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STATUS OF ASSESSMENT OF DYNAMIC CHARACTERISTICS OF INTERMEDIATE DEVICES OF VEHICLE BRIDGES

Abstract. This article describes the method of vibrodynamic evaluation from the methods of evaluating and accounting for changes in dynamic parameters of intermediate devices of girder bridges. The advantages, purpose, tasks of vibrodynamic inspection of constructions, as well as the analysis of work on the evaluation of the technical condition of bridges by means of vibrodynamic inspection, and the modern requirements for the application process of this method are discussed.

Keywords: Vibrodynamic investigation, dynamic effects, intermediate device, load carrying capacity, defects, resonance, vibration measurement.

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AVTOBONI KO'PRIKLARINING ORALIQ QURILMALARINING DINAMIK XUSUSIYATLARINI BAHOLASHNING XOZIRGI XOLATI

Annotatsiya. Ushbu maqolada to'sinli ko'priklarning oraliq qurilmalarining dinamik parametrlari o'zgarishini baholash va hisobga olish usullaridan vibradinamik baholash usuli yoritib o'tilgan. Konstruksiyalarning vibroдинамик tekshirishning afzalliliklari, maqsadi, vazifalari, shuningdek, vibroдинамик tekshirish orqali, ko'priklarni texnik holatini baholash bo'yicha ishlarning tahlili ko'rib chiqilgan hamda, ushbu usulni qo'llash jarayoniga qo'yiladigan zamonaviy talablarga to'xtalib o'tilgan.

Kalit so'zlar: Vibroдинамик tekshirishlar, dinamik ta'sirlar, oraliq qurilma, yuk ko'tara olish qobiliyati, nuqson, rezonans, tebranishlarni o'lchash

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СОСТОЯНИЕ ОЦЕНКИ ДИНАМИЧЕСКИХ ХАРАКТЕРИСТИК ПРОЛЁТНЫХ СТРОЕНИЙ АВТОДОРОЖНЫХ МОСТОВ

Аннотация. В данной статье описан метод вибродинамической оценки из методов оценки и учета изменения динамических параметров промежуточных устройств балочных мостов. Обсуждаются преимущества, назначение, задачи вибродинамического контроля конструкций, а также анализ работ по оценке технического состояния мостов средствами вибродинамического контроля и современные требования к процессу применения этого метода.

Ключевые слова: Вибродинамические испытания, динамические воздействия, пролётное строение, несущая способность, дефекты, резонанс, измерение вибраций

Introduction

Timely detection of defects in Transport facilities will significantly reduce the cost of their maintenance and repair.

Recently, many studies have focused on improving strategies for maintaining and using bridges. Periodic inspection and timely detection of defects and damages is the





basis for operational reliability and safety of transport facilities.

The complex of work on the diagnostics of bridges requires highly qualified engineers who carry out work on the inspection and technical inspection of bridges and its structures. In addition, due to the complexity of currently used diagnostic methods and sometimes the impossibility of detecting hidden defects and damage, it is impossible to sufficiently determine the operational state of structures. It is possible to improve the efficiency of the obtained results by introducing modern computer technologies to increase the reliability of the obtained results, to ensure the safety, reliability and economic efficiency of vehicles, to minimize the influence of the human factor on the obtained results. Therefore, the development of methods to increase the reliability of the obtained results is currently a very important problem.

Methods

Fundamentals of studying the methods of evaluating the dynamic characteristics of intermediate devices of automobile bridges.

Results and Discussion

The basis for determining the current state of Transport facilities is periodic examinations and diagnostics in order to assess the technical condition of the object. In general, the assessment of the technical condition of bridge intermediate devices can be described as the process of identifying injuries and determining the category of technical conditionDuring the conversation, the parties expressed satisfaction with the development of cooperation between Tajikistan and China, as well as the development of cooperation between Tajikistan and China. Bugungi Kunda diagnostics every project engineering facility as a standard calculation procedure. This is important for bridges, because the information obtained in this way, in addition to the main task of detecting damage in the structure, can also be used for research purposes to evaluate the performance of the structure, ensure timely strengthening and repair, as well as to improve design solutions and construction technologies.

