

Summaries

TERESA ABARAMOWICZ-GERIGK, ZBIGNIEW BURCIU

Operational Problems of Evacuation Systems • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

The paper presents operational problems of evacuation systems used on board offshore drilling and production installations, especially with respect to the final stage of evacuation process. The systems characteristics influencing the evacuation process have been described and significance of knowledge of safety characteristics of life saving appliances has been emphasised. The safety function for the life raft has been proposed.

Keywords: *drilling platform, FPSO, evacuation system, lifeboat, lifesaving appliances*

TOMASZ ABRAMOWSKI, RYSZARD A. KOTLIŃSKI

Contemporary Challenges in Exploitation of the Ocean Polymetallic Deposits • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

UE countries are in the face of shortage of some metal mineral deposits which are essential for the development of many branches of industry, e.g. Ni, Co and RE. One of the strategic demand for UE development is the securing of balanced access to metal ore resources. Ocean mineral deposits have potential for the future and they contain several scarce strategic metals, recognized by the UE in June 2010 as crucial. In the group of 14 raw materials connected with the risk of supply deficiency are such resources as: rare earth elements, niobium, tantalum, platinum family metals, cobalt, gallium, germanium, indium, manganese, tungsten. The time forming relations of metals revealed on the basis of regional metallogenic analysis indicate that the characteristics of distribution and geological and mining conditions of polymetallic ore resources and metals content are regionally different. High potential of ocean polymetallic resources including oxide concentrations Fe-Mn (nodules and cobalt crusts) and massive sulphides is the result of geodynamic processes forming conditions of deposits in different oceans of the World. Most perspective deposits of polymetallic nodules and cobalt crusts are located in Pacific and Indian Oceans and massive sulphides in Pacific, Indian and Atlantic Oceans. There is very high content of metals recognized as deficient in European countries (Mn, Co, Ni, Ti, REE, Pt).

Keywords: *ocean deposits of polymetallic nodules and cobalt crusts, geological and mining characteristics of deposits distribution, ocean mining economic feasibility*

TOMASZ ABRAMOWSKI, TADEUSZ SZELANGIEWICZ

Exploitation Polymetallic Nodules with Deep Seabed • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

Polymetallic nodules discovered in 19th century become the potential resources of the metal ore. Very large depths, the possibility of harsh weather conditions and long distances to the shore causes that the exploitation at industry scale becomes the technically difficult and expensive venture. In the paper several different concepts for nodule mining systems together with problems which have to be solved before exploitation were presented.

Keywords: *polymetallic nodules, mining technology*

ANDRZEJ BĄK

Positioning Systems and Base-Map Used in “Offshore” Industry on Example of Fugro Implementation • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

The main specialist positioning systems used in offshore operations are described in the article. Their properties were analyzed as well as visualization methods of spatial information. Also ECDIS systems were compared to those used in offshore industry pointing the crucial differences between them.

Keywords: *offshore, positioning systems, cartography, satellite systems*

ADAM BOLT, PATRYCJA JERZYŁO

Exploitation Polymetallic Nodules with Deep Seabed • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

The water transport is cheapest, safest and least troublesome for the natural environment. Restoring the regular goods navigation will result behind himself in the revitalization existing and construction of new infrastructure handling-logistic of inland commercial ports. Creating the transport policy, it is necessary to remember that the water transport is the most ecological type of transport. He is producing the 10% of the emissions of gases expelled to the atmosphere by the equivalent wheeled transport scarcely. His energy consumption is a 30% of the energy consumption of the wheeled transport. A characterization of the Lower Vistula was included in the article, concept of development of the watercourse at the part Bydgoszcz — Gdańsk. Barriers hindering the development of the water transport and argumentation speaking for the activation of watercourses in Poland are presented. An alternative transport was described for carriages of cargo overland. The Lower Vistula constitutes the very important length for the inland waterway shipping. He constitutes the part of international E40 watercourses and E70 as well as Gdańsk and Gdynia can fulfill the transport important function for bulk goods or in containers at the part from the center of Poland to ports. The presented watercourse of the Vistula, as the chain in the all-Polish transport network with using container terminals on existing wharves in the Port Gdańsk and with new terminal in Bydgoszcz.

