|  |
| --- |
| Original article  УДК 539.3/.6:629.5 DOI: 10.17217/2079-0333-2025-71-8-20  **THE ESTIMATION OF THERMAL ENERGY AMOUNT DURING ELASTIC COUPLING OPERATION OF THE SHIP'S SHAFT LINE**  Tsarenko S.N.1, Zaitsev S.A.2  1 Kamchatka State Technical University, Petropavlovsk-Kamchatsky, Klyuchevskaya Str. 35  2 Testing laboratory of torsional and linear oscillations of IE “Zaitsev S.A.”, Moscow, Roslovka Str. 10  The paper presents calculated dependences for determining the amount of thermal energy released by an elastic coupling during torsional vibrations of the shaft line. The wall line is modeled by a two-stage rod with an elastic connection of the sections. Active forces are acting on the shaft line: on the engine side, represented by the partial sum of the Fourier series and the average value of the torque on the screw, as well as damping moments: on the screw side, the cylinder piston group and in the elastic element of the clutch. The simulation is performed for the nominal and resonant frequency of the engine. It has been found that the coupling dissipates oscillation energy better under non-harmonic loading conditions. The method of calculating thermal energy presented in the paper makes it possible to increase the informative value of thermometric data in the wall line monitoring system.  **Key words:** shaft line, dynamic loads, damping coefficient, torsional vibrations, Fourier method, stepped rod, elastic coupling. |
| Original article  УДК 517.91/.93:519.642.2 DOI: 10.17217/2079-0333-2025-71-21-32  **ON ONE ABSTRACT CONTROL SYSTEM WITH MEMORY IN FEEDBACK**  Vodinchar G.M., Kazakov E.A.  Kamchatka State Technical University, Petropavlovsk-Kamchatskу, Klyuchevskaya Str. 35.  Many real control systems of different nature have the property of memory – when future states cannot be predicted without taking into account how the system arrived at the current state. In mathematical description, this effect can indicate itself both in the equations of state and in expressions for feedback control. A characteristic feature of memory is the presence of integral operators of the Volterra type in the system equations. In this paper, some properties of integro-differential equations describing one class of abstract control systems with memory in feedback are investigated. The existence and uniqueness of a solution to the system equations are proved, and the impossibility of blowing up the solution in a finite time in the linear case is shown. A class of feedback kernels is identified that allows a transition to a memoryless model due to the introduction of additional controls.  **Key words:** integro-differential equations, hereditary dynamics,feedback, memory,control systems. |
| Original article  УДК 664.955.2 DOI: 10.17217/2079-0333-2025-71-33-45  **JUSTIFICATION OF THE CARBON DIOXIDE GAS USE AS A STABILIZER OF GRAIN QUALITY OF SALTED FROZEN SALMON CAVIAR**  Rumyantsev A.Е., Efimova M.V., Efimov А.А.  Kamchatka State Technical University, Petropavlovsk-Kamchatskу, Klyuchevskaya Str. 35.  The results of a study of the effect of carbon dioxide treatment of salmon granular frozen caviar during its preparation on the strength of caviar grains and on the dynamics of changes in the physico-chemical parameters of products during storage for four months are presented. It was concluded that carbon dioxide treatment contributed to an increase in the strength of the caviar shell, and, as a result, after defrosting, the degree of product defects such as bursteggs and, consequently, sludge decreased. The prospects of combining the use of frozen caviar as a raw material and the preparation of frozen granular caviar with a high degree of preservation of the integrity of the eggs by increasing the strength of the caviar shell by treating caviar with CO2 gas are substantiated. It was shown that the treatment of caviar with carbon dioxide before packing and during packing in cans increased the strength of caviar grains by an average of 22–26 g compared with the strength of eggs of samples prepared without the use of CO2, and also did not lead to an intensification of the processes of proteolytic and oxidative spoilage of products.  **Key words:** carbon dioxide, bursteggs, salmon granular caviar, strength of the caviar shell. |
