SUMMARIES

Aisayev S., Zhapbasbayev U., Turegeldiyeva K.: **Law of development turbulent non-isothermal jet flow in pit oil** • AGH Drilling Oil Gas 2012 • Vol. 29 • No. 1

This paper reviews development of turbulent non-isothermal round jet flow in pit oil. Increasing requirements for environmental protection challenge the oil industry to minimize the oil spill accidents throughout the production and transportation processes. Hydrodynamic interaction of pit oil with flow is in reasonable agreement with data of industrial tests.

The authors prove law of development turbulent non-isothermal jet flow in pit oil. In this paper a mathematical model was designed and numerical simulation of turbulent non-isothermal flow in pit oil was performed. The mathematical method is based on the non-isothermal fluid flow in pit oil using solution of Reynolds-averaged Navier–Stokes equations and equations of the k-□ model of turbulence. The developed model has been validated with experimental data.

Numerical simulation calculation results were found to be in reasonable agreement with data obtained from the experiments. Turbulent (molar) transfer is important in flow part and vortex zone of reverse flow. In the other part convection and molecular mechanism of momentum and heat transfer dominated.

The developed mathematical model and numerical simulation methods are used to study the process of heating pit oil by hot fluid flow. In technical aspect it allows to determine the mass of heated pit oil which is used in thermo-mechanical technology of gathering spilled oil.

Keywords: *pit oil, turbulent non-isothermal jet flow, mathematical model, numerical simulation*

Akzhalova A., Alexeyev M., Bissekenova J., Myltykbekov M., Shabdirov A., Zhapparkulov B., Zhunusov Ch.: **An automated control system of oil and gas fields exploitation for the fountain extraction method** • AGH Drilling Oil Gas 2012 • Vol. 29 • No. 1

This work proposes smart hardware and software components of the automated control and monitoring information self-adaptive system for the fountain exploitation mode based on adjusting the valve according to the change of values of the pressure sensors, flow rate, temperature and other parameters. The core of the self-adaptive computer system is an "intelligence" which is implemented on the platform for a more proactive approach to the management of such elements as sensors and intellectual controller devices which interact via wireless self-organized network can ultimately lead to a more flexible data routing, precise analysis and prediction and finally increase oil production rate. The primary component of the self-adaptive system is the developed intellectual controller device based on the principle of predictive logic to improve access and performance of production assets, in particular, automatically and semi-automatically regulated valves. This approach considerably facilitates process of monitoring of oil deposit and raises level of reliability of the whole information system.

Keywords: *control system, automatically controlled valves, self-organized network, fountain extraction method*

Artymiuk J., Lengersdorf F.: **Advanced drilling equipment to ensure efficient and maintenance free shale gas drilling** • AGH Drilling Oil Gas 2012 • Vol. 29 • No. 1

Since the 19th century when shale gas was first extracted as a resource, shale gas wells have ever since been extensively put to test of being economically viable or unworkable, primarily dependent on the level of technological sophistication of the drilling equipment involved. Shales ordinarily have insufficient permeability to allow significant fluid flow to a well bore, thus most shales are not commercial sources of natural gas, which is why technical advances in hydraulic fracturing (fracking) are the main cause for the shale gas boom in Poland and around the world. To keep the cost factor down at shale gas drilling sites, low drilling equipment maintenance cost are an important factor as well to keep shale gas drilling economical. Here, the focus has been on the main drilling

equipment such as top-drives, roughnecks, drawworks, mud pumps, and rotary tables. Prolonged equipment operating hours guarantee operations of up to 50,000 hours continuously until maintenance work is required. Actual time needed to replace wear and tear machinery parts has overall become negligible at an unprecedented level of safety using sophisticated so called hydraulic quick release system techniques. Equipment noise, weight, and size have shrunk continuously by the use of advanced drive motors and gear driven transmission trains. New and innovative mud pump and top-drive designs allow high pressures of up to 7,500 PSI. Electronically controlled auto driller systems enable fully autonomous drilling operations with continuous, automatic weight-on-bit control. In conclusion, by utilizing these entire component technologies, overall drilling costs go down and make ever more shale gas drilling wells economically viable, which in return increases production potential of natural gas year by year in Poland and elsewhere.