Keywords: *inland transport, balanced transport, Vistula river, Cascade of the Lower Vistula*

DANIEL DUDA, ANDRZEJ KRÓLIKOWSKI

Polish Exclusive Economic Zone (EEZ) Marine Environment Protection Supported by Aircraft Monitoring • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

This paper present problems of airborne monitoring Polish Exclusive Economic Zone (EEZ).

Keywords: *monitoring, environment protection, BALTIC SEA, Exclusive Economic Zone (EEZ), Maritime Office. (Authority)*

DANIEL DUDA, ANDRZEJ KRÓLIKOWSKI, RYSZARD WRÓBEL, WIKTOR KOSZAŁKOWSKI

Survey on International Standard for the Safe Management and Operation of Ships and For Pollution Prevention (ISM Code) Based on the Example of Mobile Offshore Drilling Units • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

The paper deals with the issue of analysis of Safety Management System supported on International Management Code for the Safe operation of ships and for Pollution Prevention and on Revised guidelines on implementation of The International Safety Management (ISM) Code by Administrations Res.A.1022(26), mandatory standard of the Safety Management System on the example of “Baltic Beta” IMO Nr 8756588 and “Petrobaltic” IMO Nr 8753940 Mobile Offshore Drilling Units. The objectives of the Code is to ensure safety at sea, prevention of human accidents, loss of life and investment goods, and avoidance of deterioration of the natural environment, in particular, to the marine environment, it means mostly in practice to minimization of Human and Organizational Errors — (HOE), which are the reason of much percentage of marine accidents.

Keywords: *safety at sea, sea oil mining, safety management system, ISM Code, offshore technology*

REMIGIUSZ DZIKOWSKI, PIOTR GŁOGOWSKI

Prediction for the Oil Spillage Expansion Due to the Potential Leakage from the Oil Rig in the Northeastern Part of the Caspian Sea • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

The article presents simulation method for prediction of potential crude oil spill at north-eastern part of the Caspian Sea with various weather parameters. Authors emphasized the danger of the oil spillage on the area of the Caspian Sea due to the specific environmental conditions.

Keywords: *oil spill, sea pollution, quasi-Arctic conditions*

MIROSLAW GERIGK

A Method of Safety Assessment of Ocean Engineering Objects Oriented on the Object Performance and Risk Assessment. Procedure of Safety Management of a Damaged Object at Sea • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

The paper concerns the safety of seaborne transportation and is devoted to safety of ocean engineering objects and ships in damaged conditions at sea. A method (procedure) of safety assessment of damaged objects (ships) is presented. The method is oriented on the object performance and risk assessment. For the risk assessment the risk based techniques are applied including the Formal Safety Assessment FSA introduced by IMO. The method (procedure) is based on application of the holistic approach to safety. An influence of factors affecting safety following from the different sources (design, operation, management, human factor) is taken into account. The holistic risk model is implemented which enables to estimate the risk of not surviving a collision (grounding, stranding, terrorist attack, etc.) using the object (ship) performance assessment during the accident. The event tree analysis ETA is used for the risk assessment. The different scenarios of accident are used and they include the hazards, intermediate events, additional events and consequences. The risk estimation is based on the matrix risk model. The safety measure in the method (procedure) is the level of risk. The risk assessment (RA, QRA) is conducted using the risk acceptance criteria (RAC) in the form of either the risk matrix or ALARP concept. The risk assessment is associated with using the risk control options (RCO) as well. Within the method safety is the objective.

Keywords: *safety of seaborne transportation, safety management, risk assessment, risk, ocean engineering object in damaged conditions, ship in damaged conditions*

MARZENA GÓRTOWSKA

Aspects of the Choice of Places of Refuge for Ships in Need of Assistance on the Polish Coast • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

