Морской Вестник

№3(79)
сентябрь
2021
ISSN 1812-3694

Morskoy Vestnik

Морской Вестник

№3(79)
september
2021

Morskoy Vestnik

SCIENTIFIC, ENGINEERING, INFORMATION AND ANALYTIC MAGAZINE

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IN THE MARITIME ASSEMBLY

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Editorial office
office 13H, 84, Nab. r. Moyki,
190000, St. Petersburg
The magazine is registered by RF Ministry of Press, TV and Radio Broadcasting and Means of Mass Communications, Registration Sertificate ПИ № 77-12047 of 11 march 2002
Founder-Publisher
JSC Publishing House «Mor Vest»
office 13H, 84, Nab. r. Moyki,
190000, St. Petersburg
The magazine electronic version
is placed on the site LLC «Nauchnaya electronnaya biblioteka» www. elibrary. ru and is also included to the Russian index of scientific citing
By the decision of the Council of VAK the Morskoy Vestnik magazine is entered on the list of the leading scientific magazines and editions published in the Russian Federation where basic scientific outcomes of doctoral dissertations shall be published.
www.perechen.vak2.ed.gov.ru
You can **subscribe to the Morskoy Vestnik** magazine using Russian Post Catalog «Subscription editions» (subscription index ПМ 467), JSC «Ural-Press», LLC «Pressinform» or directly at the editor's office via the Morvest Publishing House
Printed by Premium Press Printing House LLC
Printing house address 190020 St. Petersburg Narvsky prospect, 18, letter A
Circulation 500. Order № 1170
Publication date – 02.09.2021
Catalog price – 675,42 rubles

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1. Authors shall submit articles of up to 20,000 characters, including figures, in electronic form. The text shall be typed in MS Word under Windows, formulas – in the equation editor «MathType.» Illustrations present in the article shall be submitted additionally, in the following formats: TIFF CMYK (full color), TIFF GRAYSCALE (grayscale), TIFF BITMAP (dashed), EPS, JPEG, with resolution of 300 dpi for grayscale figures and 600 dpi for dashed ones and in sizes desired for placement.

2. Articles shall contain an abstract of up to 300 characters, keywords, and bibliographic library UDC identifier. Authors shall indicate their degree, academic status, place of employment, job position, and telephone number, as well as provide a written permission of the Editor to place articles on the Internet and in the Scientific Electronic Library after publication in the journal. Articles shall be submitted with reviews.

3. The articles of postgraduate and degree-seeking students shall be accepted for publication on a free and royalty-free basis.

4. The control review of these articles shall be performed by the editorial board, with the assistance of dedicated experts, if necessary. Reviews of articles are stored in editorial office of the magazine within 5 years.

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6. The contents of the journal shall be submitted to the editorial board quarterly. The decision concerning the next issue of the journal shall be formally established with the protocol.

ABSTRACTS

UDC 623.827 **Keywords:** integrated software package of intellectual support, design of new generations of submarines, modern data storage (HD), virtual environment of hybrid modeling (GM)

Yu.N. Kormilitsyn, Yu.I. Nechaev. Intelligent support for the design of new generations of submarines: the concept of a modern data warehouse//Morskoy Vestnik. 2021. № 3(79). P.9

The article discusses an approach to the creation of an integrated software package for intelligent support (IP) for the design of new generations of submarines based on a modern data warehouse (CD). Conceptual solutions for the creation of CD are implemented in a virtual environment of hybrid modeling (GM) using data from a physical experiment and Grid technologies for integrating knowledge in interaction with co-executing organizations. Uncertainty and incompleteness of the initial information used in the early stages of design predetermined the approach to information processing based on the concept of soft computing (Soft Computing) and revealing «hidden» knowledge (Data Mining). Algorithms for interpreting information and IP procedures when choosing solutions are implemented in the environment of emergency computing - an evolutionary strategy for analyzing alternatives in the spaces of behavior and control of the modern theory of catastrophes (STC). Fig.5. Bibliography 11 titles.

