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UPDATING OF DRILL-BIT CUTTING STRUCTURES OF ROLL DRILLING TOOLS TO MINIMIZE RACK FORMATION (p. 4)

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The results of work aimed at updating the design of drill-bit cutting structures of roll drilling tools to minimize rack formation effect are presented in the paper. The main causes of rack formation effect while drilling are determined. Presented several options of drill-bit cutting structures of peripheral and top tips of roll drill-bits, providing effective prevention of well bottom rack occurrence are discussed. The principal schematic diagram of three-roll cutter drilling bits simultaneously equipped by peripheral teeth and disc tips, as well as various options for their manufacture, allowing to increase efficiency of drilling tools work due to reducing energy consumption during rock destruction and prevention of well bottom rack occurrence are developed.

All presented options of designs of drill-bit cutting structures of roll drilling tools weapons cutters drilling tools as well as their various versions of manufacture allow raising drilling and mechanical drilling thanks to more perfect geometry of their drill-bit cutting structures, thus reducing the self-cost of drilling.

Key words: rolling cutter drilling bit; geometry of drill-bit cutting structures; well bottom rack.

DIFFERENTIAL SUCKER-ROD PUMP FOR DIRECTIONAL AND HORIZONTAL WELLS (p. 8)

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At present many oil companies expect to compensate oil production decline caused by decrease of old wells flow-rate by means of sidetracking, directional and horizontal wells. That's why the need for development and usage of high-performance pumping systems for these purposes is an obvious fact. Sucker-rod pumps with mechanical seals of the piston or the plunger, developed by "Ekogermet-M, Ltd." Company, meet the requirements for pumps most of all. The first differential sucker-rod pump of 2SPNL45/24 type was developed for horizontal wells and introduced at a well of Kadyrov field of "Prikamneft" Oil and Gas Production Department. Oil production at the well was increased more than three times, from 4,3 up to 13 m³/day. Fold increase of the well flow-rate was achieved due to the fact that the pump was lowered directly into the oil formation and design of standard differential pump was appropriately revised.

Key words: oil; production; differential sucker-rod pump; mechanical seal; horizontal well; well flow-rate.

POSSIBLE USAGE OF VORTEX SEPARATING EJECTOR WHILE GAS GATHERING AND SEPARATION (p. 11)

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Development of gascondensate fields accompanied by the gas-liquid flows formation in the gas gathering and preparing to transport system at different pressures. Lack of utilization of low-pressure gas flow leads to the loss of light hydrocarbons that are burned in flares.

To increase the pressure of low-pressure gas flow requires the construction of a compressor station, which is not acceptable because of the cost. Application throttling device to unite gas flows high and low pressure leads to a significant loss of energy flow of high-pressure gas.

In view of the above aspects new construction of vortical and separation ejector is proposed. Its construction and operation principle are considered. The possibility of implementing at the same time the ejection and low-temperature gas separation processes are shown. The advantages of the ejector are described.

Key words: pressure; temperature; rate; jet nozzle; adiabatic expansion; flow; energy; vortex flow.

MODERN DRILLING RIGS OF PG "GENERATION" COMPANY AS A KEY TO ECONOMIC EFFICIENCY (p. 14)

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At the end of 2011 PG "Generation" presented some innovative project, namely, "UBK 320 MKS-Ch" completed drilling rig at the drilling equipment market. Today the drilling rig is fully ready for operation. This is world class equipment with no analogues in Russia.

Key words: drilling equipment; modernization; innovative drilling rig; reducing the risk and cost; the world level equipment.

EFFECTIVE REGENERATED ABSORBENT OF CARBON DIOXIDE BASED ON WATER SOLUTION OF AMINO ACID SALT (p. 20)

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Experimental data of a liquid absorbent based on potassium salt of a lysine for absorption of carbon dioxide from an air stream are given. Indicators of efficiency of potassium lysinate solution are compared with mono-ethanolamine solution used in the industry. It is shown that absorption effective level in a case potassium lysinate is 30 % higher than in case of usage of mo-

no-ethanolamine solution. Nuclear magnetic resonances ranges of the solutions indicating formation of various carbamates, being formed as a result of carbon dioxide absorption by potassium lysinate solution are submitted. Data on stability of the installation work are provided. Basic possibility of the absorbent use for carbon dioxide absorption in industrial processes is shown.