Keywords: *drilling equipment, shale gas drilling, drilling efficiency*

Bednarz S., Teper W.: **New technical idea of long stroke piston cylinder for drilling hydraulic hoists** • AGH Drilling Oil Gas 2012 • Vol. 29 • No. 1

The conventional line drawworks systems mainly are used worldwide in petroleum industry. Hydraulic hoisting systems are generally adapted in portable mobile drilling rigs and there have solid status. The application of hydraulic hoisting systems for heavy exploration and oil drilling rigs is not wide presently but it systematically increases on the market dominated by the conventional line drawworks systems. Principle of the long stroke hydraulic piston cylinder design is presented in that work and the laboratory model has been manufactured to allow demonstrate an operation. The cylinder design presented creates the possibility for increase of hydraulic hoisting system load capacity in drilling rigs for exploration and useful minerals production. The cylinder may be applicable for all machines and equipment, where long stroke and/or high load capacity cylinders are required and minimal mass of steel structure is necessary.

Keywords: *hydraulic hoists systems, hydraulics*

Beisembetov I.K., Bekibaev T.T., Assilbekov B.K., Zhapbasbayev U.K., Kenzhaliev B.K.: **Application of GPU in the development of 3D hydrodynamics simulators for oil recovery prediction** • AGH Drilling Oil Gas 2012 • Vol. 29 • No. 1

In this article computer's graphics card application in prediction of oil recovery using the CUDA architecture is studied. CUDA is architecture of parallel computing made by NVIDIA Company. It allows increasing dramatically the calculating performance due to GPU (graphical processors) usage. Calculations were executed on field models with 3 million grid blocks. Material balance equation approximated with IMPES method. As the result of numerical modeling of oil recovery prediction with GPU, dozens of times acceleration of calculations comparing with CPU has been taken.

Keywords: *GPU, CPU, NVIDIA, 3D hydrodynamics simulators, prediction of oil recovery*

Blicharski J., Smulski R.: **Laboratory apparatus for fluids displacement in porous media in aspect of carbon dioxide sequestration** • AGH Drilling Oil Gas 2012 • Vol. 29 • No. 1

Article describes laboratory apparatus for conducting core flood displacement experiments during CO_2 injection into depleted hydrocarbon reservoirs. Authors made characteristics of main components of experimental apparatus e.g: corefood cell with porous material, injection system, production system and data recording system. Described apparatus allows for investigation of various physical phenomena which occur in fluid displacement processes at reservoir conditions. In order to calibrate apparatus a set of experiments were conducted on reference core sample of known parameters to evaluate its permeability. Achieved results show good agreement with reference values.

Keywords: *fluid displacement, porous media, CO_2 sequestration, permeability*

Bujok P., Klempa M., Koziorek J., Rado R., Porzer M.: **Evaluation of influence of climate conditions on rock mass energy balance in the research area of VSB – TU Ostrava** • AGH Drilling Oil Gas 2012 • Vol. 29 • No. 1

VŠB – Technical University of Ostrava has a unique possibility of studying temperature changes in the rock mass for long-term operation of heat pumps. The new Auditory building is not only the biggest object heated by a system of heat pumps in the Czech Republic but also in Central Europe. Along with a system of technological boreholes recuperating the heat of the rock mass there were also performed monitoring boreholes controlling temperature changes in the surrounding rock mass during when the heating system is active. The monitoring system is localized in the area of technological wells, the so called Big Research Range. VŠB-TU has another such area called Small Research Range located near the Centre for Energy Investigations. It consists of two technological wells exploiting thermal energy with heat pumps and nine monitoring wells located nearby. All wells performed within both Research Ranges are equipped with sensors monitoring temperature changes during heating (taking energy from rock medium in winter) and cooling (accumulation of energy in the rock mass in summer). The main objective of the research is checking out the functionality and efficiency of the entire system. Some aspects of thermal energy production as well as the results of analyses from the monitoring and measurement of temperature changes in surface layers of the rock mass to about 20 m of depth have been presented in the paper.

