

## SUMMARIES

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**Ahmed R., Miska S., Miska W.: Friction Pressure Loss Determination of Yield Power Law Fluid in Eccentric Annular Laminar Flow • Drilling Oil and Gas 2006 • Volume 23/1**

Accurate predictions of friction pressure losses are very important in drilling and well completions operations. In some applications, for example, drilling in areas where the margin between pore pressure and fracture pressure gradients is small, inaccurate predictions of bore hole pressure may lead to serious complications and even a loss of the well. This paper is focused on a flow of yield power law type (pseudo-plastic with the yield stress) fluid in the annular space with the possibility that the inner pipe maybe eccentric. A new mathematical model that is based on a concept of generalized average wall shear rate – wall shear stress relationship is presented. A carefully designed laboratory facility that permits accurate differential pressure measurements as a function of flow rate in both pipe and annular flow has been developed. The desired rheology of the fluids was obtained by mixing two types of polymers (PAC and HEC) with water. Pipe flow measurements have been utilized to produce flow curves and subsequently the fluid rheological characterization (yield stress, consistency index and flow behavior index). The results of measured pressure losses are compared to those predicted by the proposed model. While the discrepancies are noticeable the difference is less than 15% and frequently is even less than 5%. We believe that the proposed model is simple useful for practical design applications.

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**Artymiuk J.: Exploitation Efficiency of Self-Supporting Vertical Pipelines for Coalbed Methane Removal • Drilling Oil and Gas 2006 • Volume 23/1**

Coalbed methane can be found in the Upper Silesian Coal Basin. In the Lower Silesian Coal Basin the methane resources are smaller, and in the Lublin Coal basin no significant methane concentrations have been documented so far. Recently, a successful technology of methane removal has been elaborated, which is treated as gas recovery from unconventional sources. Almost 16 mln PLN was spent on a methane removal system implemented in the coal mine “BUDRYK”, consisting of two vertical self-supporting pipelines connected with motors and electrical energy generators. This is the most advanced installment in the Polish mining industry, thanks to which the cost can be lowered and the gas, source of numerous catastrophes, used economically. The continuity of supplies to the surface systems depends on the efficiency of pipelines suspended in the mine’s shaft, through which methane it transmitted to the nearby gas power and heat plant. Their control is one of the basic exploitation issues to be solved, especially in the conditions of hindered direct access. Additional obstacle is the strength sensor, which may disconnect a well working gas pipeline. The calculation and research methods enabling safe operation of the pipelines are presented in the paper.

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**Artymiuk J., Zachariassen E.: New Combined Drilling, Workover and Snubbing Rig Concept • Drilling Oil and Gas 2006 • Volume 23/1**

Today’s workover and service operations require multi-functional ability to let operators select the best way to perform the well operation. By introducing a new land rig concept based on a patented rack & pinion drive system a new generation of rigs can instantly switch between workover, drilling and snubbing operations. The new rig concept has direct drive thus no drill line. Mobilization time is reduced as the rig has fewer truck loads, faster rig up and a higher automation level. One land rig currently under construction will be the world’s first single operator unit, with full pipe handling capability and fully automated control system. The rig is fully equipped with 250 T top drive which can be used for rotation and snubbing, purpose designed snubbing slips and other features supporting multifunctional well operations. The paper will focus on features related to the land rig under construction, and how it may reduce operational cost and improve well performance.

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Bednarz S., Bochenek K., Serafin R.: **Exploitation Problems of Cement Aggregates in High Risk Operations** • Drilling Oil and Gas 2006 • Volume 23/1

Cementing of drilling wells in some conditions may encounter difficulties related with the behaviour of the cement aggregate, e.g. injection of cement slurry when packer has to be introduced to the annular space, injection of foam solutions, sealing up to prevent the migration of gas through the sealing cover, injection of solutions with microspheres. Owing to the progressive and turning motion, hydraulic vibrations are observed during the cement plunger pump operation. They intensify when an aerated slurry is injected, e.g. air adsorbed by microspheres, gas bubbles in foamy cement or having high density/viscosity (at high rates of the plunger). Other operations sensitive to hydraulic vibrations are cementing of shallow gas horizons, especially in clayey intervals prone to shrinking after a contact with the cement filtrate. The recirculation of the slurry to degas the aggregate hinders fluent application of the cementing procedure. Possibilities of limiting exploitation difficulties of aggregate operation to cementing operations are presented in the paper.

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Bednarz S., Urba R.: **Drilling Rigs Vibration and Safety of Work** • Drilling Oil and Gas 2006 • Volume 23/1

Vibrations cause hazardous effects in mechanical systems of machines. They may result in misoperation of the machines and their working parts, lowering their durability. They also have a negative influence on the crew's health and the environment. Considerable vibrations accompany the process of a well drilling (drilling, hoisting and tripping of the casing, auxiliary works with the main set, e.g. drilling table, head, hoist and pumps). The results of measurements of American, Romanian and Polish drilling rigs are presented in the paper. Drilling rigs should have such a design that hazards related to their use are minimized, mainly at their source.

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Bříza K., Bujok P., Luner K.: **Application of Enhanced Oil Recovery Methods to Oil Deposits** • Drilling Oil and Gas 2006 • Volume 23/1

At present, oil can be ranked among the most important fuels and energy minerals. In the majority of cases, primary recovery moves, however, merely in the range of 30–40% of original oil in place (geological reserves). But with deposits containing very viscous oil, percent recovery is much lower, i.e. from 5 to 10%, and the use of primary methods brings about only little economic effect. It is the application of so-called secondary and tertiary methods that enables the effective exploitation of reserves. In the submitted study, we present some results obtained by laboratory experiments with using polymers and surface-active agents in the displacement of highly viscous oil from reservoir rocks.

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Brudnik K., Przybyło J., Winid B.: **Hydrogeological Situations of Wieliczka Deposit on the Base of Mine Seepages Conditions** • Drilling Oil and Gas 2006 • Volume 23/1

Wet conditions in salt deposits are observed on the group of leaks reported in Wieliczka Salt Mine. More than 180 leaks are under quantity and quality control. Discharges and contest of chloride and sulphate and sulphate indicators of Wieliczka leaks are presented on probability curves. Leaks were classified based on their origin (waters from the boundary and waters inside the deposit), on the discharge (for groups) and salinity (three groups). Waters leaking to the deposit are characterised by bigger discharge and variety salinity. Waters circulated inside the deposit are less variable of discharge, more contest of sulphate and small differences in chloride contest.

