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HYDROJET OPERATION OF WELLS USING "BRIF" DISTRIBUTION, MEASURING AND FILTRATION BLOCK MANUFACTURED BY CJSC "NOVOMET-PERM" (p. 4)

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Today most of the West Siberia fields, and Krasnoleninskoe oil and gas field in particular, are brownfields (being at the latest stage of their development, which means that production decline rates become higher from year to year along with growth of idle, low rate and uneconomic well stock. Moreover, efficiency of wells equipped with traditional units, such as electric submersible pump (ESP) and sucker-rod pumps (SRP), is negatively affected by the following geological and reservoir factors: high content of gas at the pump suction, high temperature, water cut, suspended solids removal. Pumps' efficiency is very low even in non-problematic wells with low production rates of about 20 cubic meters per day and does not exceed 24...30 %. Herewith, occurrence of gas at the pump suction also reduces the pump efficiency heavily. The efficiency of traditional production methods declines significantly. Thus, the conditions, having been formed by now, require prospecting, further appraisal and development of alternative production methods, able to efficiently provide development and operation of "brownfields". One of the alternative production

methods is hydro-jet well operation. It is not a new method, but unfortunately it has not been widely used primarily because it requires big capital investments at the early stages of its realization and engaging of service companies that provide special fluid-lift services.

Key words: hydro-jet operation; alternative production method; low rate well stock; problematic well stock.

EQUIPMENT CHARACTERISTICS SELECTION AND ANALYSIS TO PROVIDE OPTIMIZATION OF OIL PRODUCTION SYSTEM IN CASE OF HYDRO-JET WAY OF WELL OPERATION (p. 15)

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Extraction of oil by means of using hydro-jet pumping units appears a promising method of wells operation in complicated conditions. In case of low-rate wells fund hydro-jet method of operation can successfully compete with electric submersible pumps in terms of energy efficiency. However, optimization of production system under specific conditions requires studying of methodological grounds of analysis of the whole system operation.

Key words: jet pump; operation of wells; energy efficiency perfection.

RESULTS OF USAGE OF STATIONS CONTROLLING OPERATION OF ELECTRIC SUBMERSIBLE PUMPING UNIT WITH INTELLECTUAL SYSTEM IN JSC "SAMOTLORNEFTGAZ" (p. 19)

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While developing fields at the latest stages of their development, with availability of high portion of hardly-recoverable oil reserves and difficult operating conditions of the equipment, the direction of oil production "intellectualization" becomes one of the priorities of a Company.

The project of development of intelligent algorithms to control wells and equipment operation has been developed in JSC "Samotlorneftgaz" since 2011. Positive results of using ESP control stations with "intelligent" system (Control Stations with Intelligent Systems, CS IS) were obtained in 2012; the declared performance capabilities and efficiency of the implemented algorithms were confirmed.

The paper presents clear examples of operation of Control Stations with Intelligent Systems at the wells of JSC "Samotlorneftgaz". Operation of "intelligent" modes in real conditions is shown: wells "automatic bringing on the mode" without personnel' participation as well as unattended mode and the "maximum oil production" mode are demonstrated.

Key words: intelligent control station (ICS); control stations with "intelligent" system (Control Stations with Intelligent Systems, CS IS); ESP control station.

COMPLEX ANALYSIS OF OPERATION AND FAILURES OF ELECTRIC SUBMERSIBLE PUMPING UNIT (ESP) (p. 25)

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The company implements the "ESP GAMS" project, namely, introduction of software for information-analytical support of wells operation with ESP.

The paper describes some functional features of GAMS, as well as presents examples of the system application as analytical calculations for wells operation and failure with ESP.

Key words: ESP failure analysis; ESP GAMS; GAMS information system; GAMS system.

