IMPACT ON TECHNOLOGICAL FREQUENCIES AND POWER CHARACTERISTICS CRUSHERS

A. Synyavsky, Ph.D.

Switching frequencies affects the angular speed of the motor, which in turn causes a change technological characteristics of working machines.

As a result of prof. I. Revenko experimental studies found that the rate of hammers is most essential factor in grinding hammer mill. Growth crushing rotor angular velocity increases due to increased intensity grinding rate of deformation and fracture of the processed material particles that with increasing deformation behave like a fragile body. However, the practical application of increasing crushing intensity by increasing the speed of the rotor limited crushing capacity installed sieves. Therefore, the action of the rotor angular velocity crushing on crushing process can be divided into three characteristic periods.

1. Initial, in which the growth rate causes an intense increase crush action hammer rotor, resulting in reduced energy process and increases productivity.

2. The most beneficial to the process, which corresponds to a change in the speed range from minimum power consumption until the maximum performance crusher. Crusher works with high performance, providing good quality shredding. But bandwidth sieves begins to affect the velocity of the surface layer of the processed material crushing chamber, which affects performance and causes an increase in energy consumption for grinding material.

3. The critical when power consumption to further improve the speed does not lead to increased productivity and growth sufficient degree of crushing and grinding his cause superfluous.

The aim - setting frequencies influence on the angular velocity, technological and energetic characteristics of grinders.

Materials and methods research. Laboratory studies conducted in experimental setup, made on the basis of universal hammer crusher KDU-2

conversion, allowing to set limits to change the parameters studied. As processed material used hay clover and lupine.

In experimental studies, current frequency changed by frequency converter firm "Mitsubishi", while measuring the frequency of rotation tachometer. Using the known dependence of technological parameters of the crusher experimental angular velocity and angular velocity depends on the current frequency, determined by technological and energy performance crusher rejecting frequencies of the nominal value.

Results. When switching frequencies

$$f_* = \frac{M_0 + (M_{сн} - M_0)\omega_*^2 + \beta_д \omega_н \omega_*}{\beta_д \omega_{0н}}. \quad (1)$$

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

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

Engines crushers with hard mechanical characteristic small nominal slip and ωn≈ω0n because the first term in expression (2) can be neglected. Then we get:

$$f_* = \omega_*. \quad (3)$$

Thus, the angular velocity varies in direct proportion crushers frequency current.

Dependence of energy consumption and performance crusher of frequencies within 0.5 - 1.2 Nominal values are shown in Fig. 1, a module of grinding frequencies - in Fig. 2.

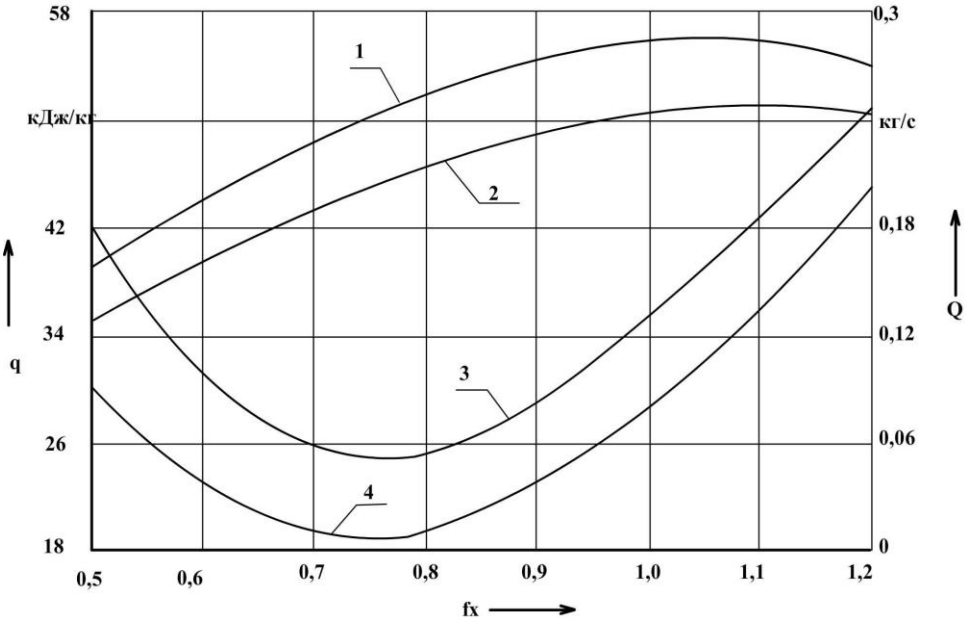

Fig.1. Dependence of the crusher KDU-2 (1, 2) and specific energy consumption (3,4) of frequencies:

1,4 - lupine hay; 2,3 - clover hay

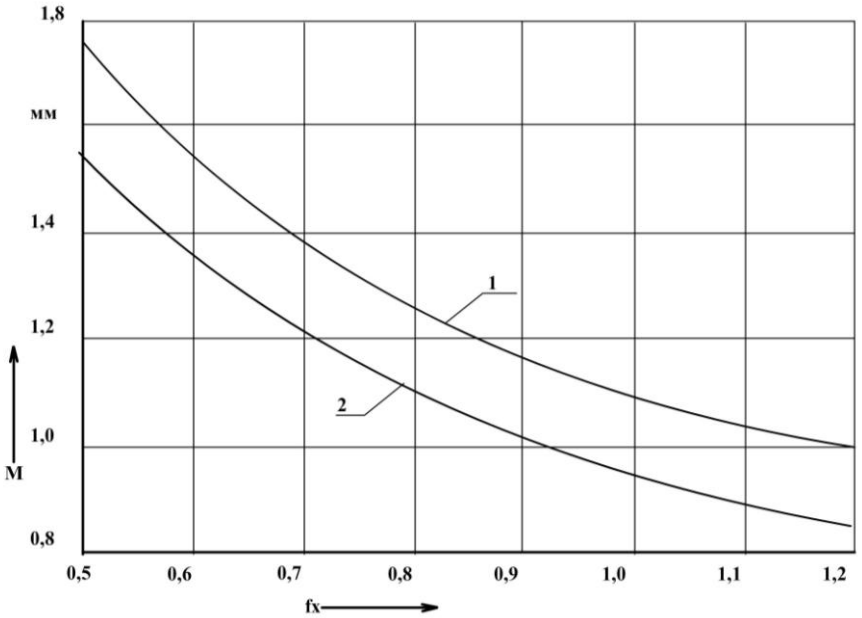

Fig.2. Module dependencies grinding mills KDU-2 from frequencies:

1 - lupine hay; 2 - clover hay

It follows from the above dependency, increase frequencies to 0.75 nominal value is almost rectilinear growth performance crusher. Thus the relative power consumption and reduced grinding module. With further increase frequencies within 0.75 - 1.0 nominal value performance crusher nonlinearly increases, but at a

slower pace than in the previous period. This increases the specific consumption of energy and grinding module decreases nonlinearly. Increased frequencies above the rated value leads to a decrease in performance crusher, an increase of energy consumption and quality of flour.

Conclusions

Based on the studies found that at lower frequencies by 2% performance crushers reduced to 2%. This reduced specific energy consumption and increasing grinding module. The use of frequency-controlled drive enables the optimum support for workflow mode crusher.