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DIAGNOSING AGRICULTURAL MACHINESBY HOLOGRAPHY

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Abstract. *The article examines the possibility of using holography to diagnose technical state agricultural machines by comparing the actual parameters obtained experimentally, the data defined in terms of regulatory and technical documentation. A wide range of external factors, and work environment leads to significant changes in the prescribed condition and loosing efficiency, especially in the agricultural machinery operating in very difficult conditions. Holography can receive interference patterns studied the surfaces of objects regardless of their physical size and shape. High level of organizational and technical diagnostics operations of agricultural machinery in the creation and accumulation database object for each repair is the use of computer technology. This may set all the information on the results of diagnostics, maintenance, repairs, determine the impact on the cost of their implementation from the start of the machine until the end. Diagnosis helps prevent premature dismantling of some parts of machine and thus reduce rate of depreciation of equipment, reduce complexity of maintenance, better use of spare parts to repair machines, determine residual life and thus reduce total cost of repairing agricultural machinery, tractors and cars.*
Key words: *holography, technical condition, diagnosis, mikrodeformation surface detail, physical size*

Introduction. Farm equipment and their components are made largely of variations in quality. They are stochastic, probabilistic nature of the loss of operability during operation. A wide range of external factors, work environment also leads to significant changes in the speed loss workable state, particularly in agricultural machines, which use conjugated with severe conditions.

Formulation of problem. To determine agricultural machinery technical condition is one of the most important tasks for the purpose of timely technical maintenance and repairs to prevent failures.

Analysis of recent research results. Objective assessment of the technical condition of the car can give diagnosis or defect determination after dismantling [2, 3]. High level of organizational and technical

operations diagnosing agricultural machinery, creating and accumulating a database for each object repair using computer technology, where you can lay all the information on the results of diagnostics, maintenance, repair and influences the cost of their implementation from the beginning and the end of the operation the machine allows you to:

- prevent premature dismantling of certain parts of the machine and therefore the wear rate common parts conjugations;
- reduce the complexity of current repairs;
- better use resources assembly of the machine and thus reduce the consumption of spare parts and the overall cost to repair cars.

Purpose of research. Set the opportunity and implement methods for diagnosing of holographic technical condition of agricultural machinery for destination type and extent of the repair and servicing work.

Results of research. It is considered an established fact that every disassembly machine reduces workability due to losses in the operation common conjugations. That is why the diagnosis takes precedence in determining real parameters of technical condition and timing trouble-free operation of each machine.

To systems that actually evaluate the parameters of technical condition vehicles include methods and means of non-destructive testing, including computer holography. Chance occurrence limit state machine allows applying the methods of mathematical statistics by comparing the actual technical condition parameters obtained from experimental control, defined regulations of normative and technical documentation. Holography allows obtaining interference patterns investigation surfaces of objects regardless of their physical size and shape. Readjustment of the optical system allows us to study the details, machines, or machines in general, with sizes ranging from 40x40 mm to 1000 x 3000 mm and record optical images in memory. Comparing these images with control lets you explore the technical condition of vehicles and diagnose its suitability for further use. Specificity technical diagnostics, especially agricultural machinery, is the direction of its assets to establish the parameters of the technical state of vehicles with determination necessary [1, 4, 5] in restoring operability and possible indication of the type and volume of repair and service work.

The maximum state of parts defined as the inability to further operation of the machine or while reducing its operational efficiency or in non-compliance to safety, industrial health or the environment. Such technical condition of vehicles causing the technical documentation requirements. Indicators define durability loss machine operability for all timing its operation. The main indicator of the durability of the machine is a term of service or operating time to failure T, which is determined by a

random process some unidentified losses operability, such as - loss of strength of the surface layers of the working zones of contacting parts or size of deterioration, warping or corrosion. A resource critical part is regulated value, as they are potentially workability. Experimental studies have stated that only holographic techniques can properly and fully define the technical condition of agricultural machines. Using holography possible to assess the state of the surface layers of the working areas of complex parts and integrated, not differentially. The sensitivity of the optical system to record micro-changes in the surface layers, which in turn makes it possible to evaluate the technical condition and accordingly workability at any randomly chosen point in time of the production operation of agricultural machinery.

It is established that the use of holography makes it possible to reduce the number of incorrectly rejected suitable for further use parts, respectively: $n_{ct.} = 9,66\%$; $n_n = 6,60\%$, and incorrectly taken appropriate: $m_{ct} = 10,83\%$; $m_n = 6,97\%$. Computer holography increases the reliability of agricultural machinery by reducing errors in fault detection and control of machine parts.

On the other hand the implementation of holography may limit or determine the allowable stress. Thus, by choosing settingdiagnostics strength of the surface layers of parts was investigated possible to determine the technical condition and appropriate resources controlled machines. Applying the inverse fourier transform to the cross-correlation functions depending on the strength of the surface layers of the coordinate values microdeformations and therefore stresses get mutual spectral density and mutual correlation function [4]:

$$K_{xy}(\tau) = \int \int_{-\infty}^{\infty} [x_1 - x(t_1)\rangle\rangle]\cdot[y_2 - y(t_2)\rangle\rangle]f(x_1, y_2|\tau)dxdy, \qquad (1)$$

or in kind for a sample of 25 holograms using specific coordinates of points on the surface holograms, we get:

$$K(x, y) = \int_0^{25} \int_0^{25} [x_1 - x(t_1)]\cdot[y - by(t_2)]f(x, y|\tau)dxdy, \qquad (2)$$

Present formula (2) is nothing but a work done under the influence of a load on the stochastic interval т. Calculations showed that a minimum of work performed meets minimum microdeformations → no damage, residual stresses, stress concentrators. The spread between these holograms is removed from 0,02 – 0,06 percentage with significant correlations obtained approximating curves.

