

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
VOLODYMYR DAHL EAST UKRAINIAN NATIONAL UNIVERSITY
Department "Logistics management
and traffic safety in transport»

RPE "ZARYA"

REGIONAL BRANCH «DONETSK RAILWAY»
PJSC «UKRZALIZNYTSIA»

EASTERN INTERREGIONAL DEPARTMENT
OF UKRTRANSBEZPEKA

**GLOBALIZATION OF SCIENTIFIC
AND EDUCATIONAL SPACE.
INNOVATIONS OF TRANSPORT.
PROBLEMS, EXPERIENCE, PROSPECTS**

Certificate UkrISTEI 302 of April 23, 2021

THESIS OF XIII INTERNATIONAL SCIENTIFIC
AND PRACTICAL CONFERENCE

21-26 May, 2021
Vlora (Albania)

ORGANIZING COMMITTEE

Chairman of Organizing Committee

Borysenko Dmytro - Chief engineer First Deputy Head of Regional branch «Donetsk railway» PJSC «Ukrzaliznytsya».

Vice-chairman

Riazantseva Antonina - Acting Deputy Head of the Eastern Interregional Department of Ukrtransbezpeky, Eastern Interregional Department of Ukrtransbezpeky.

Chernetsov Alexander – general director RPE "Zarya" the leading company in chemical industry of Ukraine.

Vodolazskiy Alexander – President AVA Carrier LLC, USA.

Members of organizing committee

Chernetska-Biletska Nataliia - Professor, doctor of engineering sciences, head of department "Logistics management and traffic safety in transport", Volodymyr Dahl East Ukrainian National University, (Severodonetsk, Ukraine).

Tkachenko Viktor - Professor, doctor of Engineering Sciences, Head of department of Traction Rolling Stock of Railways, State University of Infrastructure and Technologies (Kiev, Ukraine).

Zagnoiko Evgeniy – Transport Director PJSC "Severodonetsk Association of Nitrogen".

Svitlana Sapronova - Professor of the department "Wagons and wagon economy", State University of Infrastructure and Technologies (Kiev, Ukraine).

Butko Tetiana - Professor, doctor of engineering sciences, - the Head of the Department of Operations Management Ukrainian State University of Railway Transport (Kharkiv Ukraine).

Oleg Frantsuz - Member of the business Council of Europe.

Okhrin Ostap - Professor, doctor of engineering sciences, Institute of transport and Traffic Sciences, chair of econometrics and Statistics, Technical University of Dresden (Dresden, Germany).

Erofeev Aleksandr - Vice-Rector for Scientific Work of the Belarusian State Transport University (Gomel, Belarus).

Berezhnaya Svetlana – director training and development RPE "Zarya" the leading company in chemical industry of Ukraine (Rubezhnoe, Ukraine).

Sydnev Volodymyr - Head of the Lyman Center for Professional Development of Personnel Regional branch «Donetsk railway» PJSC «Ukrzaliznytsya» (Lyman, Ukraine).

Scientific secretary

Shvornikova Hanna - Ph.D., Associate Professor of department "Logistics management and traffic safety in transport", Volodymyr Dahl East Ukrainian National University.

Coordinator

Miroshnykova Mariia - assistant of department "Logistics management and traffic safety in transport", Volodymyr Dahl East Ukrainian National University.

Recommended for publication by department "Logistics management and traffic safety in transport", Volodymyr Dahl East Ukrainian National University (protocol 24 from May 13, 2021)

Globalization of scientific and educational space. Innovations of transport. Problems, experience, prospects: thesis, 21-26 May, 2021, Vlora (Albania) / Executive editor: Chernetska-Biletska N. – Severodonetsk: Volodymyr Dahl East Ukrainian National University, 2021.

CONTENTS

Bedenko D., Biletskyi V., Rogovyi A. SIMULATION OF TRAFFIC WITH THE HELP OF PTV VISSIM SOFTWARE.....	7
Chernetskaya-Beletskaya N., Baranov I., Miroshnykova M. IMPLEMENTATION TRAFFIC SAFETY MANAGEMENT SYSTEM FOR RAILWAY TRANSPORT IN INTERNATIONAL TRAFFIC	9
Dehtiarova L., Odarushchenko E., Miroshnykova M. USING ARTIFICIAL INTELLIGENCE IN TRANSPORTATION AND LOGISTICS.....	13
Fomin O., Vatulia G., Lovska A. DETERMINATION OF VERTICAL LOADS OF THE BEARING STRUCTURE OF A FLAT CAR WITH VISCOUS RESTRAINT IN THE LONGITUDINAL BEAMS	16
Fomin O., Vatulia G., Lovska A. RESEARCH OF DYNAMIC LOADING AND STRENGTH OF A LONG-BASE FLAT CAR WITH RESILIENT ELEMENTS IN THE LONGITUDINAL BEAMS	18
Husarenko K., Medvediev Ie. USING MESSENGERS AND CHATBOTS IN LOGISTICS	20
Khalipova N., Lesnikova I. REGARDING THE QUALITY MANAGEMENT OF ENTERPRISES TRANSPORT AND LOGISTICS PROCESSES	22
Kirichenko I., Kuzmenko N. QUALITY OF TRANSPORTATION SERVICES ON DIFFERENT TYPES OF TRANSPORT.....	25
Kliuiev S., Pschenychnyi S. ANALYSIS OF MODERN TRANSPORT LOGISTICS PROBLEMS.....	29