Keywords: *research range, wells for heat pumps, heat exchange in rock mass, production and accumulation of heat in rock mass*

Chatzistamou V.: **Design and construction of a magneto-rheometer to determine the rheological properties of magnetorheological fluids for use in drilling applications** • AGH Drilling Oil Gas 2012 • Vol. 29 • No. 1

Magnetorheological (MR) fluids are suspensions which exhibit a rapid, continuous and reversible change in their rheological properties upon application of an external magnetic field. They consist of micron-sized magnetizable solid particles suspended in a non-magnetic carrier fluid. The dispersed phase can be ferromagnetic, ferrimagnetic, and paramagnetic materials while the carrier fluid can be water, kerosene or mineral oil. The main drawback of this kind of fluids is the sedimentation and settling of the magnetic microparticles due to the high mismatch density, so the addition of surfactants is essential. When no magnetic field is applied the suspensions of magnetizable particles are randomly distributed, so the fluids behave similarly to a Newtonian fluid. Under the influence of magnetic field the particles form chains aligned with the field direction and this causes the MR fluid to exhibit semisolid behavior, with increased yield stress. The yield stress, ranges between 10 and 100 kPa proportionally to the magnetic field, the percentage of the solids in the fluid and their particle size. The rheology is described by non-Newtonian models such as Bingham plastic or Herschel–Bulkley model.
To study the effect of the different components of the MR fluids on the rheology of the suspensions, a flexible and innovative magneto-rheometer has been designed and fabricated in the laboratory. It consists of a vertical pipe running across a magnetic field created by an electromagnet. The system is equipped with a coriolis flowmeter and three pressure transmitters. The flow is provided by a peristaltic pump. The pipes which carry the fluid are non-magnetic. The parameters which are monitored are flow rate, density, temperature, pressure, pressure drop and magnetic flux. The rheological properties of the MR fluids in the homogenous magnetic field perpendicular to the shear flow direction are evaluated under different flow conditions like flow rate, different additives and solid loading and different strength of magnetic field. The data can be analyzed via a data acquisition system and a personal computer.

Keywords: *magneto-rheometer, magnetorheological fluids, drilling*

Dubiel S., Luboń K., Luboń W., Wartak W.: **Problems with geothermal wells workover on the example of well Biały Dunajec PAN-1** • AGH Drilling Oil Gas 2012 • Vol. 29 • No. 1

The article discusses the causes and extent of the geothermal wells reconstruction, with particular regard to steel equipment components corrosion and the salt and polymetallic sediment formed on the casing, or in reservoir skin

rocks. Analyzed a Biały Dunajec PAN-1 borehole reconstructions, caused by production casing damage due to corrosion.

Keywords: *Podhale Geothermal System, geothermal wells, BD PAN-1 borehole reconstruction*

Dubiel S., Zubrzycki A., Maruta M.: **Analysis of carbonate reservoir rock properties on the basis of dst and well logging (the Upper Jurassic basement of the Carpathian Foredeep)** • AGH Drilling Oil Gas 2012 • Vol. 29 • No. 1

In the paper reservoir properties – effective permeability (K_{DST}) and porosity ($\Phi_{geof.}$) of the Upper Jurassic carbonate reservoir rocks were analyzed. Data of the permeability from DST and porosity from well logging were used to determine the relationship between them by statistic methods. On the basis of analysis's results the equation as $\log K_{DST} = -0.142 + 0.178 \cdot \Phi_{geof.}$ was established for oil and gas bearing Upper Jurassic carbonate formation in central part of the Carpathian Foredeep basement (in the area: Bochnia – Dębica – Mędrzechów).

Keywords: *petroleum explorations, Carpathian Foredeep basement, Upper Jurassic carbonates, DST, effective permeability relationship to porosity, statistic methods*

Gonet A., Śliwa T., Hendel J.: **Underground thermal energy storage from various sources** • AGH Drilling Oil Gas 2012 • Vol. 29 • No. 1

The most popular methods of subsurface energy storage has been presented within the article. The result was a characterization of two storage methods, which are using either borehole heat exchangers (BTES – Borehole Thermal Energy Storage) or layers of aquifers (ATES – Aquifer Thermal Energy Storage). Many sources of waste energy in industrial facilities were pointed out. Furthermore, a brief description was made on the experiences concerning the UTES technology (Underground Thermal Energy Storage) in the pioneers countries. Authors have demonstrated the necessity for energy storage, benefits were indicated and also safety of the UTES systems. Involvement of AGH Faculty of Drilling, Oil and Gas in the process of better understanding, describing the phenomena accompanying the process of energy storage in the subsurface and its effectiveness was also mentioned.