STUDYING OF SCREEN FILTERS EFFICIENCY USED TO PROTECT ELECTRIC SUBMERSIBLE PUMPS IN CASE OF BIG AMOUNT OF PROPPANT FLOWBACK (p. 29)

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The problem of proppant flowback in wells after performing operations of a formation hydraulic fracturing (FHF) is not a new one. The amount of proppant flowing into the wellbore together with the formation fluid flow is the largest at the stages of a field development and initial operation. The paper considers the results of field tests of screen filters used to protect ESP in case of big proppant flowback in wells of Samotlor oil field. The cases of successful and unsuccessful filters' usage are described and studied in detail. Some mechanism of filter clogging is described, recommendations on updating of the filter designed to protect ESP from proppant flowback are submitted.

Key words: screen filters; protection of ESP from proppant flowback; ESP operation after performing a formation hydraulic fracturing.

ACCOUNTING OF OPERATIONAL CONDITIONS WHILE DESIGNING PERIODIC OPERATIONAL MODES OF WELLS, EQUIPPED BY ELECTRIC SUBMERSIBLE PUMPING UNITS (p. 33)

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The technique of cyclic operation of wells by means of usage of electric submersible pumping units (ESP) has been widely spread in oil industry lately.

The paper shows that cyclic operation of wells is a special case of periodic operation, the usage of which is justified by a set of technical and economic indicators. The correct usage of cyclic operation of wells equipped by ESP (correct choice of equipment and operational indicators) allows increasing technical-economic efficiency of wells, characterized by low and medium production

rate, by reducing energy consumption, increasing operational time to failure and oil production. The values of operating parameters of central electric stations (CES) should be chosen with account of conditions of "formation-well-pumping unit" system operation, as well as with account of ambient temperature at the wellhead.

Key words: oil production; periodic operation; cyclic operation of wells; unit of electric centrifugal submersible pump (ESP); producing well.

REALIZATION OF POWER SAVING PROJECT WHILE MECHANIZED OIL PRODUCTION IN JSC "SAMOTLORNEFTEGAZ" (p. 40)

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The paper describes complex approach to the problem of power saving, based on development of data base with on-line operational parameters of each well.

The paper discusses advantages, presents results and examples of carrying out efficient activities, which were obtained due to the system introduction.

Key words: power efficiency; power saving operations; power management; power saving design; mechanized oil production.

HIGH-VOLTAGE SUBMERSIBLE MOTOR OF 180 kW POWER. THE FIRST EXPERIENCE OF ITS USAGE IN RUSSIA (p. 46)

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Enhanced energy efficiency and reliability of some new electrical submersible motor (NESM) as compared with conventional submersible motors is ensured by reduction of operating current of the motor in proportion to the voltage increase, thus reducing losses in the cable and the transformer.

Pilot testing of new electrical submersible motor (NESM) of 180 kW power and rated voltage of 4500 V in oil field conditions was successfully completed by the Company in 2012. The pilot-testing results served the basis for presenting comparative indicators of energy consumption by standard and experimental equipment. Testing of innovative motors with higher voltage in wells conditions confirmed nearly 6...7 % actual reduction of power consumption as compared with standard electrical submersible motor.

Key words: new electrical submersible motor (NESM); power efficiency; motor with increased voltage; electrical power saving; innovative equipment; high-voltage motor; power losses.

FIELD TESTING OF "RAUHF" INLET FILTERS DEVELOPED BY "SCHLUMBERGER" COMPANY (p. 51)

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Control stations of frequency regulation (CS FR) capable of regulating rotation speed of electric submersible motors in order to optimize oil production are widely used at the objects of JSC "NK "Rosneft". At the same time CS FR have a negative impact on the quality of electric power supply, as they generate higher harmonics.

Taking into account the fact that the majority of CS FR unlike stations providing control of electrical submersible pumps (ESP) of direct and smooth start are composed of outlet sinusoidal filters for the power proper quality supplied to the transformer for submersible pumps, submersible cable and electric motor, power quality problems at the points of common coupling are relevant both for electric power equipment of package transformer substations and electrical submersible equipment of ESP.