RESEARCH OF DYNAMIC LOADING AND STRENGTH OF A LONG-BASE FLAT CAR WITH RESILIENT ELEMENTS IN THE LONGITUDINAL BEAMS

Fomin O.¹, Vatulia G.², Lovska A.²

¹*State University of Infrastructure and Technologies,*

²*Ukrainian State University of Railway Transport*

Efficient transportation is the key factor of economic development of European countries; its main component is railway transport. The railway network in Europe maintains effective cooperation and development of all countries in Europe. It is important to mention that the leading position of railway transport can be maintained by introducing modern efficient rail vehicles.

The most required type of rail vehicles for international transportation is the flat car. Flat cars are used for transportation of the freight which does not require protection from atmospheric fallout. Particularly in the international transportation these cars are used for all types of containers. The main bearing element of a flat car is the welded frame.

Long-base flat cars can provide more efficient service as each can transport four 20-ft containers. However, due to their elastic-yield structures they suffer from large vertical loads. It causes accumulation of fatigue stresses in the bearing structure and damage. Therefore, there is a need to implement new alternative solutions aimed at lower dynamic loads of the bearing structure in operation [1 – 3].

Thus, the dynamic loads on the bearing structure of a flat car can be decreased, and the fatigue strength can be increased during operational modes with application of resilient elements. They are placed in the main bearing structures, the longitudinal beams. It requires replacement of the main longitudinal beams of the frame with ones of the U-like profile.

The dynamic loading on the bearing structure of the improved flat car was determined by means of the mathematic modelling. The research was made in the XZ plane coordinates.

The maximum vertical acceleration of the bearing structure of an empty flat car was about 2 m/s^2 (0.2g), and that of the bogies – about 8.29 m/s^2 (0.8g). This solution can decrease the vertical accelerations on the bearing structure of a flat car by about 15% in comparison to that of the prototype car. The motion of the car was estimated as excellent [4, 5].

The study deals with the research into the fatigue strength of the bearing structure of a flat car. The calculation was made with the finite element method in the SolidWorks (CosmosWorks) software. The

maximum equivalent stresses were in the contact area between the bolster beam and the diagonal braces; they amounted to 254.0 MPa. The maximum displacements were in the middle part of the longitudinal beams and amounted to 12.6 mm. Thus, the strength of the bearing structure of a flat car was provided [4, 5].

The study presents the numerical values of the accelerations in the bearing structure of a flat car and their dislocation fields. The difference between the results of the mathematical and computer modelling of the dynamic loading of the bearing structure of a flat car was about 12%.

The research deals with the fatigue strength and natural oscillation frequencies of the bearing structure of a flat car. It was found that the fatigue strength of the bearing structure at a test base of 10^7 was provided.

The research may be useful for those who are concerned about designing innovative flat cars and improved operational efficiency of combined transportation.

References:

1. Panchenko S. Determining the load on the long-based structure of the platform car with elastic elements in longitudinal beams / S. Panchenko, O. Fomin, G. Vatulia, O. Ustenko, A. Lovska // *Eastern-European Journal of Enterprise Technologies*, 2021, №1/7 (109). – P. 6 – 13. doi: 10.15587/1729-4061.2021.224638
2. Vatulia G. Optimization of the truss beam. Verification of the calculation results / G. Vatulia, S. Komagorova, M. Pavliuchenkov // *MATEC Web of Conferences*, 2018, 230, 02037 doi: 10.1051/mateconf/201823002037
3. Krason W. FE numerical tests of railway wagon for intermodal transport according to PN-EU standards / W. Krason, T. Niezgoda // *Bulletin of the Polish Academy of Sciences technical sciences*, 2014, Vol. 62, Issue 4. – P. 843 – 851. doi: 10.2478/bpasts-2014-0093
4. Vagoni vantazhni. Zagalni vimogi do rozrakhunkiv ta proektuvannya novikh i modernizovanih vagoniv koliyi 1520 mm (nesamokhidnikh): DSTU 7598:2014, 2015. – 162 s.
5. Vagony gruzovye. Trebovaniya k prochnosti i dinamicheskim kachestvam: GOST 33211-2014, 2016. – 54 s.