

SUMMARIES

Abdrakhmanova D., Jiyembayeva K., Zhappasbayev U.: **Improved Calculations for Bottom Hole Injection Pressure Versus Depth while Gas Injection for Pressure Maintenance of Tengiz Field** • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

The aim of this project is to calculate bottom hole injection pressure versus depth while gas injection for pressure maintenance of Tengiz field in order to determine injectivity of various reservoir layers (Bash, Serp, Okskey). The main objective is to develop correlations for the 7 active injection wells to predict bottom hole injection pressures at the end of the tubing, middle of Bash, middle of Serp, and middle of Okskey. Each well will have its own individual correlation. These correlations based on factors such as depth, temperature, pressure and rate. As a result, there are some deviations of predicted pressure versus measured pressure. I think, the basic reason is that we have different approximate gas injection rates. So we can't exactly determine its volume.

Keywords: Tengiz field, injection, pressure, wells, temperature, rate

Alibayeva K.A., Kulzhabekov A.B., Kaltayev A.: **The Modeling of Uranium Extraction Process by the in Situ Leaching Method** • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

Sparse distribution of uranium, gold, boron and other minerals deposits are developed by the in-situ leaching (ISL) method. As a mineral, uranium is considered and the sulfuric acid is used as a solvent reagent in the governing reaction describing of uranium leaching process. At the problem decision the following assumptions was applied: the medium is homogeneous and isotropic, the density of solution and layer are constant, and solution flow on the layer border doesn't exist. Mathematical model of process is based on mass conservation equation, Darcy law, and transfer equation of reagent concentration in liquid phase, equation of useful element concentration in solid phase, and its transition to liquid phase. Distribution of hydro dynamical pressure, velocity field, distribution of uranium concentration in layer, reagent concentration and useful element concentration in product solution are obtained.

Keywords: uranium extraction, leaching method

Artymiuk J., Bednarz S.: **Design Solution Trends in Pipe Thread Connections for Borehole Mining** • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

Big depths of holes and high pressures and temperatures related as well corrosive environment have decisive impact on development of thread connections modernization. Additionally casing/tubing running to the directional and horizontal holes results in increasing loads of thread connection surfaces. The review of tubular thread connections for petroleum industry is presented on the basis of production requirements and load and environment conditions impacts.

Keywords: OCTG, thread connection, thread, casing, tubing

Artymiuk J., Lengersdorf F., Loland J.H., Sokalski M.: **Working Rig Machines for Deep Drilling 7500 psi Rated Drilling Equipment for the Future** • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

Prospecting with longer drilling wells, at greater depth of water, sets greater and greater technical challenges before designers, producers and users. Especially marine drilling, in new and unprospected areas, where explo-

ration works are planned in the close future, where will necessitate involving higher deadweight capacity of on-water rig construction, machines of higher torque on the string, and more powerful mud pumps. Hence the need of making new equipment capable of performing necessary works safely and effectively.

Keywords: *drilling units, hoisting system, deep water, mud pump, top drive*

Batistatu M.-V., Malureanu I., Neagu Daniela-Doina: Using Formations Overpressures for Subsidence Calculations • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

The origin of overpressures in geological formations is basically related with the burial history of the sediments / rocks. Among the overpressures generating mechanisms we may emphasis clays under compaction and tectonic uplift of sealed tectonic blocks/formations. The main overpressures calculations are obtained both from pressure tests in producing wells, which is the most accurate determination, and from well log data. According with the existent data base we used in our calculations well logs mainly resistivity (ρ) and velocity /transit time (Δt) parameters corrected with borehole conditions. Also we had the possibility to compare, respectively shift the well log data with the mechanical cores analysis and drilling history of the wells. These enabled us to depict the origin of overpressures in order to estimate the burial speed and the magnitude of formations uplift. As a case study we calculated the overpressures values for the oil bearing structures from the attenuated diapiric alignment from the Miopliocene Zone of Eastern Carpathians. Calculations were based on Ben Eaton relations adapted for sedimentary basin conditions, respectively a α exponent shift for a better correlation with pressure measurements from the wells. The pressure gradients values showed an overpressured interval corresponding to middle and lower miocene deposits where the pressure gradients were about 0.175–0.190 at/m. According the overpressure calculations with the existence of a depositional/erosional hiatus corresponding to middle-upper Miocene (Ba and Sa) we estimated for the studied area (SW – outer part of Eastern Carpathians' inner fore deep flank) a tectonic uplift of more than 2000 m of Miocene formations.

Keywords: *well, overpressure, subsidence*

Beisembetov I.K., Assilbekov B.K., Zhabbasbayev U.K., Kenzhaliev B.K.: Modelling of Two Phase Filtration in Fractures of Hydraulic Fracturing • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

Aim of this work is to demonstrate a simulation of two-phase filtration in ruptures of breakdown which stated by mechanical conception of interpenetrating continuums. The worked out computing method forecasts degree of drowning, an amount of stocked up oil extraction and oil extraction ratio. Design data is in satisfactory fit with hydraulic fracturing coefficients got in industrial acceptance of oil fields.

Keywords: *two-phase filtration, simulations*

Bujok P., Klempa M., Rado R.: The Results of Inclinoetric Measurement Analysis on Monitoring Wells in the Area of Small Research Polygon VŠB – Technical University of Ostrava • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

In the year 2009 arisen in the campus of VŠB – Technical University of Ostrava new research polygon called Small Research Polygon (SRP). This research polygon is intended for investigation of regeneration and accumulation behavior of rock massive in the surroundings of energy exploited wells used by “small” consumers house holders. In the area of the Small Research Polygon are situated two operating wells attached to one heat pump and 9 monitored wells (each one of 140 m deep). A special complex of logging measurements including inclinometry was made during the realization of this project. The main goal of this article is data analysis about a steric progression of well axis in light of possible influences on curving of boreholes.