Keywords: *geothermic, geothermal energy, heal pumps, borehole thermal energy storage, thermal energy storage*

Grigoraş I.D.: **Production and evaluation study for an oil with dissolved associated gas field in the Pannonian Depression** • AGH Drilling Oil Gas 2012 • Vol. 29 • No. 1

The work targets are:
- additional data analysis,
- geological model update,
- resources and reserves reevaluation in order to be confirmed,
- optimum production scenario set up,
- discounted cash flow analysis.

Keywords: *oil, non-associated gas, natural gas, condensate, reservoir, production, well, resource, reserve, geological*

Hlinčík T., Tenkrát D.: **Analysis of gas condensate** • AGH Drilling Oil Gas 2012 • Vol. 29 • No. 1

Cleaning of pipelines is standard operation prior to internal inspection of gas pipelines performed regularly by all transmission system operators (TSO). Internal inspection performed by intelligent inspection tools (IIL) is important procedure which identifies e.g. material loss, corrosion and cracks in pipeline system. However, also liquid or solid deposits can provide much information on pipeline condition and can help with identification of possible

problems and its sources.Proposed paper focuses on analytical methods of different types of pipeline deposits with special aim to the complex analysis with practical examples using classical methods for e.g. coal analysis combined with novel analytical methods (XRF spectrometry, GC-MS, GC-ECD, SIM-DIST).

Keywords: *natural gas, condensate, analysis*

Kaliski M., Białek M., Jedynak Z.: **Impact of fuel prices subsidies on crude oil market in the world** • AGH Drilling Oil Gas 2012 • Vol. 29 • No. 1

In Poland, motor fuel prices are maintained at a very high level. Their structure includes VAT, excise duty and fuel charges. The final price of petroleum products is dependent on the purchase price of crude oil. For many years the value of this product in the world commodity exchanges has maintained a very strong and unpredictable growth. But in the world there are countries where the prices of motor fuels are maintained at a very low level through various subsidies. This group includes, among others, Saudi Arabia, India, China and Venezuela. The purpose of this article is to assess the global supply and demand for oil, in the event of the abandonment of subsidizing the retail price of gasoline and diesel in the "oil" countries. It has been assumed that moving away from subsidies for motor fuels in the above countries may affect the increase in the supply of this product on world markets and simultaneously contribute to lowering its price.

Keywords: *crude oil, energy, demand, supply, price, economy*

Kaliski M., Jedynak Z., Białek M.: **Factors shaping world's oil prices in 2011** • AGH Drilling Oil Gas 2012 • Vol. 29 • No. 1

Crude oil is a strategic material of limited availability, whose resources do not permit the full satisfaction of all reported needs. On the one hand this is due to open and constantly increasing fuel needs of man. On the other hand, is the result of a limited quantity of material, which can be delivered in a given place and time. It should be emphasized that the current global balance of supply and demand for oil is maintaining equilibrium. Also, imperfect competition in the oil sector makes that only a threat of disruptions in the supply of this material is the impetus for the growth of prices on commodity exchanges.The purpose of this article is to identify the phenomena which take place in the socio-economic environment in the world. The actions taken will make it possible to determine their influence on the level and dynamics of petroleum price changes in 2011. The article ends with available predictions for years 2012–2013.

Keywords: *crude oil, energy, price, economy, Russia, OPEC*

Kaliski M., Krupa M., Sikora A.: **Analysis of the existing forecasts of the development of consumption and supply of natural gas in Poland in the light of the available forecasts of the European Union** • AGH Drilling Oil Gas 2012 • Vol. 29 • No. 1

The article discusses the existing and publicly available forecasts of supply and demand of natural gas in Poland in the Polish Energy Policy (PEP 2030) and the estimation of the possible emerging shale gas production in Poland. The authors of the article argue that although the strategy of diversification of suppliers is a clear prerequisite to enhance national energy security, despite the differences in prognosis above all "energy mix", and a huge impact on the forecasts in the EU climate policy or even the lack of predictability as to the possible scenarios for the development of gas production from shale are large enough that it's hard to talk about the predictability and stability of the gas market in Europe. Also discussed the gas market scenarios taking into account the development of energy generation from renewable sources, nuclear power and the prospect of zero-energy development of the country (increased the level of the energy efficiency). The conclusion of this article is the need to build a predictive model for the natural gas market in Poland and forecasts changes in the PEP 2030.

