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September 22 – 29, 2014
Netanya, Israel

СОВРЕМЕННЫЕ ДОСТИЖЕНИЯ В НАУКЕ И ОБРАЗОВАНИИ

Сборник трудов
IX Международной научной конференции

22 – 29 сентября 2014
г. Нетания (Израиль)

National Council of Ukraine for Mechanism and Machine Science
(Member Organization of the International Federation
for Promotion of Mechanism and Machine Science)
Council of Scientific and Engineer Union in Khmelnitsky Region
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Independent Academy for Development of Sciences of Israel

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Включены материалы IX международной научной конференции "Современные достижения в науке и образовании", проведенной в г. Нетания (Израиль) в сентябре 2014 г.

Рассмотрены проблемы образования, динамики и прочности технических систем, материаловедения, информационных технологий и проблем принятия решений, энергетики, экологии и экономики. Кратко представлены доклады участников конференции, опубликованные в авторской редакции.

Рассчитано на ученых, инженеров, работников и аспирантов ВНЗ.

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Рассмотрены проблемы прочности и материаловедения, информационных технологий, системного анализа и принятия решений, специальных проблем, а также экономические и образовательные аспекты этих вопросов.

Рассчитано на научных и инженерных работников, специализирующихся в области изучения этих проблем.

Розглянуті проблеми міцності та матеріалознавства, інформаційних технологій, системного аналізу і прийняття рішень, спеціальних проблем, а також економічні та освітні аспекти цих питань.

Розраховано на науковців та інженерних працівників, які спеціалізуються в області вивчення цих проблем.

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СЕКЦИЯ ПРОБЛЕМ ПРОЧНОСТИ И МАТЕРИАЛОВЕДЕНИЯ

ИССЛЕДОВАНИЕ ВОЗДЕЙСТВИЯ ВИБРОУСКОРЕНИЙ НА ТЕМПЕРАТУРОПРОВОДНОСТЬ МАТЕРИАЛОВ

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Исследование температуропроводности и теплопроводности материалов в поле действия виброускорений является новой и сложной проблемой, решение которой имеет актуальное значение для авиакосмической техники. Необходимо отметить, что любые виды ускорений: линейные, центробежные [1, 2] и виброускорения влияют на температуропроводность металлических материалов. В электронно-инерционных опытах русских ученых-физиков Мандельштама Л.И. и Папалекси Н.Д., которые они провели в 1913 г., подтверждается, что ускорения оказывают влияние на перемещение свободных электронов в металлах, в частности, при торможении [3, 4].

В данной работе предложена методика определения теплофизических характеристик металлических материалов в поле действия виброускорений. Разработано устройство для определения указанных характеристик на вибростенде. Методика исследований предусматривала закрепление на конце балки теплопроводника (рис. 1) из тонкого хромелевого провода (образца из никелевого сплава) и небольшого электронагревателя, состоящего из нескольких витков провода.

Рис. 1. Устройство для исследования температуропроводности материалов в поле действия виброускорений

complex system that is composed of such parts, and for which, in general, at the moment there is no means of research [1].

Elements of the system approach as a universal methodology in solving various technical problems, including the creation of information technology dynamic analysis of mechanical oscillation system can be represented by the set of tasks $Z=\{Z_k, Z_m, Z_{Lg}, Z_{Sp}, Z_{pL}, Z_{pN}\}$, where Z_k – problem kinematic analysis; Z_m – problem modal analysis; Z_{Lg} – problem of linear harmonic analysis; Z_{Sp} – problem of spectral analysis; Z_{pL}, Z_{pN} – linear and nonlinear dynamic transient analysis, which are discussed later.

The object of the *kinematic* analysis of oscillatory systems is the study of motion units regardless of existing mechanisms for forces, and the identification of rotation frequencies of all its moving parts. Simulation-based representation poliharmonichnomu fluctuations, and is usually performed on kinematic diagnostic deterministic models. In the kinematic modeling is considered equations of motion of mechanical systems $[M]\{\bar{u}\}+[C]\{\dot{u}\}+[K]\{u\}=\{F\}$, where $\{u\}$ – nodal displacement vector system elements, $\{\bar{u}\}$, $\{\dot{u}\}$ – acceleration and velocity vectors of elements of the system, $[K]$, $[C]$, $[M]$ – global stiffness matrix, damping and mass elements of the system, $\{F\}$ – vector of equivalent nodal forces of elements.

Problem *modal* analysis is the analysis of natural frequencies and forms of vibrations. It is assumed that the external forces and damping are zero. Solved the equation of free oscillations of the system in matrix form, having the form $[M]\{\ddot{u}\}+[K]\{u\}=\{0\}$. *Spectral analysis* is a task analysis of the vibrational spectrum of the system response to shock loading.

Linear harmonic analysis is to determine the resonance frequencies and study the dynamic response of the system to effect periodic loads. In harmonic analysis solved the equations of motion for the case of steady-state vibrational processes (forced oscillations) $[M]\{\bar{u}\}+[C]\{\dot{u}\}+[K]\{u\}=\{F^a\}$, where $[M]$ – mass matrix, $[C]$ – damping matrix, $[K]$ – stiffness matrix, $\{\ddot{u}\}$ – acceleration vector at the nodes, $\{\dot{u}\}$ – vector velocity in knots, $\{u\}$ – vector displacements at the nodes $\{F^a\}$ – vector of applied external forces.

Linear dynamic transient analysis is the analysis of the response to external, time-dependent load for the case of linear oscillatory system, when the superposition principle is valid. As for the linear and nonlinear dynamic transient analysis examines a relatively short period of time when the movement is not established. Analysis of transients is direct integration of the matrix equation system $[M]\{\bar{u}\}+[C]\{\dot{u}\}+[K]\{u\}=\{R\}$ where $\{u\}$ – desired vector of nodal displacements, time-dependent, $[K]$, $[C]$, $[M]$ – matrix stiffness, damping and mass elements of the system, $\{R\}$ – known vector of external load, depending on the time.