The purpose of technical diagnostics is research based on accurate measurement, which allows to establish criteria and objective functions, which allows to evaluate changes in the state of stress and deformation in load-bearing structures of automobile bridges.

The development of methods for assessing the dynamic characteristics of Transport facilities is carried out in two main areas:

1) Improving dynamic calculations of bridge structures in order to obtain sufficiently accurate and practical convenient methods for determining dynamic parameters;

2) Currently, we are constantly exploring new devices and manuals, as well as exploring new opportunities, exploring new improvement methods, exploring new opportunities and exploring new opportunities.

Assessment of the technical condition of the structure can be carried out by visual inspection and instrumental methods. Assessment by visual inspection has a number of significant disadvantages: it depends on the qualifications of the research engineer - it is impossible to accurately assess the degree of development of defects, as well as defects in the structure, hidden and difficult to see with the naked eye. It is such defects that affect





the operation of the structure and can be determined by testing methods without instrumental distortion. These methods are used by A.Rytter [11] cited his analysis in his work. Examples of these are acoustic emission, Ultra-sound inspection, magnetic powder inspection, Vibrodynamic inspection, electromagnetic (vichretocovy) inspection and other testing methods. Of these, we can say the method of vibrodynamic verification as the most effective method in checking bridge intermediate constructions and other structures.

Vibrodynamic techshrish methodining the main ideas are artificial or natural dynamic reactions based on Celtic reactions, object-dynamic dynamic parametric mode to combat violence. Yuk sought to influence every jandai mahalining to find a job, dynamic parameter management. During the meeting, the sides expressed satisfaction with the development of cooperation between Tajikistan and China. If you have any problems, you may not know how to do it. In this regard, Bundai universal diagnostics only allows dynamically influencing pregnant women with learning disabilities.

Based on the definition, we can divide the examinations carried out without breaking into local and global diagnostic groups. During the examinations, global Diagnostics is important and allows you to assess the presence of damage in the structure, and, using the vibrdynamic examination method, it is possible to localize damage and determine the degree of its development. In addition, in the planned diagnostics of bridges, their dynamic parameters can be diagnosed through the vibrdynamic examination method. For structures, this diagnosis at the end of the exploitation period is of significant operational and financial importance. Because if the technical condition of the bridge is good, reconstruction or overhaul may be delayed. The application of this approach from the point of view of the management of the bridge infrastructure makes it possible to develop an optimal strategy for the reconstruction of structures, determining the priority of repair work depending on the technical condition of each structure.

Such a management system increases the efficiency of using the road network by choosing an optimal strategy for maintaining artificial structures that meet the basic requirements, minimizes the costs of repair and reconstruction, increases the service life of structures, increases the reliability of structures.

The researchers were faced with the task of determining the degree to which the deflections and forces caused by the moving load in the bridge structure differ from the deflections and forces under static loading conditions.

In 1905 A. N. Krylov [1] found a complete solution to the problem of the uniformly distributed mass movement of a non-inert load along an intermediate device.

$$y(x, t) = \sum_{i=1}^{\infty} F_i(t) \sin \frac{i\pi x}{l} \quad (1)$$

S.E. Inglis [2] and A. In the work of Schallenkamp [3], the intermediate device and inertial forces were taken into account. S.E. The essence of Inglis [2]'s method is to construct a curvilinear curve at any time when the car is above the intermediate device. The solution is found in the discrete form for an arbitrary section according to the specific forms of vibration of the intermediate device, where the inertia of the moving vehicle is taken into account as follows:





$$m \frac{d^2y}{dt^2} = m \left\{ \frac{\partial^2 y}{\partial t^2} (\text{portable acceleration}) + \right. \\ \left. + 2v \frac{\partial^2 y}{\partial x \partial t} (\text{Corellois acceleration}) + \right. \\ \left. + v^2 \frac{\partial^2 y}{\partial x^2} (\text{Center aspiration acceleration}) \right\} \quad (2)$$

