KINEMATIC PARAMETERS OF THE INTENSIFIER WITH ELASTIC RODS

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Abstract. *In this article, depending on the design parameters of the intensifier with elastic rods, the rotation time of the toothed star of the intensifier, the rotation speed, the path traveled by the elastic rods when they hit the soil layer, the angular velocity of the elastic rods, the toothed stars and their acceleration are calculated.*

Key words: *intensifier, rods, toothed sprocket, parameter, angular velocity.*

The toothed stars of the rod intensifier are mounted on the sieve chains, and due to the movement of the potato digger sieve, it rotates, i.e. no additional chain transmissions are required to move the spiked amplifier. The main parameters of the screw amplifier are as follows (Fig. 1)[1].

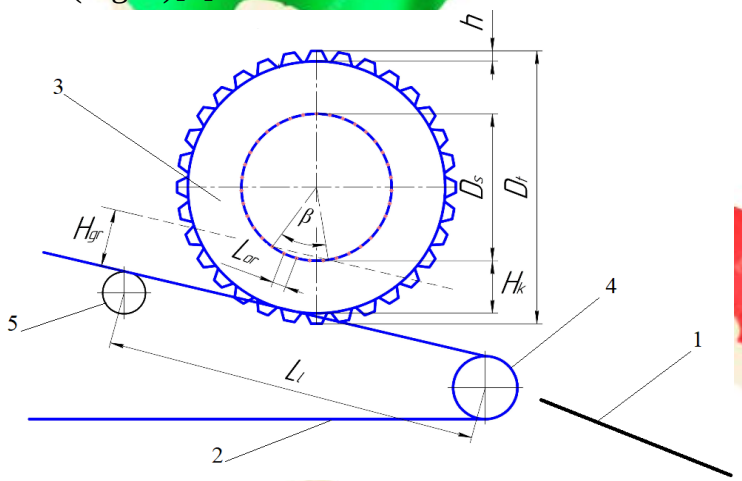

Fig. 1. Design and technological scheme of a rod intensifier[1]

1- ploughshare; 2 – elevator; 3 – intensifier with elastic rods; 4, 5 – drive and tension sprockets

D_t – diameter of the elastic rod intensifier star, m;

D_s – diameter of the circumference of the toothed sprocket along which the elastic rods are located, m;

h – height of sprocket teeth, m;

H_k – distance from the elevator surface to the elastic rod, m;

Z_{ts} – number of teeth, pieces

L_{su} – length of elastic rod, m.

The speed of rotation of the toothed star is the same as the speed of the sieve. In this case, if we take into account that the sieve of the potato digger moves at a speed of 1.5 m/s, the rotational speed of the toothed star will be the same. The length of the sieve of potato diggers is 3 m. From this it can be concluded that in two seconds the sieve rotates around its leading and driven stars once. Or we can understand that an arbitrary point on the sieve travels a distance of 3 m in two seconds[2].

We can determine that the cogwheel rotates twice when the sieve rotates once. Or we can see the gearwheel make one complete rotation per second.

We express it as follows, i.e

$$t = \pi(D_t - 2h)/V_e, \quad (1)$$

or

$$t = \pi(D_s + 2H_k)/V_e \quad (2)$$

where V_e is the elevator speed, m/s.

Considering that the speed of the sieve and the speed of the toothed star are the same, the expression (2) can be written as follows

$$t = \pi(D_s + 2H_k)/V_t, \quad (3)$$

where Vt is the rotation speed of the sprocket, m/s.

Putting the parameters of the intensifier from the expression (3), we get the following[3]:

$$t = \frac{\pi\left(D_s + 2(H_{gr} - h_r)\right)}{V_t} \quad (4)$$

or

$$t = \pi(L_l \cos\alpha - 2h)/V_t \quad (5)$$

or

$$t = \frac{\pi\left(L_l \cos\alpha - 2(L_z \sin\alpha_e\right)}{V_t}. \quad (6)$$

According to Fig. 1, one fly sinks into the soil and travels the following distance:

$$S_1 = L_{yo} n_1. \quad (7)$$

Using the main parameters of the intensifier to the expression (7), the expression (8) can be written as follows[4]:

$$S_1 = n_1\left(\frac{1}{2}L_l \cos\alpha_e - 2(H_{gr} - h_r) - 2(L_z \sin\alpha_e)\right)\cdot\frac{\pi\beta}{180^0}. \quad (8)$$

The working time of one rod in the soil is determined by the following expression:

$$t_{bch} = S_1/V_{el}. \quad (9)$$

or

$$t_{bch} = \left(n_1 \left(\frac{1}{2} L_l \cos\alpha_e - 2(H_{gr} - h_r) - 2(L_z \sin\alpha_e) \right) \cdot \frac{\pi\beta}{180^0} \right) / V_{el} . \quad (10)$$

Putting certain values in the expression (10), we determine that t_{bch}=0,1 s.

(7) according to the expression, when the toothed star rotates once, the path traveled by all the teeth is determined as follows:

$$S_{um} = L_{yo} Z_{um} . \quad (11)$$

If we put the values of expression (10) into expression (11), the expression will look like this:

$$S_{um} = \left(\left(\frac{1}{2} L_l \cos\alpha_e - 2(H_{gr} - h_r) - 2(L_z \sin\alpha_e) \right) \cdot \frac{\pi\beta}{180^0} \right) \times$$

$$\times \left(L_l \cos\alpha_e - 2(H_{gr} - h_r) - 2(L_z \sin\alpha_e) \right) \cdot \pi / L_{or} . \quad (12)$$

The angular velocity of the elastic rods in a toothed star is determined by the following expression:

$$\omega_t = \frac{2V_t}{D_s + 2H_k} . \quad (13)$$

or

$$\omega_t = \frac{2V_t}{\left(D_s + 2(H_{gr} - h_r) \right)} . \quad (14)$$

Having determined the angular velocity of the elastic rods in the toothed sprocket, we write their acceleration as follows:

$$a_t = \left(\frac{2V_t}{\left(D_s + 2(H_{gr} - h_r) \right)} \right)^2 \cdot \frac{D_t - 2h}{2} . \quad (15)$$

Conclusion. Parameters of the intensifier with elastic rods to expressions (V_e=1,5 m/s, H_k=0,1 m, H_{gr}=0,15 m, h_r=0,05 m, h=0,02 m, L_{ro}=0,025 m, L_l=0,6 m, α=30^0, L_z =0,04 m, β=45^0, D_t=0,52 m, D_s=0,28 m) and set the following values t=1,0048 sec, S_1=0,11 m, S_{um}=3,85 m, ω_t =6,25 rad/s, a_t =9,375 m/s^2.

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