Growing in recent years, human activity at sea, especially in the transport of liquid cargo, may increase the risk of marine pollution. The main cause of oil spills are ships in need of assistance, especially on high seas, where the reduction of the spill and securing the vessel may be difficult due to hydrometeorological factors. In this case, the leakage of petroleum substances may contaminate vast area and threaten the life of representatives of many species of marine flora and fauna. By giving the ship in need of assistance the refuge in the port or another sheltered area the consequences of the spill at open sea can be avoided, and the vessel can be protected in a controlled way. However, the presence of such vessels carries the risk of contamination of the coastal waters, damage to the port facilities or impact on local economical and social factors. For several years international organizations have tended to develop policies and guidelines to assist foundation and management of so-called Places of Refuge. It means places able to stabilize the vessel in a safe manner, avoiding possible ecological disaster. The decision on acceptance or refusal the ship in need of assistance to a place of refuge must be preceded by an analysis of the vessel's condition and suitability of certain place of refuge, especially in terms of current hydrometeorological conditions, the available depth and attainable rescue equipment. The article lists the most important legislation acts concerning the creation of places of refuge in Poland, indicating the key issues and presenting criteria for selection of such places. In particular, the article takes into account the intensity of the vessel traffic in the Polish area of responsibility for search and rescue in terms of number and size of units and also examines the parameters of the Polish ports, availability of the rescue resource and proximity to the ecologically sensitive areas.

Keywords: *oil spill, ecological disaster, maritime rescue, harbour, place of refuge*

PAWEŁ GÓRTOWSKI, KINGA ŁAZUGA

The Influence of Oil Spill on Effectiveness of the SAR Action • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

The increase in the extraction of oil from the seabed carries a risk of increasing the likelihood of an oil spill not only in the region of exploited deposits, but also on routes frequented by vessels transporting crude oil and its products. This study moves the driving theme of searching survivors share while petroleum product spill occurs and therefore the risks associated with staying in both survivors and rescuers in environment toxic to humans. Risks associated with the presence of petroleum products on the site include the share of their flammability, formation of explosive vapors in the air, lowering the oxygen content in the atmosphere and the toxicity of the product. Article also considers the influence of an oil spill on the possible of location of survivors.

Keywords: SAR, oil spill, search and rescue

JERZY MAREK GUTTETER-GRUDZIŃSKI

New Ways of Bilge Waste Water Treatment on Ships and Oil Platforms • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

The paper presents concepts of a solution method for the purification of oily bilge water on ships and oil platforms as required by Marpol 73/78, HELCOM 92 and the EU. The solution draws on the author's own research, uses hydrocyclone, oil separator Neptune and ceramic UF module.

Keywords: separation to oil, oily bilgeon ships, mimng platform

BENEDYKT HAC, JULIUSZ GAJEWSKI, LUCJAN GAJEWSKI, JAROSŁAW NOWAK, KAZIMIERZ SZEFLER

Organization of Marine Geophysical Investigations — BalticPipe Project as a Case Study • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

Exploration of raw minerals on sea bottom using specialised research vessels, equipped in devices (multibeam echosounders, side scan sonars, subbottom profilers, etc.) for geophysical investigations, in its organizational aspects does not essentially differ from other activities aimed at investigation of surface sea bottom sediments. This information concerning sea bottom is also necessary for preparatory work before laying pipelines, power and telecommunication cables, and building hydraulic engineering constructions. The organization of geophysical investigations in the sea named in the title of the paper, aimed at gaining knowledge on sea bottom structure along a planned pipeline, is a good tool to demonstrate the way how to prepare and to carry out exploration of raw materials on the sea bottom, using acoustic methods.

Keywords: sea bottom relief, character and structure; exploration and estimation of marine aggregates resources; non-invasive methods; multibeam echosounder (MBES); side scan sonar (SSS); subbottom profiler (SBP); magnetometer; Baltic Sea

JERZY HAJDUK

Safety of Mining Operations on the Deep Sea • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

To conduct mining activities on the high seas requires the introduction of new technological solutions. In addition to the use of new technologies for mining, ship's positioning and resolve issues more locations, handling supplies and mined material, a matter of the system is to ensure an acceptable level of safety for all components of a technological process of such a venture. The article provides safety requirements, which should be implemented by the participants engaged in the mining of natural resources of the seabed, and additional considerations arising from the pursuit of a new type of human activities at sea.

