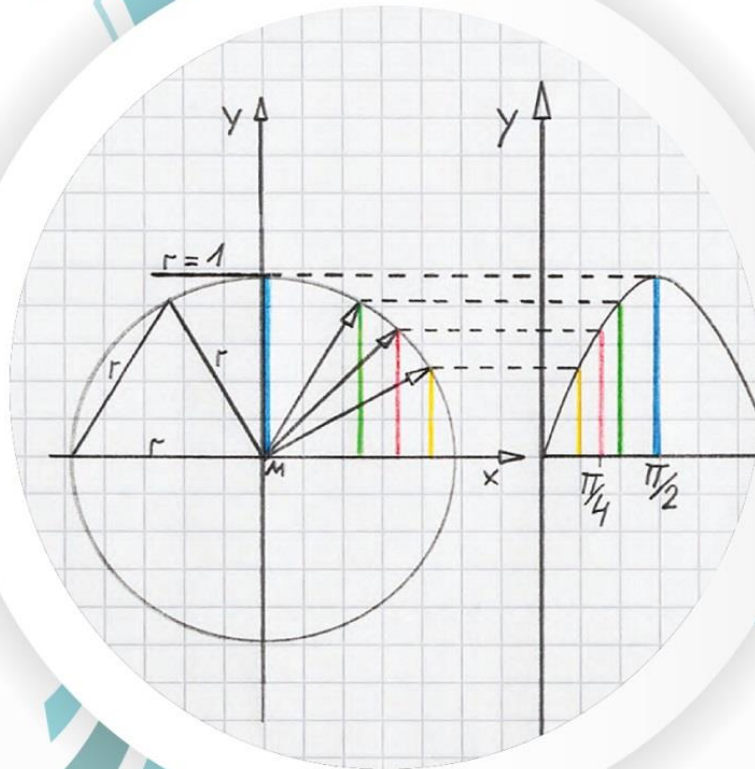


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## ANALYSIS OF CHANGE OF ANGULAR VELOCITY OF BELT CONVEYOR ROLLER MECHANISMS AS A RESULT OF EXTERNAL LOADS

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**Abstract.** The article presents opinions on the modern condition and economic indicators of belt conveyors in mining, agriculture and light industry enterprises today. The recommended values of the angular velocity of vibration range of roller mechanisms with belt conveyor belt element bearing support on the technological resistance and the dependence of the angular velocity on the increase of various loads have been presented.

**Keywords.** Conveyor, roller mechanism, belt element, deformation, loading, transportation, amplitude, vibration, technology.

### INTRODUCTION.

Today, one of the main issues of mechanical engineering is the design of reliable, modern, resource-saving and high-economical machines and mechanisms and their implementation in production enterprises. The development of modern technology is closely related to the design of new machines and mechanisms. It is necessary to introduce resource-saving technologies in the production of mining, metallurgy, agriculture and light industry enterprises, and make effective use of modern techniques created on the basis of the latest achievements of science and technology.

The development of mechanical engineering is inextricably linked with the development of science and technology. The need for modern equipment in our country is increasing day by day. Belt conveyors are an example of such a means of transport. Because this vehicle is considered to have higher economic efficiency in continuous product delivery than other transport vehicles. Therefore, the development of resource-efficient constructions of belt conveyors, which are important for production enterprises, and the justification of their parameters remain one of the important tasks.

### MATERIALS AND METHODS.

The following preliminary data are provided for the ongoing calculations: the study of the dependence of the angular speed of the vibration coverage of the roller mechanism with a belt conveyor belt element bearing support on the technological resistance; it is necessary to study the dependence of the angular speed of the roller mechanism on various loads, the coefficients of relative closeness and analyze it theoretically.

In theoretical studies, mainly the study of the dependence of the angular speed of the vibration coverage of the roller mechanism with the bearing support of the belt conveyor belt element on the technological resistance; It is important to recommend the optimal values of the angular speed of the roller mechanism based on the study of the dependence on various loads and the influence on the law of motion [1-3].