Keywords: *inclinometry, geothermal wells*

Dębiński M., Rachwalski G., Żdziebko A.: **Installation of the Plunger Lift and Downhole Sucker Rod Pump in Gas Wells Flooded by Reservoir Water – the Results of Tests Carried Out in PGNiG SA Branch in Sanok** • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

In order to improve the ultimate recovery coefficient of water driven natural gas reservoirs, PGNiG Branch in Sanok for two years has been testing the plunger lift equipment and downhole sucker rod pump installations. This paper presents how these methods have affected the fluid production as well as solutions implemented during tests adapted to the standard gas well completion. Plunger lift method was used in a marginal well, where the foaming agents and normal blow out had no longer ensured the stable production. Pumping was utilized in completely flooded gas well, intended for the abandonment. First gained experiences confirm the effectiveness of both methods of gas well de-watering.

Keywords: plunger lift, sucker rod pump, de-watering, natural gas, well

Drożdżak R., Twardowski K.: **Dielectric Permittivity of Porous Media – Factors Influencing Its Variability** • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

The basic regularities, followed by one of the basic electrical properties of porous media, i.e. electric (dielectric) permittivity, are discussed in the paper. The basic types of electric polarization of dielectrics and changes of its character, depending on the frequency of external electromagnetic field, are presented. Petrophysical models enabling indirect evaluation of relative electric permittivity, frequently called dielectric constant of porous rock media, are presented. It mainly depends on the qualitative and quantitative characteristic of the mineral skeleton (solid phase) of the rock and saturating porous fluids, in that waters having anomalously high dielectric constant.

Keywords: dielectric permittivity, electric polarization, petrophysical models, porous media

Dubiel S., Zubrzycki A.: **Analysis of Reservoir Properties of Autochthonous Miocene Deposits in the Area of Carpathian Foredeep on the Basis of DST and Well Logging** • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

In the paper reservoir properties – effective permeability (K) and porosity (Φ), of autochthonous Miocene deposits in the area of the Carpathian Foredeep were analyzed. Two zones were selected (first – southern in area of Tarnów – Rzeszów and north-eastern of Wola Obszańska-Nowosielec) both differ in structural position and thickness of Miocene profiles. Data of effective permeability from DST and porosity from well logging as well laboratory data were used to determine relationships between them by statistic methods. On the basis of analysis's results simple equations: $\log K = a + b \cdot \Phi$ were established for gas-bearing autochthonous Miocene formation in the area of Carpathian Foredeep.

Keywords: petroleum explorations, Carpathian Foredeep, autochthonous Miocene deposits, DST, effective permeability, effective porosity, statistic analysis

Duse D.-M., Duse C.S.: **Appraisal of the Emotional Intelligence in the Natural Gases Engineering Education** • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

In 2006, in Romania was founded the Romanian Agency for Quality Assurance in Higher Education (ARACIS), an agency that required all universities to analyse themselves and to self-appraise themselves from the point of view of quality. The quality of education provided to the students by a certain faculty has as dimensions, among

others, the quality of academic staff, a quality resulting from the analysis of three components: appraisal by the students, appraisal by the colleagues and appraisal by the institution's management. In this paper we aim to determine to what extent the picture created by the students of the professors can be superposed on the one resulting from the appraisal of the academic staff's emotional intelligence competence. This is possible due to the fact that in the research on the appraisal of academic staff by the students there has been used a questionnaire that targeted the quality of teaching, the quality of the employed evaluation methods, the communication and relating competences, the empathy, the management of relationships, i.e. the components of emotional intelligence.

Keywords: *emotional intelligence, academic staff, academic quality, students' appraisal*

Fabia B., Chlebosz R., Wysocki S., Bielewicz D.: Mud System for HDD Drilling with New PT-52 Polymer • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

From the beginning of the 1990s there has been observed the resilient development of horizontal directional drillings. They are an alternative to traditional engineering methods. They enable creating less expensive and environmentally safe type of underground installations. The essential advantage of HDD methods is the possibility to avoid easily the obstacles both on the ground and underground. It is of special importance nowadays, when the population is growing rapidly, and the infrastructure in urban areas is in the process of constant development. One of the most important elements of HDD technology is the drilling mud. Similarly to muds used in different boreholes they should fulfill the criteria resulting from the destination of a borehole, minimize technical difficulties, as well as the risk of investment. It is achieved by choosing liquids of high gels, high yield value, good lubricity, ones which are environmentally safe, as well as ones of a small solid-phase content. In this research, drilling mud with the addition of new polymer PT-52 modified by CO_3^- ions was tested. Created mud was tested against salt monovalent and bivalent contamination. The temperature resistance and lubricity were examined, too. Test results show that this mud can be used by the industry.