UDC 629.576 **Keywords:** high-speed amphibious vessel, aerohydrodynamics, design, digital twin

A.V. Fevral'skikh. Designing the aerodynamic layout of a high-speed amphibious vessel using digital twin technologies//Morskoy Vestnik. 2021. № 3(79). P.14

The possibilities of using ROM-modeling technologies and digital twins in the design of the aerodynamics of a high-speed amphibious ship are investigated. An algorithm for designing an aerohydrodynamic layout is proposed, based on the technology of numerical modeling and automated optimization. A study of the layout of the main wing, empennage and pylon of the propulsion system was carried out in order to determine the layout factors - the angle of installation of the pylon and the distance from the leading edge of the wing, corresponding to the maximum value of the aerodynamic quality. Based on the results of the computational experiment, the response surface was determined and a ROM-model of the aerodynamic layout was created. It was found that in the studied area of the factor space, the aerodynamic quality changes more noticeably with a change in the angle of installation of the pylon than with a change in the distance of the pylon from the leading edge of the wing. An explanation of the obtained result is proposed. The maximum value of the aerodynamic quality of the layout, as well as the corresponding value of the angle of installation of the pylon and the distance from the wing, have been determined. A variant of the architecture of a digital twin of a high-speed amphibious vessel based on a ROM model is proposed. T.3. Fig.9. Bibliography 10 titles.

UDC 629.576.532 **Keywords:** amphibious hovercraft (ASVP), amphibious properties, overcoming the coastal slope

V.K. D'yachenko, D.E. Tsymlyakov. The problem of leaving a hovercraft ashore with overcoming a slope// Morskoy Vestnik. 2021. № 3(79). P.20

The analytical problem of overcoming the coastal slope by an amphibious hovercraft (ASVP) is considered, a tool for assessing the real amphibious qualities of ASVP is proposed at the early stages of its design. Fig.5. Bibliography 4 titles.

UDC 629.12: 539.433 **Keywords:** steady-state vibrations, quasi-one-dimensional model, joint vibrations, inertial-stiffness characteristics, partial responses

A.L. Melkonyan, D.A. Nikolaev. Algorithm for calculating the joint vibration of a ship's hull and its structural modules with a small interface area//Morskoy Vestnik. 2021. № 3 (79). C. 24

A number of approaches are proposed for calculating the joint vibration of a ship's hull and its structural modules (ship structures and devices). Computational algorithms have been developed, the implementation of which will make it possible to uniformly solve the problems of steady-state vibrations of structures modeled by quasi-one-dimensional models. The essence of the method is to correct and modify the values of the inertial-stiffness characteristics of such a model, as well as the external load acting on it. A program for calculating the parameters of joint steady-state vibrations of the bearing quasi-one-dimensional model and the elements attached to it has been created. Fig.4. Bibliography 6 titles.

UDC 629.463.3 **Keywords:** plasma cleaning, cryogenic blasting, laser-plasma treatment, ultrasonic cleaning

R. A. Sakharov. Technologies for plasma cleaning of the surface of metal structures for ship engineering// Morskoy Vestnik. 2021. № 3(79). P.31

The paper presents an alternative approach to cleaning the surface of metal products, which consists in improving the technology of plasma treatment. Fig.5. Bibliography 9 titles.

UDC 629.05.081 **Keywords:** dimensional control, net size, sudometry, electronic geometric model

K.O. Budnikov. Variant of technology of dimensional control in the formation of hull structures of ships with ensuring the uniformity of geometric measurements// Morskoy Vestnik. 2021. № 3(79). P.37

The process of controlling dimensional chains by analyzing the relationships between geometric elements in geometric models and measurements is considered. The geometric model is used in the process of dimensional control, which allows you to determine at the initial stage a set of geometric relationships and measurement goals. These data must be laid down in the design and taken into account in production. T.1. Fig.2. Bibliography 1 titles.

UDC 621.531.3-112 **Keywords:** shipbuilding, improving of quality, accuracy, reliability, technological system, dynamics, vibration, self-oscillations, fixed assets, certification, diagnostics

M.V. Alexandrov, A.V. Veber, V.A. Barsukov, Yu.M. Zubarev, V.I. Chernenko. Dynamics of the technological system and its impact on the quality of shipbuilding products // Morskoy Vestnik. 2021. № 3(79). P.40

The article deals with issues related to improving the efficiency of mechanical processing production in shipbuilding, based on taking into account the harmful effects of self-oscillations in the machining of blanks of machine parts and mechanisms, methods for eliminating the harmful effects of these fluctuations in order to improve the performance and reliability of products. Fig.1. Bibliography 6 titles.