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Brylicki W., Stryczek S.: **Influence of Klinoptilolit Zeolites on the Microstructure and Phase Composition of Hardened Slag-Alkaline Slurries** • Drilling Oil and Gas 2006 • Volume 23/1

Modification of slag-alkaline slurries with mineral additives to obtain a new generation injection binders is one of the methods of making the so-called geopolymer binders. Addition of natural zeolites creates a possibility of inten-

sifying puzzolan reactions in slag-alkaline slurries, and also their sealing and enhancing the formation of zeolites in the slag-alkaline matrix. The many years' experience shows that the processes of zeolite formation in a slag-alkaline matrix in the conditions of natural maturing take place slowly. Only the hydrothermal conditions to which the slag-alkaline slags are exposed cause that the processes radically accelerate and zeolites are formed. Addition of natural klinoptilolit zeolites may result in an unstable acceleration of zeolites and also hydrogranates formation; the latter are responsible for the durability and immobilization potential of the slag-alkaline matrix. The results of analyses of fresh and hardened slurries with addition of Slovak klinoptilolitowych zeolites maturing in natural and hydrothermal conditions typical of deep well cementation processes, are presented in the paper.

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**Brylicki W., Stryczek S., Gonet A.: Geopolymer Slurries for Injection Operations • Drilling Oil and Gas 2006 • Volume 23/1**

Injection works carried out for sealing and reinforcing the rock mass have been usually performed with the use of sealing slurries based on classical cement binders, cement-clay, clay, gypsum and their compositions with mineral and swelling additions. Sometimes also costly polymer and cement-polymer slurries are used. The results of analyses of fresh and hardened geopolymer slurries obtained in laboratory conditions of both Faculties are presented: results of analyses of technological parameters of fresh and hardened slurries, i.e. strength parameters, microstructure and microporosity.

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**Burachok O.: Investigation of Horizontal Wells Interference in the Well Cluster • Drilling Oil and Gas 2006 • Volume 23/1**

There has been observed the problem of well's horizontal parts interference in the well cluster. There has been investigated the interference of horizontal well based on replacement of horizontal parts with linear rows of vertical wells. The optimal length of well's liner part and optimal radius of strata entry have been calculated.

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**Cholevová I., Mazáč J., Janák L.: The Analysis of Records of Gas-Air Mixture amount and Methane Concentration in Dependence on Barometer Pressure • Drilling Oil and Gas 2006 • Volume 23/1**

The process of firedamps' release into worked-out areas, which often communicate with the surface after stopping the coal mining activity is very topical problem in the region of Ostrava. Firedamps contain namely dangerous methane, which is a result of the coalification process. Contemporary findings in this area show that the outflow of firedamps into the atmosphere is above all related to barometer pressure's development. In 1995, the realization of degassing wells was initiated in region of Slezská Ostrava. Within the framework of monitoring, methane concentrations, gas-air mixture amount and barometer rates are measured among others. This paper gives information about mathematic data processing originated from the monitoring unit of the degassing well used for leading of firedamps from the underground, which is situated in Slezská Ostrava region.

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**Danayev N.T., Akhmed-Zaki D.Zh.: The Usage of Mathematical MLT Model for the Calculation of Thermal Filtration • Drilling Oil and Gas 2006 • Volume 23/1**

During the research we used a well-known mathematical MLT model – Muskat–Leverett thermal for the numerical calculation of the thermal filtration of a biphasic liquid in a porous space. The mathematical theory of thermal influence on filtration of the biphasic liquid for MLT model was offered by V.N. Monakhov and O.B. Bocharov. The influence of temperature on the character of liquid motion is possible through the change of viscosity and capillary properties of different liquid components which depends on their temperature and temperature of skeleton in a porous space. The characteristic feature of the thermal model of biphasic filtration – is all equalizations which are necessary for making biphasic filtration, except the laws of Darcy and Laplas, are the results of saving laws of the continuous environment mechanics. In addition, a MLT model is technological in sense that for its description only the functions-parameters are used, which are defined experimentally. The computational analyses of the in-

fluence of thermal processes of joint motion of many-fazed liquids allows to describe the process of filtration of two and more liquids with different physical properties in a porous environment adequately, which represents a large interest in planning and development of gas- and oil fields.

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**Dubiel S., Ziaja J.: Block Diagrams for the Analysis of Borehole Conditions during Drilling-Up Hydrocarbon Deposits and Selection of Preliminary Eruption Liquidation Methods • Drilling Oil and Gas 2006 • Volume 23/1**

Prevention against spontaneous eruption of hydrocarbons from oil wells requires proper analysis of drilling-up conditions and faster methods of safe preliminary eruption liquidation. The presented block diagrams enable clear detection of eruption hazard and selection of a suitable method of its liquidation, especially when it is possible to determine basic technological parameters, when technical parameters of the borehole as well as drilling up conditions are known. The proposed procedures significantly increase the safety of work.

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**Dudla N.A., Kondratenko V.M., Kiriczenko G.N.: New Materials Used in Drilling, Exploitation and Transport of Hydrocarbons and Extension of Drilling Pump Life • Drilling Oil and Gas 2006 • Volume 23/1**

The causes of failure of casing and its connections are discussed in the paper. The influence of carbon on the mechanical properties of steel pipes was analysed. The advantages of a multilayer steel highly resistant to corrosion were analysed in view of pipes and other operation elements production.

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**Duliński W., Ropa C.E.: Selection of a Pump for the Production of CO<sub>2</sub> Saturated Mineral Water • Drilling Oil and Gas 2006 • Volume 23/1**

The paper deals with the problem of exploitation and transport of gas saturated mineral waters in the aspect of deliveries in specific quantities and maintaining physicochemical properties. Special attention is paid to the cavitation effect. It appears during exploitation with various types of pumps. Having considered the technical and exploitation characteristics of the used pumps, a Czech screw pump, driven with an underwater electrical motor was selected. No cavitation effect appears in the pump, therefore it is not hazarded with gassing. Simultaneously it creates possibilities for water and gas deliveries directly from the well to the customer's separator.

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**Fąfara Z.: Comparison of Filtration of Chosen Petroleum Substances in Physical Soil Model • Drilling Oil and Gas 2006 • Volume 23/1**

This paper presents results of comparative analyses of vertical filtration of chosen petroleum hydrocarbon substances, for which were realized measurements of hydrocarbons migration on prepared laboratory measuring position. The hydrocarbon contaminants were controlled spilt on surface of the soil models. It was used ethylene, winter car fuel and petroleum from the mine Grobla for research. It estimates of vertical filtration velocity of hydrocarbons based on results of direct measurements. It compares these values with velocity of filtration calculated according to the Darcy law, where it was approved laboratory properties of porous media and measure or tabular properties considered hydrocarbon substances.