By expressing the expression of the bending function in the following form,

$$y = f(t) \sin \frac{\pi x}{l} \quad (3)$$

We get the vibration equation of the intermediate device

$$\left[1 + \gamma(1 - \cos \omega t) \right] \frac{d^2 f}{dt^2} + 2[\varepsilon + \omega \gamma \sin 2\omega t] \frac{df}{dt} + \\ + [\omega_0^2 - \gamma \omega^2 (1 - \cos 2\omega t)] f = \frac{2P}{m_\delta} \cos qt \cdot \sin \frac{\pi vt}{l} \quad (4)$$

here $\omega_0 = \frac{\pi^2}{l^2} \left(\frac{EI}{m_\delta} \right)^{\frac{1}{2}}$; $\gamma = \frac{m_n}{m_\delta}$; m_n ; m_δ - intermediate device and linear load mass;

ω - circulating frequency of the intermediate device; q - external load frequency;

v — the rate of movement of the accumulated mass; S — linear depreciation coefficient.

$$f(t) = \sum_{r=-\infty}^{r=\infty} A_r \cos(\omega r + q)t \quad (5)$$

As a result of solving the equation (5), the corresponding coefficients A_r and A_{-r} up to ω and $r=11$ are determined. This solution of the equation (5) is called the method of dividing the function by specific coordinates. It can be seen from (2) that in the expression of the deviation function on the geometric coordinate E. Englis left only one word of the line.

A. Schallenkamp, S.E. Inglis, the deflection under load is expressed as a series Fourier with uncertain coefficients A_i :

$$y(vt, t) = \sum_{i=1}^{\infty} A_i \sin \frac{i\pi vt}{l} \quad (6)$$

As a result, the evaluation of deflection under load is reduced to solving a system of infinite linear algebraic equations.

The results of the research analysis show that the dynamic effect of speed increase and moving load increases according to the Inglis method and decreases according to the Shallenkamp method. Also, A. B. Based on the results of both methods in the work of Morgaevsky [4], he concluded that it is necessary to avoid determining the value of the dynamic coefficient under load, because it can lead to a significant distortion of the results and wrong conclusions at high speeds. A. B. Morgaevsky recommended estimating the value of the dynamic coefficient by the absolutely largest deviation or deviation in the middle of an interval that does not differ from each other.

A.B. Morgaevskii solved the problem of movement of a mechanical system consisting of two elastically connected loads along a smooth interface. The bottom load





rests firmly on the intermediate device. By combining the differential equations of combined vibrations of the intermediate device and the load with the numerical method of Adams-Stermer, he made graphs of the dependence of the dynamic coefficient on the stiffness of the elastic joint between the loads.

The modern expression of the system of differential equations, collected and distributed - in any combination of loads with the distribution of weight along the length of any fixed intermediate device, corresponding to the state of movement, is reflected in the Inglis-Bolotin equation [5, 6, 7] in terms of magnitude. The critical speed of load movement with constant and variable time was determined in a generalized form. For example, the critical speeds in the first and second approximations when the car moves along the hinged opertnoy intermediate device are calculated using the Inglis-Bolotin method

$$\begin{aligned}v_{kr} &= \frac{\pi}{l} \left(\frac{E/l}{E/l} \right)^{\frac{1}{2}} (1 + 4a)^{-\frac{1}{2}}, \quad a = \frac{M}{M_0}, \\v_{kr} &= \frac{\pi}{l} \left(\frac{E/l}{M} \right)^{\frac{1}{2}} [5 + 12a - 4(1 + 4a + 5a^2)^{\frac{1}{2}}]^{-\frac{1}{2}},\end{aligned}\quad (7)$$

бу уерда M_0 ва M мос равища оралиқ курилма ва юкнинг массалари.

S. E. Inglis, S. A. Ilyasevich, S. P. Tymoshenko, K. E. Contrary to the conclusions of Kitaev's works, it is possible to determine and estimate resonance speeds and corresponding frequencies through the solutions of equations (7).