Keywords: seabed mining, maritime safety, ship's safety, safety management system

CLAUDIA JACASZEK

Marine Mining of Aggregates from the North Sea and its Influences on the Environment • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

In the article the marine mining of aggregates (sands and gravels) from North Sea on the coastal areas of Germany and Holland was introduced. The attention was paid to the potential influences of exploitation on the sea environment and possible conflicts with the protection of the environment.

Keywords: *marine mining, aggregates, environmental protection*

LECH KOBYLIŃSKI

Some Hazards to Safety of Offshore Mining Operations • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

Offshore structures designer for deep sea mining operations Or prone to many different hazards. The most important hazards are from the sea waves. During violent storm huge waves possessing extremely high devastating force appear from time to time. Such waves are called freak waves or rogue waves. The paper described several case of meeting such very rare waves by ships. It described also conditions that are necessary to their appearance and their basic characteristics. Because offshore structure must withstand devastating force of such a wave, the possibility of meeting it should be taken into account in the design process of those structures

Keywords: *safety at sea, monster waves*

RYSZARD A. KOTLIŃSKI

Clarion–Clipperton Nodule Field — a Future Source of Mineral Deposits • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

The paper presents revealed relationships and regularities of polymetallic nodules distribution occurring on the Clarion–Clipperton nodules field. The strict correlations between morfostructural development of the region with the Pacific Plate evolution in the mezo-cenozoic were demonstrated. The seabed form characteristics are direct reflection of geological development and changing sedimentation conditions determining the formation of productive nodule deposits. The selected hydrogenetic nodule type “H” with higher relative contents of Fe and Co shows in comparison against diagenetic type “D” and transition type “HD” lower contents of Mn, Ni and Cu. In the IOM mining area the greatest significance have type “D” and “HD” (with increased content of REE) and high nodules abundance and metal content, occurring at depth interval of 4200–4500 m. Adopted criteria for mining area delineation, including high nodule abundance above 10 kg/m² and Mn content (> 30%) and high grade sum of Cu, Ni, Co > 2,5% and bottom slope < 7°, confirm the IOM ore deposits can be considered perspective.

Keywords: *polymetallic nodules deposits in CCZ, origin, distribution, resources estimates of manganese nodule deposits*

WIESŁAW KOZIOL, ANDRZEJ CIEPLIŃSKI, JOANNA GOLEŃIEWSKA, ŁUKASZ MACHNIAK

Aggregates Exploitation of Sea Areas in Poland and UE • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

The paper presents the technologies exploitation aggregates of sea areas with particular emphasis on the European Union including Poland. Given the size of production in the EU and documented resources in Poland. Attention was paid to the impact of exploitation of the sea bed on the environment.

Keywords: *marine mining, aggregates, technology*

KINGA ŁAZUGA, PAWEŁ GÓRTOWSKI

Analysis of the Influence of Oil Spill on Effectiveness of the SAR Action Using SARMAP and OILMAP Simulators • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

This paper considers the human search and rescue raft search in the place of oil spill using the Anaconda helicopter, aircraft M-28 X2 and the ship Captain Poinc. Results represent the trajectory of movement of oil slick, the trajectory

of motion of survivor dressed in survival suit and life raft for two hydrometeorological situation. The search for life-saving measures mentioned above are held by schemes IAMSAR. Search results are presented in the form of the probability of success (POS [%]) based on the probability of detection and probability of containment.

Keywords: *oil spill, search and rescue, SAR*

LUKASZ MACIĄG, RYSZARD A. KOTLIŃSKI, RYSZARD K. BORÓWKA

Lithological Variability of Siliceous Clayey Silts from IOM Area (Clarion–Clipperton Fracture Zone, East Pacific) • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

Authors presented geospatial variability of selected sedimentological, mineralogical and diagenetical features of clayey–siliceous sediments from Interoceanmetal deposit area (eastern Pacific, Clarion–Clipperton fracture zone). Changes of environmental conditions essential to geological and palaeogeographical situation into C-C zone, and also their importance to forming processes of Fe/Mn oxide concentrations have been described. Research studies on sediments, classified to the uppermost part of Clipperton F_{ClIV} Formation (pliocene–holocene), show unimodal distribution of samples, poor sorting and mean grain size of siliceous clayey muds amount to $\bar{x} = 6,83 \phi$. Some qualitative/quantitative changes into the mineral composition of the clay < 0,004 / < 0,002 mm subfractions (clay minerals from kaolinite/illite/chlorite/smectite groups), perpendicular variability of some Radiolaria/Diatomeae species and also micronodules amount depletion during burial processes have been confirmed. Environmental conditions into the C-C zone enable to form economically attractive depositional fields covered by polymetallic nodules that constitute potential ore sources of Mn, Ni, Co, Cu and other metals in the future.