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**Fąfara Z., Miska W.: Prediction of Absolute Permeability of Loose Soils on Base of Laboratory Research • Drilling Oil and Gas 2006 • Volume 23/1**

During construction of the laboratory position for research of migration of petroleum hydrocarbon substances in soil, was found chosen properties of materials used to made of physical soil models, on base of direct laboratory research. It predicts of permeability ratio used these parameters and generally recognized petrophysical models. It compares received estimates with results of laboratory research realized on measuring position for finding of absolute permeability for air. For each soil model two models of porous media were prepared for loose and condensed grain laying.

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**Făfara Z., Solecki T.: Comparative Research of Hydrocarbons Concentration in Soil in the Area of Petroleum Fuel Magazine • Drilling Oil and Gas 2006 • Volume 23/1**

This paper performs comparison of result of measurement of the hydrocarbon pollution in soils on area of the fuel base. This research realized two different methods. First one relied on drilling well and collecting of samples from definite depth, insurance and transport for laboratory, where it means the contents of hydrocarbons of infrared absorption method using specialistic stationary equipment. It drilled in this purpose 11 investigative wells in each collecting the samples from three intervals. Second method relied on introduction of measuring probe for soil on definite depth and direct measurement of equivalent concentration of explosive hydrocarbons in soil gasses, also method of infrared absorption with use of specialistic alienable equipment. Research execute this method in 17 locational points on two or three depths. Gotten results of research are base of comparative analysis.

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**Frățilă M., Sofonea G.: The Calculation of Distortion in a Gas Pipeline in the Overcrossing Area • Drilling Oil and Gas 2006 • Volume 23/1**

The proper execution, exploitation and maintenance of pipelines used for the transport of natural gases requires a detailed knowledge both of the phenomena which appear during exploitation, as well as of the causes which led to them. The goal of the current paper is to analyse the behaviour and the loading mode of the pipeline for the transport of methane gas in the crossing area. After executing the pipeline section from the river crossing area, a raising of the pipeline from the support pillars has been noticed. The analysis of the deformation mode of the pipeline section, of the efforts and stresses has been carried out using the analytical calculation method.

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**Frydrych M.: Applications of Well-Bore Measurements to Optimize Field Revitalization • Drilling Oil and Gas 2006 • Volume 23/1**

Well-bore measurements can contribute to risk management of revitalization by identifying and monitoring the drainage of remaining hydrocarbons. These measurements can be carried out both cased-hole and open-hole. Applications of these technologies are illustrated through case histories of revitalization projects. In cased-hole have been employed traditionally neutron logging tools. The pulsed-neutron capture measurement is mainly used to determine producing gas-oil and oil-water contact. Measurement of the gamma ray spectra, produced by both inelastic and capture of thermal neutrons, can be used to determine reservoir saturation (from C/O ratio) and lithology evaluation. In order to increase depth of investigation a new tool has been used that makes stationary measurements of resistivity through-casing. In open-hole can be used an array induction tool. Processing of array induction data provides information about a drilling mud invasion of the formation and can yield prediction of the expected field respond to water flooding.

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**Grigoraș I.D.: Core Data Statistical Analysis for Natural Gas Reservoirs from the Southern Part of Transylvanian Depression • Drilling Oil and Gas 2006 • Volume 23/1**

The paper has the following targets: the statistical analysis for the parameters determined from the cores of the natural gas reservoirs of the Southern part of Transylvanian Depression, fulfilment of some correlations between these parameters, the analysis of the results of the correlations and a comparison analysis between the resulted parameters and the present parameters used in the volumetric estimation of the resources from the natural gas reservoirs.

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**Gustek J., Krawczyk J., Lenart S.: Analysis of Influence of ECP on the Quality of Sealing of Annular Space • Drilling Oil and Gas 2006 • Volume 23/1**

The paper tackles the problems of applicability and technology of use of inflatable ECP and analysis of influence of such packers on the annular space tightness. Moreover, the particular conditions of packer application were referred to the downhole conditions. The technological aspects conditioning the efficiency of sealing procedure were reviewed. The influence of annular packers on annular space tightness as well as conditions of isolation of productive layers was analysed in view of isolation of annular space in the deposit area.

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**Janocha A., Bęben D.: New Generation Chemical Agents for Separating Emulgated Oil-Water Systems • Drilling Oil and Gas 2006 • Volume 23/1**

In the course of oil exploitation, the quantity of reservoir water in its composition increases. Water results in the corrosion of pipelines, increases the exploitation and oil processing costs. From oils, which tend to form emulsions, water is removed by means of more or less sophisticated physical and chemical methods. The results of laboratory experiments on new generation chemical agents, having a high destabilization level of water-oil systems, are presented in the paper. The presented laboratory results can be used for technological processes applicable in exploitation industry.

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**Janowski M., Kośmider J.: A Method of the Gas Recovery Restoration from the Water Loaded-Up Packer Gas Wells • Drilling Oil and Gas 2006 • Volume 23/1**

The article describes the method of restoring the gas production from the water encroached packer gas wells. The incidents of a loss of the natural gas outflows from the shut down wells, even throughout several hours, have been many times recorded in the industrial practice. The losses resulted directly from the blockage of the gas zone and filling the production string with the reservoir water column exerting its hydrostatic pressure equal to the reservoir pressure. The occurrence of these phenomena in several wells of the Radlin Gas Field made the authors of this publication to search for an effective method to restore the gas production from the water loaded-up packer gas wells. The outcome of the undertaken researches is a method that enables restoring of the gas production from the wells. The effectiveness of the method has been proved in the engineering practice. The result of the treatment of the Radlin 53 gas well is successful restoration of the gas production after four months of the well shut down due to the water encroachment.

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**Kaliski M., Jedynek Z.: Factors Shaping World's Oil Prices in 2005 • Drilling Oil and Gas 2006 • Volume 23/1**

The factors shaping the world's oil price in 2005 are presented in the paper. The most important economic events influencing the level and dynamics of prices are discussed. The role of OPEC and of Middle East countries is defined. The influence of natural factors on fuel market is determined. The paper is closed with a forecast of world's oil prices for 2006.