In addition to vibration contact repair of bearings installed in belt conveyor roller mechanisms, abrasive and friction repair types are also characteristic. This type of surface wear is predominant for the bearing supports of roller mechanisms. These types of wear determine the technical source of the bearings. The cause of this phenomenon is considered to be low-quality production of protective covers and sealing elements of the roller mechanism. However, belt conveyor roller mechanisms are such a mass product that perhaps the cost savings on protective cover elements justify themselves, so a type of wear not typical of bearings should be considered [4, 5].

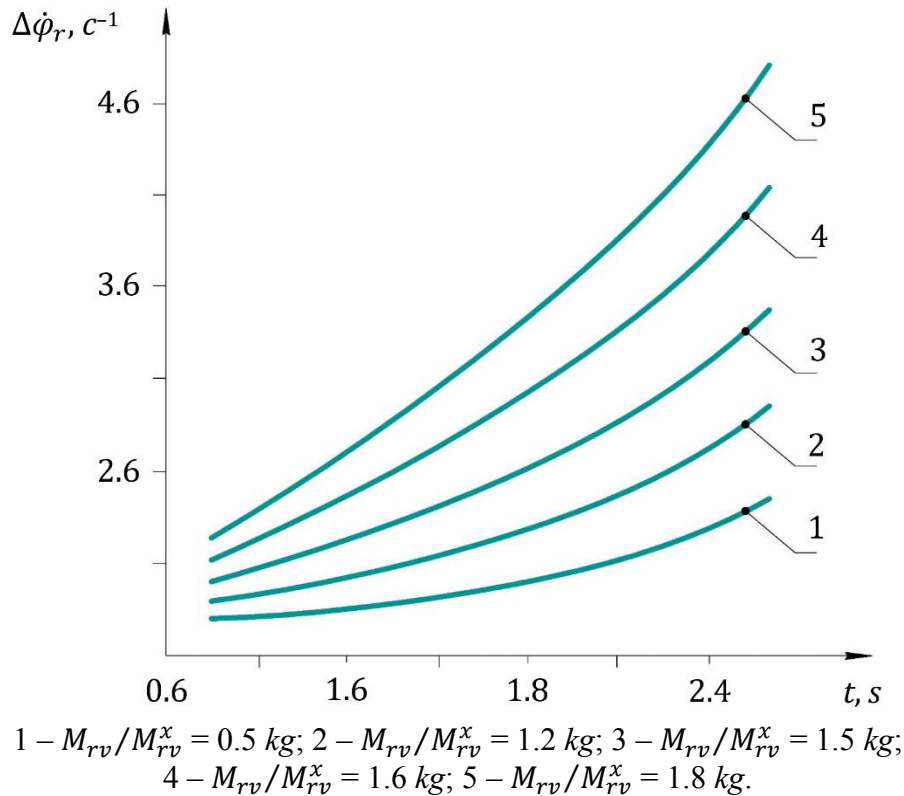
### RESULTS.

Fig. 1 shows graphs of dependence of the angular speed of vibration coverage on the technological resistance of roller mechanisms with belt conveyor belt element support. According to