| Original article  УДК 664.9.047 DOI: 10.17217/2079-0333-2025-71-46-60  **ANALYSIS OF *SPIRULINA* AND FISH ROE DRYING METHODS**  Ermolaev V.A.  Kuzbass State Agrarian University named after V.N. Poletskov, Kemerovo, Markovtsev Str. 5.  *Spirulina* and fish roe are heat-labile products that require gentle drying modes. Various methods of drying *Spirulina* and fish roe that were used by other authors are considered. The beneficial properties of *Spirulina* and fish roe are described. A freeze-drying technology is proposed. Freeze-drying allows to get a dry product with high quality indicators and to preserve all the nutrients that were in the product before drying. The experiments on freeze-drying *Spirulina* and fish roe were conducted. The layer thickness and final drying temperature were used as variable factors.  **Key words:** fish roe, *Spirulina*, freeze-drying, drying temperature, layer thickness. |
| Original article  УДК [502.51:628.54]+543.544 DOI: 10.17217/2079-0333-2025-71-61-71  **CHROMATOGRAPHIC ANALYSIS APPLICATION TO CONTROL SURFACE WATER BODIES POLLUTION**  Nadvotskaya V.V.1, Timofeev V.V.2  1Altai State Technical University named after I.I. Polzunov, Barnaul, Lenin Ave. 46.  2Barnaul Law Institute of the Ministry of Internal Affairs of Russia, Barnaul, Chkalova Str. 49.  Ensuring the normative indicators of drinking water quality is possible only if a high level of environmental requirements for the condition of surface water bodies, which are the main sources of drinking water in our country for currently existing and newly created centralized water supply systems of settlements, are met. The paper considers issues related to the control of man-made pollution of water bodies located within Biysk (Altai Territory) and in the territory adjacent to the city. The research site is determined based on its typicality in relation to a number of characteristics: the age of an urban settlement, the service life of technological equipment of its industrial enterprises, the availability of a centralized water supply system, as well as the object of research itself – surface water bodies. The results of experimental studies of the pollution of surface water bodies located in the specified territory are presented, and the method of controlling the pollution of surface reservoirs developed by the authors is described.  **Key words:** pollution of reservoirs, pollution control, surface waters, wastewater, chromatography, environmental safety. |
| Original article  УДК 502/.504 DOI: 10.17217/2079-0333-2025-71-72-86  **TECHNOGENIC IMPACT OF DECOMMISSIONED SHIPS  ON THE MARINE COASTAL WATERS OF KAMCHATKA  (INCLUDING THE AVACHA BAY) AND NORTHERN KURILE ISLANDS**  Kasperovich E.V.1, Bochkarev N.Yu.1, Radaikin E.А.2  1Kamchatka Directorate for Technical Support of Maritime Supervision, Каrl Marks Ave. 29/1.  2State Technical University, Petropavlovsk-Kamchatskу, Klyuchevskaya Str. 35.  The results of survey of partially submerged and sunken ships from the waters of Kamchatka and North Kuril Gulf are presented. We aimed to assess the impact of sunken ships on the marine coastal waters in the area, including the Avacha Bay and North Kuril Gulf in the Second Kuril Strait, as well as in the Ozernaya Channel in the mouth of the Kamchatka River. We analyzed the underwater photos and videos using the remote operated underwater vehicle and also performed chemical analysis of selected samples of surface (marine) waters collected from the locations of submerged ships. Suspended substances, total iron and oil products were used as markers characterizing negative impact of sunken ships on the aquatic environment.  **Key words:** suspended substances, common iron, decommissioned ships, corrosion, oil products, coastal zone, remote operated underwater vehicle (ROV). |