Key words: carbon dioxide; lysine; absorption; properties.

DISPERSION INFLUENCE OF NON-INTERACTING COMPONENTS ON COMPOSITION MATERIAL CHARACTERISTICS (p. 28)

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The paper the example of Copper-graphitic composition is taken as an example for consideration in the present paper of the results of researches carried out to develop some powder material, components of which do not interact with each other. Some regularities of the material characteristics dependence on components dispersion and their ratio are identified.

Key words: copper-graphitic composition; components dispersion and their ratio; copper plating graphite; copper + copper-graphitic composition.

OXYGENE-CONTAINING ORGANIC COMPONENTS OF INDUSTRIAL OILS (p. 31)

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Molecular composition of "I-20A" and "I-40A" industrial oils, produced by different companies, is studied by means of application of chromatography-mass-spectrometry method. About 100 toxic oxygen-containing compounds, including phenols and their derivatives, in the amount of 0,12...0,40 µg/g were identified in them. It is proved that lack of naphthenic acids is a specific feature of the researched industrial oil parties. It is shown that molecular composition of oils of each brand, produced by different companies, varies greatly. Some measures providing protection of the environment from the detected compounds are proposed.

Key words: industrial oil; oil coolants; oxygen-containing organic compounds; environmental protection.

QUALITATIVE COMPLETION AND DEVELOPMENT OF WELLS DRILLED IN ABNORMALLY-LOW-PRESSURE CARBONATE RESERVOIRS: CHALLENGES AND SOLUTIONS (p. 36)

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The paper is devoted to integrated solution of the problem that appear while well completion. Some modified methodological approach to development of wells, drilled in carbonate reservoirs with abnormally low formation pressures (ALFP), is offered. The methodology includes sequential use of qualitative compositional compounds on hydrocarbon and acid basis at the stages of formations secondary opening, well killing and oil inflow stimulation. Basic methodological pattern of the technique implementation includes displacement of well fluid in the bottomhole zone by some special perforation liquid, creation of perforation channels in perforation liquid media (preserving or even increasing reservoir properties in the near-bottomhole zone), test injection of hydrocarbon-based technological fluid in the near-bottomhole zone, design of selective acid treatment with individually-selected acid compositions with calculated volumes and injected rates into formations, damage-minimizing well development.

Key words: stimulation fluids; fluids for casing perforation; multicomponent acid systems for well stimulation following casing perforation.

DEVELOPMENT OF SOME NEW METHOD OF WELLS INVESTIGATION WORKING UNDER NON-STEADY FLOW (p. 38)

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The literary sources analysis, conducted in the research, showed that a number of investigations are devoted to salvation of the problem of pressure recovery curve while a formation hydrodynamic probing in case of its permanent porosity. The investigations are focused on non-stationary solution of Darcy's deterministic equation for an everlasting formation or on the

methods of empiric or partly empiric modeling for statistically medium formations. Such assessment of the main hydrodynamic characteristics of an oil formation leads to great statistical mistakes due to unconventional approximation of symptom-free part of pressure recovery curve.

The performed research suggests some new calculation method of oil formation hydrodynamic parameters that takes into account all the information relating to pressure recovery curve, a new method of hydrodynamic parameters of oil reservoir has been offered in this investigation. Unlike the existing methods, some new model of pressure dependence on time, adequately describing all pressure recovery curve in case of a closed well and allowing complete assessment of formation hydrodynamic parameters is proposed.

Key words: oil formation; well; pressure recovery curve; hydraulic conductivity; dynamic viscosity.

SOME TECHNIQUE OF MAINTAINING OPERATIONAL VOLUME OF VERTICAL STEEL TANKS (p. 43)

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The legislative base of the Russian Federation operating in the field of operation of tanks and tank parks is considered, and consecutive stages of technological process of cleaning of vertical steel tanks from oil bottom sediments are presented. The paper describes shortcomings of existing most widespread electromechanical mixers when using a hydraulic method of removal and prevention of formation of bottom sediments in tanks with oil and oil products. Some new design of the system of funneled washout and prevention of bottom sediments formation is proposed with the aim of raising efficiency, reliability and reduction of electric power consumption during the process of washout of oil bottom sediments in vertical stock tanks.

