THE EXPERIMENTAL ANALYSIS OF DYNAMIC PARAMETERS TO THE VIBRATING SCREEN WITH FUNCTION IN RESONANCE

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In this paper is presented the method of experimental analysis
for establish the dynamic parameters to the vibrating screen, with function in resonance

1. Introduction

The vibrating screen with function in resonance is maked by: superior frame, inferior frame, balancer, elastic group of the eccentric rod, driving shaft, elastic group for compling, support.
Screens are in the inferior and superior frames. It must be to achieve the vibrating level to the direction of the eccentric rod under entering angle who’s formed these with the orizontal position.
For maintain the operating conditions in resonance, it was adopted the constructif system with the eccentric rod and for perturbation with eccentric bush fixed to driving shaft.
In this paper are present the next dynamic parameters of the vibrating screen with function in resonance: rigidity coefficients, damping factors, vibrating mass.

2. The experimental analysis

The rigidity coefficients was establish both for the elastic group of the the eccentric rod and for the elastic group of the couplings tooth the superior and inferior frame.
Thus, depending on the number of elements rallyed in parallel, we have:

$$\begin{aligned} k_0 &= k \cdot s_0 \\ k_1 &= k \cdot s_1 \end{aligned}, \qquad (1)$$

when: k_0 and k_1 are the rigidity equivalent coefficients to the elastic group of eccentric rod and for the couplings group;

s_0 and s_1 - the number of the rubber elements rallied in parallel of the elastic groups;

k - the rigidity coefficient to one rubber element.

The coefficient k was established through tests to a group by 50 piece rubber elements, through recording of deforming steps for shearing strain.
Thus, for one parallelipipedic element with size $160 \times 125 \times 65$ mm, by rubber SAB 31 with hardness $45^0\ sh\ A$, after tests, on obtained the value $k = 178 \cdot 10^3$ N/m.
The total number of elements to the group is $s_0 = 2 \times 8 = 16$ pieces for eccentric rod and $s_1 = 8 \times 4 = 32$ pieces for group of the couplings.
The rigidity equivalent coefficients are:

$k_0 = 2848 \cdot 10^3$ N/m and $k_1 = 5696 \cdot 10^3$ N/m.

The mass of the movable elements, in vibrating movement, make by the total mass m_1, of superior frame and total mass m_2 of inferior frame.

Experimental was obtened: $m_1 = 1450$ kg and $m_2 = 1680$ kg.

Damping factors was established using the method of the system answer to the free vibration.

The logistic decrement of the moving system, formed at s rubber elements rallied in parallel is:

$$\Delta_{p\ sist} = \frac{1}{j-1} \cdot \ln \frac{x_1}{x_j}, \tag{2}$$

where: x_1 is the limit moving of system, considered to the initial moment $t_1 = 0$;

x_j - the limit moving of system to the moment t_j;

j - the serial number of the limit moving of system.

The logistic decrement of the moving for one rubber element Δ_1:

$$\Delta_{p\ sist} = \Delta_1 \cdot \sqrt{s}, \tag{3}$$

which s is total number of the rubber elements rallyed in parallel.

For a system formed by $s^{'}$ = 32 elements rallyed in parallel, on have:

$$\Delta^{'}_{p\ sist} = \frac{1}{4-1} \cdot \ln \frac{34}{5} = 0{,}63$$

$$\Delta_1 = \frac{\Delta^{'}_{p\ sist}}{\sqrt{s^{'}}} \quad or \quad \Delta_1 = \frac{0{,}63}{\sqrt{32}} = 0{,}11.$$

The angle of internal loss δ who reflect the dissipation of energy is:

$$tg\delta = \frac{\Delta}{\pi}. \tag{4}$$

For the antivibrating system formed by $s^{'} = 32$ elements:

$$\delta^{'}_{sist} = arctg \frac{\Delta^{'}_{p\ sist}}{\pi} \text{ or } \delta^{'}_{sist} = arctg \frac{0{,}63}{3{,}14} = 0{,}198 \text{ rad.}$$

In the case of the total antivibrating system, formed by $s = 48$ elements, on have:

$$\Delta_{p\ sist} = \Delta^{'}_{p\ sist} \cdot \sqrt{\frac{s}{s^{'}}}. \tag{5}$$

So, for the vibrating screen with function in resonance, who has 48 antivibrating rubber elements, we have:

$$\Delta_{p\ sist} = 0{,}6\sqrt{\frac{48}{33}} = 0{,}77,$$

$$\delta_{sist} = arctg \frac{0{,}77}{3{,}14} = 0{,}24\ rad.$$

The angle of loss δ_1 for one antivibrating element will be:

$$\delta_1 = arctg \frac{\Delta_1}{\pi} = arctg \frac{0{,}11}{3{,}14} = 0{,}035\ rad.$$

3. The checking of operational factors using the experimental results

For verify the assumptions and the theoretical base on use the relations:

$$\lambda_0 \cdot G_0 = k_0 \text{ and } \lambda_1 \cdot G_1 = k_1.$$

On establish the next initial dates:

- the eccentricity of the bush r, in m;

- the report of mass $\mu = \frac{m_1}{m_2}$;
- the consistency factor to the rolling track f_r;
- the equivalent diameter to the rolling track for the bearings of driving shaft, d, in m.

