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Satbayev University

ХАБАРЛАРЫ

ИЗВЕСТИЯ

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V. Solonenko[1], N. Makhmetova[1*], M. Kvashnin[1], N. Ivanovtseva[1], V. Nikolaev[2]

[1]Academy of Logistics and Transport, Almaty, Kazakhstan;
[2]Omsk State University of Railway Transport, Omsk, Russian.
E-mail: makhmetova_n1958@mail.ru

VIBRODIAGNOSTICS OF METAL RAIL STRANDS FOR DIFFERENT TYPES OF FASTENINGS

Abstract. Based on the results of studies of mechanical vibrations of metal rail strands under real reversible moving dynamic load carried out by the authors, the methodology of vibrodiagnostics of rail strands is proposed, allowing to compare the dynamic operation of rail strands with different types of intermediate fasteners.

This article compares the joint dynamic operation of metal rail strands with several types of intermediate fasteners used on mainline railroads, and selects the most optimal intermediate fastener design for a particular section of rail strands.

The proposed methodology for vibrodiagnostics of metal rail strands includes the following set of indicators assessing the joint dynamic operation of rail strands and fasteners under moving dynamic load:

- peak and RMS values of vibration velocity of the metal rail in the center of the inter-tie box and in the middle of the sleeper on the axis of the rail strand, which characterize the bending vibrations of these elements and the mechanical stresses arising in them;
- the ratio of movable dynamic forces arising in the middle of the sleeper on the axis of the metal rail thread to the static forces, characterizing the force dynamic impact on the sleeper.

The results of the relationship between the vibration parameters of the metal rail under the influence of the moving dynamic load along the various sections of the metal rail strands based on the variation of different types of intermediate fasteners are presented.

Key words: metal rail, intermediate fasteners, moving dynamic load, static force, vibration displacement, vibration velocity, vibration acceleration.

В.Г. Солоненко[1], Н.М. Махметова[1*], М.Я. Квашнин[1], Н.В. Ивановцева[1], В.А. Николаев[2]

[1]Логистика және көлік академиясы, Алматы, Қазақстан;
[2]Омбы мемлекеттік қатынас жолдары университеті, Омбы, Ресей.
E-mail: makhmetova_n1958@mail.ru

МЕТАЛЛ РЕЛЬС ЖІПТЕРІНІҢ ВИБРОДИАГНОСТИКАСЫ БЕКІТУДІҢ ӘР ТҮРЛЕРІНДЕ

Аннотация. Авторлар орындаған нақты айналымдағы жылжымалы динамикалық жүктеме астындағы металл рельс жіптерінің механикалық тербелістерін зерттеу нәтижелері бойынша рельс жіптерінің вибродиагностикасын жүргізу әдістемесі ұсынылады, бұл рельс жіптерінің динамикалық жұмысын әртүрлі аралық бекітпелермен салыстыруға мүмкіндік береді.

Бұл мақалада темір жолдардың магистральдық желілерінде қолданылатын аралық бекітпелердің бірнеше түрімен металл рельсті жіптердің бірлескен динамикалық жұмысы салыстырылды және рельсті жіптердің белгілі бір бөлігі үшін аралық бекітудің ең оңтайлы конструкциясы таңдалды. Металл рельс жіптерінің вибродиагностикасын жүргізудің ұсынылып отырған әдістемесі жылжымалы динамикалық жүктеме кезіндегі рельс жіптерінің және бекіткіштердің бірлескен динамикалық жұмысын бағалайтын көрсеткіштердің мынадай кешенін қамтиды:

- осы элементтердің иілу тербелістерін және оларда пайда болатын механикалық кернеулерді сипаттайтын рельс жіпшесінің ортасындағы және шпалдың ортасындағы металл рельс тербелістерінің діріл жылдамдығының ең жоғарғы және орташа квадраттық мәндері;
- металл рельсті жіптің осіндегі шпалдың ортасында пайда болатын жылжымалы динамикалық күштердің шпалға динамикалық әсерін сипаттайтын статикалық күштерге қатынасы.

Аралық бекітпелердің әртүрлі түрлерін өзгерту негізінде металл рельс жіптерінің әртүрлі бөліктерінде жылжымалы динамикалық жүктеме әсерінен металл рельстің діріл параметрлері арасындағы байланыс нәтижелері келтірілген.

Түйін сөздер: металл рельс, аралық бекітпелер, жылжымалы динамикалық жүктеме, статикалық күш, дірілді ауыстыру, діріл жылдамдығы, діріл үдеуі.

