SUMMARIES

Mirosław Rzyczniak: **The equivalent and the substitute outside diameters of the spiral drill collars** • Drilling Oil and Gas 2011 • Volume 28 • No. 3

In the article, there is the introduction of the theoretical bases of calculating the equivalent and the substitute outside diameters value of spiral drill collars. There is a calculation of the value of the equivalent and the substitute diameters and the length of the spiral parts, for sizes of spiral drill collars being produced.

Keywords: *spiral drill collars, equivalent diameters, substitute diameters, well hydraulic*

Mariusz Łaciak: **Technical and technological problems of exploitation of LNG unloading terminals** • Drilling Oil and Gas 2011 • Volume 28 • No. 3

The required LNG industrial infrastructure consists primarily of liquefaction instalation, loading terminal, methane ships and unloading terminal, in which is making the regasification from liquid to gas phase. The task of unloading LNG terminal is to receive the cargo of liquefied natural gas from methane ship tanks, and then, according to the schedule of operation – to process liquid LNG to the gas phase and at a certain pressure to introduce gas into the transmission system. In the unloading terminal is carried out a few basic operations: unloading, storage, pumping and compression, and regasification of LNG.The discharge of LNG – from the methane ship tanks specially equipped for berthing quays. On the waterfront is installed on the discharge station, equipped with the unloading arms and a system of pipelines to transport LNG. Storage of LNG – usually for a short period of time in specially constructed tanks at cryogenic temperatures. Regasification of LNG – liquefied natural gas is heated in special equipment (vaporizers) and goes into the gas phase at a temperature at the exit of a few degrees. The gas pressure at the outlet from vaporizers is predetermined in correlation to the requirements of the gas system. Regasification at high pressure makes it possible to maintain the process in the supercritical phase, in which heat transfer is better, while avoiding the complications of exploitation. Unloading terminal is connected to the gas network, which is transporting a natural gas after having established the quality parameters supplied to the gas network (possible mixing of gases). No less important are the rules and safety systems used in LNG terminals. The paper presents the technological processes involved in the operation of terminals, from the unloading of LNG in a liquid phase to its reception in the gas phase by the transmission system. The four main operations forming the core production line on which the LNG liquid is subjected to physical changes, but causes no significant changes in its chemical composition and properties were presented. There were also presented the methods used to LNG regasification and technical security issues at terminals.

Keywords: *LNG, liquefied natural gas, unloading terminal, regasification, storage of LNG*

Jerzy Stopa, Paweł Wojnarowski, Paweł Pyrzak: **Prognosis of efficiency of the heavy oil reservoirs exploitation with cyclic steam stimulation method using numerical simulation** • Drilling Oil and Gas 2011 • Volume 28 • No. 3

Heavy oil is a type of petroleum that is different from conventional petroleum insofar as it is much more difficult to recover from the subsurface reservoir. It has a much higher viscosity than conventional petroleum, and recovery of this petroleum type usually requires thermal stimulation of the reservoir.This study presents results of analysis of influence of thermal methods like Steam Assisted Gravity Drainage (SAGD) and Cyclic Steam Stimulation (CSS) in the one of heavy oil fields in Karpaty mountains.Numerical simulation was used for investigation of

thermal EOR influence on recovery. Application of horizontal and vertical wells was analyzed. Variable volume of injected steam and different stages time steps were used.Results of analyses scenarios suggests that quantity of injected steam and length of injection cycles has large influence on oil recovery.

Keywords: *heavy oil, thermal EOR Methods, numerical simulation*

Jerzy Stopa, Paweł Wojnarowski, Piotr Kosowski, Paweł Pyrzak: **Technical and economical considerations of CO_2 sequestration in oil field** • Drilling Oil and Gas 2011 • Volume 28 • No. 3

Geological sequestration of CO_2 generates costs connected with gas separation and injection, which in some situations makes this process unprofitable. Solution in this situation can be connection of this process with enhanced oil recovery. In majority oil fields only small part of oil is produced witch standard methods of exploitation. Experience from developed projects shows that CO_2 injection into partially depleted reservoir can increase oil production making this process cost-effective. In this work technical and economical efficiency analysis of CO_2 injection into Carpathian oil field was presented. Numerical simulation of production was developed. Results of multi variant simulations shows, that CO_2 sequestration increase oil production, but there is no simply correlation between amount of injected gas and production increment. Capacity of typical Polish Carpathian oil fields is not sufficient for power plant emission. For this kind of process more suitable are large reservoirs, which guarantee stable injection during power plant lifecycle.

Keywords: *oil field, geological sequestration of CO_2, EOR methods, numerical simulation, economical analysis*

Maciej Kaliski, Zdzisław Jedynak, Piotr Janusz, Adam Szurlej: **Polish energy resources – threat or opportunity?** • Drilling Oil and Gas 2011 • Volume 28 • No. 3

Energy is a key factor influencing the level and quality of human life; in an indirect way it meets the basic and further everyday needs. Utilized both in industrial processes, it is associated with the production of material goods or services, and commonly found in households. In Poland, the fuel and energy sector is facing serious problems that require immediate action. Coal have a fundamental importance in the national structure of primary energy consumption. There exists a significant dependence on imported natural gas and almost full dependence on crude oil. The level of productive and transport infrastructure for fuels and energy are inadequate to the reported needs. However, the adopted international climate commitments are not reflected in internal capabilities. At the same time, there are numerous socio-economic problems in the country. This issue prompted the authors to formulate the question: Are Polish energy resources an opportunity or a threat?