Keywords: *Clarion–Clipperton, lithology, mineralogy, granulometry, early diagenesis, clay minerals*

WOJCIECH MALEIKA, MICHAŁ PAŁCZYŃSKI

The Influence of the Beam width in Multibeam Echosounder on the accuracy of Seabed Models • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

Digital terrain models (DTMs), finding a wide range of applications in the exploration of water areas, are mainly created on the basis of bathymetric data from a multibeam echosounder. The estimation of DTM accuracy dependent on the choice of the survey parameters is difficult due to the lack of reference surface. These authors have developed the methodology of simulation called virtual survey, which enables examining how various parameters of the echosounder, survey and DTM construction algorithms affect the errors of the created models. They are aimed at precise estimation of the model accuracy and the optimization of depth measurement work. The article includes the results of the examination of the influence of the beam width in multibeam echosounder on the accuracy of seabed models. It has been proved that a significant reduction of recorded data (by increasing beam angle) leads to only a slight increase in the modeling error, which makes the bathymetric survey much more cost-effective.

Keywords: *cyfrowy model terenu, sondaż batymetryczny, echosonda wielowiązkowa, szerokość wiązki*

BOLESŁAW MAZURKIEWICZ

Offshore Mining of Raw Resources of the Sea and Ocean Bottom as the Principal Task for the State Maritime Policy • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

The paper is devoted to the requirements of the state maritime economical policy in relation to the offshore mining of the raw resources of the sea and ocean bottom. After a presentation concerning the future increase of number of people in the World, and the resulting power demand, are characterized the on the sea bottom and under the sea bottom reserves of hydrocarbons and other minerals. Further are presented the different permanent structures in the form of steel and concrete platforms, as well as different kinds of floating units, used for the exploration and mining of the existing and discovered reserves. It is stated that for a proper development of the maritime policy there exists a real chance to supplement the onshore reserves by mean of the offshore one. It is concluded that at the time being a serious intensification of the state activities in the direction of an increase of offshore mining is for our State urgently needed.

Keywords: *Górnictwo morskie: wymagania, rezerwy, stałe i pływające konstrukcje do eksploracji i eksploatacji złóż podmorskich, morska polityka ekonomiczna państwa*

WACŁAW MORGAS, ZDZISŁAW KOPACZ

Marine Mining in the Human Activity at Sea • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

In the report the attempt of presenting of the oil-mining as the kind of the special human activity at sea is presented. Into this group of activities executed on sea we can introduce the exploration and the exploitation of natural resources, raising of oil rigs and wind power stations, putting of cables and pipelines on the bottom etc. A main goal of navigational and hydrographic support of the special activities at sea is to guarantee of the safe and efficient sea navigation and the assurance of the high affectivity of the realization of this kind of activities. This is achieved by producing and delivering of additional and more detailed navigational information as well as hydrographic information about the environment and the sea. The sea variant of geospatial information including her three basic kinds, which are: geographical, operational and legal. The range and the form of this additional information as well as the expectations depend mostly from needs of participants of the process.

Keywords: *kinds of the activity at sea, geospatial information, exploration and exploitation of sea wealths*

JACEK MUCHA, RYSZARD A. KOTLIŃSKI, MONIKA WASILEWSKA-BŁASZCZYK

Polymetallic Nodules Resources — Procedures and Requirements for their Estimation in IOM Area (Clarion–Clipperton Fracture Zone) • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