Keywords: *HDD, drilling mud, horizontal directional drilling, biopolymers, PT-52*

Fafara Z.: Prediction of Diffusion Coefficient of Hydrocarbon Vapour in Soil • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

Diffusion of hydrocarbon vapour can be sometimes very important during numeric modeling of migration of oil contaminations in the soil. It decides on pollution range and zone of danger of explosion. Therefore, acquaintance of diffusion speed of hydrocarbon vapour in soil is indispensable for proper estimate these threats. There are made some laboratory measurements of diffusion speed of hydrocarbon vapour in specially selected models of soil. The ethylene was the hydrocarbon source. As it happens, that the diffusion coefficient is depends on kind of soil very strong. Next it was adjusted the regressive dependence to estimate the diffusion coefficient of hydrocarbon vapour using soil composition parameters – the pore surface and the effective diameter of grains. Get are featured for pilot data equaling very high degree of adjusting and there can be used with success during the numeric modeling process of migration of hydrocarbon in soil.

Keywords: *loose soil, hydrocarbon migration, hydrocarbon vapour diffusion, diffusion coefficient*

Grasela A., Gonet R.: Registration of Dangerous Accidents in Oil Mining Companies • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

Article presents problems of the registration of near miss accidents, potentially dangerous in oil mining companies. Demonstrated statistics shows situations, during which there were no near miss accidents during work. Understanding the range of registration discussed occurrences is crucial for gathering and then analyzing of near miss situations. Registration of near miss accidents allows to make those analysis and help to prepare proper conclusions and preventive precautions.

Keywords: *quasi accidental event, accident at work, quasi accident's registration, prevention of work accidents*

Grigoraş I.D., Nicolescu Ş., Ionescu M.: **Feasibility Study for Exploitation and Evaluation for a Commercial Field from the Getic Depression** • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

The work targets are: update of the geological model, update of the production history, resources and reserves reevaluation, well production predictions, discounted cash flow analysis. The oil reservoirs and oil reservoirs with gas cap from Burdigalian (Helvetian) and the non-associated gas reservoirs from Meotian are exploited by one company and the free gas reservoirs from Burdigalian (Helvetian) are exploited by another company. This work refers to the oil reservoirs and oil reservoirs with gas cap from Burdigalian (Helvetian) and the non-associated gas reservoirs from Meotian.

Keywords: the Getic Depression, exploitation, evaluation

Ivankiv O.O., Ahmetova V.M., Dyvoniak Ju.I.: **The New Generation of the Reagents for Restoring of the Capacity-Filtrating Characteristics of the Productive Fields at the Conditions of the Repeated Opening and Overhaul of a Well** • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

At time of the repeated opening of the low-permeable collectors the worsening of their filtrating characteristics takes place. The worsening happens because of negative influence of the solid phase and filtrate of the washing fluid, especially because of polymeric pollution. It was estimated, that quantity of so-called “dry” fields increases during increase of the duration of the effect of the washing fluid over the field. For example, according the results of the tests on wells in Ukraine it was established that if the washing fluid was effecting on the field during was not less than 3 days, the inflow was gained from 50% of the objects; that if the effecting was 4 to 10 days, the inflow was gained from 29% of the objects; and that if the effecting was more than 10 days, the inflow was gained only from 17% of the objects. The conducted laboratory and analytic researches discovered the mechanism of the collector blocking by the polymeric component of the washing fluid. Removal of the polymeric reagents from the pore space is a urgent problem during the recovery of the filtrating characteristics of the fields at the ending of the drilling, as well as after overhaul of the well. At Ukrainian State Geological Institute there were developed and researched two chemical solutions of reagents-oxidizers HV and DT. Their function was cleaning of the pore space during repeated opening of the productive fields and during development. These reagents contribute in destruction of the polymeric connections of the colmatants and their removal from the field. For improving of the effectiveness of the developed reagents by the temperatures from 20 to 100 °C, there were analysed the main polymers used for wells drilling, such as PAA (marking A-1020, A-227), Celpol R, carboxyl-methyl-cellulose, Fin-Fix HL, Duo-vis, Flo-vis, and Xhanthan Gum IV). At the end of the research, the needed temperature conditions were selected, which are needed for their destruction at field conditions. The research on the real samples from oil and gas fields showed that the developed reagents HV and DT have a high level efficiency in recovery of the filtrating characteristics of the sand and carbonate collectors.

Keywords: polymer, filtration, collectors

Jamrozik A., Gonet A., Stryczek S., Czekaj L.: **Possibilities and Conditions for Desalination of Drilling Waste** • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

Neutralization of waste material is an important issue in terms of maintaining equilibrium within natural environment. In oil mining drilling waste is an essential by-product, that is generated as a result of drilling boreholes (explorative and exploitive). These by-products consist of hydrated, organic-mineral structures, which possess tixotropic properties. Their composition depends on drilled rock layers as well as on the organic and non-organic components of the drilling mud. Management of drilling waste, which is highly saline (it should be noted that

in recent years the amount of such waste increased rapidly) creates serious hazards to natural environment. Therefore, it is indispensable that such waste should be utilized according to strict environmental standards. In this article the authors present laboratory research pertaining to the possibility of salt release (Na^+ , K^+ , Ca^{+2} , Mg^{+2} , Cl^- , HCO_3^- , SO_4^{2-}) as well as the impact of additional material (fly ash and slaked lime) on the desalination of drilling waste.

Keywords: *drilling waste, environmental protection, management of drilling waste*

Kaliski M., Janusz P., Szurlej A.: **Underground Gas Storages as an Element Ensuring the Continuous of Natural Gas Supplies** • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

The article concerns types of UGS and their importance to the natural gas systems. It describes currently operating underground gas storages, giving their storage capacities and maximum peak output. Moreover, the article analyses the relations between UGS's locations, directions of natural gas supplies and the amount of gas consumption in chosen countries.

