at improving the technical equipment of the VTS that makes the system more costly and cumbersome. As a result the use of modern VTS is effective only in economically developed areas with sufficiently strong transport infrastructure of the port. The main function of operators in the management of the CFS Centre involves a great influence of human factors. Not enough attention is paid to improving information and technology security, which is an alternative to technology modernization. There are a number of specific problems in navigation, which are out of VTS activity and pose a real security problem: small size vessels, sports vessels, and other craft that are not under the control of marine register; outlying offshore and coastal regions of fisheries preventing navigation on the traditional transportation routes; areas of extraction of natural resources in the coastal shelf, where shipping is characterized by high degree of environmental risk and where the deployment of fixed VTS services is economically unreasonable or impossible, medium and small port areas with poorly developed industrial and economic infrastructure cannot maintain the efficiency of the VTS.

Solving such problems is proposed by using special localized geographically Mobile Vessel Traffic Services (MVTS – by analogy with the VTS/MSUDS-system – a mobile control system of movement of vessels) [1]. MVTS are characterized by locality area of service, efficiency, speed of deployment and termination, deep formalized management procedures based on the use of modern information technologies and means of implementation, which reduces the negative impact of human factors in decision making, ease of implementation, flexibility. MVTS do not demand technical resources and energy, are not critical to the area-based, ground or surface, and can ensure safety of navigation in any area with heavy shipping, including remote marine areas, which are act of control of stationary VTS. MVTS may be temporarily or permanently deployed in any location to service floating in the river or lake areas. To realize MVTS can be used standard technical resources of port, including equipment for monitoring and identification of ships and other floating equipment – AIS, radar, ARPA, physical channels and means to implement procedures for information exchange between system components – GMDSS, TV, radios, computational tools (computers) and software. Information for MVTS does not require any significant computational power [2] and can be implemented on the basis of small computers and affordable mobile telecommunications to the provision of mobile subscribers (ships) and the operators of the MVTS Centre and preserving access to the networks of GSM/GPRS, Internet and corporate networks (Intranet). MVTS Center can be placed in coastal areas or in conjunction with the VTS Center, as well as be waterbased, e.g. the flagship. Implementation of interaction services MVTS based on Reference Model Open Systems Interconnection (OSI) of the International Organization for Standardization (ISO) using protocols and standards governing the normalized procedures for safety of navigation, as well as the interaction of system components at communication and transfer of management decisions (recommendations) provides accessibility of MVTS to interact with other systems in accordance with current standards.

Conclusion

Combined use of opportunities for both stationary and mobile VTC and future telecommunications and navigation technologies will expand the functionality of traditional VTS, remove the territorial limits of use, flexibility, mobility, to expand the range of services for the posting of various boats, to reduce the negative impact of human factors in navigation. Due to this, such systems can significantly improve the safety of navigation. VTS and MVTS should be considered as part of a multimodal associative transport system (MATS), seaport, providing efficient and safe navigation in the waters with heavy traffic of vessels. The use of such systems in areas of the Arctic shelf and the northern sea routes can be considered as a promising means of ensuring the safety of navigation in Arctic Russia.

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APPLICATIONS OF LASER-PARAMETRICAL TECHNOLOGIES FOR SEISMIC EXPLORATION OF PETROLEUM FIELDS

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Among various innovative technologies for exploration and development of oil-and-gas fields, there are some ideas and projects not realized as yet. Nowadays when a technological breakthrough in oil-and-gas exploration and production is urgently needed, laser technology is supposed, in a long-term prospect, to make it possible to extract almost all the oil from an oilfield with no environmental pollution.

In order to create ultra-high resolution means of seismoacoustic or electromagnetic location, capable of displaying details of smaller size than the probing wave length, the effects of nonlinear parametric interaction of wave fields should be used.

New possibilities in performing the main tasks of laser-parametric diagnostics as applied to seismic exploration of oilfields are based on detailed analysis of quickly changing interference pattern formed by scattered wave fields, through varying parameters of complicated probing signals such as frequencies, phases, intensity, polarization and the direction of propagation. These new possibilities use the present-day developments in the physics of nonlinear-wave parametric processes and in the theory of inverse scattering problem [1].

There is a large number of works devoted to diagnostics of weak vibrations with the use of various methods (see, for example, [1–5]).

Ultrahigh-resolution means of laser radiation allow interaction of laser impulses with objects smaller than the radiation wavelength; for this purpose, it is offered to use the effects of parametric interaction of waves. Thus, the resonance-parametric method for registration of vibrations in irradiated media makes it possible to classify them through measuring the vibration spectrum for various directions of irradiation, and to restore details of the scattering object with the resolution of the wavelength order and higher. This method is similar to laser-parametric method for registration of plasma vibrations.

Parametric satellite lines in laser irradiation can be used to impact vibrations with amplitudes much less than the radiation wavelength.

Thus, requirements for technical characteristics of parametric sources of laser radiation can be significantly weakened if differential methods are used for registration of various wave field parameters, as these methods make it possible to dismember the complicated pattern of nonlinear-wave interaction into separate details and to analyze their structures. The specific feature of these methods is measuring the differences in frequencies, phases, amplitudes, and polarizations of various components of laser radiation. Formally, these methods are similar to differential methods of analysis of nonlinear resonance in laser spectroscopy.

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