International Joint Organization (IOM) is the contractor of International Seabed Authority since 2001 and has the exclusive rights for exploration of polymetallic nodules within a 75000 km square area situated in the Clarion–Clipperton fracture zone in the Pacific. The main factors affecting estimation accuracy of the nodules resources in the IOM area have been described and particularly: distinctive feature of deposit, structure of nodules variability and strategy of deposit exploration. The results of the geostatistical analysis of nodule accumulation variability and the nodule resources estimation using of the ordinary kriging procedure have been presented. The variability of the nodule accumulation is high with the coefficient of variation about 60–70% and reveals a strong contribution of the random component and small range of autocorrelation. In the great scale observation (> 50 km) the weak anisotropic style of nodule accumulation variability has been observed with the N-S direction of minimal variability, compatible with the elongations of the ore fields. The accuracy of the nodule resources estimation is very differentiated in dependence on the dimensions of the calculation blocks with the median of the kriging errors (for the 95% confidence level) from 70% (for blocks 0.5×0.5 km) to 10% for the large blocks (4000 km²) The results of two phases of sampling in a part of the IOM area have been compared. The assessments of nodules resources for data of both sampling are very close. The need of the accuracy analysis of the nodule fields surface assessment for more reliable nodule resources estimation has been emphasized. Increasing resource estimation accuracy can be achieved by the implementation of the results of the multi-beam echo sounding and seafloor photographic surveys.

Keywords: *nodules, Pacific, resources, geostatistics, semivariogram, kriging*

ADAM PIESTRZYŃSKI

World Ocean Mineral Commodities • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

The work consists of a mineral deposits characteristics occurring in the World Ocean, based on genetic classification. The following type of the mineral deposits have been discussed: sedimentary biogenic, chemical, and placer as well as hydrothermal types. Localization and an economic importance of all deposits types listed in the text has also been presented.

Keywords: *mineral commodities, ocean environment, genetic classification*

DOROTA PYĆ

Offshore Mining and Sustainable Environmental Governance • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

It is rather obvious that in the nearest future oil companies will be a subject to strengthened technological and safety regulations and sanctions in the event of non-compliance. The environmental arguments against offshore

drilling are now weak. Marine governance is fragmented where the various sectors are regulated and managed independently of each other. Marine spatial planning provides a comprehensive, integrated view of both the uses and resources. The ecosystem and precautionary approaches are recognized as rules of conduct the whole marine resources management together with the paradigm of sustainable offshore drilling. Integrated marine governance is a sharing of responsibilities, rights and duties between agencies and stakeholders.

Keywords: *marine environment, sustainable development, offshore drilling*

ANNA RABAJCZYK

Environmental Threats Resulting from Methane Clathrate Extraction: an Environmental Impact Assessment • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

Methane clathrates, also known as methane hydrates, occur in permafrost regions as well as below marine sediments, in particular on continental slopes. These compounds are stable only under specific physico-chemical circumstances and they simultaneously provide the living conditions for specific specialised organisms. In consequence, plans for gas hydrate resource exploitation have provoked much heated debate. On the one hand, methane clathrates offer an opportunity for obtention of large amounts of „green fuel”, an alternative to crude oil, traditional coal or natural gas. On the other hand, this breeds understandable anxiety as for the environment in terms of dangerous changes to water ecosystems and consequences thereof, or the possibility of uncontrolled release of large amounts of methane into the atmosphere, which would threaten the climate and life on Earth. In view of the above, discussion is needed to assess the cost-effectiveness of marine sediment exploitation, with focus on environmental cost and change, both at the stage of extraction and upon works completion. Understanding the scope of interference into the water ecosystem structure together with the consequences for the environment makes it possible to conduct environmentally sustainable works as well as limiting negative environmental impact.

Keywords: *Methane clathrates, environmental management, environmental impact*

LECH ROWIŃSKI

Getting Polymetallic Nodules Using Autonomous Underwater Vehicles • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

Getting polymetallic nodules out of the oceanic bottom requires applying extraordinary technical means and organizational. Workplace at depth from 3 to 6 km is so difficult that just a few simple and little gifted devices are for acting in such conditions. The Gdańsk University of Technology developed a conception of the method of the work and complex of technical means which let the mining and the transport of 5 million ton of the polymetallic nodules annually. This concept is based for achievements to date of the depth technique. According to the presented exploitation procedure they to processing plants are also ensuring the continuity of output and supplies of the raw material in case of inevitable damage and of the breakdown of elements of complex. Estimated costs of the study and construction of complex allow for commencing analytical, design follow-up works and examinations.