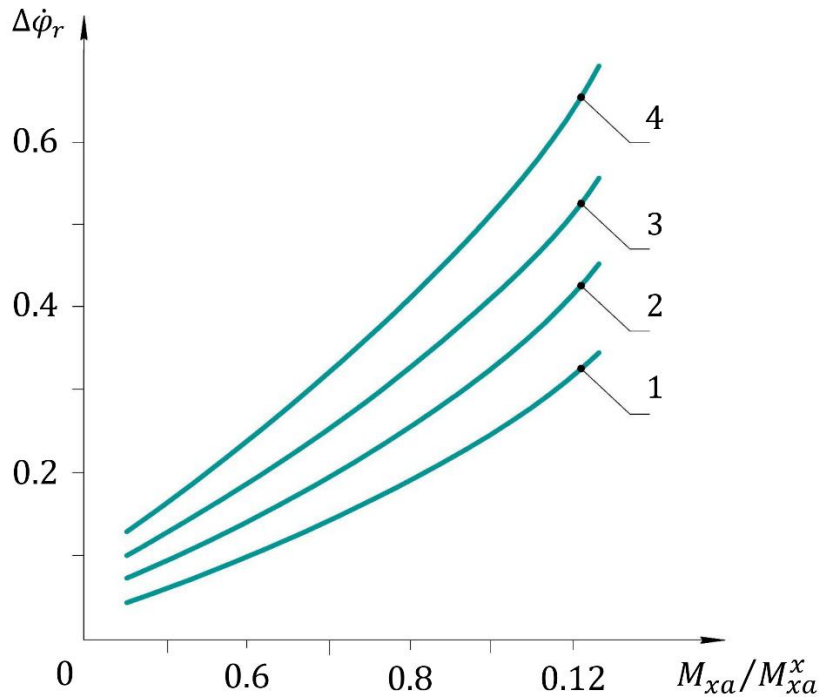
the analysis of the graphs, when the range of vibrations increases from  $0.6 \times 10^{-2} m$  to  $1.6 \times 10^{-2} m$ , it was found that the range of angular velocity changes increases nonlinearly from  $1.64 \times 10^{-2} m$  to  $2.50 \times 10^{-2} m$ . It was found that when the load is increased to  $M_{rm}/M_{rm}^x = 2.1 kg$ , the values of  $\Delta\dot{\phi}_r$  increase from  $2.21 c^{-1}$  to  $4.49 c^{-1}$  [6-9].

It is known that according to the results of the experimental research on belt conveyor roller mechanisms, taking into account that  $\Delta\dot{\phi}_r \leq (2.7 \div 4.7) c^{-1}$ , the loading is  $M_{rm}/M_{rm}^x = (1.5 \div 3.0)$  range is desirable, it is recommended that the vibration range of the roller mechanism be in the range of  $(0.6 \div 1.26) \times 10^{-2} m$ .



**Figure 1. Dependence graphs of the angular speed of the vibration coverage of the roller mechanisms with a belt conveyor belt element support and the technological resistance**

Fig. 2 shows graphs of dependence of the angular speed of the roller mechanism with a bearing support of a belt conveyor belt element on the increase of various loads. According to the analysis of the graphs, if the relative values of loading are increased from 1.5 to 4.5, the range of angular velocity fluctuations can increase from 0.01 to 0.07 when  $\Delta\dot{\phi}_r = 0.06 c^{-1}$ . It was found that it increases from 0.19 to 0.124 when  $\Delta\dot{\phi}_r = 0.012 c^{-1}$ . According to the results of experimental studies, the values of  $M_{rv}/M_{rv}^x \leq (0.8 \div 1.25)$  are recommended so that the values of  $\Delta\dot{\phi}_r$  are within  $(0.06 \div 0.12) c^{-1}$  [10,11].



**Figure 2. Graphs of dependence of the angular speed of the roller mechanism with a belt conveyor belt element bearing support on the increase of various loads**

According to the analysis of the obtained graphs, with the increase in technological resistance, the torque in the roller mechanism increases up to  $(124 \div 132) \text{ Nm}$ . This leads to an increase in the power consumption of the belt conveyor. The technological resistance  $\Delta\phi_r$  at  $102 \text{ Nm}$  decreases significantly, from  $3.2 \text{ s}^{-1}$  to  $2.1 \text{ s}^{-1}$ . This is not a good indicator, because the decrease in  $\Delta\phi_r$  reduces the efficiency of the belt conveyor. Therefore, the recommended value is  $(0.4 \div 0.46)$  [12, 13].

**Conclusion.** The laws of change of the angular speed of the roller mechanism of the belt conveyor with a bearing support with a belt element were obtained. The dependence graphs of the speed range of the roller mechanism on the technological resistance were constructed. According to the results of experimental studies, if it is appropriate to choose  $M_{rv}/M_{rv}^x \leq (1.5 \div 3.0)$  to be within the limit of  $(0.06 \div 0.12) \text{ s}^{-1}$ , the vibration range is  $(0.6 \div 1.26) 10^{-2} \text{ m}$  it is recommended to be in the range.

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