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**Kaltayev A., Tungatarova M.S.: The Influence of Wells Location on Deposit's Excavation Rate at Ore Extraction by the Method of Underground Dissolution • Drilling Oil and Gas 2006 • Volume 23/1**

The influence of wells location on deposit's excavation rate at ore extraction by the method of underground dissolution is investigated. Dissolution of salt by water is considered as a model of ores extraction. The equations for pressure, transfer of dissolved component are basic equations for the description of solution's filtration in the layer. The dependence between layer extraction completeness and wells location is investigated. Reduction of distance between wells increase deposit's excavation rate and have not influence on excavation time at the same minimum output concentration on the drain. Increasing of minimum output concentration on the drain decreases excavation time and almost has not effect to deposit's excavation rate.

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**Kopey B.V., Kopey V.B., Chaplinskiy S.S.: Performance Simulation of Mud Pump Valve with a Damper Chamber by Finite Element Method • Drilling Oil and Gas 2006 • Volume 23/1**

The computer three-dimensional parametric model of valve with a damper chamber has been developed for the valve of triplex single action pump. A parametric model gives a possibility to change the height of getting up of plate H and the geometrical parameters of seat and plate and clearances in damper chamber. By a programmatic complex CosmosFlowWorks®, which will realize the finite element method for the tasks of hydrogasdynamics the values of speeds of stream and pressure were calculated in the area of landing of plate

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**Kopey B.V., Lopatin V.V.: Independent Power Supplies in Mobile Information-Measuring Systems for Pumping Units and Mine Elevating Complexes • Drilling Oil and Gas 2006 • Volume 23/1**

The results of researches and practical work experience of independent power supplies of the experimental mobile measuring equipment for pumping units, mine elevating complexes and mine excavations are stated.

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**Kurka M., Mazáč J., Šulcek P., Sovíček S., Řehoř M.: Utilization of Logging Methods in Geological Drilling Exploration in Localities of Mostecká uhelná A.S. • Drilling Oil and Gas 2006 • Volume 23/1**

Geophysical logging methods represent very important part of geological research. Results gained by logging measurement are a very important addition to the information gained by laboratory analyses of the drill core. Utilization of logging methods in coal deposits is always a very expensive matter which requires to gain as much necessary information as possible from every measurement and laboratory analysis. This paper gives information about main logging method utilization in geological drilling exploration in localities of Mostecká uhelná, Inc.

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**Kwaśniewski K., Sas J.: Strategy of Shaping the CNG Prices Level Based on the Break-Even Analysis of the Gas Distributor and the Vehicles Fleet Operator • Drilling Oil and Gas 2006 • Volume 23/1**

From among alternative fuels, in the nearest future it is the natural gas that will have big enough economic potential which may reduce the highest level dependency of the transport sector on fuel oil, additionally reducing its harmful influence on the environment. The article presents the perspectives of market development of alternative fuels including CNG in Poland. Discussing the economic aspects of substitution of fuel, the authors do the BEP (Break-Even Analysis) investment i.e. the building of a compression station as well as the replacement of the fleet of vehicles. On this basis they look for the best price assuring development of the NGV market under fulfilment of the condition of effectiveness of investment. In order to fulfil this condition in the long-term perspectives and at the same time stimulate the faster development of the NGV sector, the appropriate tax policy is necessary in our country.

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**Lewkiewicz-Małyś A., Winid B.: Interpretation of Chemical Indicator Changes Based on Selected Chloride Waters • Drilling Oil and Gas 2006 • Volume 23/1**

Water origin and processes taking place on their inflow affect water chemical composition. Interrelations between ions may be presented as ratios called hydrochemical indicators. The following hydrochemical indicators  $\frac{r\text{Na}^+}{r\text{Cl}^-}$ ,  $\frac{r\text{HCO}_3^-}{r\text{Cl}^-}$ ,  $\frac{r\text{SO}_4^{2-} \cdot 100}{r\text{Cl}^-}$  and  $\frac{\text{Cl}^-}{\text{Br}^-}$  have been discussed in the paper. The changes of the last few years in indicator values in chloride waters of Anticline Iwonicz have been presented as well. The value of  $\frac{r\text{Na}^+}{r\text{Cl}^-}$  and  $\frac{r\text{HCO}_3^-}{r\text{Cl}^-}$  indicators and their changes may speak about supplying water intakes with the infiltration component from an active zone of water exchange. The value and changes of  $\frac{\text{Cl}^-}{\text{Br}^-}$  and  $\frac{r\text{SO}_4^{2-} \cdot 100}{r\text{Cl}^-}$  may reflect the increasing or decreasing influence of hydrocarbon deposit on the water chemical composition in a given area.

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Łaciak B., Czepirski L., Wójcikowski M.: **Evaluation of Possibility of Microwave Heating Utilization for Dehydration of Glycols Used in Natural Gas Mining** • Drilling Oil and Gas 2006 • Volume 23/1

Methods of regeneration of glycols from natural gas dehydration were analysed. The aim of experiment was an application of microwave radiation for used glycols dehydration. Microwave radiation is a promising method for introducing energy into reactive systems. Liquids can be heated by converting electromagnetic energy into thermal energy. Microwave heating offers many advantages over conventional one such as: non-contact rapid and volumetric heating; selective heating; heating start from interior of the material.

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Macuda J., Solecki T.: **Groundwater Contamination with Hydrocarbons near an Oil Refinery** • Drilling Oil and Gas 2006 • Volume 23/1

Oil refineries belong to the industrial plants where water environment is most frequently contaminated with hydrocarbons. Water may be contaminated through leaking production installments, storages of oil and oil products, as well as the installment for filling the cisterns with oil products. The results of quantitative analyses of groundwaters for the hydrocarbons content in the area of an oil refinery in Poland is presented in the paper. The comparison of the standard water environment quality threshold values and the results of analyses of groundwater samples revealed that hydrocarbon contaminations in the analysed groundwaters exceeded the admissible standards, and thus, have to be cleaned.

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Macuda J., Winid B.: **Mineralization Waters in Czarna Region – Management Feasibility Study** • Drilling Oil and Gas 2006 • Volume 23/1

In the Karpaty region natural mineral ground waters occur as a varied mineralization waters, therapeutic mineral waters and brine. The evaluation of mineral waters which occur in petroleum mine – Czarna was presented in the paper. Among the waters' mineral components,  $\text{HCO}_3^-$ ,  $\text{Ca}^{2+}$  and  $\text{Na}^+$  were the predominant ions. Hydro-chemical indicators calculated on the basis of following ions content:  $\frac{r\text{Na}^+}{r\text{Cl}^-}$ ,  $\frac{r\text{HCO}_3^-}{r\text{Cl}^-}$  and  $\frac{r\text{SO}_4^{2-} \cdot 100}{r\text{Cl}^-}$ ; suggest the water intake from the active infiltration zone. The values of the chloro-bromide indicator proved the coexistence of water and hydrocarbon deposit. The evaluation of the water quality has been conducted to assess the feasibility of water management.