Keywords: *natural gas, underground gas storage, energy security*

Kaliski M., Krupa M., Sikora A.: **Europe's LNG Market Versus Unconventional Natural Gas Sources** • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

The role of natural gas in the world's energy supply is growing rapidly. Since the autumn of 2008, the global LNG supply/demand balance has changed dramatically especially in the US. Forecasts showed, that in the future potential world demand for LNG will be higher than supply over about 35 bln m³. The most competitive region will be "Atlantic Ocean market" where there is estimation for available supply for ca. 150–160 bln m³ natural gas in liquid form and potential demand which will reach the level of even 225–230 bln m³ natural gas. In such circumstances Europe could "in reality" buy max. 80–90 bln m³ natural gas in LNG form without additional overpayment for such commodity. Recent announcements evaluate increase of the CBM, "tight sand gas" and "shale gas" production to 2020 by major players i.e. Sweden, Poland and Germany. These new players could or will ensure shale gas production growth in the next decade. Market situation is developing rapidly. While the LNG situation is changing dramatically and there are the factors which are additionally expected to the great influence on the LNG market. **Authors discuss the LNG balance for the European market. Article focuses on possible influence of unconventional gas in Europe which will be evaluated together with LNG supply/demand balance.**

Keywords: *LNG, unconventional natural gas sources, demand increase, supply, energy security, Poland, Russia, European Union, American market, natural gas, energy mix, energy sources, fossil fuels, scenario, terminal, hub*

Kopeć P., Wysocki S.: **Barite Replacement with Chalk in Weighted Polyglycol Drilling Mud with PT-51 Polymer to Drilling in Clays and Shales – Lab Research** • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

The right weighting of drilling mud is very important for drilling to balance well pressure and exert back pressure to the walls. In instance to wrong match of drilling mud, there is a crawling rocks effect. In order to prevent this effect, drilling mud with high density are use. Materials which we use to weighting should be a chemical inertness to other components of mud and don't change of technological parameters. Because of high consump-

tion it also should be easily accessible and cheap. In this work we research for replacement barite by chalk in weighted polyglycol drilling mud to reborings clays and shales. Research shows that using a chalk and barite on prepared mud successfully weight it to density of 1.5 g/cm³ without significant influence of rheological parameters. Chalk influence similarly like barite at technological parameters and have lower abrasiveness and it's cheaper than barite.

Keywords: drilling mud, weighting agents, barite, chalk

Krochmal J.K.: Analysis of Angle of Electric Phase Displacement for Sand and Bentonite Samples • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

A prototype research stand based on modern impedance meter Hioki 3522 type was made in the Laboratory of Oil Engineering, Faculty of Drilling, Oil and Gas, AGH-UST. It was used for realization of a research project no. N524 348335 within which phase angle ϕ of modeled fine sand and bentonite samples was tested for frequencies available with the meter, i.e. 0.001 Hz to 100 kHz in air-dry conditions. These media have different water sorption qualities; being strongly polar, water influences electrical polarization. The results of these experiments confirm results expected on the basis of previous tests. Significant differences were revealed between frequencies corresponding to the observed maximum value of angle ϕ for fine sand and bentonite.

Keywords: angle of electric phase displacement

Leosz A., Pojnar M., Ziobro R.: Modern Technologies of Horizontal Well Completion for Underground Gas Storage Purposes and Experience from Test Production of Such Wells on UGS Strachocina • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

Project of increasing working capacity of UGS Strachocina demanded drilling and completing of eight horizontal wells in order to provide required production and injection rates. The paper discusses problems encountered and experience gained during execution of four wells SH-5, 6, 7, 8 being part of Production Centre no. 2. The wells were completed with unique – in UGS environment – technology of expandable sand screens. In addition results of test production from those wells in winter season 2009/2010 are presented.

Keywords: underground gas storages, Strachocina, horizontal drilling, expandable sand screens

Lewkiewicz-Małysa A., Winid B.: Reduction of Hydrocarbon Contaminations with the Use of Chemical Methods • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

The development of the oil industry and use in various branches of the economy of hydrocarbon compounds is a risk to soil-water environment. Petroleum substances is a broad spectrum of organic compounds with different chemical properties and thus to remove them from the environment is not sufficient a universal method. The choice of method depends on both time and extent of the contamination, geological site, the hydrogeological conditions as well as the availability and cost effectiveness of the method. Today increasingly to degrade the pollutants used chemical oxidation methods. It can be carried out under in-situ and ex situ. As oxidants can be used: hydrogen peroxide, ozone, chlorine compounds, potassium permanganate, and UV radiation. The article presents the results of laboratory tests to remove hydrocarbons from contaminated water by using 30% solution of hydrogen peroxide and hydrogen peroxide with the addition of iron (II) as catalyst activation reactions. The efficiency of both variants effectiveness was compared.

Keywords: chemical methods of treatment, hydrocarbons, environmental protection

Macuda J., Dubiel S.: **Evaluation of Influence of Oil Blow out on Ground and Water Environment on the Example of well “Daszewo-1”** • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

At the turn of 1980–1981, when exploration well “Daszewo-1” was drilled, an intense eruption of oil and natural gas occurred. It lasted 33 days and during that time dozen to tens thousands tones of oil were released to the environment. The soils around well “Daszewo-1” were polluted in the area of 27 ha. After 30 years the soil, ground and groundwater samples were taken for laboratory analyses, during which hydrocarbon concentrations were established. The obtained results were compared with the present qualitative standards of soil, ground and groundwater in the agricultural areas. They do not reveal any higher values than the standards for admissible hydrocarbon concentrations.

