

**PROSPECTS FOR CREATING AND IMPROVING RESOURCE-
SAVING DESIGN SOLUTIONS FOR THE MAIN ELEMENTS
OF A BELT CONVEYOR**

Jumaev Akbarjon Sayfullaevich

Almalyk State Technical Institute, Almalyk, Uzbekistan Doctor of Philosophy (PhD)
in Technical Sciences, Associate Professor
ORCID: [0009-0009-3026-8052](https://orcid.org/0009-0009-3026-8052); E-mail: akbarjumayev011@gmail.com

Abdurakhmanova Muattar Musurmakulovna

Almalyk State Technical Institute, Almalyk, Uzbekistan Assistant
E-mail: muattarabdurahmonova984@gmail.com

Abduraximova Mohina Dilmurod qizi

Almalyk State Technical Institute, Almalyk, Uzbekistan Student of the 7A-25 ME
group, Mechanical Engineering
E-mail: da3468447@gmail.com

Annotation. This article discusses the development of resource-saving design solutions for the main elements of belt conveyors widely used in the mining industry. The study analyzes methods for improving the efficiency and service life of roller mechanisms. Based on new structural parameters, lightweight and high-precision mechanisms are proposed to enhance operational reliability. The possibilities of reducing energy consumption and optimizing operating costs are substantiated. The practical significance and future prospects for the development of belt conveyor constructions are also highlighted.

Keywords: mining industry, belt conveyor, roller mechanisms, resource-saving design, new structural parameters, lightweight mechanisms, high precision, energy efficiency.

Annotatsiya. Mazkur maqolada tog‘-kon sanoatida keng qo‘llaniladigan tasmali konveyerning asosiy elementlari uchun resurstejamkor konstruktiv yechimlarni yaratish masalalari ko‘rib chiqilgan. Tasmali konveyer tizimida qo‘llaniladigan rolikli mexanizmlarning samaradorligini oshirish va ularning xizmat muddatini uzaytirish yo‘llari tahlil etilgan. Resurslarni tejashga qaratilgan yangi konstruktiv parametrlar asosida yengillashtirilgan va yuqori aniqlikda ishlaydigan mexanizmlar taklif etilgan. Energiya sarfini kamaytirish hamda ekspluatatsion xarajatlarni optimallashtirish imkoniyatlari asoslab berilgan. Shuningdek, ishlab chiqilgan takliflarning amaliy ahamiyati va rivojlantirish istiqbollari yoritilgan.

Tayanch so‘zlar: tog‘-kon sanoati, tasmali konveyer, rolikli mexanizmlar, resurstejamkor konstruksiya, yangi konstruktiv parametrlar, yengillashtirilgan mexanizmlar, yuqori aniqlik, energiya samaradorligi.

Аннотация. В статье рассмотрены вопросы разработки ресурсосберегающих конструктивных решений для основных элементов ленточного конвейера, широко применяемого в горнодобывающей промышленности. Проанализированы пути повышения эффективности роликовых механизмов и увеличения их срока службы. На основе новых конструктивных параметров предложены облегчённые и высокоточные механизмы, обеспечивающие надёжную работу системы. Обоснованы возможности снижения энергопотребления и оптимизации эксплуатационных затрат. Также определены перспективы дальнейшего совершенствования конструкций ленточных конвейеров.

Ключевые слова: горнодобывающая промышленность, ленточный конвейер, роликовые механизмы, ресурсосбережение, новые конструктивные параметры, облегчённые механизмы, высокая точность, энергоэффективность.

The development of workshops, technical technologies, design work and technical fields arose due to the need for engineering inspections based on scientific research.

Before planning and designing an engineering inspection, it reveals global and potential development paths for the development of technology. It differs from scientific approaches in ensuring the continuity of inspection in the medium and short term and in selecting accurate sources of information. In engineering inspections, almost all available sources of information can be used, depending on the purpose, and conditionally they can be divided into parametric and non-parametric.