В.Г. Солоненко[1], Н.М. Махметова[1*], М.Я. Квашнин[1], Н.В. Ивановцева[1], В.А. Николаев[2]

[1]Академия логистики и транспорта, Алматы, Казахстан;
[2]Омский государственный университет путей сообщения, Омск, Россия.
E-mail: makhmetova_n1958@mail.ru

ВИБРОДИАГНОСТИКА МЕТАЛЛИЧЕСКИХ РЕЛЬСОВЫХ НИТЕЙ ПРИ РАЗЛИЧНЫХ ТИПАХ СКРЕПЛЕНИЙ

Аннотация. По результатам исследований механических колебаний металлических рельсовых нитей под реально обращаемой подвижной динамической нагрузкой, выполненных авторами, предлагается методика проведения вибродиагностики рельсовых нитей, позволяющая производить сравнение динамической работы рельсовых нитей с различными типами промежуточных скреплений.

В данной статье выполнено сравнение совместной динамической работы металлических рельсовых нитей с несколькими типами промежуточных скреплений, используемыми на магистральных линиях железных дорог, и осуществлен выбор наиболее оптимальной конструкции промежуточного скрепления для конкретного участка рельсовых нитей.

Предлагаемая методика проведения вибродиагностики металлических рельсовых нитей включает следующий комплекс показателей, оценивающих совместную динамическую работу рельсовых нитей и скреплений под подвижной динамической нагрузкой:

- пиковые и среднеквадратические значения виброскорости колебаний металлического рельса в центре междушпального ящика и в середине шпалы на оси рельсовой нити, характеризующие изгибные колебания данных элементов и возникающие в них механические напряжения;

- шпалы на оси металлической рельсовой нити, к статическим силам, характеризующее силовое динамическое воздействие на шпалу.

Приведены результаты взаимосвязи между параметрами вибрации металлического рельса при воздействии подвижной динамической нагрузки по различным участкам металлических рельсовых нитей на основе варьирования различных типов промежуточных скреплений.

Ключевые слова: металлический рельс, промежуточные скрепления, подвижная динамическая нагрузка, статическая сила, виброперемещение, виброскорость, виброускорение.

Introduction. One of the directions of the strategy of the Republic of Kazakhstan is the development of a network of high-speed and high-speed train traffic. The organization of such traffic on the railroad network is closely related to ensuring the necessary level of reliability of metal rail strands, which has a significant impact on the safety of train traffic. Railroads in developed countries are constantly looking for ways to use advanced technologies to improve the reliability and durability of metal rail strands. They invest in the purchase of sensors and measuring systems of different designs to solve some particular problems, but so far there is a lack of such technical means that could solve the problem as a whole, with obtaining all the potential benefits from it. Such sensors and measurement systems are widely used on freight railroads in North America, in accordance with AAR 41as guidance document on criteria for wheel removal based on detector readings, which has been in effect since 1994. U.S. railroads realize substantial savings by extending the life of metal rail strands (Kalay, et al., 2002).

Vibrations occurring in metal rail strands under movable dynamic loads significantly affect the strength, and therefore the durability, of both the elements themselves and the rail strand as a whole (EN 13146-3:2002), (EN 13481-6:2002), (ISO 2017-2), (NS 8176:1999). Professor G.M. Shakhunyants noted that «the adverse effect of vibrations affects both the resistance of the rail strand to moving dynamic loads in the longitudinal and transverse directions and the stability and strength of intermediate and joint fastenings» (Shakhunyants, 1987).

Materials and methods. This paper presents some results of measurements of mechanical vibrations (vibrations) of metal rail strands in two sections of couplings of different types of intermediate fasteners under the influence of moving dynamic load and the basic provisions of the methodology for assessing the response of its structural elements to this impact.

The research was carried out on the main lines of JSC «NC «KTZ» using a mobile vibration-measuring complex. The complex consists of vibration sensors (velocimeters) MV-25D-V, which convert mechanical vibrations (vibration) acting on them into an electric signal. Conversion of analog signals into digital form is carried out in the electronic block of ADC model E-14-440. Digital data acquisition from ADC, general measurement control and signal processing are realized by means of special software of «Notebook» type personal computer.

Vibration sensors are installed in two sections of the studied section of metal rail strands in accordance with the developed scheme. The scheme of sensors installation depends on the research tasks and can vary in the process of vibrodiagnostics in a fairly wide range (Figure 1).