Keywords: drilling eruption, environmental degradation, field study, environmental state

Macuda J., Zawisza L.: **Analysis of Soils and Grounds in the Area of a System for Treating Mercury-Contaminated Natural Gas** • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

The operational technological systems for treating natural gas in gas fields are a source of potential ground contamination with inorganic and organic substances. They may leak from broken or untight industrial installations used for separating and storing formation fluids, drying and regeneration of glycol as well as drying of natural gas and then to penetrate the environment. The results of analyses of the quality of ground environment within the technological installation of the Paproć Group System are presented in the paper. Samples for environmental analyses were taken in the close vicinity of main technological installations. The obtained results of chemical analyses of soil and ground samples were compared with the quality standards for grounds and silos for industrial areas.

Keywords: gas exploitation, soil contamination, mercury contamination, mineral oil, soil and ground standards

Malureanu I., Marinoiu C., Boaca T.: **The Influence of Lithology on Permeability Values Determined by Wyllie and Rose Relation** • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

The main reservoir properties that define a petroleum field are: bed thickness of reservoir, area, porosity, hydrocarbon saturation and permeability. Excepting permeability, the other ones can be determined accurately from well log data. Permeability is a measure of the ease with which a formation permits a fluid to flow through it. In order to be permeable, a rock must have interconnected porosity (pores, vugs, capillaries, fissures, or fractures). Multiple processes of sedimentation and diagenesis can create complex and variable pore systems and their morphology depends on the mineralogical composition, structure and texture of the reservoir. The multitude of factors which influence the permeability make them difficult to determine, based on the correlations with others petrophysic properties, obtained from well log (porosity, irreducible water saturations etc.). Such correlations have represented a major concern for many reservoir engineers and geophysicists (e.g. Kozeny, Wyllie & Rose, Tixier, Timur, Coates, etc). A good porosity – permeability correlation for different lithologies was obtained by Chilingarian. The results showed a considerable improvement in permeability estimation that was also obtained by Herron (1987) with a relation adjusted after Kozeny-Caraman in which he introduced the same coefficients dependent on texture and mineralogical composition. Therefore, we may remark that introducing lithology in the relations for permeability estimation leads to the improvement of permeability determination based on correlations. The aim of this paper consists in establishing the coefficients from Willy and Rose in function of lithology

using experimental determinations on sand, siliceous sandstone, calcareous sandstone and limestone samples. In order to materialise this objective, we used linear models of regression, obtained from the linearization of Willy and Rose relation. With these models, the authors can obtain a confidence interval up to 95%. In the end of the paper, the authors propose new relations for permeability evaluation for these lithologies, and also new proceeding of calculus for other lithologies.

Keywords: *permeability, lithology, porosity, water irreducible saturation, linear model regression*

Moslavac B., Pašić B., Malnar M.: **Frac-Pack Well Stimulation • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2**

During the hydrocarbon production, the formation sand movement has a frequent negative influx to the process because of its hazardous nature. Gravel pack placement is a common well treatment procedure for prevention of formation sand flow to the wellbore. This method is used in petroleum engineering industrial practice since 1950s. Based on it as a conventional technique Frac-Pack method came up as a new modern technology of sand control containing gravel pack placement and hydraulic fracturing all-in-one procedure. In Frac-Pack application, the appropriate viscosified fluid and proppant selection has a key role for achievement of desired fracture height, length and width. Fracture dimensions are controlled by TSO (Tip-Screenout) fracturing procedure. In this paper basic types of proppant are presented as well as resin coated sand, which improves packing of fracture with proppant. Numerous and various Frac-Pack fluids able to resist the high temperature and pressure are described. Downhole Frac-Pack equipment is also presented. Paper also contains a field example of Frac-Pack application performed on one of the Adriatic offshore gas fields, Republic of Croatia.

Keywords: *Frac-Pack, well stimulation, fracturing fluids, proppant, TSO, completions*

Thanh N. Nguyen, Stefan Z. Miska, Mengjiao Yu, Nicholas E. Takach, Ramadan Ahmed: **Experimental Study of Hydraulic Sweeps in Horizontal Wells • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2**

Drilling fluid sweeps are commonly run in the field to help clean the borehole of cuttings that have not been removed with normal drilling fluid circulation, especially in high angle or extended reach wells where efficient hole cleaning is more difficult to maintain. This study focuses on the use of “conventional” and “enhanced” sweeps in horizontal well bores. Not much information pertaining to the use of drilling fluid sweeps is available in the literature. Furthermore, there has been a lack of agreement as to which types of sweep fluids are most effective. Conventional sweeps most often include high viscosity fluids, high density fluids or a combination of both. In addition to conventional sweep fluids, an attempt was made to use enhanced sweep fluids, in which surfactants are used to attach cuttings to oil droplets that are intentionally introduced to the drilling fluid system. Because of their low density, oil droplets can have the ability to keep cuttings particles in suspension. The use of oil droplets is a new concept in cleaning horizontal and deviated wellbores. This work focuses on experimental analysis of sweep fluids with the goal of quantifying the sweep “efficiency”. A small-scale sweep loop (SSL) was mainly used to conduct sweep experiments. Moreover, some experiments were carried out in a field-scale flow loop that operates at low-pressure ambient temperature (LPAT) conditions. Results show that pipe rotation plays a very important role in improving hole cleaning. Particularly, the improvement is substantial with high-viscosity fluids. The rotation of pipe has agitation effect that forces the cuttings particles into the main flow and facilitates the removal process. As anticipated, increasing the flow rate enhances the sweep efficiency or cuttings removal regardless of the drillpipe rotation. Furthermore, the study suggests that with a more rigorous evaluation of sweep efficiency, one can objectively determine the type and frequency of drilling sweep. The results of this study are useful for selection of the optimal sweep fluid.

