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Information on the articles

THE 60th ANNIVERSARY SINCE THE DISCOVERY OF THE WEST SIBERIAN OIL AND GAS BEARING PROVINCE

Gennady Iosifovich Shmal

Union of Oil and Gas Industrialists

9, Degtyarny pereulok, 125009, Moscow, Russian Federation.
Phone: 8 (495) 411-70-87.
E-mail: Shmal.oil@mail.ru

The article is dedicated to the 60th anniversary since the discovery of the West Siberian oil and gas bearing province. The history of discovery and development of oil and gas fields possessing unique oil and gas reserves that provided creation of powerful raw hydrocarbons base, industrial, scientific, technical and employees potential is described in brief.

Development of such oil and gas fields is connected with difficulties overcoming of which could have been possible thanks to selfless work and experience of specialists engaged in all branches of the industry. The role and merits of discoverers, organizers, senior managers, scientists as well as Komsomol-youth teams in creation of a big national economic complex are stressed. Problems, which arise in development of the West Siberian complex at the contemporary stage as well as all possible ways of their solution are shown.

Key words: the West Siberian oil and gas complex; raw hydrocarbons base; efficiency; production; construction; personnel potential.

STRUCTURAL AND KINEMATIC SYNTHESIS OF NEW MECHANISM OF ON-LAND DRIVE OF SUCKER-ROD PLUNGER PUMP USED FOR OIL PRODUCTION

**Bauyrzhan Akimzhanovich Bilashev,
Kairbek Aitzhanovich Ikhsanov,
Sairanbek Makhsutovich Akhmetov,**

West Kazakhstan Engineering and Humanitarian University – WKEHU

208, Dostyk prosp., 090000, Uralsk, Republic of Kazakhstan.
Phone/fax: 8 (7112) 54-27-17.
E-mail: bilashev@mail.ru, ikhsanov_k@mail.ru, axmetov_aing@mail.ru;

Nurken Makhsutovich Akhmetov

Atyrau Institute of Oil and Gas – AING

1, Azattyk prosp., 060002, Atyrau, Republic of Kazakhstan.
Phone/fax: (7122) 36-54-09.
E-mail: Ahmetov_n.m@mail.ru

Possibility of use of the 3d class six-link mechanism as on-land drive of plunger pumps for oil extraction is considered. To solve the problem the author of the present article suggests to carry out structural and kinematic synthesis of the mechanism and gives some technique of its implementation. This served the basis for scientific justification of some new technical solution, which allows applying of such mechanisms in pumps drives.

Key words: sucker-rod plunger pumps; on-land drive; mechanism; driving group; rigid contour.

SOME SPECIFIC FEATURES OF DYNAMIC INTERACTION OF A ROD STRING AND A BEAM-PUMPING UNIT AS A SINGLE-ROW CRANK MECHANISM

Igor Eugenievich Ishemguzhin

Ufa State Oil Technical University (UGNTU)

1, Kosmonavtov str., 450062, Ufa, Republic of Bashkortostan, Russian Federation.
Phone: 8 (3472) 43-15-73; факс: (3472) 60-57-31.
E-mail: ishemguzhin@yandex.ru

The existing designs of beam-pumping units do not provide balancing of inertia forces by crank counterweights. Complex kinematic schemes of balancing of the second order inertia forces are not widely spread. Dispersion of inertia forces and change of resistance forces, when moving of a rod string, increase dynamic loads on a beam-pumping unit. Such phenomena are observed in complex-profile wells, when significant axial forces and pressing forces at the tubing contact points and rods can cause dry friction. The same phenomenon can be observed in case of presence of a large number of solids at contact points and when pumping of viscous oil. Sharp disagreement between horsehead and rod string movements is observed, impact loads leading to a beam-pumping unit deformation and rod strings increased failures are quite possible. Non-damaging operational modes are recommended for directional wells of complicated profile.

Key words: beam-pumping unit; rod string; crank mechanism; reducer; inertial forces of the second order; friction fluctuations; relaxation oscillations.

USAGE OF STRING AND CAPACITANCE APPARATUS AS OIL AND GAS DISCHARGE SCRUBBER

Leonid Markovich Milshtein

E-mail: mleonmark@gmail.com

The article is devoted to updating parameters of oil and gas discharge scrubbers. String separators at the final stage of separation can work on gravitational and string modes. In case of transition from gravitational mode to a string one, liquid specific carry-over by gas decreases from 2 to 0,1 mzh³/nmg³. Transition to a string mode takes place in case of achieving gas velocity factor of 5 nmg/sec near a string mist separator. Less expensive capacitive device should be used at the final stage and at sufficiently low flow rate of gas when it is possible to provide gas factor velocity of 0,2 nmg/sec in a gas (gravity) zone of liquid fall in a separator.

Key words: updating; parameter; discharge scrubber; string mode; gravitational mode; carry-over; liquid; factor, velocity, gas; zone.