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Macuda J., Zawisza L.: **Waste Storage in The Rock Mass in View of Polish Legal Regulations** • Drilling Oil and Gas 2006 • Volume 23/1

Storing of liquid waste in the rock mass by injecting it to the rock mass through injection wells is both environmentally safe and economically competitive as compared to other utilization methods. However, such activity has to be licensed by a respective minister. The basic legal acts regulating reservoirless waste storage underground, i.e. Geological and Mining Law as well as Environmental Law are discussed in the paper. Economic Activity Law for waste storage in the rock mass is also presented.

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Macuda J., Zawisza L.: **Technical Conditions of Liquid Waste Storage with a Borehole Method** • Drilling Oil and Gas 2006 • Volume 23/1

Liquid waste storage in the rock mass through injection wells is conditioned by all requirements imposed on safe mining and environmental protection. This issue is especially important when closed or to-be-closed wells are involved. Selection criteria for injection wells are presented along with principles of wells' design, and range of geophysical surveys of post-exploitation wells, which were designated for injecting liquid waste. Potential complications and drilling failures accompanying waste injection to the rock mass are also pointed out.

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**Nikolaev N.I.: Electronic-Microscopic Researches of Process of Formation of a Cement Stone in Oil and Gas Wells • Drilling Oil and Gas 2006 • Volume 23/1**

In work results of researches of process of formation crystallization structure and pore structure hardening plugging material are presented at cementation boring casing in oil and gas wells. Influence of the water-cement influence on physicomachanical properties of a cement stone is shown. It is revealed, that thin crystals  $C_3SH$  and  $C_2SH$  to the greatest degree define mechanical and adhesive properties polymer-cement compositions with the low contents of the dispersion medium.

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**Nikolaev N.I., Kapitonov V.A.: Results of Properties Researches of Biopolymer Drilling Muds on a Basis Xantan Gums for Tailing-In Petroleum and Gas Reservoirs • Drilling Oil and Gas 2006 • Volume 23/1**

Clay completion drilling fluid is negatively influence on reservoir. Oil-base drilling mud have low carrying capacity and it pollute the environment. These lacks are deprived biopolymer completion drilling fluid on the basis of modified bacterial polysaccharide materials. In work are compared filtration and flow properties of biopolymer drilling muds. We researched influence on well-completion fluid condensed sulphite-spirit grain, carboxymethyl-cellulose, chalk, salts of polyvalent metals, etc. The best successes have achieved with the modified starch. Researches have shown efficiency of application modified biopolymer drilling mud for preservation of filtration and natural porous properties bottomhole formation zone.

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**Rado R., Lubaś J.: Drilling in a Gas-Bearing Structure on the Example of Deposit Kościan • Drilling Oil and Gas 2006 • Volume 23/1**

The demand for energy minerals and their high prices in the last years resulted in increasing investments for geological and prospecting works aiming at finding new oil and gas deposits. As a result, a gas field was discovered near Kościan. The competition on the market made the drilling company efficiently use the equipment and optimize the drilling process, leading to lowered cost of drilling and faster implementation of the drilling wells. The specific drilling stages have a different influence of the final technical-economic output. The organization of specific stages of drilling and technical realization of the drilling process has a direct influence on the costs of realization of the enterprise. Technical aspects of drilling the deposit Kościan are presented on the basis of 10 opening wells. Attention is paid to the selection of tools and drilling mud. Drilling times of specific boreholes are analysed

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**Radwan R., Wandzel J.: Production Tests Accompanied by Preliminary Sweetening of Crude Oil in the Field LGM • Drilling Oil and Gas 2006 • Volume 23/1**

Production tests with preliminary sweetening of crude oil have been performed since 2003, with the first well Lubiatów-1. By April 2006 a dozen of positive production tests have been made. Sweetening of crude oil to a value acceptable for the investor was made concurrently. Owing to the mobile character of devices used for production tests, an uncomplicated way of sulphur removal from crude oil was applied. The oil was heated and pumped between pits several times. The accompanying gas with hydrogen sulfide was combusted in a discharge system. Preliminary sweetening system has been modified since it was used in the well Lubiatów-1 uptil now, to provide efficient sulphur removal and thus safe work conditions of the crew and environmental protection.

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**Savula S., Banakhevych Y., Dragilyev A., Kychma A.: Monitoring Methods of Technical State of Oil and Gas Pipelines • Drilling Oil and Gas 2006 • Volume 23/1**

A method of assessing the state of stresses in welded joints of pipelines with the use of numerical-experimental diagnostics is presented in the paper. Recommendations for engineers are formulated on the basis of the experimental results.

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Savula S., Kharchenko Y.: **Attenuation of Pump-Compressor Pipes Vibrations in an Underground Gas Storage Well** • Drilling Oil and Gas 2006 • Volume 23/1

While pumping gas from the main pipeline into the gas storage and vice versa, turbulent processes appear in the well that quite often results in considerable vibrations of the lower part of the column of the tubing string. Because of this, the column screw thread halving is weakened; lower pipes sometimes unscrew and fall into the well. It substantially violates the normal operating mode of the gas storage and negatively affects its productivity. If the lower end of the column is not fastened then it takes the dominant role in the vibration processes. Fixing the lower part of the column by means of spacing devices substantially enables decreasing the amplitude of the tubing string and improving the conditions of the screw thread halving.

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Slusarev N.I., Feller V.V.: **Perfection of Hydrodynamical Processes at Drilling of Horizontal and Directed Wells** • Drilling Oil and Gas 2006 • Volume 23/1

For a rating of an opportunity of creation of the twirled streams in ring channels of horizontal trunks of wells at circulating fluid, ratings of a degree of influence of the major factors determining technological features and regime parameters of process of removal drilling mud which laws can be established only by practical consideration, were carried out researches. Researches were carried out on specially developed stand a transparent pipe similar to site bottomhole zones of the ring channel of a well in length of 6 m. The carried out researches have proved physical preconditions of use of centrifugal forces and axial speeds of a stream for effective carrying out of mud at drilling horizontal trunks of wells.