Key words: bottom sediments cleanup; washout of oil bottom sediments; oil products storage in tanks.

MATHEMATICAL MODELLING OF SEWAGE CLEANING PROCESS FROM ORGANIC SOLVENTS IN SPRAYING EXTRACTION COLUMN (p. 47)

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At present cleaning process of sewage from organic solvents is carried out by mechanical, physical-chemical, chemical and biological methods of cleaning. It should be mentioned that these methods have some disadvantages. For the first time the author of the present article performed cleaning of sewage by using spraying extractor that has a number of advantages as compared with previously used ones. The paper presents sewage composition, principle scheme of flows in the apparatus. It also defines mole volumes of components necessary for calculation of molecular diffusion coefficients. The paper proposes op-

timal parameters of the process to be conducted as well as it justifies consumptions of continuous and disperse phases. The results of research works on sewage cleaning, left by lacquer production, from phenylisopropanol and acetic acid are presented. Some mathematical model of the process is proposed, specific surface of the contact surface, the distance among the extractor cells, coefficients of mass output and mass transfer of the components in the phases are determined, concentrations of the components in the opposite phases and the height of the apparatus are calculated.

Key words: cleaning; extraction; extractor; refined oil; extract; phase; phenylisopropanol; acetic acid; cell model; coefficient; mass output; mass transfer.

COMBINATION UNIT TO BE USED FOR FIRE EXTINGUISHING OF OIL IN VERTICAL STEEL TANKS OF LARGE CAPACITY AND THEIR EMBANKMENT (p. 52)

The RF patent of utility model.

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The useful model belongs to the facilities of storage and fire extinguishing of oil. The unit provides simultaneous supply of both foam to the upper layer of oil, to the tank roof, to the embankment and a mixture of carbon dioxide with the extinguishing powder composition into the upper part of the tank. The useful model includes module for gas storage, reservoir with powder composition, gas pipeline, foam pipeline connected with floating plate with the help of metal hose, equipped by distribution system and foam supplying nozzles, as well as stationary foam lifting device.

Key words: oil; reservoir; extinguishing; floating plate; module for gas storage; reservoir with powder composition; gas pipeline; foam pipeline; foam lifting device; embankment.

SOME DEVICE TO BE USED FOR LEAKAGE DIAGNOSIS BY MEANS OF SPECIAL PLATES FROM THE BOTTOM OF A GROUND VERTICAL TANK FOR OIL PRODUCTS STORAGE WITH USE SPECIAL METAL PLATES (p. 57)

The RF patent of utility model.

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The utility model belongs to the devices of petroleum products storage and can be used while receiving, storing and deliv-

ering of fuel from tanks. The stationary device provides diagnosing of fuel leakage out of a tank bottom without its release of oil products. The device's operation is based on ground resistance change in case of the ground contact with oil products.

The utility model involves special metal plates, communications lines, electronic switch, ohmmeter and personal computer.

Key words: tank; bottom; ground; special metal plates; communications lines; electronic switch; ohmmeter; resistance; personal computer; leakage of oil products.

LOW-VOLTAGE DIRECT-ACTION HEATERS OF NATURAL GAS (p. 60)

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The article considers the basic techniques of hydrate formation reduction in main gas pipelines. It is noted that among the existing techniques applied for hydrate formation prevention gas heating before its reduction appears the most effective and the least expensive one. The existing designs of natural gas heaters, used at gas distributional stations before reduction are discussed. It is shown that the existing designs of natural gas heaters have a number of serious drawbacks, including high anthropogenic impacts on the environment, complexity of heating level controlling in case of natural gas flow-rates pulsations. Some alternative designs of natural gas heaters that use direct electrical heating from the 12 volts network are offered. The proposed designs of natural gas heaters are characterized by high efficiency coefficient, they are easy in heating control and industrially and ecologically safe. Calculation methodology is submitted for the proposed natural gas heaters.

Key words: gas pipeline; gas distributional station; hydrates; heater.