

## SUMMARIES

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Leszek Pająk, Andrzej Gonet, Tomasz Śliwa, Dariusz Knez: **Analysis of energy production possibilities from liquid propane storage in salt domes cavities** • Drilling Oil and Gas 2010 • Volume 27 • No. 4

Paper presents fluids storage problems in cavities made in salt domes. Using heat from salt domes is future concept. This work raise a problem of combination propane storage and heat extraction. There are analyzed possibilities of using storage cavities with liquid propane to heating and air conditioning systems. Paper discuss usability of electric energy production in analyzed case.

*Keywords: salt domes, cavity, fuels storage, waste heat*

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Ryszard Drożdżak: **Comparative analysis of selected laboratory methods of assessing filtration coefficients in cohesive ground** • Drilling Oil and Gas 2010 • Volume 27 • No. 4

Archival results of laboratory analyses of filtration coefficient in cohesive ground made in 1997 at the Department of Engineer Geology, Institute of Engineering Geology, University of Warsaw, Poland were re – interpreted in the paper. Over 200 independent measurements were made, e.g. with the use of six different types of cohesive ground. The re – interpretation was aimed at statistical analysis of the results, accounting for the present metrological standards, e.g. verification of dubious results and interval evaluation of final results with the uncertainty coefficient calculated. Various laboratory methods of analyzing the filtration coefficient for cohesive grounds are based on different physical assumptions and employ different input parameters, therefore it can be expected that the assumed methods and conditions of analyses will have significant influence on the obtained results. This problem is addressed in the paper.

*Keywords: filtration coefficient, laboratory analytical methods, cohesive ground, statistical analysis, measurement error*

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Kazimierz Twardowski, Ryszard Drożdżak: **Analysis of correctness of selected analytical formulae for ground filtration coefficient** • Drilling Oil and Gas 2010 • Volume 27 • No. 4

Results of comparative analyses of correctness of selected analytical formulae for prognosed ground filtration coefficient are presented in the paper. Analyses were made with the use of three model grounds, different as far as their petrophysical properties are concerned. They represented different grounds: sand, sandy clay and silt (according to geotechnical standards) of very different filtration properties ( $10^{-4}$  to ca.  $10^{-8}$  m/s). Qualitative analyses were based on current measurement standards. The analyses are closed with practical recommendations on the correctness of specific analyzed empirical formulae in view of various types of the ground.

*Keywords: filtration coefficient, petrophysical models, statistical analysis*

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Czesław Rybicki, Jacek Blicharski: **Storage capacity of depleted gas reservoirs for carbon dioxide sequestration – material balance approach** • Drilling Oil and Gas 2010 • Volume 27 • No. 4

In order to prevent CO<sub>2</sub> concentrations in the atmosphere rising to unacceptable levels, carbon dioxide can be separated from the flue gas, for example from a power plants and subsequently sequestered. Different technologies for carbon dioxide sequestration can be proposed. They are:

- storage in depleted gas reservoirs,
- storage in oceans and aquifers,
- sequestration CO<sub>2</sub> by means of so-called “mineral CO<sub>2</sub> sequestration”.

A depleted gas reservoir represents an attractive target for carbon sequestration for several reasons. It contains a geological trap, transport and injection infrastructure. Moreover CO<sub>2</sub> injection can be thought as enhance gas production either by re-pressurization or pressure maintenance. The purpose of this paper is to evaluate storage capacity of carbon dioxide in a depleted gas reservoir in relation to the recovery factor of hydrocarbons. A material balance equation for CO<sub>2</sub> sequestration proposed by Lawal and Frailey (Lawal, Frailey, 2004) was modified to predict a CO<sub>2</sub> sequestration volumes. On the basis of derived material balance equation there were made calculations for a chosen natural gas reservoir

**Keywords:** carbon dioxide, sequestration methods, material balance, gas reservoirs

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**Mariusz Łaciak, Stanisław Nagy: Problems of technical safeties and characteristic of threat related with LNG terminal • Drilling Oil and Gas 2010 • Volume 27 • No. 4**

LNG (Liquefied Natural Gas) has been produced, transported and used safely in the worldwide for roughly 40 years. The LNG industry has an excellent safety record. Safety in the LNG industry is ensured by four elements that provide multiple layers of protection both for the safety of LNG industry workers and the safety of communities that surround LNG facilities. Primary Containment is the first and most important requirement for containing the LNG product. This first layer of protection involves the use of appropriate materials for LNG facilities as well as proper engineering design of all types of storage tanks. Secondary containment ensures that if leaks or spills occur at the onshore LNG facility, the LNG can be fully contained and isolated from the public. Safeguard systems offers a third layer of protection. The goal is to minimize the frequency and size of LNG releases both onshore and offshore and prevent harm from potential associated hazards, such as fire. For this level of safety protection, LNG operations use technologies such as high level alarms and multiple back-up safety systems, which include Emergency Shutdown (ESD) systems. ESD systems can identify problems and shut off operations in the event certain specified fault conditions or equipment failures occur, and which are designed to prevent or limit significantly the amount of LNG and LNG vapor that could be released. Fire and gas detection and fire fighting systems all combine to limit effects if there is a release. The LNG facility or ship operator then takes action by establishing necessary operating procedures, training, emergency response systems and regular maintenance to protect people, property and the environment from any release. Finally, LNG facility designs are required by regulation to maintain separation distances to separate land-based facilities from communities and other public areas. Safety zones are also required around LNG ships. There is a very low probability of release of LNG during normal industry operations due to the safety systems that are in place. LNG operations are industrial activities, but safety and security designs and protocols help to minimize even the most common kinds of industrial and occupational incidents that might be expected. Our review of the LNG industry safety and technological record, engineering design and operating systems and the standards and regulations that governing the design, operation and location of LNG facilities indicates that LNG can be safely transported and used all over the world so long as safety and security standards and protocols developed by the industry are maintained and implemented with regulatory supervision.