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Staszewski R., Nagy S., Machowski T., Rotko P.: **New Possibilities of Installing Adsorption-Desorption Systems in Gas Treatment Technological Processes** • Drilling Oil and Gas 2006 • Volume 23/1

The course of methanol adsorption on active carbon as well as its desorption and course of regeneration of active carbon with a neutral gas (nitrogen) in the presented system are presented in the paper. Calculation procedures for cleaning technological air with concurrent recovery of the adsorbed substance are given in the paper. The values of calculated technical and technological parameters are presented. Guidelines for a specific adsorption-desorption system having efficient and cheaper technological processes have been worked out on the basis of these studies.

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Ștefănescu D.-P., Piteiu M.A., Tataru A., Vlasin I.: **The Technical Management of the Underground Gas Storages of Medium Capacity in Transylvanian Basin (Romania)** • Drilling Oil and Gas 2006 • Volume 23/1

The present worldwide energetic crisis represented by the natural decline of the gas fields associated with a very increased demand for new reserves discoveries claims for a more accurate approach of the whole technical and economical strategy. In this general context, the efforts supported by romanian national gas company "Romgaz" for the development of new underground gas storages of medium capacity are really significant .

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Steliga T., Kapusta P., Turkiewicz A., Jakubowicz P.: **Optimisation of *in situ* Biodegradation Process of Drilling Mud Contaminated with Petroleum Substances** • Drilling Oil and Gas 2006 • Volume 23/1

The article presents problems of purification of wastes in old reservoir pits containing drilling mud mixed with soil, which is contaminated by petroleum compounds – as a model object reservoir pit Graby-10 was used. Optimisation works of using soil purification complex technology (including preliminary re-cultivation, basic bioremediation and bioaugmentation done by inoculation of biologicals based on autochthonous microorganisms) were discussed. Parameters of purification process were modified due to characteristic of cleaned object. The transfer of laboratory ex site tests of soil purification process to industry in site conditions creates many problems. In spite of,

laboratory data was the base to determine parameters of purifying process, which were used in an *in site* technique. Moreover, laboratory tests enable to study drilling waste purifying process, to calculate a biogenic substances dose, a time of the process and effectiveness of a biological work. Each step of petroleum-contaminated soil purification process was controlled by the chromatographic method. This method enables to determine the quality and quantity of hydrocarbon compounds in soil. This analytical method is used for observation of decrease in every single hydrocarbon pollutant quantity in purification process and valuation of a hydrocarbon biological degradation level by n-C<sub>17</sub>/Pr and n-C<sub>18</sub>/F ratios.

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**Stopa J., Rychlicki S., Wojnarowski P.: Influence of Capillary Pressure on the Efficiency of Oil Contaminations from Aquifers in View of Computer Modelling • Drilling Oil and Gas 2006 • Volume 23/1**

A majority of known models based on two-phase flow theory ignores the influence of the capillary pressure on the phase contact. This results in a description of a phenomenon based on the Buckley –Leverett equation being a quasi linear partial differential equation of the first order. By accounting for the capillary pressure the mathematical model assumes a form of a differential parabolic equation of second order, having solutions of quite a different character. A mathematical model accounting for capillary pressure and a computer model described with a simulator „Black-Oil” were made. Variant modeling for various capillary pressure values was made. On this basis conclusions were drawn on the propagation of oil contaminations and the respective remediation works.

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**Stopa J., Rychlicki S., Wojnarowski P., Kosowski P.: Evaluation of Efficiency of Enhancement Procedures in Production Wells • Drilling Oil and Gas 2006 • Volume 23/1**

Enhancement procedures significantly influence the physical properties of the near-hole zone, thus increasing its productivity. The efficiency of such procedures can be evaluated by analyzing basic exploitation parameters and comparing them with productivity before and after the enhancement. In a majority of cases, these procedures are assessed as positive, significantly improving the productivity of wells. However, the economic factor may change the final evaluation. Hence a conclusion that additional exploitation data should be gathered and analysed. Exemplary assessments of enhancement efficiency are presented. The above mentioned factors were accounted for and economic profitability established.

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**Stryczek S., Brylicki W., Rzepka M.: Analysis of Hardened Microstructure of Cement Slurries Used for Sealing Deep Wells • Drilling Oil and Gas 2006 • Volume 23/1**

Hardened cement slurry in a well can be affected by a number of factors, e.g. formation waters, high temperature and high pressure. The borehole conditions and also type of the used binder decide about the microstructure of the slurry. The results of analyses of microstructure of hardened slurries used for cementing production pipes in drilling wells are presented. Cement slurries were made on the basis of drilling cement WG and metallurgical cement CEM III/A 32.5. Samples were exposed to the well-like conditions (in static temperatures 95°C and 120°C and at a pressure of 20 MPa). The microstructure was analysed with SEM and X-ray microanalysis. The obtained results enable an evaluation of the sealing properties of specific binder types, and their correct selection in view of the conditions in deep wells.

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**Stryczek S., Brylicki W., Wiśniowski R.: New Generation, High Durability Sealing Slurries • Drilling Oil and Gas 2006 • Volume 23/1**

One of the most important criteria of durability of sealing slurries injected through wells is providing a suitable phase composition of the hardened slurry and obtaining a microstructure of smallest possible total porosity, lowest level of continuous capillary pores, and also minimal permeability. The introduced new version of European cement standard PN-EN 197-1 also covers new types of very economic multicomponent cements CEM V/A and CEM V/B. The results of analyses of fresh and hardened sealing slurries based on a multicomponent cement CEM V/B with Slovak klinopilitowych zeolites (1–5% mass) added to the slurry.

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**Stryczek S., Gonet A., Rzyczniak M., Czekaj L.: Influence of Vertical Loads in Sedimentation of Ground-Soil Mixtures with Chemical and Organic Admixtures • Drilling Oil and Gas 2006 • Volume 23/1**

The edometric experiments were made on 48 samples of used matrices of drilling mud admixed with soil and organic matter, e.g. sawdust of coniferous trees, straws and selected organic compounds. The studies were part of works conducted on methods of managing drilling mud waste in the place of their production. The analysed ground-soil mixtures were characterized by determining values of their edometric modulus of primary compressibility and primary compressibility curves. The results of analyses were listed in Tables, accounting for the recipes for individual samples and edometric values of primary compressibility modulus, depending on unit loads.