| Original article  УДК [504.5:665.7](265.5) DOI: 10.17217/2079-0333-2025-71-87-107  **OIL PRODUCTS POLLUTION OF THE AVACHA BAY COASTAL AREAS (AVACHINSKY GULF)**  Martynenko D.O.1, 2, Pozolotina L.A.1, 2, Nazarova M.A.2, Klimova A.V.1, 3  1Kamchatka State Technical University, Petropavlovsk-Kamchatsky, Klyuchevskaya Str. 35.  2Institute of Volcanology and Seismology FEB RAS, Petropavlovsk-Kamchatsky, Piip Blvd 9.  3Kamchatka Branch of Pacific Geographical Institute FEB RAS, Petropavlovsk-Kamchatsky, Partyzanskaya Str. 6.  A retrospective analysis of studies of the ecological state of the Avacha Bay in the period from 1999 to 2024 based on data from 114 open-source publications and official annual reports is presented. It has been established that long-term pollution monitoring covers exclusively chemical analysis of water for the content of oil products, phenols, metals, anionic surfactants (surfactants), suspended and biogenic substances (in 56.8% of all studies). In other components of the environment, pollutants are rarely and unsystematically observed within the framework of initiative studies, while in bottom sediments only the content of oil products and solid metals is monitored (in 15.9% of publications), the latter pollutants are also determined in aquatic organisms (in 27.3% of publications). As a rule, in the coastal ecosystems of the Avacha Bay, these are representatives of mass species of marine macrophytes, bivalve mollusks and marine fish. It has been established that petroleum products make the greatest contribution to pollution of the Avacha Bay water area; in the last few years, there have been accidental spills and leaks of this pollutant. The existing network of state environmental reports includes 10 surveys, while in its north-eastern part, on the city coast of Petropavlovsk-Kamchatsky, only 4 have been registered. These stations are located from 265 m to 1.6 km from the coastal port regional province. Over the past five years, state environmental monitoring has revealed a decrease in the average annual level of dissolved petroleum products in water to 0.005 mg/l, while the maximum one-time values of their content may exceed the maximum established standards and requirements of 19 mg/l. The authors of the research on determining the content of oil products in the coastal regions of the north-eastern part of the Avacha Bay for the period from November 2022 to August 2024 revealed excesses of established standards in 85% of water samples and, in general, at a high average annual level of 0.3 to 1.3 mg/l. The conducted review of data from open sources and the obtained results of chemical analysis allows us to maintain the presence of a long-term and intense impact of oil pollution of the coastal waters of the Avacha Bay. Therefore, with the strengthening of the role of the Petropavlovsk-Kamchatsky port as a stronghold of the Northern Sea Route, measures should be developed to continue and gradually improve the ecological state of the bays, especially in the coastal zone, in order to preserve and restore marine coastal communities.  **Key words:** the Avacha Bay,pollution, oil products, coastal ecosystems, environmental monitoring, South-Eastern Kamchatka. |
| Original article  УДК 504.4:574.5(265.5) DOI: 10.17217/2079-0333-2025-71-108-119 **DISTRIBUTION OF SUSPENDED MATTER  IN THE COASTAL WATERS OF THE KAMCHATKA PENINSULA** Zaripova K.M., Tikhonova E.A.  A.O. Kovalevsky Institute of Biology of the Southern Seas of RAS, Sevastopol, Nakhimov Ave. 2.  The study of suspended matter in seawater is crucial for assessing ecosystem health and monitoring the spread of pollutants caused by human activities. This paper presents data on the concentrations of suspended matter in seawater from surface and bottom layers of coastal areas in the southern part of the Kamchatka Peninsula. The concentrations were measured using vacuum filtration and nitrocellulose filters with a pore size of 0,45 micrometers. To analyze the dependence of suspended matter concentrations in coastal waters on various urbanization parameters along the shoreline, taking into account individual natural factors, was made.  **Key words:** suspended matter, marine pollution, Pacific Ocean, coastal urbanisation, the southeastern part of Kamchatka Peninsula. |