Various random processes that must be present during experimental studies are possible and show a scatter of stochastic characteristics (dispersion coefficients of variation, expected value). At the permanence of the distribution, in our case with probability P_i by

changing the x, y and distribution of random variables f_i(x, y), then the total density of expression:

$$f_i = \sum_i^k P_j f_j^i (x_i; y_i),$$ (3)

that is the actual probability of out of defects of parts, components or machines in general.

Conclusions. Thus, confirmed the need for holography of computer to determine the most perceptible way of diagnosing the technical condition of parts for cell analysis system in determining the longevity of agricultural machinery. It experimentally proved the need for improved means of non-destructive testing computer holography to determine the necessary parameters of technological modes of diagnosis that would set life of parts of agricultural machines least 80% of the new. They are based on the factors determining the durability, the value of which is proportional to the strength of the surface layers and change its value proportional to the operating time by decreasing exponential law or by their close physical meaning to it.

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ДІАГНОСТУВАННЯ СІЛЬСЬКОГОСПОДАРСЬКИХ МАШИН ГОЛОГРАФІЄЮ

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Анотація. *У статті розглядаються можливості використання голографії для діагностування технічного стану сільськогосподарських машин шляхом порівняння фактичних параметрів, які отримані експериментально, з даними, які визначені за показниками нормативно-технічної документації. Широкий діапазон зовнішніх чинників, а також робоче середовище призводить до значних змін в установленому технічному стані і втрати ефективності використання, особливо, в сільськогосподарських машин, які експлуатуються в дуже важких умовах. Голографія дозволяє отримувати інтерференційні картини досліджуваних поверхонь об'єктів незалежно від їх*

фізичного розміру і форми. Високий рівень організаційно-технічних операцій діагностики сільськогосподарської техніки при створенні і накопичення бази даних для кожного ремонту об'єкта проходить з використанням комп'ютерних технологій. При цьому, можливо встановити всю інформацію про результати діагностики, технічного обслуговування, ремонту, визначати вплив на вартість їх реалізації з самого початку проведення до закінчення роботи машини. Діагностування дозволяє запобігти передчасному демонтажу деяких частин машини і, отже, зменшити швидкість зносу основних частин техніки, уменшити складність поточного ремонту, краще використовувати запасні частини на ремонт машини, визначати залишковий ресурс і, таким чином, зменшити загальну вартість ремонту сільськогосподарської техніки, тракторів і автомобілів.

Ключові слова: *голографія, технічний стан, діагностування, мікродеформування, поверхня деталь, фізичні розміри*

ДИАГНОСТИРОВАНИЕ СЕЛЬСКОХОЗЯЙСТВЕННЫХ МАШИН ГОЛОГРАФИЕЙ

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Аннотация. *У статье рассматриваются возможности использования голографии для диагностирования технического состояния сельскохозяйственных машин путем сравнения фактических параметров, которые получены экспериментально, с данными, которые определены по показателям нормативно-технической документации. Широкий диапазон внешних факторов, а также рабочая среда приводит к значительным изменениям в установленном техническом состоянии и потере эффективности использования, особенно, в сельскохозяйственных машин, которые эксплуатируются в очень тяжелых условиях. Голография позволяет получать интерференционные картины исследуемых поверхностей объектов независимо от их физического размера и формы. Высокий уровень организационно-технических операций диагностики сельскохозяйственной техники при создании и накопления базы данных для каждого ремонта объекта проходит с использованием компьютерных технологий. При этом, возможно установить всю информацию о результатах диагностики, технического обслуживания, ремонта, определяет и влияет на стоимость их реализации с самого начала проведения и окончания работы машины. Диагностирования позволяет предотвратить преждевременный демонтаж некоторых частей машины и, следовательно, уменьшить скорость износа основных*

частей техники, уменьшить сложность текущего ремонта, лучше использовать запасные части на ремонт машины, определять остаточный ресурс и, таким образом, уменьшить общую стоимость ремонта сельськохозяйственной техники, тракторов и автомобилей.

Ключевые слова: *голография, техническое состояние, диагностирование, микродеформировиние, поверхность деталь, физические размеры*

CALCULATION METHODS OF RETAINING WALLS

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Abstract. *Calculations of envelope structures of deep pits with developing of universal design models for soil mass in a contact with rigid elements of pits and foundations using methods of nonlinear theory of elasticity and plasticity and their computer realization is the actual modern problem of buildings and structures design.*

Calculations of envelope structures of deep pits with developing of universal design models for soil mass in a contact with rigid elements of closures of pits and foundations using methods of nonlinear theory of elasticity and plasticity and their computer realization is the actual modern problem of buildings and structures design.

The basis of introduced method is the generalization of dependence of soil mechanics for getting rules that allow more precisely know the meaning of deflected mode of closures of pits, bases and foundations of adjacent buildings depending on the heterogeneity of soil base. This method of determination of rated characteristics of soil base differs from others because it allows take into account not only its heterogeneity but also anisotropy of physical-mechanical characteristics of soils, separate elements and their replacement.

Fulfilled preproject researches of the interaction of space-enclosing structures of deep pits with soil half-space that include the bases and