Keywords: *forecast, prognosis, supply, demand, natural gas, energy policy development, scenario of the market, the forecast model*

Kelessidis V.C., Chatzistamou V., Repouskou E., Zografou M., Karimi M.: **Use of PHPA polymer for modification of rheological and filtration properties of water based drilling fluids used for conventional and casing drilling** • AGH Drilling Oil Gas 2012 • Vol. 29 • No. 1

Water based drilling fluids depend primarily on bentonite to provide appropriate rheological and filtration properties. In many instances, however, other additives such as natural or synthetic polymers have been utilized to impart for e.g. shale stabilization, wellbore stabilization, control of flocculation or deflocculation of bentonite dispersions while at the same time they reduce excessive friction and increased torque and also have low environmental impact. Such polymers include Carboxymethylcellulose (CMC), starch, guar gum, polyanionic cellulose (PAC), partially hydrolyzed polyacrylamide (PHPA) which can be used alone or in combination between them or as additives to bentonite dispersions. There have been several studies publishing results on the effect of CMC, of PAC and the other polymers on the extension of rheological properties of water bentonite dispersions, but there are not much published data on the effect of PHPA polymer. PHPA polymer is believed to interact with bentonite particles, when added in water-bentonite dispersions and to facilitate linking of the bentonite particles thus improving rheological properties of the suspension. Furthermore, due to the unique morphology of the PHPA polymer and the coating it offers to bentonite particles, it can reduce substantially fluid loss. In this work we present results from a study on the improvement in rheological and filtration properties of dilute water-bentonite dispersions after the addition of different concentrations of PHPA, critically evaluate the results, compare them with similar results gathered using one of the most common used polymers, CMC, and propose optimal concentrations of PHPA for better efficiency of the drilling fluid.

Keywords: *drilling fluid, PHPA, fluid loss, rheology, SEM*

Kopey B.V., Stefanyshyn O.I., Bednarz S.: **Analysis of pumping unit reducers diagnostic algorithms by formalized methods** • AGH Drilling Oil Gas 2012 • Vol. 29 • No. 1

Diagnostic model of pumping unit reducer is designed for the construction and analysis of algorithms by diagnosing formalized methods. The using of the diagnostic model allows us to ease and formalize decisions on the diagnostic problem. For the synthesis of algorithm for diagnosing the functional-logical model has been selected, which allows to consider the links between individual elements and assemblies of the reducer by simple means and consider the impact of these items on measuring diagnostic features. For a more detailed study of processes occurring in the gearbox of pumping unit, and facilitate the development of its diagnostic model, a functional diagram of reducing gear was built. Diagnostic logic model will help to establish and classify defects in development, to determine the direction of their development and cause-effect relationship with other defects.

Keywords: *pumping unit, reducer, gear, defect, diagnostic model, algorithm*

Kosowski P.: **Real options – an alternative approach to the estimation of profitability of investment projects in the petroleum industry** • AGH Drilling Oil Gas 2012 • Vol. 29 • No. 1

Paper discusses issues relating to the valuation of investment efficiency in the petroleum industry using a real options theory. The example of investment pricing using real options was depicted and it was confronted with the analysis executed with the use of traditional methods. Indicators commonly used to evaluate profitability of investment projects, based on a discounted cash flow method, have a few significant drawbacks, the most meaningful of which is staticity which means that any changes resulting from a decision process during the time of investment cannot be taken into consideration. In accordance with a methodology that is currently used, investment projects are analysed in a way that all the key decisions are made at the beginning and are irreversible. This approach assumes, that all the cash flows are specified and does not let the fact that during the time of investment there may appear new information, which could change its original form. What is also not analysed is the possibility of readjustment, due to staff managment's decisions, to the current market conditions, by expanding, speeding up/slowing down, abandoning or changing an outline of the undertaking. In result, traditional methods of investment