Keywords: *primary energy, non-renewable energy, renewable energy, Poland, fuel and energy economy*

Tomasz Śliwa, Andrzej Gonet: **Heat transfer efficiency analysis in different constructions of borehole heat exchangers** • Drilling Oil and Gas 2011 • Volume 28 • No. 3

There are described in the paper drillling of borehole heat exchangers (BHE) on the world and in Poland. The most popular constructions of BHE are described with possibility of heat extraction. There are also showed results of calculation of effective heat transfer coefficient of the Laboratory of Geoenergetics of Drilling, Oil and Gas Faculty of AGH University of Science and Technology BHEs with its heat resistivity. This parameters decided for energetic efficiency of the BHEs.

Keywords: *borehole heat exchangers, geoenergetics, heat pumps, geothermal*

Tomasz Śliwa, Mirosław Sowa, Stanisław Stryczek, Andrzej Gonet, Albert Złotkowski, Aneta Sapińska-Śliwa, Dariusz Knez: **The study of hardened cement slurries with addition of graphite** • Drilling Oil and Gas 2011 • Volume 28 • No. 3

High conductivity of borehole plugging is advantageous for borehole heat exchangers. There is described in the paper results of laboratory tests of hardened cement grout with graphite. Graphite causes concrete to happen growing heat conductivity.

Keywords: *borehole heat exchangers, borehole sealing, cement grout*

Tomasz Śliwa, Andrzej Gonet: **The biggest Polish heating/cooling installation based on borehole heat exchangers** • Drilling Oil and Gas 2011 • Volume 28 • No. 3

The heating/cooling systems based on borehole heat exchangers become increasingly popular in Poland. A number of boreholes are drilled for separate installations in estates of detached houses or blocks of flats. The biggest such single installation in Poland supplied by a set of pipes in the rock mass was made for IKEA in Łódź in 2009. It has been based on 160 boreholes 100 m deep each, forming a heat/cold reservoir. Heat taken from the rock mass in winter cools the reservoir, thus forming a reservoir of cold for the summer months. Providing cold to the receiving installation in summer lies in introducing heat to the rock mass to be later used for heating purposes in the winter season. The number of borehole heat exchangers depends on the required heat exchange power between the rock mass and the receiving installation, as well as the properties of the borehole heat exchangers and the rock mass involved. For determining the needed number of borehole heat exchangers it is necessary to know the efficiency of heat conductance of the profile λ_{ef}, thermal resistance of the borehole R_b and natural average annual static temperature of the rock mass involved T_{sr}. These parameters can be established after a heat exchanger is performed and thermal reaction test (TRT) carried out in it.

Keywords: *geoenergetics, borehole heat exchangers, heat pumps*

Marcin Kremieniewski, Stanisław Stryczek: **Cement slurries resistant to the gas migration process** • Drilling Oil and Gas 2011 • Volume 28 • No. 3

The article presents the research results of cement slurries resistant to the gas migration process during the bonding of the slurries in wellbore conditions (HTHP). The research was done on slurries with density range 1.48–1.84 g/cm^3, the temperature range was 25–80 ^{o}C and the pressure range was 3–42 MPa depending on the conditions. The research was carried out on the specially constructed device. It enables the observation of the gas migration through the slurry in simulated wellbore conditions. The research results were than correlated with the slurry's setting time. Both new and previously used additives that prevent gas migration through the bonding slurry were added during the research.

Keywords: *gas migration, cement slurry, gas, wellbore conditions, deposit fluids, setting time, microsphere*

Stanisław Dubiel: **Halliburton drill stem testers of Ful-Flo type for oil prospecting** • Drilling Oil and Gas 2011 • Volume 28 • No. 3

The technical and technological applicability of Halliburton drill stem testers of Ful-Flo type for oil prospecting has been analyzed in the paper. The technical characteristic of the device and principle of assembling the set up are given in view of the planned technological testing solutions. An exemplary industrial application of a DST Ful-Flo type in a well L-7 has been used for testing the Devonian strata in the Western Carpathians.

Keywords: *oil prospecting; testing techniques and technology, DST of Ful-Flo type, Devonian, Western Carpathians*

Maciej Stec, Andrzej Goc, Patrycja Wojtasiak, Zbigniew Obuch: **Preparing and application of formate based mud system while drilling-in of the K-88 well** • Drilling Oil and Gas 2011 • Volume 28 • No. 3

This article reports the application of formate based drilling mud system while drilling-in through the main dolomite layers of the K-88 well. Paper exhibits the changing tendency of some mud parameters while drilling in progress. The crack was taken to conduct the lab researches on the mud conditioned in 130 ^{o}C. All the results are given in the table and on the charts. The paper also describes the advantages and supremacy of formate based mud system.

Keywords: *drilling mud, formate based mud system, sodium formate, potassium formate, cesium formate, application of formate based mud system*