The relations of gravel establish the next parameters:
- the amplitude relative:

$$A = r \cdot k_0 \cdot \sqrt{\frac{1+\delta_0^2}{\left(k_0 + k_1 - m\cdot\omega^2\right)^2 + \left(k_0\cdot\delta_0 + k_1\cdot\delta_1\right)^2}}\,; \qquad (6)$$

- the amplitude of the mass m_1 and m_2:

$$A_1 = \frac{1}{1+\mu}\cdot A \,;\quad A_2 = \frac{\mu}{1+\mu}\cdot A \qquad (7)$$

- the power for the driving shaft:

$$N = 0{,}5\cdot F\cdot\omega\cdot\left(z\cdot d_r\cdot f_r + r\cdot\sin\theta\right), \qquad (8)$$

where: z is the number of the couples by identical bearing;
θ - lagging between the force and the elastic elements of eccentric rod;
- the total power for moving:

$$N_m = \frac{N}{\eta}, \qquad (9)$$

where η is output to transmission the energetic tide by engine to diving shaft.

4. Conclusions

The methods of experimental investigation to the parameters cover the necessary of dates for established the performances of vibrating screen with function in resonance.

Following the theoretical dates and experimentaly it was eastablished the gravel relation and the testing methods for vibrating screens with function in resonance.

5. References

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Conditions in wich limit speed link holder equipment ditch attached machinery with base machine overhead loader

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The paper studies conditions in wich limit speed link holder equipment ditch attached machinery with base machine overhead loader. Along the abbreviate calculations on explore condition stability landportiere range the cutter plate

1. Introduction

The link holder equipment assembled to base machine overhead loader are from the group of trench excavators.
In construction to these equipments, a large area have the operating part sort knife which, in analogy with sort buckets, have a smole mass, which take to decrease the dynamic effects in chain, increase his speed and increase the capability of machine.

2. The considerate elements

Unloading of the earth off knifes do to fore part, which take increase the crossed speeds of knifes.
But are some conditions which limit the speed of chain, that is:

- cutting speed must assure gravitation discharge of the cutter knifes;
- the path to fall of earth must join in feeding area of the conveying spiral.

The quantitive knowledge to influence of speed chain about the performances of discharge is very useful in activity of projecting equipment.
These influence is establish fuction by angle of tilt of chain and by the length space covered by knife for earth discharge.
Either the reference system $x_1O_1y_1$ solidary with the knife and forces who drive about earth particle white mass m_0.
The condition for equilibrium for earth particle on knife surface in the reference system $x_1O_1y_1$ is:

$$m_0 \cdot g \cdot cos(\theta - \delta) - \mu_1 \cdot m_0 \cdot g \cdot sin(\theta - \delta) + m_0 \cdot a = 0 \quad (1)$$

or

$$\ddot{x}_1 + g \cdot [cos(\theta - \delta) - \mu_1 \cdot sin(\theta - \delta)] = 0, \quad (2)$$

where: g is gravity acceleration;

θ, δ - the angles of declivity chain, respectively of knife surface;

μ_1 - frictional coefficient earth – knife.

Integrating equation (2) on establish:

$$x_1 = \frac{1}{2} g \cdot [cos(\theta - \delta) - \mu_1 \cdot sin(\theta - \delta)] \cdot t^2 \tag{3}$$

where t is the necessary time for earth discharge to the knife.
The relative speed of earth particle, v_1, who drop to the knife is:

$$v_1 = \sqrt{2g \cdot l_c \cdot \{g \cdot [cos(\theta - \delta) - \mu_1 \cdot sin(\theta - \delta)]\}} \tag{4}$$

where l_c is length surface of knife.
The absolute speed of particlegiven the fixed system xOy earth is:

$$v = \sqrt{v_1^2 + v_2^2 + 2v_1 \cdot v_2 \cdot sin\,\delta}\,, \tag{5}$$

where v_2 is the chain speed.

3. Conclusions

For ensure the best run of equipment on select adequate the chain speed (correspondingly with the machine speed on the work process) and the discharge parmeters of operating part. These reduce the earth overflowing in the delved ditch.

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