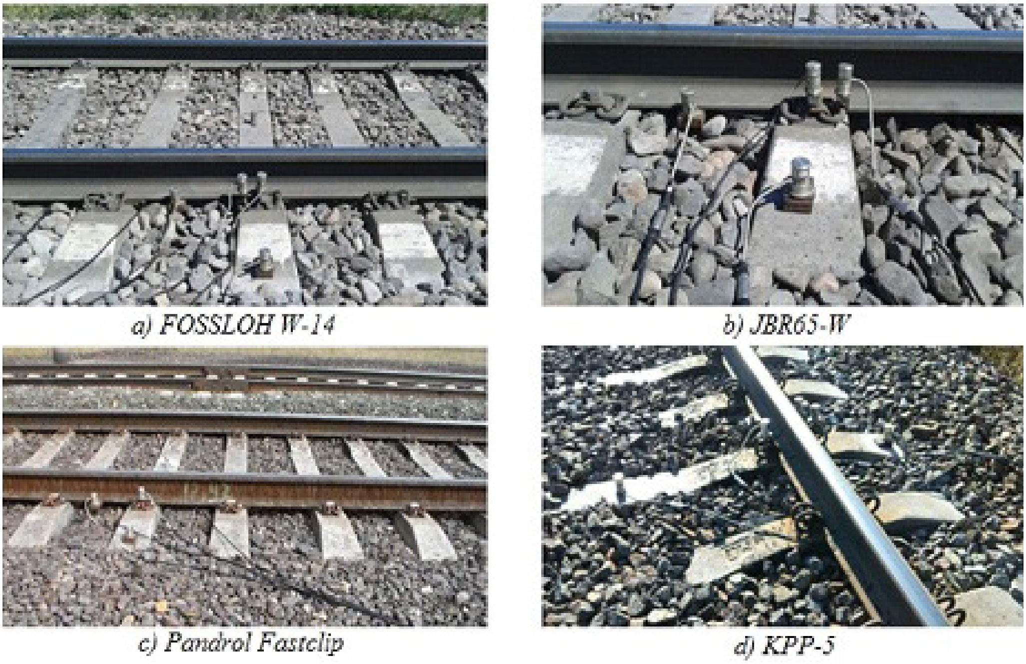

Figure 1 - Installation options for vibration sensors

In order to minimize the mutual influence of oscillations of metal rail strands with different types of fasteners at the interface sections, the distance between the sections should be as large as possible, and the length of the measuring path does not affect the measurement results. Records are made (at least 5) of the vibration process of metallic rail strands and fastenings from the impact of moving dynamic load. Analog signal from vibration sensors in the ADC is converted into a digital form and brought to the real values of vibration velocity by calibration coefficients derived for each sensor in the process of their calibration. Amplitude-time dependences (vibrograms) are built for each element separately (for metal rail strings, fasteners).

Figure 2 shows plots of the spectral density of vibration velocity (power spectra) of the metal rail sole vibrations at the interface areas with fasteners FOSSLOH W14 and ZBR65-Sh, Pandrol Fastclip and KPP-5 at a moving dynamic load at a speed of 85 km/h.

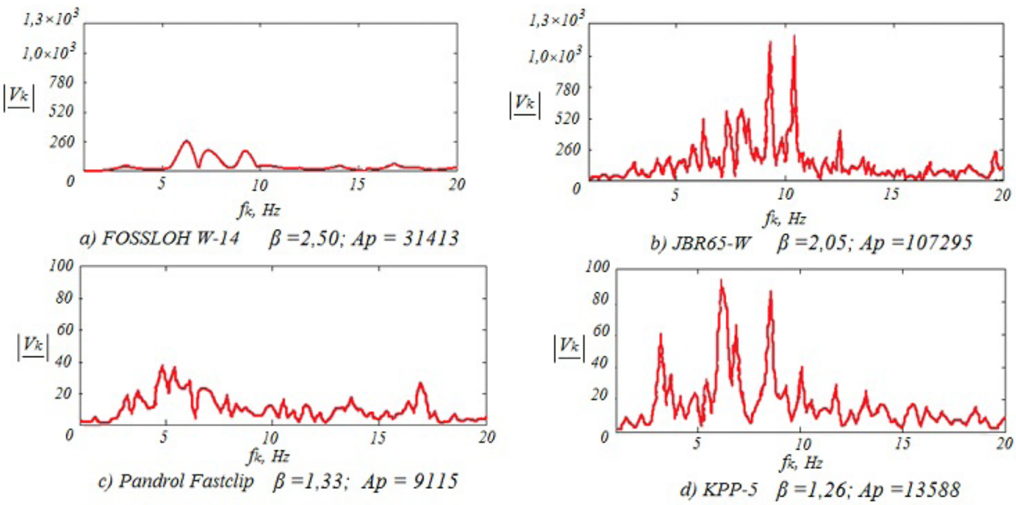

Figure 2 - The graph of the spectral density of vibration velocity of the base of the metal rail under the moving dynamic load at a speed of 85 km/h

