JOURNAL OF ADVANCED SCIENTIFIC RESEARCH

ISSN: 0976-9595

Journal of Advanced Scientific Research (ISSN: 0976-9595)
Vol.5. Issue 3 page 15

Editorial Team

C/O Advanced Scientific Research,
8/21 Thamotharan Street,
Arisipalayam, Salem

Journal of Advanced Scientific Research (ISSN: 0976-9595)
Vol.5. Issue 3 page 16

THEORETICAL PRINCIPLES OF CALCULATING PARAMETERS AND AMPLITUDE OF VIBRATION OF BELT CONVEYOR ROLLER MECHANISMS OF STRAP ELEMENT BEARING SUPPORTS

Beknazarov Jasur Kholmamatovich
Navoi State University of Mining and Technology
Doctor of Philosophy in Technical Sciences (PhD), Associate Professor
E.mail: j-beknazarov@mail.ru
Jumaev Akbarjon Sayfullaevich
Almalyk branch of Tashkent State Technical University named after Islam Karimov
Doctor of Philosophy in Technical Sciences (PhD), Associate Professor
E.mail: akbarjon.jumaev@mail.ru
Juraev Nodirbek Normuradovich
Navoi State University of Mining and Technology
Doctor of Philosophy in Technical Sciences (PhD)
E.mail: Nodirjura@mail.ru

Abstract. The article presents ideas about the reliability and durability of belt conveyors in mining enterprises today, as well as the constantly increasing requirements for equipment. In order to increase the service life of the bearing supports of belt conveyor roller mechanisms, it was found that it is possible to increase the service life of the mechanisms by using rubber bushings on the outer side of the bearing. According to this, the analysis of scientific studies has been carried out that when bushings with belt elements are used in roller mechanisms, it is possible to increase the UWK compared to the traditional one due to the reduction of the amplitude of vibrations in it.

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

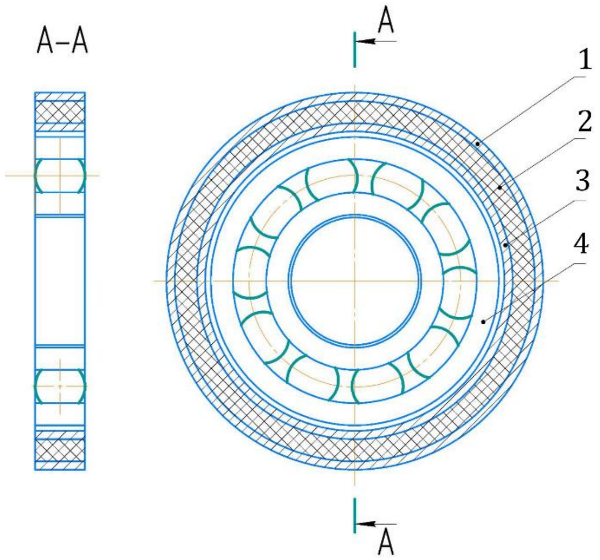
Today, belt conveyors are widely used in mining enterprises of our country and abroad, and they are significant for the fact that they have the highest performance compared to other means of transportation at a very low cost. In addition, this vehicle characterizes a high level of interaction with other types of technological machinery and equipment, which in turn increases the technical level of the production cycle and the work of the entire mining enterprise. has a positive effect on increasing efficiency.

One of the parts that determine the efficiency and periodicity of the belt conveyor is the guide roller mechanism. The durability and reliability of the guide roller mechanism is characterized by factors such as various loads (percussive and non-percussive), physical and mechanical properties. Depending on the operating conditions of the guide roller mechanism, the parts of rolling bearings are designed in different ways [1, 2].

During the operation of belt conveyor equipment, vibrations occur mainly in roller mechanisms. This, in turn, does not affect the support bearings of roller mechanisms. We can see that the vibrations change minimally when the roller mechanism of the new design with the belt element bearing support is used [3, 4].