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**Śliwa T., Gonet A.: Concept of Making Use of Closed Wells in Field Turaszówka for Heat Recovery and Heating an Indoor Swimming Pool • Drilling Oil and Gas 2006 • Volume 23/1**

Closed wells used for hydrocarbon production, frequently are located close to buildings, therefore can be used for the recovery of low-temperature energy of the rock mass, which can be then delivered to the heat pumps and finally to the end user. A concept of managing closed wells in the field Turaszówka, their adaptation to heat exchangers is presented in the paper. A small distance to an indoor swimming pool creates a possibility of using the heat by a customer who requires a reliable energy source of good characteristic all year long. Having assumed heat deliveries for heating water in the swimming pool, a high efficiency of heat pump is possible. This concept was analysed in view of 5 closed wells, and also perhaps the already operational ones.

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**Twardowski K., Drożdżak R.: Indirect Methods of Estimating Hydraulic Properties of Grounds • Drilling Oil and Gas 2006 • Volume 23/1**

The most important petrophysical models used in geotechnics and hydrology for a direct evaluation of the filtration coefficient (hydraulic conductivity) of ground media are presented in the paper. These models (input data) frequently make use quantitative indices characterizing the granular composition and porosity of grounds.

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**Twardowski K., Traple J.: Quantitative Characteristic of Ground-Rock Media Porosity vs. Molecular-Surface Phenomena • Drilling Oil and Gas 2006 • Volume 23/1**

The quantitative parameters characterizing porosity of multiphase ground-rock media encountered in oil and hydrogeological literature are discussed in the paper. A uniform systematics of these parameters is presented, accounting for phenomena and physical processes taking place in these media, e.g. character of wettability, double electrical layer and capillary effects.

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**Vasyuchkov Yu.F.: Bases of Intensive Extraction of Coalbed Methane after Hydrofracturing Process • Drilling Oil and Gas 2006 • Volume 23/1**

The report is notified important question about planning active influence process on the methane-giving back from a coal seam through a borehole to the surface. The gas-giving back surface of the coal seam is introduced in a practice and methane-obtaining index too. The filtrating and time indexes are discussed in the report. The conclusion from the researching work is done.

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Vickers S., Cowie M., Jones T., Twynam A.J.: **A New Methodology that Surpasses Current Bridging Theories to Efficiently Seal a Varied Pore Throat Distribution as Found in Natural Reservoir Formations** • Drilling Oil and Gas 2006 • Volume 23/1

This paper presents a new method (model) for predicting the most efficient way to create a particle bridge on a formation face having a wide spread of pore throat sizes. Laboratory data, based on particle bridging distributions using this new model, are shown to be an improvement over two current industry methods. The improvement using this design has been effective in the field and has resulted high productivity

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Wilk S., Galas M., Mijal M.: **Influence of Landslides on Gas Pipelines** • Drilling Oil and Gas 2006 • Volume 23/1

If a gas pipeline has been deposited in an inclined ground and owing to the changed ground properties the creeping ground process started during exploitation, the conditions of gas pipeline exploitation radically change too. With time, the load exerted by the creeping ground on the gas pipeline increases, causing increased stresses in the pipe material. This results in a change of the gas pipeline axis and more prominent deformations in the pipeline material.

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Wiśniowski R., Skrzypaszek K.: **Analysis of Rheological Models Applied in Engineering Technologies** • Drilling Oil and Gas 2006 • Volume 23/1

The present area of application of rheological investigations and the development lines are presented in the paper. Rheological models of liquids employed in engineering (especially drilling) technologies are analysed. The advantages and disadvantages of the mathematical descriptions are presented. The newest solutions for determining rheological parameters of non-Newtonian fluids are reviewed and characterized.

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Wiśniowski R., Stryczek S., Skrzypaszek K.: **Determining Resistances of Cement Slurry Laminar Flows Described by Herschel–Bulkley Model** • Drilling Oil and Gas 2006 • Volume 23/1

Rheological characteristic of cements slurries presently used in practice is presented. Then a rheological model of a non-linear elastic-viscous (Herschel–Bulkley) fluid was given, as recommended for sealing slurries. Suitable dependences were introduced, enabling determination of flow resistances accompanying pumping of the sealing slurry, as described by the Herschel–Bulkley model, through an installment having a spherical and ring cross-section. Methods of determining an equivalent diameter of flow cross-section were given and calculated values for Herschel–Bulkley fluid flowing through an annular space between concentric pipes were compared. A calculational example was given in the closing part of the paper.

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Wiśniowski R., Wójcik M., Toczek M.: **New Drilling Technologies Used for Engineering Drilling** • Drilling Oil and Gas 2006 • Volume 23/1

The necessity to have reliable geotechnical data and also to modify the ground qualities has recently created conditions for modernization of old and development of new drilling techniques and technologies. The newest design and technological solutions used worldwide for rotary, rotary-percussion and percussion drilling condition their further development. Attention was paid to the comparison of frequently different technologies enabling drilling and concurrent tripping of pipes. On the basis of distribution of forces acting in the casing, strength conditions were established, thanks to which the physical and geometrical parameters of pipes can be selected.

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**Wiśniowski R., Ziaja J.: Selection of Mechanical Parameters of Rigs Used in HDD Technologies • Drilling Oil and Gas 2006 • Volume 23/1**

Design solutions of rigs used for HDD are characterized in the paper. Criteria of HDD rigs classification are given and a classification of rigs is proposed. The principles of determining minimal power of the rig, necessary to perform a HDD are discussed. For this purpose the following analyses were made: influence of a HDD well axis, geological conditions and applied drilling technology on the required stress, torque and power values enabling the drilling process realization. The final result of these analyses were mathematical dependences, on the basis of which the mechanical parameters of HDD rigs could be selected.

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**Wojnarowski P., Stopa J., Rychlicki S.: Computer Simulation of Influence of Gas Pump Stations on the Atmospheric Air • Drilling Oil and Gas 2006 • Volume 23/1**

During reservoir works in the gas pumping station, pollutions from the motor compressor are emitted. When the operating devices are in a bad technical state, the admissible standards for atmospheric pollution can be easily exceeded. The key component of combustion gases which undergo regular measurements are nitrogen compounds. To determine the influence of the pumping station on atmospheric pollution, the pollutants propagation owing to atmospheric factors is analysed. A computer simulation was made to illustrate the influence of the gas pumping station on the atmospheric air with the use of the Gauss model. The effects of modernization of the equipment. As a result of the calculations, the distribution of NO<sub>x</sub> concentrations in the air are determined, and on this basis the influence of the pumping station is established for various configurations and periods, before and after the modernization.