Discussion. Using fast Fourier transform (FFT) the plots of signal dispersion spectral density (amplitude-frequency dependences) - vibration velocity spectra are built. The root-mean-square value (RMS) of vibrose velocity is calculated. With the help of numerical integration operation the amplitude-time dependences of vibration velocity are plotted (oscillograms), and then using FFT the vibration velocity spectrum plots (amplitude-frequency dependences of vibration velocity) are plotted.

Further, after a preliminary filtering of the digitized signal from vibration sensors in the lower frequency range (from 0 to 1000 Hz), by means of differentiation operation the diagrams of amplitude-time dependence of vibration acceleration (accelerograms) are constructed. Using FFT, graphs of amplitude-frequency dependences of vibroacceleration - vibroacceleration spectra (spectral density of dispersion graphs) are plotted. The RMS of vibroacceleration is calculated.

It should be noted that the FFT is an approximation of the real Fourier transform on a finite time interval Δt and, therefore, to increase the accuracy of the approximation, the distance between the points should be as small as possible. In addition, FFT algorithms require that the number of points is 2 to the power of N, i.e., $n = 2^N$, where N is an integer. As a result, the transition when analyzing the signal from the time domain to the frequency domain, can occur in real time. The problem of «spreading» of the spectrum is solved by using a signal recording technique in which the recording equipment starts and ends the recording at a signal level close to zero. Measurements and analysis of oscillations (vibrations) of metal rail strands in a number of interface sections with different types of intermediate fasteners have allowed to reveal their main regularities and to recommend evaluation criteria for comparison of metal rail strand structures operation in dynamics.

From the analysis of the above results of vibrodiagnostics follows:

1. The main parameters of the response of the elements of the metal rail strand by different types of intermediate fasteners to the vibrodynamic effects of the moving dynamic load differ in amplitude-frequency characteristics and damping criteria;

2. Evaluation criteria obtained during vibrodiagnostics of metal railroad strings with different types of fasteners adequately reflect the technical condition of metal railroad strings, and also agree with the score of the railroad strings according to the results of the impact of moving dynamic load.

Results. Comparing the response of the metal rail thread at the coupling sections by the area Ap of the power spectrum, and the damping coefficient β of the vibration velocity amplitude of the metal rail in relation to the sleeper vibrations, it can be concluded that the FOSSLOH W14 coupling at the moving dynamic load speed of 85 km/h absorbs vibrations better than the ZhBR-65ShD coupling (Fig. 2a, b). A comparison of the same parameters of the sections with Pandrol Fastclip and KPP-5 fasteners shows that the best damping properties, i.e. the best vibration dampening ability, belong to the section of track with Pandrol Fastclip (Fig. 2 c, d).

Currently, the railroads use a computerized KVL-P2.0 car laboratory, which automates the collection, transcription, storage and correlation with standards of data obtained by car measuring instruments (Instruction, 2011), (Instruction, 2011), (Methodology, 1998), (Solonenko et al, №439, 2020), (Solonenko et al., №440, 2020), (Bulavin et al., №6, 2021), (Solonenko et al., №444, 2020), (Murzakayeva et al., 2021), (Akhatov et al., 2021).

Table 1 shows the data on the technical condition of the metal rail strand according to the results of the impact of moving dynamic load and vibrodiagnostics of the interface sections of the rail strand structures with different types of fasteners.