Centrifugal force (350 ÷ 400) N changes within the limit, taking into account the variation of $D_r = 0.4\ m$ at the rotation speed of $n = 450\ rev/min$. It should be noted that the belt element changes proportionally to the load on the bearings of the roller mechanism. However, we can see that the deformation of the support changes in a non-linear state depending on the changes in the loads of cylindrical belt element bushings used as an outer cover for the roller mechanism support bearings (Fig. 1) [5-9].

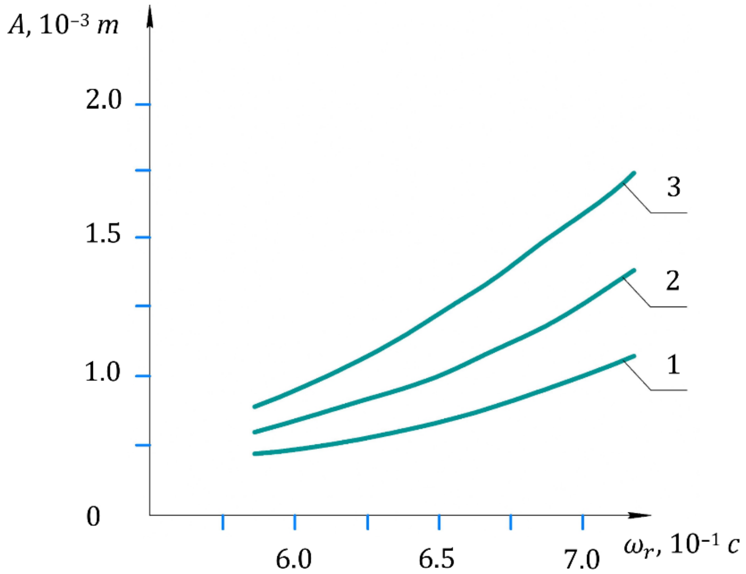
Journal of Advanced Scientific Research (ISSN: 0976-9595)
Vol.5. Issue 3 page 17



1- outer ring; 2- bushing with belt element; 3- inner bushing; 4- bearing

Figure 1. Bearing support with elastic element (Roller mechanism)

Fig. 2 shows graphs of the dependence of the amplitude of the vibrations on the belt supports of the roller mechanisms and the change of the angular speed. In this case, the increase in the angular velocity of the roller mechanism causes its nonlinear vibration amplitude to hang. As a result, when changing from 68 c^{-1} to 80.2 c^{-1}, the amplitude of vibrations with the mass of the roller mechanism bearing shell and the outer flange of the belt element increases from $0.205\cdot10^{-3}$ *m* to $0.61\cdot10^{-3}$ *m*. When the mass of the bearing shell is m_{sh} = 0.5 kg and the mass of the outer flange of the belt element is m_f = 0.350 *kg*, the amplitude *A* increases from $0.42\cdot10^{-3}$ *m* to $1.409\cdot10^{-3}$ *m*. The results of the experimental studies show that the vibration amplitude of the support of the roller mechanism with a belt element is in the range of $(0.3\div0.38)\cdot10^{-3}m$. To ensure these values, values $m_{sh} = (0.450 \div 0.5)$ *kg*, $m_f = (0.3 \div 0.350)$ *kg* are recommended [10, 11].

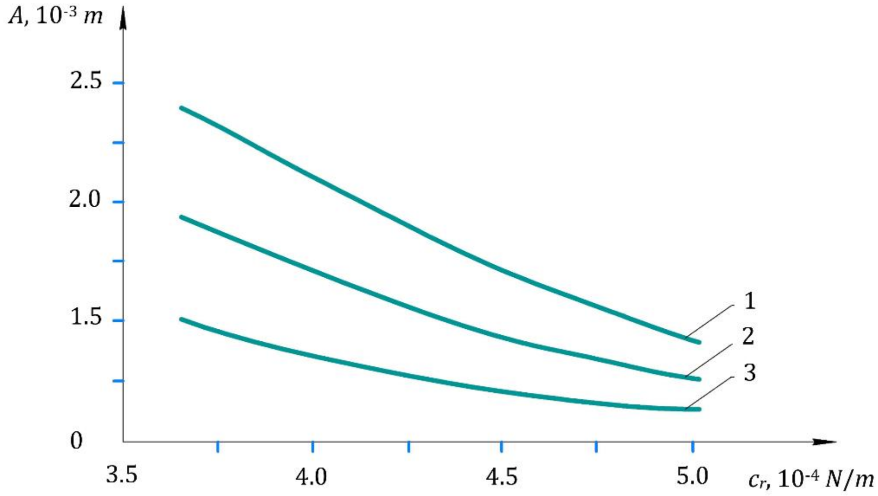


where, 1 – m_{sh} = 0.35 *kg*, 2 – m_{sh} = 0.45 *kg*, 1 – m_{sh} = 0.55 *kg*.