Keywords: *underwater vehicles, polymetallic nodules, mining*

STANISŁAWA SANAK-RYDLEWSKA, AGNIESZKA GALA

Methods of Recovery of Some Metals From Oceanic Nodules • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

This paper presents the informations about the possibility of cobalt and nickel recovery from some poor raw materials, including ocean concretions. Due to the low content of these metals, it is necessary to apply leaching processes using acidic or alkaline reagents. After reviewing the value of concentration of the leached metal, it is preferable to separate this metal from spent pickling liquors by extraction or electrolysis. In the case of low metal concentration, it is necessary to use a method that allows to concentrate the metal and then to use a method of selective separation. To concentrate the component in dilute solutions, methods based on ion exchange (eg ion exchangers) or ions and

precipitates flotation are used. The success of these methods mainly depends on whether the applied reagent (or reagents) can be regenerated, to be used again in the process. This determines the economic viability and environmental protection.

Keywords: *oceanic concretions, cobalt and nickel hydrometallurgy*

KRZYSZTOF SZAMALEK, WŁODZIMIERZ MIZERSKI

Sea-bed Mineral Resources — Current Knowledge and Perspectives • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

Seabed minerals constitute a possible new source for mineral commodities. Marine mineral resources occur in the bedrocks beneath the ocean floor, the ocean floor itself, in the sea water and in the shallow, coastal zones. The perspective of their extraction is shaped by the following factors: geological, legal, technical, technological, environmental and economical. It appears that in spite of years of on-going research, mineral resources of seas and oceans are still known insufficiently. This applies in particular to polymetallic massive sulphides ores, Co-crusts, metalliferous clays or methane gas hydrates. The deposits of crude oil and gas in seas and oceans are still poorly known in the deeper parts of the oceans. Mineral researches of oceans are conducted by several countries (e.g., Russia, US, France, Japan, Germany, South Korea, China, Poland); their activity is regulated and controlled by the International Seabed Authority. The perspective of marine minerals extraction is more imminent in rich, technological advanced countries; having access to the sea in itself is a factor of lesser importance. Underwater geological surveys are costly and can be undertaken only by countries which are characterized by either a strong economy and/or willingness to conduct an active concession policy and close cooperation in managing of measured mineral reserves.

Keywords: *marine minerals, seabed mining, mineral commodities*

KAZIMIERZ SZEFLER, BENEDYKT HAC,
STANISŁAW RUDOWSKI, LUCJAN GAJEWSKI, ŁUKASZ GAJEWSKI

Methods of the Sea Bottom Studies in Relation to Estimation of the Mineral Aggregates Resources within the Bay of Koszalin • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

The effects of the application of modern, integrated non-invasive measuring system to detailed recognition and mapping of the sea bottom in relation to determination of the mineral aggregates are presented. The bottom images obtained by Multibeam Echosounder and Side-Scan Sonar, seismic profiling by Subbottom Profiler, bottom inspection by underwater TV ROV system and magnetometer measurements were used. All data were collected and elaborated with precise positioning system, with precision better than 0.2 m, in nearly real time. Presented examples are situated within sandy/gravelly exploitation field in the Bay of Koszalin. The obtained results demonstrate the necessity to strongly demand the use of the adequate methods in regulations concerning exploration, exploitation and monitoring of the resources on the sea bottom. According to authors the first stage of the work must be to obtain bottom images by Multibeam Echosounder. The next stages will depend on the obtained bottom shape. The studies and measurements realized without Multibeam Echosounder images are not credible.

Keywords: *sea floor relief, character and structure, recognition and assessment of the mineral aggregates resources, non-invasive methods, Bay of Koszalin, Baltic Sea*

ARKADIUSZ TOMCZAK

Modern Methods of Underwater Positioning Applied in Subsea Mining • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

The project of subsea exploration is a long lasting and complex process. In most of the cases the underwater operations are connected with hydrographic and construction surveys that is equivalent of geodetic survey on shore. In the industry the need of constant monitoring of underwater activity such as tracking of autonomous robots and elements of infrastructures exist. It is possible by means of underwater acoustic positioning systems. The paper presents

modern underwater positioning methods widely used in offshore mining sector in the aspect of system principles, measured navigation parameters and their achievable accuracy. The underwater LBL (Long Baseline) acoustic spoolpiece (segment of pipe joining the manifold and well) metrology was described and the necessary steps to have LBL system ready for logging session such as calibration of an array of transponders (baseline calibration) and finding grid coordinates of transponders in array (box in calibration). In the summary the present research directions in the field of underwater positioning were appointed.