UDC 621.436: 621.438 **Keywords:** navy, combat surface ships, multipurpose ships, ship diesel engines, ship gas turbine engines, ship power plants, schematic design of power plants, partial electric motion, full electric motion

A.V. Shlyakhtenko, I.G. Zakharov, V.V. Baranovsky, Trends in the evolutionary development of the schematic design of power plants of multipurpose surface ships// Morskoy Vestnik. 2021. № 3 (79). P.43

The analysis of the trends and directions of the evolutionary development of the schematic execution of ship power plants (PP), created on the basis of diesel and gas turbine engines. The differences and similarities of technical solutions in the development of shipborne PPs of the Navy of the leading naval powers and the Russian Navy are analyzed. Fig.20. Bibliography 6 titles.

UDC 621.51 **Keywords:** compressor, rotary, screw, blower, water cooling, import substitution

L.G. Kuznetsov, A.V. Burakov, N.A. Kotlov, A.A. Semyonov. Rotary compressor stations for ships of the Navy, civil fleet, oil and gas sector and energy//Morskoy Vestnik. 2021. № 3(79). P.55

The experience of JSC «Compressor» in compressor construction in terms of rotary compressors: screw compressors, blowers, in particular, the range of rotary compressor units for shipbuilding has been increased and a new generation of water-cooled units for ships and vessels of the Navy has been proposed. Fig.4. Bibliography 8 titles.

UDC 539.3 **Keywords:** porthole, glass element, holder, geometric parameters, assessment method, unmanned underwater vehicle

N.M. Vikhrov, V.P. Lyanzberg. On the development of a spherical window taking into account the deformation of the holder//Morskoy Vestnik. 2021. № 3(79). P.61

A possible method for evaluating the geometric parameters of the high-pressure window holder for small underwater structures (for example, lamps or boxes for visual observation) of unmanned vehicles is presented. Fig.2. Bibliography 5 titles.

UDC 623.946.63 **Keywords:** submarine, weapons, torpedo tube, power plant, gas generator, hydro-gas generator, hydro turbine

A.A. Boriskin, V.I. Karavaev. Hydraulic power plant of torpedo tubes with gas generators for submarines of small displacement//Morskoy Vestnik. 2021. № 3(79). P.62

The issue of armament of small displacement submarines is considered. The existing options for the im-

plementation of firing from a torpedo tube are analyzed. The proposed technical solution adapted for submarines of small displacement. Fig.3. Bibliography 5 titles.

UDC 629.5.02: 624.042.3: 534 **Keywords:** vibration-absorbing coatings, ship foundations, vibration, entangled metallic wire material, noise insulation

I.V. Nikolaev. Development of a ship foundation with increased vibration-insulating properties for conditions of high temperatures and aggressive influences//Morskoy Vestnik. 2021. № 3(79). P.66

The analysis of modern vibration-absorbing means for ship foundations is carried out. An effective system for reducing the level of vibration in conditions of high temperatures and corrosive environments is proposed. The considered vibration absorber can be used on surface and submarine ships of the Navy. Fig.3. Bibliography 8 titles.

UDC 629.5.03 **Keywords:** ship shafting, lateral vibrations, natural frequency, center line, shafting slope

G.A. Kushner, V.A. Mamontov, V.V. Shakhov. Investigation of the influence of the ship's shafting slope on the parameters of lateral vibrations//Morskoy Vestnik. 2021. № 3(79). P.69

The paper considers the problem of studying the influence of the slope of the ship shafting on the parameters of transverse vibrations. The design of the experimental setup is presented and the research methodology is described. The results of the experiment are presented in the form of tensograms of the transverse vibrations of the shaft. Equations are obtained that connect the output quantities and the factors influencing them in the form of an interpolation polynomial. A quantitative assessment of the influence of the inclination angle of the ship shafting model and the clearance in the stern-tube bearing on the frequency of occurrence of an unstable state is given. Fig.6. Bibliography 6 titles.