Figure 2. Graphs of the dependence of changes in the amplitude of vibrations on the belt supports of the roller mechanism and the change in angular speed

Fig. 3 shows graphs of the dependence of the variation of the vibration amplitude of the pulley mechanism on the variation of the stiffness coefficient of the supports with strap elements. The given graphic correlation graphs show that as the coefficient of friction of the belt element bearing support increases from $4.64\cdot10^4$ *N*/*m* to $6.2\cdot10^4$ *N*/*m*, the vibration amplitude of the roller mechanism decreases from $1.317\cdot10^{-3}$ *m* to $0.42\cdot10^{-3}$ *m* it decreases linearly up [12-14].

To ensure that the vibration amplitude of the roller mechanism is in the range of (0.3 ÷ 0.38)·10^{-3} *m* c = (5.2 ÷ 6.0) 103 *N/m*; ω_c = (7.2 ÷ 7.6) 10 c^{-1}; It is recommended that *k* = 0.3 ÷ 0.5.



where, 1 – *k* = 0.6; ω_c = 80 c^{-1}; 2 – *k* = 0.4; ω_c = 76 c^{-1}; 1 – *k* = 0.2; ω_c = 70 c^{-1};

Figure 2. Graphs of dependence on changes in the vibration amplitude of the roller mechanism

Summary. The influence of the parameters of belt conveyor roller mechanisms and the coefficient of uniformity of the bearing support with belt elements on the amplitude of vibrations was studied. Calculations were made to calculate the amplitude and frequency of vibrations of the roller mechanism, as well as the dynamic coefficient of the system, and graphs of its dependence were developed. In order to ensure the vibration of roller mechanisms in certain intervals, the recommended values were developed taking into account the support of the bearing with the belt element.

REFERENCES

[1]. A. Djuraev, B.N. Davidbaev, A.S. Jumaev. Improvement of the design of the belt conveyor and scientific basis for calculation of parameters. Global Book Publishing Services is an International Monograph & Textbook Publisher. Copyright 24 may 2022 by GBPS. 10.37547/gbps – 03. ISBN 978-1-957653-03-7 1211 Polk St, Orlando, FL 32805, USA. – 151 p.

[2]. A. Djuraev, A.S. Jumaev, M.M. Abduraxmanova. Analysis of the results of physical and mechanical experimental studies of the modernized belt conveyor // Journal of Physics: Conference Series 2573 (2023) 012012. https://iopscience.iop.org/article/10.1088/1742-6596/2573/1/012012

[3]. A.S. Jumaev, A.A. Ashirov, G.I. Salimov. Analysis of the laws of changes of the angular velocities of belt conveyor drums and the torque of the drive shaft at different technological resistance values. British View ISSN 2041-3963 Volume 9 Issue 1 2024. https://scholar.google.com/citations?view_op=view_citation&hl=ru&user=B_J2CkUAAAAJ&citation_for_view=B_J2CkUAAAAJ:QIV2ME_5wuYC

[4]. Akbarjon Jumaev, Fevzi Istablaev, Mehriniso Dustova. Development of the theory of calculation of constructive and rational parameters of belt conveyor roller mechanisms // Cite as: AIP Conference Proceedings 2467, 060025 (2022). https://pubs.aip.org/aip/acp/article-abstract/2467/1/060025/2826524

[5]. Anvar D. Juraev, Bahtiyordjan N. Davidbayev, Nodirbek N. Juraev, and Jasur Kh. Beknazarov. Results of dynamic analysis of double-inlet screw conveyor machine assembly. E3S Web of Conferences 417, 06005 (2023) https://doi.org/10.1051/e3sconf/202341706005. Geotech-2023.