Keywords: *underwater positioning systems, acoustic positioning, LBL, USBL*

BERNARD WIŚNIEWSKI, TOMASZ WOLSKI

The Hydrometeorological Protection of Clarion–Clipperton Zone • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

One synthesized and characteristics of seasonal hydrometeorological conditions in the area of Pacific where is put the Clarion–Clipperton zone. One presented the current range of the monitoring from different land centers and hydrometeorological buoys together with examples of marine chart. This monitoring can be used to the construction of the programme of the weather information reception during the mining exploitation on the Clarion–Clipperton field. The special attention was returned on problems and proposals of the regard of hydrometeorological conditions in the preservation of the safety of mining works.

Keywords: *Clarion–Clipperton zone, hydrometeorological monitoring, ship's safety*

PAWEŁ ZALEWSKI

Kalman Filter and Fuzzy Models in Dynamic Positioning Systems • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

Dynamic positioning of a ship is a process comprising two problems: 1) forcing the output of the ship to maintain a constant reference position and heading and 2) path following. In both cases the control is achieved using combination of several thrusters and rudders. The article presents various solutions to these control problems of offshore vessels, utilizing numerical filtration and fuzzy methods.

Keywords: *dynamic positioning, ship motion modeling, Kalman filter, fuzzy logic*

DOMINIK ZAWADZKI, RYSZARD A. KOTLIŃSKI

Conditions of the Occurrence and Distribution Prospective Ferro-manganese Oxide Deposits • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

This article presents the general characteristics of the manganese oxide concentration and the oceanographic conditions of their occurrence and distribution. The geological analysis has been based on the distinguishing characteristics of the most promising ore fields of polymetallic nodules occurrence, i.e. Clarion–Clipperton Ore Field, Central Indian Ocean Ore Fields and Peruvian Ore Field, as well as cobalt-rich ferromanganese crust on the submarine mountains of the Pacific (Marshall, Wake-Necker). The study has been based on current data and literature resources. Data regarding the forms of occurrence, depth, the structure of the ocean floor and disclosed oceanographic relations of their occurrence is extremely important for taking actions with respect to future excavation processes of the metallic minerals discussed.

Keywords: *manganese oxide concentration, polymetallic nodules, cobalt-rich ferromanganese crust, the most promising ore fields*

KATARZYNA ŻELAZNY, TADEUSZ SZELANGIEWICZ

Loads and Tensions of Vertical Mining Pipeline • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

One of the methods to obtain polymetallic nodules from the ocean bed is hydraulic — with the use of deep-well pumps. In this method a vertical deep-sea mining pipeline 4.000–6.000 m long is suspended from a vessel. The

pipeline is subjected to various loads and kinematic forcing, which results in tension out of pipeline. This paper presents the results of simulation tests of loads and tensions of vertical mining pipeline.

Keywords: *polimetallic nodules, deep-sea mining hydraulic installation, loads and tensions of a vertical mining pipe*

KATARZYNA ŻELAZNY, TADEUSZ SZELANGIEWICZ

Shape Deformation of Vertical Mining Pipeline • Kwartalnik Górnictwo i Geoinżynieria • z. 4/1, 2011

One of the methods to obtain polimetallic nodules from the ocean bed is hydraulic – with the use of deep-well pumps. In this method a vertical deep-sea mining pipeline 4.000–6.000 m long is suspended from a vessel. The pipeline is subjected to various loads and kinematic forcing, which out of shape deformations. This paper presents the results of simulation tests of shape deformations in deep-sea mining pipeline.

Keywords: *polimetallic nodules, deep-sea mining hydraulic installation, shape deformations of a vertical mining pipe*