omega_{0н}}. \quad (2)$$

For engines with rigid mechanical characteristic nominal slip a little, so the first term in expression (2) can be neglected. Then we get:

$$f_* \approx \omega_*. \qquad (3)$$

In bucket conveyors productivity increases with the angular velocity of the drive shaft to a certain limit, then by reducing the bucket fill factor remains constant or even slightly decreasing. At the same time static resistance by reducing the fill factor buckets also reduced.

Experimental study of productivity and moment of static resistance elevator Н3-20 at switching frequencies showed that these dependencies are nonlinear and complex functions are described.

Dependence of static and moment resistance elevator Н3-20 from the frequencies shown in Fig. 1. When the frequencies over 10% of the nominal value of productivity increases nonlinearly elevator. With further increase of frequencies it starts to decrease due to reduction in the filling buckets. The moment of static resistance elevator with increasing frequencies decreases nonlinearly.

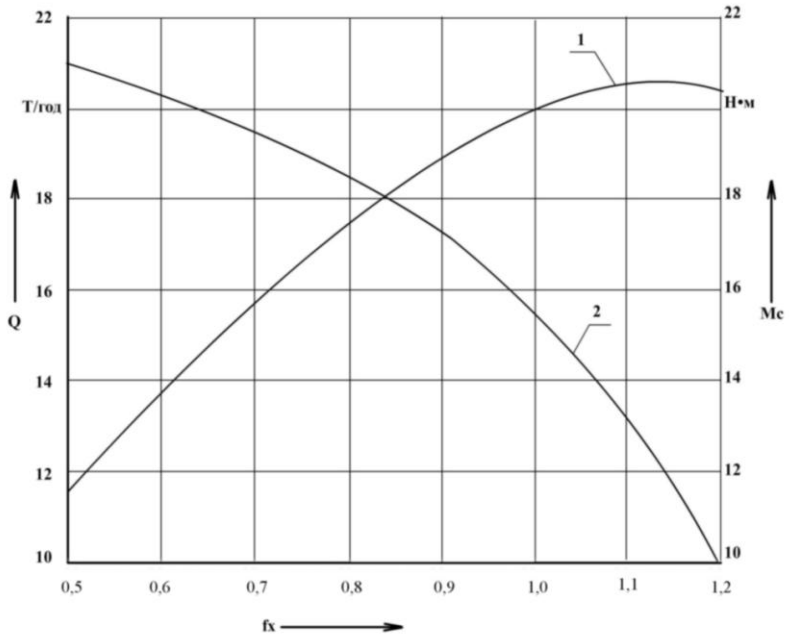

Fig.1. Dependence of (1) and static moment resistance (2) elevator Н3-20 on the current frequency

Rejection frequencies in asynchronous electric affects the power losses.

The losses in the steel engine

$$\Delta P_{cm} \approx \Delta P_{cm1н} f^{2,3}. \quad (4)$$

Variable power loss:

$$\Delta P_{v} \approx \Delta P_{vн}. \quad (5)$$

The dependence of the specific power consumption of frequencies shown in Fig. 2. Reducing the frequency of the rated current causes an increase in specific consumption of electricity in the bucket conveyors, and it increases to 10% - reduction

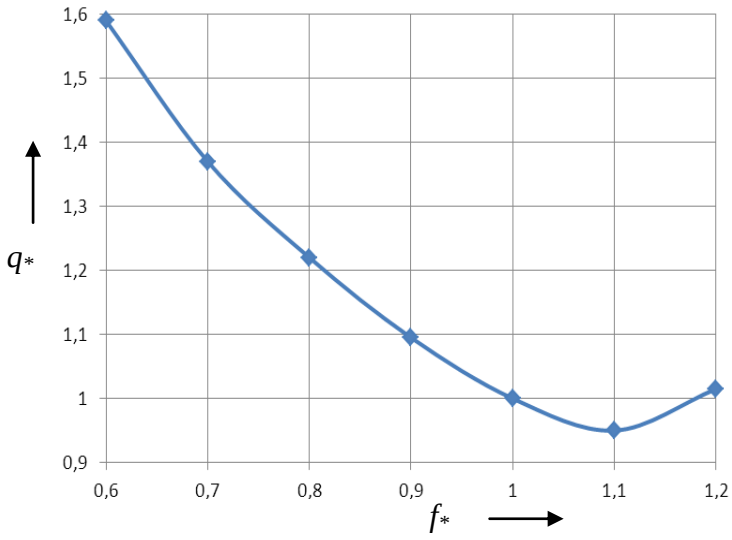

Fig. 2. Dependence of specific power consumption of bucket conveyors frequencies

Conclusions

With increasing frequency current performance bucket conveyors increases up to a point and then decreases. This decreases the time static resistance. At lower frequencies by 2 % performance elevators is reduced by 2 % and the specific power consumption increased by 1.5 %.