SAFETY OF OIL AND GAS EQUIPMENT: STRESSED-DEFORMED STATE OF RUBBER-CORD CASINGS OF ELASTIC COUPLINGS

Alexey Petrovich Evdokimov

I. Gubkin Russian State University of Oil and Gas, Chair of Technical Mechanics

65, Leninsky prosp., 119991, Moscow, Russian Federation.
E-mail: a_evdo@mail.ru

The paper presents results of computing of stressed-deformed state of rubber-cord casing by means of applying ANSYS software. The most stressed sectors of rubber-cord casing are revealed. Computing results are proved by experiments.

Key words: safety; oil and gas equipment; elastic casings; emergency situations; computing experiment.

ANALYSIS OF STRUCTURES OF DRILL-BIT ROLLER CUTTERS WITH HELICAL CUTTING EQUIPMENT

**Dmitry Yurievich Serikov,
Vitaly Anatolievich Yasashin**

I. Gubkin Russian State University of Oil and Gas
65, Leninsky prosp., 119991, Moscow, Russian Federation.
Phone/fax: (915) 372-77-79.
E-mail: serrico@rambler.ru

The analysis of existing designs of drill-bit roller cutters with helical cutting devices is performed. The operational principles of the most interesting design solutions are described. The advantages of previously developed helical gear devices as compared with the standard spur-type equipment of drill-bit roller cutters are substantiated. Some disadvantages of both the designs and manufacturing technologies of the existing drilling tools with helical devices are identified. The most rational technical solutions used in the design of cone drill-bit roller cutters with helical devices that allow improving of drilling tools reliability as well as effective influencing on drilling basic parameters are determined. The analysis of designs of the most illustrative specimen of drill-bit roller cutters with helical devices, conducted in the paper, allowed making the conclusion that usage of this type of the equipment is highly prospective, but at present there exists no structures, maximally revealing the potential of this type of the equipment.

Key words: drill bit roller cutter; helical equipment; drilling tools.

ALTERNATIVE LUBRICATING-COOLING MATERIALS ON VEGETABLE OIL BASIS

**Yury Vasilievich Golubkov,
Natalia Vadimovna Ermolaeva,
Maria Sergeevna Moguseva**

"STANKIN" State Technological University
3A, Vadkovsky pereulok, 127994, Moscow, Russian Federation.
Phone: 8 (499) 973-30-66.
E-mail: ermolaeva_n_v@mail.ru

Chromatography-mass-spectrometry method was applied for studying molecular composition of "Sloboda"-brand sunflower oil. Nontoxic oxygen-containing substances were found in it in the amount of 1...6 µg/g. Crown-ethers (crown-compounds), identified in sunflower oil, are macro-hetero-cyclic compounds containing in their cycles of more than 11 atoms, four of which are at least hetero-atoms, interconnected by ethylene bridges. Comparison of the oil molecular composition with the composition of industrial oil of I-20A (И-20А) brand is carried out. The latter contains highly-toxic sulfur-containing organic compounds in the amount of 0,2...10 µg/g, out of which thioproperazine is considered the most dangerous one. The detected sulfur-containing components of industrial oils cause equipment corrosion. It is experimentally proved that from an environmental point of view sunflower oil can serve as an alternative to petroleum oils and lubricating-cooling fluids.

Key words: sunflower oil; oil lubricating-cooling liquids; environment protection.

CONSTRUCTION OF HORIZONTAL WELLS FROM DAYLIGHT SURFACE FOR COAL MINES DEGASSING WITH THE AIM OF PREVENTING OF METHANE OUTBURST AND PROVIDING OF EFFICIENT CONTROL OVER GAS RELEASE AT EXTRACTION SITES AS WELL AS SOLVING PROBLEMS OF MINE WORKINGS PROTECTION FROM WATER INFLOWS

**Sergey Avanesovich Oganov,¹
Viktor Nikolaevich Kosterenko,²
Anatoly Petrovich Sadov,³
Ele Elderkhanovich Baisarov¹**

JSC "VNIOENG" ¹
14/2, Nametkin str., 117420, Moscow, Russian Federation.
E-mail: vnioeng@mcn.ru;

JSC "Siberian Coal Energy Company" (SUEK) ²
29, Serebryanicheskaya naberezhnaya, 109028, Moscow, Russian Federation.
Phone: 8 (495) 795-25-38.
E-mail: kosterenkovn@suek.ru;

JSC "Siberian Coal Energy Company-Kuzbass" (SUEK) ³
1, Vasiliev str., 652507, Leninsk-Kuznetsk-city, Kemerovsky region, Russian Federation.
E-mail: SadovAP@suek.ru

Coal mines degassing is one of the principal means of preventing accidents such as sudden release of methane, provision of miners' safe work. Up to now the method of vertical wells construction from the daylight surface was widely popular among the activities related to advance coal seam degasification. However, operational experience shows that this method is ineffective. The problem is proposed to be solved by using the method of horizontal wells construction, widely applied in the Russian Federation and abroad.