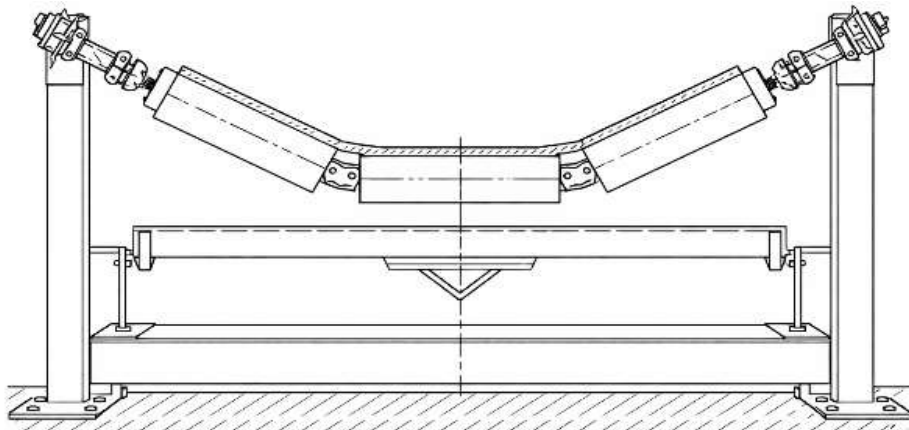
Many scientific research works at the enterprises of the mining and metallurgical industry are aimed at the theory of production and assembly of guide roller mechanisms, which are components of belt conveyors, and their design.

As noted above, it has been proven that the reliable operation of guide roller mechanisms on a conveyor largely depends on several important factors, including the characteristics of the transported cargo (environmental influences, dust, high humidity), the presence of shock loads, which are especially affected by various technological factors in the production of products in lifting units [1].

In the process of current production and assembly technologies, many mating parts of roller mechanisms, in some cases, incorrect installation of rolling bearings, subsequently leads to a significant decrease in the durability and service life of the mechanism. This situation has been confirmed by the incorrect selection of plastic lubricants [2].

There are several types of guide roller mechanisms in a belt conveyor, depending on their design, the most commonly used are three-row ones arranged at a certain angle to each other. In addition, in addition to the description of the mechanism according to its intended use, they are linear and special-function, which perform additional functions, such as centering, depreciation. At the same time, guide roller mechanisms are produced in various sizes depending on the operating conditions.

The main dimensions of guide roller mechanisms and their main characteristics are specified in GOST 22646-77, GOST 22644-77, but it should be noted [3, 4] that GOST, regulating the main dimensions, does not impose any restrictions on roller mechanisms, which results in different structural designs for different operating conditions.



Belt conveyor three-row mechanisms

Thus, the guide roller mechanisms are one of the main mass components of the belt conveyor. Roller mechanisms are one of the most important components that determine the performance and reliability of the belt conveyor.

In general, it is important to study the problems of the operation of belt conveyors of mining enterprises, to study the causes of failure of their components and the factors affecting the operation of the mechanism during experimental studies. Improving and analyzing the designs of guide roller mechanisms depending on their working conditions is one of the main reasons affecting the quality performance of the equipment.

In addition, the reliability and durability of the mechanism are one of the most important issues today. This is achieved by analyzing the technology of processing the designs of guide roller mechanisms and the assembly of parts into a single whole, creating a significant innovative design of the mechanism for operation in high humidity and dusty environments.

CONCLUSION

The results of this study show that by improving the main elements of belt conveyors used in the mining industry, their efficiency can be significantly increased. In particular, the use of new design parameters for roller mechanisms will serve to rationally use resources and extend their service life. The proposed resource-saving designs allow reducing energy consumption and optimizing operating costs. Lightweight and high-precision mechanisms ensure the stability and reliability of the system. Also, when the developed design solutions are implemented in practice, production efficiency increases. In general, scientific research in this area serves as an important theoretical and practical basis for the further development of belt conveyor systems.

