

System for Monitoring of Underwater Radioactive and Chemical Waste Objects: Information Control System on Basis of Autonomous Devices

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ABSTRACT

The present project suggests the system for on-line monitoring of underwater potentially dangerous objects. The system provides on-line notification in case if radioactivity and toxicity near such objects measured by autonomous devices exceed permissible levels.

The system consists of a set of specially developed autonomous devices which monitor the rate of radioactivity and toxicity of underwater potentially dangerous objects – such as radioactive and chemical waste. The devices are being deployed on the sea bottom for the period up to 1 year. They are equipped with specially developed spectrometric sensors for radioactivity control and potentiometric ion-selective sensors for chemical control of underwater environment for the depth up to 500 m.

When the level of radioactivity or toxicity exceeds the permissible levels the autonomous control devices come up to the water surface and transmit the signals through the satellite communication system. The information regarding the level of radioactivity, composition and levels of toxic substance concentration can be transmitted in this way. The information control system registers the satellite signals from recovered autonomous devices, processes and analyzes received data and transmits the results to the corresponding services.

The monitoring information control system are being developed for the main water areas in Russian Federation – Black Sea and Baltic Sea, Barents Sea, a number of areas in the Far East.

KEY WORDS: Underwater, radioactivity, toxicity, control, waste objects, environment, selective electrode, monitoring

INTRODUCTION

One of the most significant problems of environmental safety of Russian Federation is a problem of long-term monitoring of underwater potentially dangerous objects (UPDO) containing radioactive, chemical toxic components and explosives.

Russian company SEATECHRIM conjointly with a number of companies and Scientific Institutes have been designing and manufacturing components and subsystems for monitoring of such objects for last two years. The project allows to provide data on pollution rate for the Monitoring Center located in the Ministry of Emergency of Russian Federation.

The integrated information system controlling the condition of underwater potentially dangerous objects being under development includes but is not restricted to the monitoring of the following objects:

- The sources of radiation pollution;
- The sources of chemical pollution including submerged chemical weapon;
- Objects with explosives;
- Other potentially dangerous objects (pipelines, oil wells, submerged vessels etc).

The sources of pollution have different origins (Vialyshev A.I. *et al*, 2006).

The allies in WW II (USSR, USA and Great Britain) made a decision to liquidate captured chemical weapon and poisons by submerging on great depths in Atlantic Ocean after the Second World War ended. However many vessels were towed and submerged in Skagerrak and Kattegat connecting Baltic and North seas on depth from 200 to 680 m. The total amount of submerged vessels according to different sources varies from 42 to 60.

Shells, bombs and containers with poison substance were submerged loose 70 miles to the south-west from Liepaya (5000t) and in the area of Bornholm Island (30000t) at the depth of 100~105m. The thickness