**Keywords:** LNG, Liquefied Natural Gas, safety systems, vaporization

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**Stanisław Stryczek, Rafał Wiśniowski, Andrzej Gonet, Albert Złotkowski: Influence type of cement used in drilling technology on slurry rheological properties terminal • Drilling Oil and Gas 2010 • Volume 27 • No. 4**

Right and optimality design hydraulic of flow cement slurry has influence on good grouting drill casing in well-bore. For this purpose is necessary definite rheological parameter cement slurry and checking in rheological fluid model, which best represented characteristic this composition. Type of used cement and quantity water of concrete mix effected on physic-chemical property and command for each case water-cement ratio rheological model and his mathematic parameter. In paper presentation result laboratory studies measurement rheological parameter four popular used cement in technology of drill casing grouting and command for each rheological model and mathematic value for him.

**Keywords:** rheological parameters, rheological models, drill casing grouting, cement slurry

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Mirosław Rzyczniak, Aleksandra Felisiak: **The mikropales injection technology in use of strengthening Cracows old buildings foundations** • Drilling Oil and Gas 2010 • Volume 27 • No. 4

In article was described two examples of using injection pales technology to strengthening foundations of old buildings in Cracow. Works executed by KROZ company. First example concerns new investment on Kopernika street. The investment has caused the necessity for strengthening foundations of the existing nearby building. In the second example was described the strengthening of building foundations situated over the block channel on Floriańska street.

*Keywords: The mikropales injection, strengthening foundations*

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Paweł Pollok, Sławomir Wysocki: **Application of zinc acetate in drilling mud for clays and shales with new PT-51 and PT-52 polymers addition – lab research** • Drilling Oil and Gas 2010 • Volume 27 • No. 4

In this paper results of laboratory research of zinc acetate application in drilling mud for clay and shales were shown. In tested mud new polymers PT-51 and PT-52 are present. Influence of composed mud onto clay minerals' swelling were shown as well.

*Keywords: drilling mud, zinc acetate*

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Sławomir Wysocki: **Floculation of bentonite suspensions and salted drilling mud with new cationic flocculants (PT-floc-201107)** • Drilling Oil and Gas 2010 • Volume 27 • No. 4

The paper presents the results of lab tests on new synthetic cationic flocculants PT-floc-201107 which are used to reduce volume of bentonite suspensions and salted drilling mud. The optical method was used to investigate the mud floculation process and moving time of the phase separation boundary. The lab tests indicated that the PT-floc-201107 polymers are suitable for phase separation of drilling mud and aqueous suspensions of silty minerals which are rather difficult to separate

*Keywords: flocculation, cationic flocculants, separation*

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Katarzyna Czwarnowska, Sławomir Wysocki: **Non-bentonite poliampholytic-starch mud with PT-61 polymer for drilling in clays and shales** • Drilling Oil and Gas 2010 • Volume 27 • No. 4

In this paper research of new non-bentonite drilling mud for drilling in clays and shales were presented. Polyampholytic-starch mud with PT-61 polymer was composed. Research of technological parameters, disintegration test and its resistivity for divalent ions contamination and temperature influence were conducted. Test results show that composed mud can be use in industry.

*Keywords: drilling mud, polyampholytes*

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Andrzej Gonet, Tomasz Śliwa, Zbigniew Jezuit, Aneta Sapińska-Śliwa, Dariusz Knez: **Conception of oil wells utilization in Carpathians** • Drilling Oil and Gas 2010 • Volume 27 • No. 4

Paper describes idea of exploited wells utilization which are assigned for abandonment. Wells can be used as a low temperature sources of the geothermal heat. There are described abandonment methods and adaptation to borehole heat exchangers ways. The essence of borehole heat exchangers work was described. There is described example of Libusza-Lipinki field, where 650 wellbores were drilled.

*Keywords: geothermal energy, borehole heat exchangers, wellbore abandonment*

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Paweł Wojnarowski: **Hydrocarbons reserves estimation for fields in early stage of development with application of interval analysis** • Drilling Oil and Gas 2010 • Volume 27 • No. 4

Reliable prediction of the hydrocarbon reserves is essential for the optimization of development plans for oil and gas reservoirs. The uncertainty of the in-place volumes determination may have a direct impact on important economical decisions. In the early exploration phase, when 1 to 2 exploration wells have been drilled, we have usually limited information about reservoir's properties and main difficulty in reservoir description is use of classical tools for reservoir analysis. In this work application of interval analysis for reserves estimation with volumetric method is presented. This method allows to estimate reserves also in case of lack of data. Results obtained from presented methodology were compared with Monte Carlo simulation results. Advantages and limitations of those two methods were discussed.

**Keywords:** *interval analysis, Monte Carlo Simulation, reserves estimation*

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