REFERENCES

- [1]. Abduvaliev, U., Jumaev, A., Nurullaev, R., Ashirov, A., Abdurafikov, B. Influence of the Sectional Shape of the Grabbing Element of a Screw Composite Spindle on Agricultural Performance and Stability of Operation of a Cotton-Picking Machine. Lecture Notes in Networks and Systems, 2024, 1129.
https://link.springer.com/chapter/10.1007/978-3-031-70670-7_25
- [2]. Djuraev, A., Jumaev, A.S., Abduraxmanova, M.M. Analysis of the results of physical and mechanical experimental studies of the modernized belt conveyor. Journal of Physics: Conference Series, 2023, 2573(1), 012012.
<https://iopscience.iop.org/article/10.1088/1742-6596/2573/1/012012>
- [3]. Jumaev, A., Istablaev, F., Dustova, M. Development of the theory of calculation of constructive and rational parameters of belt conveyor roller mechanisms. AIP Conference Proceedings, 2022, 2467, 060025.
https://api.scienceweb.uz/storage/publication_files/9737/26397/666af69e34968.

- [4]. Djuraev, A., Jumaev, A.S., Ibragimova, N.I., Turdaliyeva, M.Y. Analysis of the dynamics of a belt conveyor with composite guide rollers and elastic elements. *Journal of Physics: Conference Series*, 2023, 2573(1), 012026.
https://api.scienceweb.uz/storage/publication_files/9737/26378/666ad94ba5c1b
- [5]. Abduvaliev, U., Jumaev, A., Nurullaev, R., Jakhonov, S., Investigation of the process of the influence of winding spindles with cotton fiber on the performance of a cotton picker. *E3S Web of Conferences*, 2024, 548, 04013. https://www.e3s-conferences.org/articles/e3sconf/abs/2024/78/e3sconf_agritech_x_04013/e3sconf_agritech-x_04013.html.
- [6]. Tilabov, B., Jumaev, A., Sherbutaev, J., Normurodov, U., Salimov, G. Testing of heat-treated surfaced samples and machine parts for hardness and wear resistance. *E3S Web of Conferences*, 2024, 548, 03014.
https://www.e3s-conferences.org/articles/e3sconf/abs/2024/78/e3sconf_agritech-x_03014/e3sconf_agritech-x_03014.html
- [7]. 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](https://www.globalsciencebooks.info/doi/10.37547/gbps-03-7) 1211 Polk St, Orlando, FL 32805, USA. – 151 p.
- [8]. Jumayev A.S., Abduraxmanova M.M. Modernizatsiya qilingan tasmali konveyer rolikli mexanizmlarining tajribaviy tadqiqot natijalari tahlili. *Scientific Journal of Mechanics and Technology*. ISSN 2181-158X, volume 6, Issue 1, 2025.
- [9]. Djuraev, A. Jumaev. Providing the development of new designs for the design of the roller mechanism transmitting rotational motion in belt conveyors. *International Journal of Emerging Trends in Engineering Research*. ISSN 2347 – 3983. Volume 8. No. 9, September 2020.

- [10]. 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://www.ijrte.org/portfolio-item/E6952018520/>
- [11]. [12]. A.S. Jumaev, A. Djuraev, M.M. Abduraxmanova. Analysis of the influence of the properties of oil products on the performance of belt conveyor guide roller mechanisms. Harvard Educational and Scientific Review International Agency for Development of Culture. Vol.2. Issue 2 Pages 44-52. 2020.
- [12]. A.S. Jumaev, A. Djuraev, A.N. Pushanov. Development of models of recession of defatory states of components as a result of external loads of belt conveyor drums. Harvard Educational and Scientific Review International Agency for Development of Culture. Vol.2. Issue 2 Pages 36-43. 2020.
- [13]. 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.
- [14]. A.S. Jumayev. Tasmali konveyer rolikli mexanizmlarini resurstejamkor konstruksiyalarini ishlab chiqish va nazariy tahlil qilish. Scientific journal of mechanics and technology ISSN 2181-158X, volume 5, Issue 1, 2024.