Keywords: *horizontal wells, hydraulic sweeps*

Piwowarski A.J., Rychlicki S.: **New Natural Gas Supply Technologies as the Diversification Tools • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2**

With the present annual consumption of about 14 bm^3 , not negligible indigenous natural gas reserves (approx. 100 bm^3) and long term natural gas supply contract with Gazprom, Poland is quite well endowed with natural gas resources. Nevertheless this apparently comfortable situation doesn't represent sufficient gas supply security especially in the future when the dependency on one main external gas supply source could have been increasing, and when the political factors can disturb the regular gas supply to the country. Since several years there is an intention and concern in Poland to diversify gas supply sources and routes in view of increasing not only gas supply security but also to improve the flexibility of gas transmission system, to deserve zones not supplied with gas, and to find less costly gas. Several options of gas supply diversification have been envisaged until now including off shore gas pipelines from Denmark and Norway but for various reasons political and economic couldn't be implemented until now. Some years ago LNG project has also arisen. Some troubles, but not really important in the Russian gas supplies throughout Belarus, and Ukraine occurred in the past, becoming an additional signal to intensify the search for a new solutions to enhance the gas supply security. Among several solutions the choice has been made for the shipping natural gas mainly from the North and Norwegian Sea Region to the Polish gas market using an innovative CNG sea transport technology developed in Norway, Canada, and in USA; this solution is being perceived as the most feasible and most interesting from the point of view of the flexibility, security, relatively modest investment costs, rapidity (short time of implementation), and good gas price, especially for gas from so called mature areas. However, an alternative solution to diversify gas supply to Poland remains LNG, when we have started with the project of LNG receiving terminal in North-Western part of the country (near Szczecin), which is expected to be operational in the middle of 2014 year. Another solution, that we are envisaging, constitutes the use of the new technology of gas supply i.e. LNG regasified on the LNG tanker offshore or onshore or regasified on the Floating Storage Regasification Unit – FSRU, which can be a cheap, second hand LNG carrier or a barge. The Regas LNG can be sent directly to the high pressure gas pipeline onshore; this solution is called alongside ship moored. We are taking into consideration two from four existing technologies of Regas LNG: (i) Energy Bridge Regasification Vessel – EBRV TM – owned by the American company, Energy Excelsaate from Houston, and the Norwegian technology represented by Høegh LNG company.

Keywords: *shipping natural gas, LNG, CNG*

Psiuk M.: **Corrosion and Saline Deposition Protection of Gas and Oil Field Equipment with the Use of Combined Corrosion and Saline Deposition Inhibitors and Multifunctional Inhibitors • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2**

This paper describes problems of inhibitor corrosion protection in oil and gas fields, main reasons of saline deposition in the processes of oil and gas production and technology of combined using of corrosion and saline deposition inhibitors (technology of using of inhibitors of multifunctional action) for protection of gas and oil field equipment against corrosion and saline deposition. In the paper on the basis of the results of laboratory researches has been shown high efficiency of multifunctional inhibitor “Коразол” and of the mixture of inhibitors KTI-C and ТАЛ-3. The proposed technology consists of preparation of the solution of inhibitor of certain concentration and pumping of the prepared solution into the producing well (to annular space of the well).

Keywords: *corrosion, saline deposition, gas, oil, inhibitor, oil and gas fields, oil and gas production*

Rajtar J.M.: **Shale Gas – How is it Developed? • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2**

Shales are the most abundant sedimentary rocks. The shales with high organic content are considered good source rocks for oil and gas accumulations. From the engineering standpoint, shale gas reservoirs exhibit characteristics of both conventional gas reservoirs (free gas in pore space) and coalbed gas reservoirs (adsorbed gas). Their extremely low matrix permeability (order of nanodarcies, nd) creates additional complexity in their development.

On the other hand, the abundance of shales makes this type of unconventional gas development very attractive for economies that seek relatively clean sources of energy. The paper reviews four general steps in the development of shale gas reservoir: geological identification of potentially productive gas shales, engineering characterization of gas shale reservoirs, typical completion techniques proven successful in shales, evaluation of reserves and development planning. The review focuses on the issues which in the author's opinion have major impact on successful shale reservoir development. The review is based on experiences of the independent oil and gas producer successfully engaged in shale gas development in the continental USA.

Keywords: *shale gas*

Sikora S., Wojna-Dyła E.: Environmental Hazards Accompanying Exploitation of Marine Hydrocarbon Deposits • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

In the present conditions of oil and natural gas economy, more frequently are used hydrocarbon accumulations deposited at greater and greater depths under the sea bed, also deposits, which have already been treated as marginal because of their potential. Offshore mining is connected with various ecologic problems, which are not encountered in the on-shore situations. The problem of environmental pollution with oil products generated during the offshore production of hydrocarbons from a marine platform is presented in this paper. Moreover, the state of the natural environment in the vicinity of a production platform on deposit B-3 and activities undertaken in the case of possible threats of platform operation are also discussed. The analysis of the production works on deposit B-3 reveal that one can distinguish two stages of works which can affect the marine environment. At both stages the marine environment can be also contaminated with sanitary waste, solid household-communal waste, as well as bilge waters and polluted waste waters.