UDC: 629.5.065.5, 62-137 **Keywords:** LNG, SG, submersible pump, ship pump, cryogenic, liquefied gas, gas carrier, cargo pump

P.A. Zelenov, M.N. Borovkov, I.B. Korobov. Submersible pumps for liquefied gases on ships of the transport fleet//Morskoy Vestnik. 2021. № 3(79). P.72

Submersible pumps for pumping liquefied gases are a critical element of gas carrier systems. The article analyzes their features and basic patterns of development. It is shown that the main trends are the improvement of screws, bearing systems. The necessity and feasibility of universalization of submersible pumps is substantiated. Fig.4. Bibliography 24 titles.

UDC 629.5.035.58 **Keywords:** contra-rotating propellers, two-stage multipurpose propulsor, hydrodynamic efficiency

S.L. Anchikov, A.R. Togunjac, L.I. Vishnevsky. Means of performance improvement of two-stage blade propulsors//Morskoy Vestnik. 2021. № 3(79). P.76

The paper contains brief description of two-stage multipurpose propulsors (TSMP) and steering thruster with contra-rotating propellers (CRP) in the development of which authors directly participated and protected by patents. It is schematic shown how works TSMP on the different modes of operation. The data of model tests of the TSMPs in the Krylov State Research Center are presented, which confirmed the feasibility of the adopted design solutions that provide improved operational characteristics of a vessel. The layout of the TSMP for the conceptual design of a transport vessel is presented. The design features of the steering thrusters with CRPs, affecting their operational characteristics, are considered. Solutions for improving operational characteristics of steering thrusters with CRPs are substantiated, and the expected improvement in their hydrodynamic efficiency is estimated. The prospects for the use of steering thrusters with CRPs is assessed on the example of the Russian Civil Fleet. T.1. Fig.8. Bibliography 20 titles.

UDC 629.069 **Keywords:** fouling, protection of ship pipelines, electrolysis

Yu.A. Stepanov. Antifouling system for outboard water pipelines//Morskoy Vestnik. 2021. № 3 (79). P.81

The article analyses antifouling systems for ships and floating docks based on the principle of enrichment with copper ions. The structure and description of new antifouling system designed by Marine Bridge and Navigation Systems presented. Fig.5. Bibliography 3 titles.

UDC 004.925.84: 629.5 **Keywords:** additive technologies, 3D printing, polymer materials, machining center

M.A. Ermolaev. Additive technologies in shipbuilding//Morskoy Vestnik. 2021. № 3(79). P.85

The article describes modern methods of manufacturing products from polymer materials using a unique layout of equipment that allows 3D printing and milling of products within a single machine. The advantages of using this technology and materials are outlined. Fig.3.

UDC 629.5 **Keywords:** machine-building enterprise, civil shipbuilding, military shipbuilding, design of small vessels, composite materials, marinating diesel engines, water treatment and water treatment plants

A.A. Keibal. «Vineta»: 25 years on the right course!// Morskoy Vestnik. 2021. № 3(79). P. 86

Introduces the activities and development of Vineta JSC, which is 25 years old. Provides information about the products and promising developments. It is told about the active work of the enterprise on the implementation of the import substitution program. Fig.12.

UDC: 681.5.01 / 511 **Keywords:** Analysis and synthesis of automatic systems, linear and nonlinear mathematical models, sensitivity of control systems, nonlinear dynamic correcting devices, systems with artificial intelligence

S.N. Sharov. Development of design methods for automatic control systems in the development of JSC Concern Granit-Electron//Morskoy Vestnik. 2021. № 3(79). P.90

The evolution of methods for designing automatic systems in engineering developments of automated and automatic systems of an enterprise (OsTechBuro - NII 49 - TsNIIPA - TsNII Granit - JSC Concern Granit-Electron) for on-board control and guidance systems of aircraft, as well as ship control systems missile weapons 1921-2021. Fig.14. Bibliography 36 titles.