S. I. Taking into account the research of Konashenko [8], it is noted that the maximum dynamic coefficient is reached at. $v = 0,6v_{kr}$

This is explained by the phase mismatch of natural and forced oscillations when forced oscillations reach their maximum. Calculations show that as the resonance is approached ($y \rightarrow y_{kr}$), the amplitudes of natural and forced vibrations approach each other in terms of absolute values. But since the phases of these oscillations tend to be opposite to each other (increasing phase shift), the amplitude of the resulting oscillations may decrease as they approach resonance.

A.P. Filippov and S. S. In the work of Kohmaniuk [9], the method of integral equations was used to describe the vibrations of intermediate devices. Two unknown functions for the motion of one mass $y(\eta, \eta)$, $\frac{d^2y}{d\eta^2}$, is introduced, thereby correcting the under-convergence of the integral equations. Integration of systems of equations is carried out numerically. This method allows us to solve the equations with the required accuracy for the state of movement of mechanical systems along the columns of the intermediate device.

At the beginning of the 20th century, a number of new, more advanced measuring instruments were used for static and dynamic tests based on different operating principles. Scientists N. N. Aistov, Yu.A. Nilender, N. N. Maksimov, K. I. Davidenkov, A. M. Emelyanov, S. A. Dushechkin and others developed new measuring devices (strain gauges, deflection gauges, indicators, clinometers, vibrographs) and experimental research methods.

Along with full-scale experiments, model tests Ham began to





play an increasingly important role. With their help, structural schemes for more complex structures are improved and reliably selected, and the project option of the models is also significantly accelerated.

And finally, the current state of the construction experiment is characterized by a further change in its feasibility. The determination of dynamic properties in structural elements, which until now was used in testing and scientific research and partly as a control during construction and operation, is now becoming an integral part of the construction process.

Currently, the next task in this direction is to further automate the measurements and reduce the time for processing the obtained data using computer technologies.

Experimental studies are important for evaluating the dynamic properties of intermediate devices of car bridges and for developing theoretical calculations. Many centuries of practical construction experience, the absence or presence of accidents and accidents have allowed us to choose the most reasonable constructions. Unsuccessful solutions that could not stand the test of time were canceled and, on the contrary, the most modern designs and structures were preserved.

The choice of a rational strategy for the maintenance of artificial structures increases the efficiency of the use of a network of roads that meet the basic requirements, and also minimizes the costs of repair and reconstruction, prolongs the period of operation of structures. To achieve this goal, the following tasks must be completed:

- ❖ Justification of the use of the method of vibrodynamic verification of intermediate devices of crossbar bridges to determine the technical condition of the structure;
 - ❖ Development of a sequence of calculations before dynamic tests of intermediate devices of crossbar bridges;
 - ❖ Implementation of operational modal analysis in full testing of intermediate devices of crossbar bridges;
 - ❖ Development of a methodology for determining the load-bearing capacity of intermediate devices of crossbar bridges in accordance with the data in the framework of their dynamic parameters.

Conclusion

The conclusion of the work is that the effectiveness of methods for detecting defects depends on several factors, such as the number of sensors located near the injury zones, the level of noise present in the obtained dynamic measurements, the location of the defect and the degree of development. A certain method of technical assessment is not distinguished as the best, on the contrary, it is recommended to apply all the considered methods at the same time, then a successful determination of the technical condition of the transport structure is achieved if several methods clearly show damage.