projects valuation may lead to taking wrong decisions, e.g. giving up an owned exploitation licence or untimely liquidation of boreholes, which seem to be unprofitable. Due to all the above-mentioned there appears the necessity of finding some other methods which would let one make real and adequate estimations about investments in a petroleum industry especially when it comes to unconventional resources extraction. One of the methods which has been recently getting more and more approval in a world petroleum economics, is a real options pricing method. A real option is a right (but not an obligation) to make a decision connected with an investment in a specified time or time interval. According to the method a static model of pricing using DCF is no longer used; an investment project is divided into a series of steps and after each one there is a range of possible investment decisions, technical and organizational issues and all the others called 'real options'. This lets one take many different varieties of modyfiying a strategy while pricing the project. This also makes it possible to react to the changing inner and outer situation and introducing new information while accomplishing the investment project. Owing to those, the decision process is a continuous operation, what is an actual vision of a real investment project management in the petroleum industry.

Keywords: *real options, profitability estimation, oil industry*

Kosowski P., Wielgus G.: **The profitability analysis of the small LNG regasification plant and calculating a minimum price for regasified natural gas using Monte Carlo simulation** • AGH Drilling Oil Gas 2012 • Vol. 29 • No. 1

The paper discuses issues related to the construction of the small LNG regasification plants. The use of the natural gas in LNG technology opens up new prospects for gas industry and allows it to gain new customers located outside the gas network. However, the appropriate profitability analysis is required to conduct before construction and putting such plant into operation. The authors present capital and operating costs of the small scale LNG regasification plant, as well as the profitability analysis using Monte Carlo simulation. The use of this type of simulation is justified because first assumptions very rarely correspond exactly to actual values. In the case of regasification plant it is difficult to determine precisely the capital and operating costs. Thanks to the use of the Monte Carlo simulation we receive a set of results, which may be present in the form of the histograph and described by statistical measures. It enables managers to carry out the more complex problem analysis. The article also presents the method of setting the minimum price for regasified natural gas, providing the expected rate of return.

Keywords: *LNG, Monte Carlo simulation, economic profitability*

Kryzia D., Kaliski M.: **Technologies of electricity generation importance based on natural gas for energy companies in diversification context of its productive structure** • AGH Drilling Oil Gas 2012 • Vol. 29 • No. 1

Article describes changes in energy market and domestic power sector needs. Attention was drawn to possibility of using natural gas to produce electricity. Described risk of energy company functioning and its restrictions by diversification of production technology. Portfolio analysis was discussed in terms of planning production structure of company. An analysis of case showing benefits of energy diversification for company's manufacturing structure through implementation of gas technology.

Keywords: *natural gas, electricity generation, diversification of production structure, energy technologies, portfolio analysis, planning of production structure*

Lewkiewicz-Małysa A., Winid B.: **Variability of quantitative and qualitative parameters of Rymanów mineral water springs** • AGH Drilling Oil Gas 2012 • Vol. 29 • No. 1

Springs of different mineralization water occur in Rymanów-Zdrój. These are lowly-mineralized water (Żelaziste, Hubin intake), medium-mineralized and highly-mineralized waters: Ignacy, Tytus, Klaudia, Celstyna and Basenowe. Lowly mineralized and medium mineralized waters are of HCO_3-Ca type. Highly mineralized waters are of

Cl-HCO_3-Na type. There are carbonated water containing such specific components as iodine and metabromine acid. Spring discharge of highly mineralized water ranges from 1.04 to 16.18 dm^3/min. The paper presents the parameters of Tytus, Klaudia, Celestyna and Basenowe spring regime. On the basis of measurements carried out during 2004–2011 shows the correlation between quantitative and qualitative parameters, and discusses existing relationships.