Table 1 - Data on the technical condition of the metal railroad track based on the results of moving dynamic load and vibrodiagnostics of the coupling sections

Section	Section 1 (UHR-46)		Section 2 (UHR-30)	
Binding type	FOSSLOH W-14 (4035 km)	ZHBR-65SHD (4036 km)	Pandrol Fastclip (227 km)	KPP-5 (228 km)
Technical characteristics of metal rail thread: class; group and categories of track	1B1		1B2	

Metal rails type R-65		R-65		R-65	
Locomotive speed; km/h		85		85	
Passed tonnage; mln. tn.km.br.		305,4		236,4	
Year of the last overhaul of the metal rail strand		2006		2010	
Score of the condition of the metal rail strand, point (for July 1- section; for August, 2-section)		10	40	40	150
Evaluation Criteria	n, ed	28	39	35	47
	υsh, mm/s	39,24	56,32	59,02	83,35
	υp, mm/s	98,1	115,82	78,72	97,6
	β	2,50	2,05	1,33	1,26
	Ap, o.d.	31413	107296	9115	13588
	Ash, o.d.	15646	34955	7918	9643
	$\gamma \frac{A_P}{A_{Sh}}$	2,01	3,07	1,15	1,40

*Note: n - number of detected faults of the 2nd degree by totals for July (the 1st site) and August (the 2nd site); υsh - root-mean-square value (RMS) of vibration velocity of the sleeper; υp - root-mean-square value (RMS) vibration velocity of the metal rail thread; β - attenuation coefficient; Ap - area of the dispersion spectral density (vibration velocity spectrum) of the metal rail; Ash - spectral density area of dispersion (vibration velocity spectrum) of the sleeper; □ - ratio of rail vibration velocity spectrum area to sleeper vibration velocity spectrum area.

Figure 3 shows diagrams of the relationship between the final number of 2nd degree deviations and the evaluation criteria obtained as a result of vibrodiagnostics of the metal railroad strand at the conjugate sections. The diagrams show that the evaluation criteria adopted during vibrodiagnostics quite adequately reflect the condition of the metal rail thread, determined by the results of the impact of the moving dynamic load.

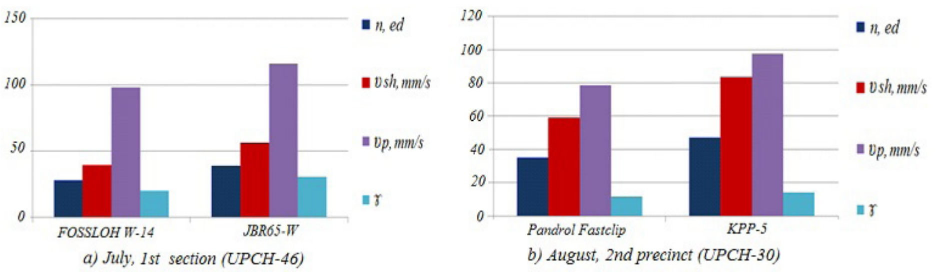

Figure 3 - Relationship between the final number of departures of the 2nd degree and the results of vibrodiagnostics of the metal rail strand at the interface areas of various fastener designs

Conclusion. From the analysis of the above results of vibrodiagnostics, and data on the technical condition of the metal rails according to the results of the impact of moving dynamic load, it follows:

- basic parameters of response of metal rail elements by different types of intermediate fasteners to vibrodynamic effects of moving dynamic load differ in amplitude-frequency characteristics and damping criteria;
- evaluation criteria obtained during vibrodiagnostics of metal rail strings with different types of fasteners adequately reflect the technical condition of metal rail strings, as well as consistent with the score of the rail strings based on the results of exposure to moving dynamic load.

The diagnostic methodology proposed by the authors, based on the analysis of the response of metal rail elements with different types of fasteners to vibrodynamic effects, allows for the selection of a rail thread design with optimal damping properties, which is especially relevant to the reconstruction of existing metal rail threads for new and upgraded locomotives and cars with increased axial loads and speed characteristics.

The implementation of the proposed vibrodiagnostics methodology will make it possible to perform an express analysis of the state of metal rail strands in the coupling sections of different types of fasteners by dynamic parameters and will allow to make the most optimal decisions when designing new and reconstruction of existing metal rail strands, taking into account the impact of moving dynamic load.