Some technical and technological solutions on application of the method of horizontal wells construction from the daylight surface for degassing of Lava 24-57 of S. Kirov Boldyrevsky mine (Kuzbass) coal bed are developed. Wells construction is envisaged to be performed by using innovative technique, namely, mobile "MNBU" drilling rigs (Germany), "SANDVIK" (Australia), depending on the expected tensile loads on a drill rig. Taking into account drill rigs' structural features, two- or three-well degassing systems, including one water-reducing well and one or two horizontal degassing wells are proposed. Project profiles of a well structure at a drill rig angle of lean equaling to 30 and 45° are developed for degassing wells. The formulas for determining the limits of a horizontal wellbore length, depending on a drill rig capacity, parameters of a well profile, convenient for practical usage, are derived.

Key words: degassing; methane; horizontal drilling; mobile drilling rig; well system; well profile; design; water-reducing; mast; working capacity.

UNIT FOR OIL PRODUCTS VAPOR RECOVERY WITH ADDITIONAL VAPOR COLLECTION TANK AND COOLING SYSTEM TO BE USED IN LAND VERTICAL STEEL STORAGE TANKS

The RF patent of utility model

**Yury Alexeevich Matveev,
Vladimir Alexeevich Kuznetsov,
Alexei Alexandrovich Butuzov,
Andrey Yurievich Mulgachev,**

Ekaterina Alexeevna Varnakova

Federal State Budget Educational Establishment of Higher Professional Education "Ulyanovsk State University"

42, Leo Tolstoy str., 432017, Ulyanovsk, Russian Federation.

Phone: 8 (8422) 67-50-53.

E-mail: bgd020762@mail.ru

The useful model refers to the devices for the reception, storage and delivery of petroleum products. The unit allows efficient recovery of oil products vapors from storage tanks at the expense of temperature reduction in the heat-exchange unit and absorption by diesel fuel. The unit includes some additional tank to collect vapors from the storage tanks, common steam pipe for vapor recovery, compressor, underground tank with diesel fuel, equipped by the shaft with centrifugal wheels, heat-exchange unit with a cooling mixture, pump and some cup for the cooling mixture, relay, electrical motor.

Key words: float collar; tank; steam pipe; compressor; heat-exchange unit; cooling mixture; pump; shaft; centrifugal wheel; absorption.

THE UNIT WITH A FLOATING PLATE DEVELOPED FOR GAS EXTINGUISHING OF OIL PRODUCTS TO BE USED IN VERTICAL STEEL TANKS

The RF patent of utility model

**Yury Alexeevich Matveev,
Stanislav Stefanovich Chebotarev,
Dmitry Fedorovich Lavrinenko,
Vladimir Valentinovich Yakhont**

Federal State Budget Educational Establishment of Higher Professional Education "Ulyanovsk State University"

42, Leo Tolstoy str., 432017, Ulyanovsk, Russian Federation.

Phone: 8 (8422) 67-50-53.

E-mail: bgd020762@mail.ru

The useful model belongs to facilities of storage and fire extinguishing of oil products. The unit allows supplying carbon dioxide simultaneously both from the top of a tank and into the top layer of oil products. The useful model includes module for gas storage, gas pipeline, connected with floating plate with the help of a metal hose, equipped by an arrangement and gas supply nozzles, as well as an internal circular gas pipeline.

Key words: oil product; storage tank; extinguishing; floating plate; gas storage module; internal circular gas pipeline; carbon dioxide.

SPECIFIC FEATURES OF UNDERGROUND EQUIPMENT OPERATION AFTER CARRYING OUT SOME ACTIVITIES, LIMITING SAND REMOVAL FROM A BOTTOMHOLE AREA

Sergey Borisovich Yakimov

JSC "NK "Rosneft"

31A, Dubininskaya str., 115054, Moscow, Russian Federation.

Phone/fax:+7 (499) 517-88-88, ext. 2275.

E-mail: s_yakimov@rosneft.ru

The problem of wearing-out and clogging of electric submersible and sucker-rod pumps by solid abrasive particles while extracting oil out of relatively weakly-cemented terrigene reservoirs is nowadays considered the most important one by a lot of oil and gas producing companies. Failures quota directly related to abrasive particles removal varies from 10 up to 60 % depending on a region. Oil companies, willing to decrease operational and capital costs on liquid lifting, have recently started introducing technologies aimed at prevention of sand removal from the bottomhole area. Neglecting the fact that technology of gravel filters installation appears the one that is most commonly applied by foreign companies, Russian companies prefer using reagents for chemical bonding (consolidation) of sand in the bottomhole area. However, application of any technology that prevents sand removal from the bottomhole area doesn't always provide 100 % protection of the equipment throughout the whole period of its operation. So, the wells equipped by a gravel filter or treated by a chemical reagent to ensure sand consolidation require some individual approach while choosing the class of equipment durability and additional protection devices. The present paper considers some specific features of wells development process after the gravel filter installation as well as wells operation process after the sand chemical consolidation. The conducted field researches served the basis for assessing potential risks relating to the operational life-time reduction of the submersed pumping equipment and for giving recommendations on the desanders application areas.

Key words: control of sand removal from wells; equipment protection from sand; desanders usage.