Keywords: *mineral water, correlation, springs, Rymanów-Zdrój*

Macuda J.: **Analysis of soils and ground in the place of long-term drilling and post-exploitation waste deposition** • AGH Drilling Oil Gas 2012 • Vol. 29 • No. 1

In the second half of the 20th century the discharge fluids and technological waste produced during oil and gas exploitation were disposed in waste pits in the rig area. Those pits were poorly protected against the migration of toxic leekings to the environment, thus causing contamination of ground and groundwater. Each time the range and magnitude of contamination depended on the quantity and toxicity of waste in the pits and also geological and hydrogeological conditions near that site. To limit the negative environmental impact for water and ground the deposited waste and sewage were solidified in waste pits with the use of various binding materials. The results of qualitative analyses of the state of ground and water environment in the area of a waste pit in the oil mine Grabownica, where solidified drilling and postexploitation waste were disposed, have been presented in the paper. The results of chemical analyses of soil and groundwater samples were compared with the present quality standards for ground environment in industrial areas.

Keywords: *quality of ground and soil, contamination of ground, utilization of waste, waste storing*

Sapińska-Śliwa A., Stryczek S., Gonet A., Mimier Ł., Śliwa T.: **Test of fresh cement slurries for borehole heat exchangers** • AGH Drilling Oil Gas 2012 • Vol. 29 • No. 1

Research on fresch cement slurries, included mixtures available on Polish market. Tests made in laboratory of Drilling Fluids on Drilling, Oil and Gas Faculty AGH in Cracow. Cement slurries which were testing were: ThermoCem Plus, Hekoterm and Stüwa Therm 2000. Various recipes were prepared. Focused on the testing density, fluidity, pH of the filtrate, conventional viscosity, effective filtration, sedimentation and rheological properties. ThermoCem Plus best met all the parameters. The other products, which probably based on quartz sand, were characterized by pour flow properties. Only ThermoCem could be classified as drilling cement. Special computer program – Rheo Solution was used for choose the best rheological model. The best model was Herschley–Bulkley's model.

Keywords: *sealing slurries, borehole heat exchangers, geoenergetics*

Ştefănescu D.-P., Piteiu M.A., Vlasin I.: **New steps in finding the potential prospects for unconventional gas reservoirs in Transylvanian Basin (Romania)** • AGH Drilling Oil Gas 2012 • Vol. 29 • No. 1

The present paper is considered a result of the Romgaz managerial team preoccupation for identifying unconventional gas resources and reserves in Transylvanian Basin and is also designed as a continuation of our last year assessments, In this respect was initiated a complex project in which we were involved. Because the recent studies have proved an insufficient maturity degree of the organic matter in Transylvanian Basin, so in this stage we can not speak about "shale gas", only "tight gas" category has been approached. The methodology applied in our study preparation included more steps which are briefly presented in the paper. After the inventory of our whole data base, with all the productive fields and also the areas between them, we performed a filtering of the collected data and information, focusing mainly on the new zones, inside the known structures and also on the isolated wells, located between fields. The main selection criterions were the badenian formations, with low permeability and porosity, based on the cores analyses, located deeper at more than 2000 m , and tested with low gas flow rates. gas shows or even no flow (dry tests). For each selected packages and the individual isolated wells, we estimated the petrophysical parameters (porosity, gas saturation), geometrical ones in terms of area and net pay and energeti-

cal (the volume factor), in order to go further to computing the initial geological resources by volumetric method. Due to the uncertainty of each parameters involved, beside the computation in deterministic way, was applied the statistical method by Monte Carlo simulation, taking into account the minimum and maximum values of the parameters. The conclusions derived from our estimations, allowed to define a play associated with the deep zone of Basin "Deep Basin Center" and to propose few prospects, based on the most attractive selection criterions, in terms of volumes, net pay, cores and logs, 3D seismic, etc. As a result of our assessment, we hope to be implemented in the near future a pilot project.

Keywords: *Transylvanian Basin ,unconventional gas reservoirs, tight gas,Deep Basin Center, prospects*

Śliwa T., Pacewicz M.: **Borehole heat exchangers drilling using a downhole motor and coiled tubing equipment** • AGH Drilling Oil Gas 2012 • Vol. 29 • No. 1

There are the slant drilling method for borehole heat exchangers described in the paper. Using coiled tubing and mud motor there is possible drilling the wells at any angle from the vertical. This allows you to access the rock mass as a heat reservoir at the facilities of urban infrastructure.