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**Wojtanowicz A.K.: Down-Hole Water Sink Technology for Water Coning Control in Wells • Drilling Oil and Gas 2006 • Volume 23/1**

Downhole Water Sink (DWS) technology has been developed from a new well completion and production method for enhancing productivity of wells in petroleum reservoirs with bottom water drive and strong tendency to water coning. DWS minimizes water invasion to the well's completion by employing hydrodynamic mechanism of coning control in-situ at the oil-water or gas-water contact. The mechanism is based upon a localized water drainage generated by another well completion (downhole water sink) installed in the aquifer beneath the oil-water or gas-water contact. The paper summarizes the development and state-of-the-art at DWS technology. Presented are results from theoretical studies, physical and numerical experiments, and field projects to date. It is demonstrated that DWS could increase recovery and control water production in vertical and horizontal oil wells – with natural flow, downhole pumps or gas lift, and in the gas wells from low-pressure tight gas reservoirs. Although by now DWS has been used in reservoirs with bottom water, theoretically the technology is also applicable in dipping structures with encroaching side-water.

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**Zajfert G.: Use of Static Probing in Investigations Carried Out by PPIeZRiG Petrobaltic S.A. • Drilling Oil and Gas 2006 • Volume 23/1**

Marine geotechnical investigations should be run for such investments as suspension of the platform, gas pipelines installment, anchoring of overflow-moor buoys to the tanker, and designing hydrotechnical objects. Petrobaltic used a penetrometer Roson 10 T, installed on a ship m/v St. Barbara. The Dutch Penetrometer Roson 10 T A.P. V.d. Berg enables soil analyses in situ. The methods lie in sticking measurement cones into the ground with simultaneous digital recording physical and mechanical parameters of the sediments. The sounder can be also equipped with cones CPT and CPTU, and tester MOSTAP-65 with which undisturbed samples can be collected. Specific parameters and ground properties are registered during the measurement. These parameters enable determination of the geotechnical profile and carrying capacity of the sediments. This device is indispensable for evaluating mechanical properties of grounds whenever intact samples cannot be collected, e.g. from sandy sediments. The paper provides descriptions of research processes, where various difficulties may be encountered. The Author presents his own solutions and experience in preventing failure or measurement errors.

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Zajfert G., Artymiuk J.: **Complex Utilization of Marine Researches for Managing Field B8 • Drilling Oil and Gas 2006 • Volume 23/1**

Management of oil and gas field B8, located in the NE part of the Polish Economic Zone requires complex marine studies. The perspective area was characterized in view of its shallow geological build, hydrometeorological conditions and present day anthropogenic factors. Investigations and expertises were made for: suspension of a drilling platform Petrobaltic, deposition of the underwater pipeline linking the platform with an overflow buoy, and for anchoring of the overflow-moor buoy CALM. Specific methods of field investigation and their results are presented. The research concentrated on: bathymetric depthfinding, establishing the purity of the sea bed on the basis of sonar images, seismic logging with two different types of devices, drilling of a geological-engineering well, collecting of cores with a VKG-6, determination of geochemical background on the basis of collected sea bed sediments, inspections by underwater vehicles, equipped with TV cameras.

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Zawisza L.: **Modelling of the Hydrocarbon Migration and Accumulation in the Lublin Basin • Drilling Oil and Gas 2006 • Volume 23/1**

Analysis of pressure and water chemistry data from the Devonian and Carboniferous formations of the Lublin Basin indicates that two regional fluid flow systems are operating within this basin. The Devonian basin is the juvenile basin with compaction-induced centrifugal, lateral water movement (before invasion by meteoric waters), and may be classified as prospective. The Carboniferous basin is an intermediate basin with centripetal water movement, artesian properties and invasion of meteoric water. In this paper author presents the hydrodynamic modelling of hydrocarbon migration and accumulation in the Lublin Basin, Poland. The pressure and water chemistry data have been used to identify hydrocarbon traps within the Devonian and Carboniferous sequences.

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Zawisza L., Macuda J.: **Evaluation of Tightness of Geological Structures Designed for Liquid Waste Storage in the Rock Mass • Drilling Oil and Gas 2006 • Volume 23/1**

The changes of rock mass tightness near deep geological structure where liquid waste has been stored may be caused by changes in the medium itself, owing to the on-going exploitation of underground waste storage. The tightness of the strata underlying the underground waste storage is checked with geophysical, hydrodynamic, hydrochemical-hydrodynamic, geochemical and drilling methods. The Authors characterize liquid waste storability, indicating the scope and type of analyses for determining the possibility of liquid waste storage in specific geological structures.

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Zhapbasbayev U.K., Khairov G.B., Konyssov A.K., Kalilanova K.A.: **Experience of Application of the COC-PGD Technology for Rehabilitation of Oil Strippers of the Zhetybai Deposit • Drilling Oil and Gas 2006 • Volume 23/1**

The COC PGD technology allows formation breakdown by the impulse power excitation of light-end combustion products of solid rocket and liquid combustion-oxidative compounds (hereinafter COC). By mechanism of action on the formation and resulting picture of flaw formation this method doesn't have analogues and significantly differs from practically using methods such as breakdown, shock-and-vibration action, electro hydraulic discharge, electromagnetic and acoustic fields etc. General advantage of the method is that it allows in a wide range changing the dynamics of rock weighting and making stress condition in the formation with the rate ( $10^1-10^6$ ) MPa/s. The most perfect breakdown systems provide rates of rock weighting not larger than 1 MPa/s. It was found out that for effective initiating of flaw formation in oil and gas mains the value of the mentioned parameter should be not less than ( $10^2-10^4$ ) MPa/s. In Kazakhstan the COC-PGD technology firstly has been used at the Zhetybai deposit. Results of 5 wells development using this technology give the grounds to conclude the effectiveness of using complex technology COC-powder generator for stimulation of marginal wells, which producing horizons are represented by low-permeable, mudded reservoirs of the terrigenous type.

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Ziaja J., Wiśniowski R.: **Analysis of Effects Taking Place during Thickening the Near-Wellbore Zone in the Course of Pushing through the Loose Ground with Expanders** • Drilling Oil and Gas 2006 • Volume 23/1

Owing to the pushing of drilling tools through a horizontal well, the ground thickens around the bore. The radius of the thickened zone depends on numerous technical and natural factors. The physical effects taking place in the course of loose grounds thickening accompanying horizontal drilling are analysed in detail. The proposed equations and formulae may be handy for assessing the radius of ground thickening and stability of the horizontal wellbore.