[6]. A. Djuraev, A.S. Jumaev, N.I. Ibragimova, M.Y. Turdaliyeva. Analysis of the dynamics of a belt conveyor with composite guide rollers and elastic elements // Journal of Physics: Conference Series 2573 (2023) 012026. https://iopscience.iop.org/article/10.1088/1742-6596/2573/1/012026

[7]. A. Djuraev, Sh.S. Khudaykulov, A.S. Jumaev. Development of the Design and Calculation of Parameters of the Saw Cylinder with an Elastic Bearing Support Jin. International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-8 Issue-5, January 2020. https://scholar.google.com/citations?view_op=view_citation&hl=ru&user=B_J2CkUAAAAJ&citation_for_view=B_J2CkUAAAAJ:Y0pCki6q_DkC

[8]. A.S. Jumaev, A.J. Juraev, N.N. Juraev, B.B. Qayumov. Parameters of Choice and Calculation of Materials By The Guiding Composite Roller Mechanisms of Tape Conveyors. International Journal of Engineering and Information Systems (IJEAIS) ISSN: 2643-640X Vol. 4, Issue 8, August – 2020, Pages: 235-240. https://scholar.google.com/citations?view_op=view_citation&hl=ru&user=B_J2CkUAAAAJ&citation_for_view=B_J2CkUAAAAJ:3fE2CSJIrl8C

[9]. J.Kh. Beknazarov, N.N. Jo'rayev. Determination of gear extension parameters of a composite flexible element. Journal of northeastern university. Volume 25 Issue 04, 2022 ISSN: 1005-3026 https://dbdxxb.cn/ Original Research Paper.

[10]. A.D. Djuraev, A.S. Jumaev. Study the influence of parameters of elastic coupling on the movement nature of support roller and rocker arm crank-beam mechanism. International Journal of Advanced Research in Science, Engineering and Technology. Vol. 6, Issue 6, June 2019. https://scholar.google.com/citations?view_op=view_citation&hl=ru&user=B_J2CkUAAAAJ&citation_for_view=B_J2CkUAAAAJ:8k81kl-MbHgC

[11]. A.S. Jumaev, M.Y. Turdaliyeva, N.I. Ibragimova. Dynamic analysis of machine assembly of belt conveyor with roller mechanisms with composite belt elements. British View ISSN 2041-3963 Volume 7 Issue 3 2022 DOI 10.5281/zenodo.7139012 Universal impact factor 8.528 SJIF 2022: 4.629. https://scholar.google.com/citations?view_op=view_citation&hl=ru&user=B_J2CkUAAAAJ&citation_for_view=B_J2CkUAAAAJ:MXK_kJrjxJIC

[12]. B. Mardonov, Z. Oripov, R. Muminov, J. Ravshanov, N. Jo'rayev. Effect of dispersed particles of aluminum oxide on the degree of defects of the crystalline structure of the chromium coating. E3S Web of Conferences 417, 06001 (2023). Geotech-2023. https://doi.org/10.1051/e3sconf/202341706001

[13]. R. Muminov, Sh. Yakhshiev, J. Ravshanov, Z. Oripov, N. Juraev, M. Maxmudova. Development of technical solutions for modernization of the rotary feed mechanism of a quarry drilling rig. E3S Web of Conferences 486, 05007 (2024). Agritech-IX 2023 https://doi.org/10.1051/e3sconf/202448605007

[14]. A.D. Djuraev, A.S. Jumaev. Study the influence of parameters of elastic coupling on the movement nature of support roller and rocker arm crank-beam mechanism // International Journal of Advanced Research in Science, Engineering and Technology. Volume 8. No. 9, September 2020. https://scholar.google.com/scholar?cluster=7335856800375738584&hl=en&oi=scholarr

[15]. Kenjaboev Sh., Djuraev A., Beknazarov J. Issledovanie deformationsii sdviga amortizatora-tulki sostavnyx zubchatyx koles peredachi. Current issues of production of import-substituting products based on the use of local raw materials in the regions of the Fergana Valley. Namangan city October 27-28, 2018.