UDC 621.389 **Keywords:** converter, NMEA 0183, pulse code, STM32, opto-isolation

M.I. Bazanov, Yu.V. Shanin. Development of a converter of NMEA 0183 signals into a pulse code //Morskoy Vestnik. 2021. № 3(79). P.99

The development of a converter of NMEA 0183 signals into a pulse code is considered. A functional diagram of a converter based on a microcontroller of the STM32 family is proposed. The conclusion is made about the prospects of using the proposed technical solution to ensure reliable interfacing of marine navigation equipment with various data transfer protocols. T.1. Fig.5. Bibliography 8 titles.

UDC 629.121/127 **Keywords:** unmanned navigation, remote control, interaction, autonomous mode

V.M. Ambrosovsky, D.V. Kazunin, S.V. Smolentsev. Remote control of unmanned vessels//Morskoy Vestnik. 2021. № 3(79). P.105

The article deals with the issues of organizational and technical support for the control and management of the IANS (autonomous and remotely controlled surface ships) from the Central Dispatch Administration (remote control center). The advantages and disadvantages of the central and regional CDU are given. The composition of the CDU for a typical IANS is given, a list of signals and the composition of information for the exchange of the CDU with the IANS is given. Fig.6. Bibliography 2 titles.

UDC 623.4.054 **Keywords:** architecture, intelligence, expert system, information, design, knowledge base

Yu.A. Yamshchikov. Design of the architecture of the expert system for displaying radar information //Morskoy Vestnik. 2021. № 3(79). P.109

The article analyzes the specifics of the functioning of the technical means of the radar information display system. An approach to design is considered and a variant of building the architecture of an expert system for displaying radar information is proposed. Fig.4. Bibliography 6 titles.

UDC 621.391 **Keywords:** maritime radio communication, electromagnetic compatibility, space-time signal processing, vector Markov random processes, methods of adaptive processing

E.I. Glushankov, E.A. Rylov, D.A. Tsvetkov. Analysis of electromagnetic compatibility in marine radio communication systems with multi-element antennas//Morskoy Vestnik. 2021. № 3(79). P. 114

A method for the analysis of electromagnetic compatibility (EMC) in maritime radio communication systems with space-time signal processing is proposed, based on a model description of the parameters of signals and interference in the form of vector Markov random processes and the use of methods for adaptive signal processing in multi-element antennas. Fig.1. Bibliography 6 titles.

UDC 519.3: 65.011.56: 621.865.8 **Keywords:** resilient object, trajectory – circumference, portable and relative movement, optimal management, the forces of inertia

A.I. Bokhonsky, T.V. Mozolevskaya. Optimal movement of an elastic object around a circle //Morskoy Vestnik. 2021. No. 3 (79). S. 116

The dynamics of the elastic object are investigated when its base moves in a horizontal plane along the circle arc. Two types of designed control (acceleration - braking) are used to achieve the state of absolute rest of the elastic object at the end of the movement. The influence of centrifugal force of inertia on the oscillation of the object is assessed during the movement; it is shown that the centrifugal force is not affected by the provision of absolute peace when reaching the final position of the object. Fig.9. Bibliography 18 titles.

UDC 004.021: 004.415.23: 004.4 "236: 004.422.1 **Keywords:** ISBU, management processes, software development technology, network and scheduling, process optimization in ISBU

S.N. Smelkov, A.N. Zaitsev. Decomposition of decision-making processes ISBU with architecture based on the principle of freely aggregated program modules//Morskoy Vestnik. 2021. № 3(79). P. 119

The article is devoted to new approaches to the development of ISBU software. Fig.2. Bibliography 7 titles.

UDC 629.5 **Keywords:** Council of Labor and Defense, naval shipbuilding, Baltic Shipyard, Admiralty Shipyard, battle cruisers Izmail, Borodino, Navarin, Kinburn, main caliber guns

V.N. Polovinkin, S.V. Fedulov, D.A. Kosarenko. The tragedy of the battle cruisers of the Russian Empire//Morskoy Vestnik. 2021. № 3(79). P.121

On the eve of the First World War, the Ismail-class battlecruisers were laid down at the Baltic and Admiralty Factories. As a result of the Civil War and the intervention of the navy and the shipbuilding industry, enormous damage was caused, as a result of which the ships could not be completed and they were scrapped. Fig.11. Bibliography 29 titles.