Information about authors:

Vladimir Solonenko – Professor, Doctor of Technical Sciences, Professor of the Department of "Highway Engineering", Academy of Logistics and Transport, Almaty, Kazakhstan, e-mail: v.solonenko@mail.ru, https://orcid.org/0000-0001-6503-6598;

Narzankul Makhmetova – Professor, Doctor of Technical Sciences, Professor of the Department of "Highway Engineering", Academy of Logistics and Transport, Almaty, Kazakhstan, e-mail: makhmetova_n1958@mail.ru, https://orcid.org/0000-0001-7324-5832;

Mikhail Kvashnin – Associate Professor, Candidate of Technical Sciences, Associate Professor, Department of Highway Engineering, Academy of Logistics and Transport, Almaty, Kazakhstan, e-mail: kvashnin_mj55@mail.ru, https://orcid.org/0000-0002-3969-9299;

Natalia Ivanovtseva – Associate Professor, Candidate of Technical Sciences, Associate Professor, Department of Highway Engineering, Academy of Logistics and Transport, Almaty, Kazakhstan, e-mail: stupchenko_n@mail.ru, https://orcid.org/0000-0002-0395-1720;

Victor Nikolaev – Professor, Doctor of Technical Sciences, Head of the Department “Theoretical Mechanics”, Omsk State University of Railway Transport, Omsk, Russia, e-mail: NikolaevVA@omgups.ru, https://orcid.org/0000-0002-0850-1796.

REFERENCES

Akhatov S.T., Solonenko V.G., Makhmetova N.M., Kosenko S.A., Ivanovtseva N.V., Malik A.A. (2021) Application of linear asynchronous motors for high-speed ground transport // News of the National Academy of Sciences of the Republic of Kazakhstan, Series of Geology and Technical Sciences, ISSN 2224-5278, 2(446): 31-36. https://doi.org/10.32014/2021.2518-170X.31.

EN 13146-3:2002 Railway applications – Track – Test methods for fastening systems – Part 3: Determination of attenuation of impact loads.

EN 13481-6:2002 Railway applications – Track – Performance requirements for fastening systems – Part 6: Special fastening systems for attenuation of vibration.

Instruction for deciphering tapes and estimation of rail track condition according to readings of track measuring car CNII-2 and measures for train traffic safety. (1997) Moscow, Transport, 42 p.

Instruction on current maintenance of the railroad track (CP-774). (dated 30.12.2011) Approved by the CP of NC KTZ, No. 1266-TZ.

ISO 2017-2 Mechanical vibration and shock – Resilient mounting systems – Part 2: Technical information to be exchanged for the application of isolation vibration associated with railways systems.

Kalay S., Samuels J. (2002) Railway Track & Structures, 3:13-16. http://cargovibes.eu/Uploads/dbsAttached Files/ D0301_APT_M27.pdf.

Methodology of automatic estimation of rail track condition according to Instruction CP-515. (2011) NPC Infotrans. Approved by CP MPS.

Murzakayeva M., Musayev J., Zhunisbekov S., Zhauyt A., Azilkiyasheva M. (2021) Experimental Evaluation of Railway Crew Impact on Tension Rails // International Journal of Mechanical Engineering and Robotics Research, 10(5):261-269.

NS 8176:1999 Vibration and shock – Measurement of vibration in buildings from land based transport and guidance for evaluation of its effects on human beings.

Solonenko V.G., Mahmetova N.M., Nikolaev V.A., Bekzhanova S.E., Kvashnin M.Ya., Bondar I.S., Mirzabaev S.A. (2020) Analysis of the stressed-deformed state of travel pipes with the use of hardware and software complex. - //News of the national academy of sciences of the republic of Kazakhstan. Series of geology and technical sciences, 1(439):181-188. https://doi.org/10.32014/2020.2518-170X.22.

Solonenko V.G., Makhmetova N.M., Nikolaev V.A., Kvashnin M.Ya., Bazanova I.A., Joldassova K.K. (2020) Influence of appendix point load training on magnitude of side power// News of the National Academy of Sciences of the Republic of Kazakhstan, Series of Geology and Technical Sciences, ISSN 2224-5278, 2(440):148-155. https://doi.org/10.32014/2020.2518-170X.42.

Bulavin Y.P., Volkov I.V., Konovalov P.Y. Bulavin Models of Locomotive Traction Drives for the Improvement of Sand Feeding System // IOP Conference Series: Earth and Environmental Science. 2021. 666(4). 042089. DOI: 10.1088/1755-1315/666/4/042089.

Solonenko V.G., Makhmetova N.M., Nikolaev V.A., Kvashnin M.Ya., Bondar I.S., Joldassova K.K., Alimkulov M.M. (2020) Study of stability of a tank-container with a filled liquid at longitudinal oscillations // News of the National Academy of Sciences of the Republic of Kazakhstan, Series of Geology and Technical Sciences, ISSN 2224-5278, 6(444):228-235. https://doi.org/10.32014/2020.2518-170X.151.

Shakhunyants G.M. (1987) Railway track. - Moscow: Transport, 236 p.

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