Based on the implementation of the considered problems using a systematic approach, developed information technology to study the dynamics of mechanical systems that allows to model oscillatory processes in the time and frequency domain [2].

Summary. The report sets out the main results of the work on the creation and further development of complex mathematical program-aided design of mechanical oscillatory systems based on a systematic approach, and implementing complex reporting tasks. Application of the developed information technology makes it possible to increase the effectiveness of dynamic modeling of oscillatory processes of mechanical systems [2].

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SYSTEM EFFICIENCY OF LOGIC-DINAMIC COMPLEX TRANSPORTATION OF DANGEROUS GOODS BY AUTOMOBILE ROAD

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Introduction. The paper deals with the problem of "Improving the efficiency of the structure, functioning and adaptation of Dangerous Goods Safety (SBPOG)" in this formulation is decomposed on reliability SBPOG in expected and extreme operating conditions as quantitative characteristics of one or more properties of reliability SBPOG: failsafe $P_{\text{[illegible]}}$, reliability P_{AT}, durability, maintainability, persistence, as well as integrated indicators of reliability (coefficients of operational readiness, maintenance, conservation efficiency).

Problem and the results of its decisions. It is shown that an integrated indicator of the safety of transport of dangerous goods accepted by the probability of a successful outcome of carriage, which is the product of three components of the integrated system of transport safety: SBPOG reliability (reliability SBPOG) in the operation; the probability that the AT in terms of threatening environmental impacts and failsafe (functional safety of ergatic system "driver – automobile"). The efficiency of antibody in extreme operating conditions is estimated survivability and in some situations can be characterized by a value that is likely misses AT in terms of threatening environmental impacts.

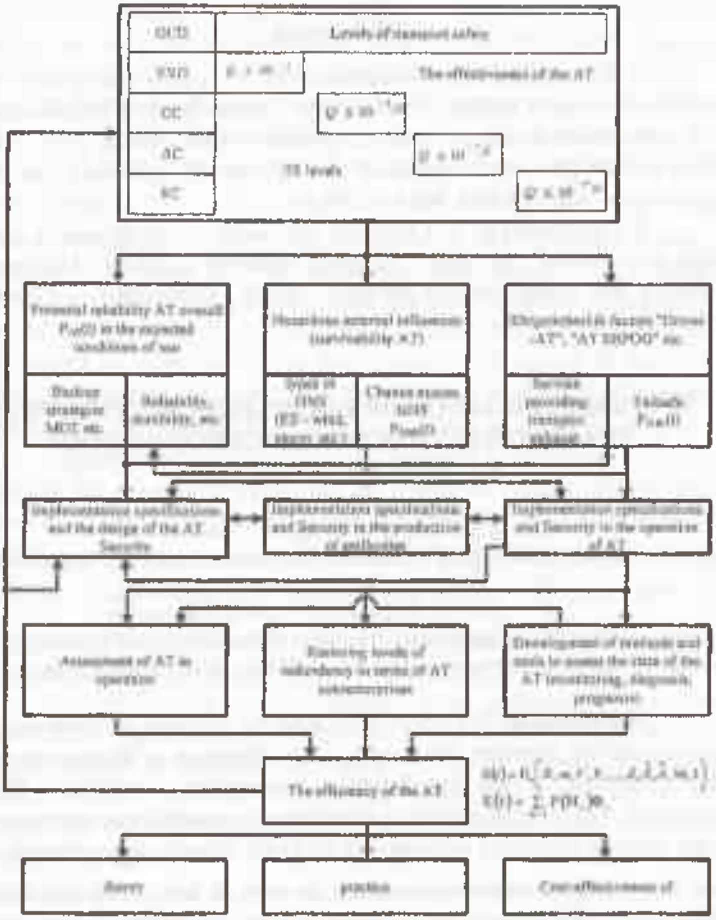

Fig. 1. Improving the efficiency of the system AT

These reliability can be enhanced with new, having an individual or a complex semantic nature, which fully applies to the indicator system ergatic – failsafe [1, 2]. Quite naturally, the phase of the AT can not be characterized by the quantities. However, it should be noted that the introduction of index offsets neglect such indicators, such as durability, retentivity $P_{ose(t)}$, etc. View of the above, consider the basic ways of increasing system efficiency AT (Fig. 1). At the top level safety requirements are formed the transport of dangerous goods and are normalized to the requirements of any manifestations of emergencies, including the complexity of the conditions of carriage (UUT), complex situations (SS), emergencies (AU), the catastrophic situations (COP). The technical condition of the AT is characterized by a set of states Z, splitting into three disjoint subsets: the healthy (A), efficient (partially functioning – B), inefficient (C) states: $A \subset Z$; $B \subset Z$; $C \subset Z$; $A \cap B = B \cap C = C \cap A = \phi_n$.

Conclusion. Thus, in contrast to the structures designed for the AT exploited systems to be understood not only the technical characteristics (reliability, durability, etc.), but also the interaction of the factors of the "man--automobile" [3].

Solution of problems of redundancy at all stages of the life cycle AT provides a specified level of system performance with is achieved through the implementation of comprehensive properties. Implementation of the properties of AT in the real world by stages of life cycle is achieved due to the widespread introduction of IACS, which are the basis of the logic-dynamic and system models. System models provide a specified level of efficiency fractionation AT and are formed in accordance with the formula: <goals> ↔ <tasks> ↔ <algorithms> ↔ <jobs> ↔ <processes>.

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