Keywords: *environmental protection, offshore exploitation of hydrocarbon deposits, environmental hazards*

Solecki T.: Analysis of Quality Dangers of Therapeutic Groundwater from Deposit “Mateczny” Connected with Hydrocarbons Solid Pollution in Closed Chemical Plants • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

Investigation of soil quality in closed chemical plants “Bonarka” showed presence of hydrocarbons which violated the current standards. Results of analysis of 231 soil samples described aromatic hydrocarbons, mineral oil (C12-C35) and petrol (C6-C12) violation. In this article also was made an analysis of archive geological and hydrogeological information of area of closed chemical plants and adjacent terrain, allowing for mining area of therapeutic groundwater resource “Mateczny”. On the basis of environmental reconnaissance, geological and hydrogeological information of area of chemical plants “Bonarka”, in this article are shown potential dangers for therapeutic groundwater resource “Mateczny”.

Keywords: *soil quality standards, hydrocarbons in soil, dangers for therapeutic groundwater resource*

Solecki T.: An Evaluation of Admissible Volume of Groundwater Well of an Quarternary Water-Bearing Horizon, in Chosen Part of Krakow, in Aspect of Water Supply Possibilities and Obtaining of Heat Energy • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

In the article is presented the analysis of hydrogeological conditions, construction of chosen groundwater capture, which contains an Quarternary water-bearing horizon well and results of hydrodynamical test and its interpretation. This test – pumping test – made an evaluation of admissible volume of extracted groundwater catchment possible. The size of counted admissible volume of water points that there is a possibility of using this groundwater catchment to water supplying for drinking and sanitary purpose, and obtaining of heat energy from groundwater, with the use of a heat pump.

Keywords: *groundwater capture, pumping test, admissible volume of groundwater, obtaining of heat energy*

Steperski P., Konieczny B.: **Implementing and Developing the HSE System by Drilling Contractor Companies on Example of PNiG Jasło Sp. z o.o. (OGEC Jasło Ltd.)** • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

The basic aim of the HSE system is to make the current operations and people involved in them safe. It also refers to the local community and the natural resources. Additionally, this system enables the company to avoid the economic and legal costs connected with the potential damages due to the higher safety level. At present the level of the HSE system is a factor limiting possibility of getting a drilling contract for world leading oil & gas market operators. The last reason seems to be more important because of two changes on the market of exploration and production of hydrocarbons in Poland. The first one is entering the Polish market operators such as Exxon Mobil, Marathon Oil or Chevron, which are known for their taking care about the corporate image of reliable suppliers of energy. The second one is implementing and developing the CSR strategy by the biggest operator in Poland which is PGNiG SA. In this article HSE system and the process of implementation of it in PNiG Jasło Sp. z o. o. (OGEC Jasło Ltd.) were presented.

Keywords: *HSE System*

Stryczek S., Gonet A., Wiśniowski R., Radzik M.: **Influence of Superplastifier Glenium® SKY 503 on the Development of Technological Parameters of Sealing Slurries** • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

The quality and efficiency of sealing the casing is significantly conditioned by proper sealing slurry for the casing as well as entire cementing procedure. The selection of slurry parameters depends on individual conditions and the well to be cemented. Sealing slurries should have certain properties so that they can well perform in the well. Sealing slurries should have a strictly defined time of bonding and be pumpable over the entire time of cementing procedure. Their technological parameters should be considerably stable in high temperatures and pressure conditions which are present at great depths. Hardened cement stone cannot be corroded, cannot be permeable. It should be adhesive to the drilled rocks and casing. It should also have time-unchangeable strength parameters over the whole period in which the field is exploited through a given well. The results of laboratory experiments on the influence of various concentrations of superplastifier Glenium® SKY 503 on technological parameters of fresh and bonded sealing slurry based on metallurgical cement CEM III/A 32,5 R are presented in this paper.

Keywords: *superplastifiers, Glenium SKY 503, cement slurries*

Stryczek S., Wiśniowski R., Gonet A., Połowniak Ł.: **The Influence of Selected Superplastifiers on Rheological Parameters of Sealing Slurries based on Metallurgical Cement** • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

The results of laboratory analyses of influence of new-generation superplastifiers based on polycarboxyl ethers Glenium® by BASF on rheological properties of sealing slurries based on metallurgical cement CEM III/A 32,5R are presented in the paper. These slurries had different water-to-cement ratios as well as different types and concentrations of applied superplastifiers. The researches reveal that the prepared models are governed by the Herschel-Bulkley model. With definite rheological parameters this model can be used for accurate calculating of flow resistivity either when cementing the casing or the ground or the rock mass.

Keywords: *superplastifiers, sealing slurries*

Twardowski K., Traple J.: Characteristic Indices of Saturation of Soil-Ground Media with Fluids • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

Quantitative indices of saturation of three-phase multicomponent porous media with various fluids (liquids and gases) are presented in the paper. The analysis mainly covered:

- grounds – with respect to various depth zones: aeration, capillary uplifting and saturation;
- gas-bearing rocks – in static and dynamic conditions, accounting for wettability and structure of porous space.

Saturation indices, already used in hydrogeology, were discussed along with their specification and way of determining. The notion of critical and residual saturation, in that irreducible ones, is defined.