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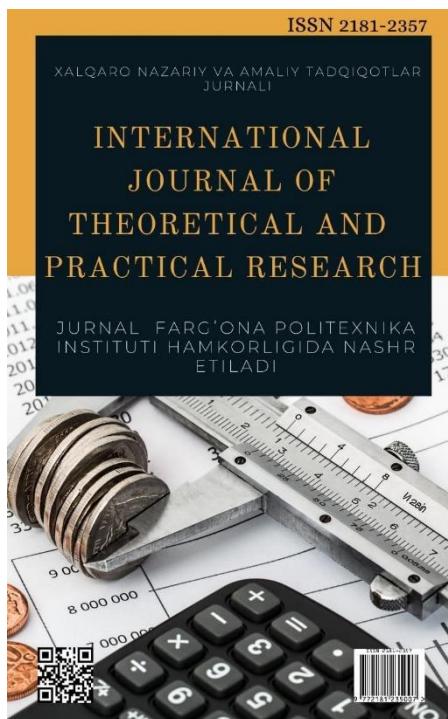
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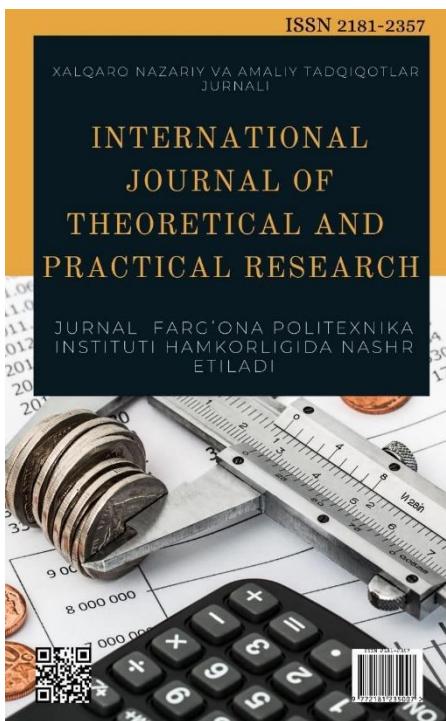
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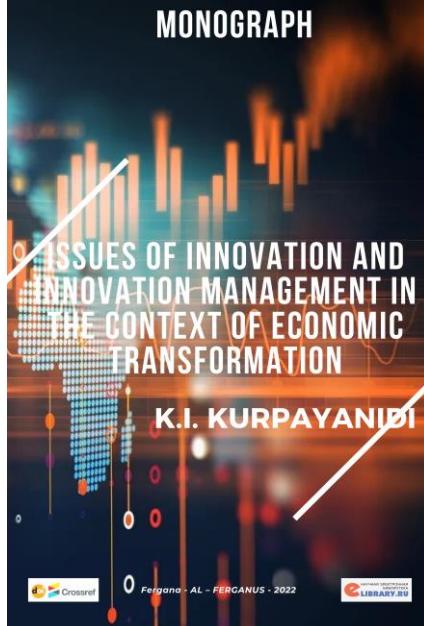
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**MANAGEMENT OF
INNOVATIVE ACTIVITIES
OF BUSINESS ENTITIES IN
INDUSTRY**

MONOGRAPH



K.I. KURPAYANIDI D.E. MAMUROV



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кластерлари
фаолиятида бошқарув
механизмларини
такомиллаштириш

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такомиллаштириш
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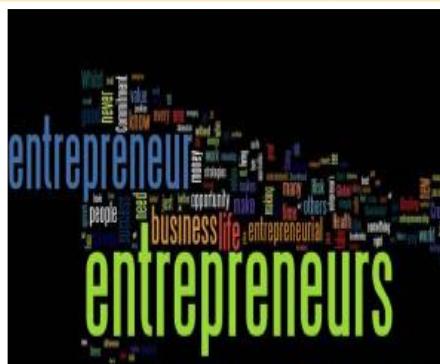
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INSTITUTIONAL TRANSFORMATION OF THE
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Monograph



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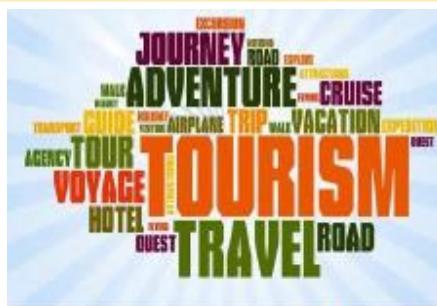
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ФАОЛИЯТИНИ БОШҚАРИШИНГ УСЛУБИЙ
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ПАРАДИГМАСИ: МЕТОДОЛОГИЯ, ТАЖРИБА
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G‘O‘ZADA DEFOLIATSIYA O‘TKAZISHNING
MAQBUL ME‘YOR VA MUDDATLARI

Ubaydullayev M.M.
G‘o‘zada defoliatsiya
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