Keywords: *directional drilling, geothermal energy, geoenergetics, coiled tubing*

Twardowski K., Drożdżak R.: **Evaluation of the effect of filtering water mineralization on measured permeability of ground media** • AGH Drilling Oil Gas 2012 • Vol. 29 • No. 1

A universal method for quantitative evaluation of the influence of changing mineralization of filtration water on ground permeability (filtration coefficient) measured in laboratory conditions, has been presented in the paper. This method lies in correcting the results of laboratory analyses of ground permeability. The authors applied a relative standard filtration coefficient defined as a ratio of filtration coefficients determined for arbitrary analyzed water and salt solution and a reference solution 0.01 n $CaSO_4$, evaluated with the use of a statistical regression model accounting for exogenous (predicting) variables, i.e. the chemistry of water expressed as ion strength and the basic petrophysical characteristics of ground represented by their found porosity and effective diameterof grain.

Keywords: *laboratory analyses, weakly permeable ground, water mineralization, double electrical coating, filtration coefficient, statistical modeling*

Winid B.: **Possibilities of using chloride-bromide ratio in the identification of fracturing fluids contamination water** • AGH Drilling Oil Gas 2012 • Vol. 29 • No. 1

The impact of the hydraulic fracturing process on the water environment is one of the problems considered in the discussion on the exploiation of shale gas. In the absence of experience in this field we refer to the work and proposals for countries that already take these actions. The paper analyzes the possibility of using chloride-bromide ratio (the equilibrium ratio of chloride and bromide ion content) to assess the state of the environment in terms of contamination by hydraulic fracturing fluids. Attention was drawn to the possibility of other pollution sources, which may result in a similar range of values of this index. As well a small amount of data on the value of this ratio in the waters of an active exchange zone in the area of Poland.

Keywords: *chloride-bromide ratio, contaminated water, saline water*

Włodek T.: **Selected aspects of carbon dioxide pipeline transportation** • AGH Drilling Oil Gas 2012 • Vol. 29 • No. 1

The most of world energy industry is based on coal. Energy production from coal can significantly contribute to climate change known as global warming because carbon dioxide generated during combustion of coal or hydrocarbons is counted among the so-called greenhouse gases. International agreements increasingly dictate or at least

provide direction for reducing carbon dioxide emissions into the atmosphere, so in many countries in many areas (mainly in power) new technologies are developed to achieve the intended target of carbon dioxide emission reduction (Carbon Capture and Storage). The paper presents the stage of transportation from the place of carbon dioxide capture to the place of storage. Technically, it is possible to transport carbon dioxide as liquid or as a supercritical fluid. In both cases, the key factor is to keep high pressure of transported carbon dioxide (above the critical pressure of 7.38 MPa). Additionally in the case of the supercritical fluid, it is essential to maintain the temperature over the entire length of the pipeline above the critical temperature, ie 31.1 degrees Celsius (88 degrees F.). Maintaining high temperature creates technical difficulties and consumes large amounts of energy, so the transport process becomes unprofitable, in this case also a special thermal insulation of the pipeline is required. An additional advantage of the transport of carbon dioxide as liquid is low pipe friction, so it is possible to transport carbon dioxide over long distances. This paper will present the basic design requirements of CO_2 pipeline transport, such as: route selection, selection and determining of pipe diameter, material requirements and concepts of technological systems. The results of the simulation flow of carbon dioxide are presented in this paper for some different cases: constant mass flow rate, constant pipe diameter, changing the composition of the CO_2 stream, the analysis of temperature changes of transported carbon dioxide.

Keywords: *carbon dioxide, pipeline, CO_2 transportation, CCS*

Wojnarowski P., Stopa J.: **New possibilities of hydraulic fracturing simulation** • AGH Drilling Oil Gas 2012 • Vol. 29 • No. 1

The aim of work is analysis of world tendency in hydraulic fracturing modeling in different geological conditions including unconventional resources. The GOHFER and Meyer Fracturing software were analyzed. Hydraulic fracturing simulations for shale gas reservoir were performed for analysis of software capabilities.

Keywords: *numerical simulation, hydraulic fracturing*