Keywords: petrophysics, reservoir engineering, soil-ground media, saturation indices

Vasyuchkov Y.: Scientific Principles of Natural Coals Transformation in Situ • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

The conventional technologies of the coal seams mining have several shortages. The ones are in technical and economical and ecology and energy effectiveness of coal utilization aspects. Many of these shortages may be removed with unconventional technologies use. One of them is technology of coal seam transformation to a gas fuel. Main object of the technology use is coal thermal effectiveness increase for energy industry. The increase may be achieved to several times. Main principle the technology consists in thermal and electrical energy recovery in situ or in the coal suite from the gas fuel. Advantages of this technology use consist in social and environment saving effects. The report has established the fact being of the principles which have basis for the unconventional technology development. The report shows technical methods and processes for the technology promotion in commercial scale. The report views possibility to produce hydrogen during the technology realization.

Keywords: conventional technology, unconventional technology, hard natural coal, gas fuel, thermal coefficient of effectiveness, generator mixture, enriched gas mixture, coalbed methane recovery, scientific principles, transformation of coal into gas fuel

Winid B., Lewkiewicz-Małysa A.: Medical-Mineral Waters of Wysowa in Focus of the Hydrochemical Indicators Research • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

Medical-mineral waters are highly-mineralized waters are of $\text{HCO}_3\text{-Cl-Na}$, $\text{HCO}_3\text{-Cl-Na-Ca}$, $\text{HCO}_3\text{-Na-Ca}$ containing such specific components as iodine and ferrum. The amount of bromine and metabromine acid is bigger than in ground water. On the basis of chemical analyses carried out during the last ten years the proportion among the ions has been calculated and ions interrelations and variability during the examined period of time have been compared. Hydrochemical ratios speak out about supplying waters intakes partly from active zone of water exchange. Highly – mineralized water has infiltration and diagenetic component. Most changes of variability are irregular. Reductions of mineralization refer to the some waters. Observed minor increase of some ratios may speak about supplying water intakes with the infiltration component.

Keywords: high-mineralized water, ground water geochemistry, chemical ratios, Wysowa

Wojtanowicz A.K., Wenting Qin: Improved Recovery of Heavy Oil with Bottom Water Using Downhole Water Sink (DWS) Technology • Drilling Oil and Gas 2010 • Volume 27 • No. 1–2

The paper presents a worldwide survey of heavy oil reservoirs and their production methods. The survey shows that one of the most important problems in heavy oil recovery is the presence of bottom water. Since the mobility of water drastically exceeds that of heavy oil, water breakthrough to oil wells occur very early causing dramatic

loss of the wells' productivity due to rapid increase of the water cut. The study captures some of the difference between heavy and light oil production in terms of mobility ratio effect, recovery dynamics prior to and after water breakthrough, and water cut control with production rate. The results also show that the controlling water breakthrough to wells in heavy oil is several-fold more important (in terms of well productivity and recovery rate) than that for conventional oil wells. Most of heavy oils with bottom water cannot be economically recovered using "cold" (non-thermal) method and conventional (single completed) wells. In these wells, operational range of production rates with variable water cut is very small comparing to light oils. Thus, heavy-oil wells would promptly (within days) switch from water free production to "all water" production. The paper also summarizes a feasibility study into potential application of downhole water sink (DWS) technology in shallow sand containing very significant deposit of heavy oil. Downhole water sink is a new technique for minimizing water cut in wells producing hydrocarbons from reservoirs with bottom water and strong tendencies to water coning. DWS technology controls water coning by employing a hydrodynamic mechanism of water drainage in-situ below the well's completion. This localized drainage is generated by a second completion – downhole water sink – installed at, above, or beneath the oil or gas-water contact. For the purpose of this study a DWS well has been modeled and compared with a conventional well using a commercial reservoir simulator. Results show that DWS technology has great potential to improve recovery in the oil sand with bottom water. All simulated predictions of DWS performance indicate a significant improvement of oil production rates and a several-fold increase of recovery factor. Also explained is the physical mechanism of the improvement that is not specific to the reservoir studied but applies to all heavy oil deposits with bottom water problem

Keywords: *heavy oil, cold production, water coning, downhole water sink*

Zawisza L., Piesik-Buś W., Maruta M.: **Role of Wolsztyn Elevation in Distribution of Hydrocarbon Deposits in the Fore-Sudetic Monocline Rotliegendes** • *Drilling Oil and Gas* 2010 • Volume 27 • No. 1–2

The analysis of reservoir pressures and changes in mineralization and chemistry of deep waters in the Rotliegendes of the Fore-Sudetic Monocline reveals that the groundwaters flow centrifugally. Groundwaters run from the central part of the Lower Permian Basin outwardly to the edge parts, i.e. from north-east to the south-west fading an obstacle in the form of the Wolsztyn elevation. The Wolsztyn elevation is a hydraulic barrier for the waters, which significantly influences the distribution of hydrocarbons in the Rotliegendes strata. Hydrocarbon deposits are encountered in the zones of reservoir waters stagnation (in the zones of their lowered filtration rates), i.e. before the Wolsztyn elevation in the Poznań trough, and after the Wolsztyn elevation in the Zielona Góra trough. As compared to the hydrodynamic classification of oil basins presented in this paper, the Lower Permian basin of the Fore-Sudetic Monocline is a centrifugal (juvenile) basin, belonging to highly perspective areas. Reservoir traps are connected with zones of increased mineralization of groundwaters and lowered filtration rate of these waters. The Wolsztyn elevation has a basic influence on the distribution of hydrocarbon deposits.

Keywords: *hydrocarbon migration and accumulation, distribution of hydrocarbon fields, Fore-Sudetic Monocline, Wolsztyn elevation*