To reach one of its priority objectives relating to energy efficiency increase of oil mechanized production the Company conducted pilot testing of "RAUHF" inlet filters in field conditions and got results of testing in real conditions of their operation. The filters are manufactured by "Schlumberger" and designed to suppress harmonic distortion.

The paper presents the results of measurements of harmonic composition of input currents and voltages before and after "RAUHF" filters' installation at the wells with ESP units of Van Egan field operated by "Varieganeftegaz" affiliate as well as calculation of the electric power economy to be obtained in case of installation of "RAUHF" inlet filters-harmonics.

Key words: energy efficiency while operating ESP units; "RAUHF" filters, manufactured by "Schlumberger"; inlet filter-harmonic.

THE FIRST RESULTS OF PILOT TESTING OF "BORETS-WEATHERFORD" ENERGY EFFICIENT ELECTRICAL SUBMERSIBLE PUMPING UNITS IN FIELD CONDITIONS (p. 56)

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Increasing energy efficiency of wells mechanized fund is one of the most urgent problems facing the oil companies at the moment. The field tests witnessed the fact that maximum effect of energy saving is provided by innovative equipment usage. But the main obstacle of its mass introduction is, as a rule, its much higher price as compared with the standard equipment, used nowadays. It often happens due to the fact that energy-efficient equipment is produced by foreign companies outside the Russian Federation borders. In this regard, companies-manufacturers do their best to reduce the cost of their products. Some of them open their production subsidiaries in Russia (for example, "Schlumberger" company). Another way of solving the problem is forming alliances between western and Russian manufacturers what allows using production capacities of domestic companies to introduce advanced foreign technologies. In particular, this way was chosen by the leaders of the domestic market engaged in oil equipment production, such as "Borets" Russian company and "Weatherford" company, the recognized authority in the field of provision of innovative technologies and services to oil and gas companies.

Key words: energy efficiency; "Borets-Weatherford"; energy efficient electrical submersible pumping units (ESPU).

"ENERGY-SAVER" CONTROLLER TESTING WITH THE AIM OF STUDYING INDICATORS OF ENERGY CONSUMPTION DECREASE AT WELLS EQUIPPED BY SUCKER-ROD PUMPS (p. 62)

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The paper presents description of operational principle of "Energy-Saver" controller-optimizer that provides control over the process of induction motors soft start. Advantage of the controller as compared with some other soft starting devices is discussed. Optimal zones of "Energy-Saver" controller usage are described. The data on the energy savings achieved at a well equipped by sucker-rod pumping unit, which is located in Bobrovsky field of JSC "Orenburgneft" are given. Economic effect of the controller usage is computed.

Key words: energy efficiency of oil mechanized production; power saving while operating wells by means of sucker-rod pumping units; equipment used for energy saving; devices for induction motor soft start.

"PLUNGER-LIFT" – ENERGY SAVING TECHNOLOGY WHILE OPERATING LOW-RATE WELLS WITH HIGH GAS FACTOR (p. 67)

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Reduction of costs spent on liquid lifting out of wells is one of the key problems while operating fields, especially those being on the verge of economic profitability of oil extraction. Some significant reduction of energy costs can be achieved by using gas energy for liquid lifting. The principle of gas energy utilization is applied in plunger-lift technology that is still rare in Russia. The paper considers criteria and conditions of plunger-lift technology application as well as describes results of plunger-lift technology application at the wells of JSC "Varieganftegaz". Some comparative analysis of wells operational parameters while applying plunger-lift technology and electrical submersible pumps (ESP) is performed, prospects for the technology implementation are discussed.

Key words: plunger-lift; use of gas energy; energy efficiency increase while mechanized production of oil; use of alternative energy sources.

TUBING DIAGNOSTICS IN OIL PRODUCTION WELLS BY MEANS OF SCANNING DEVICE APPLYING METAL MAGNETIC MEMORY METHOD (p. 71)

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The paper presents results of pilot testing of a unit which provides control of tubing directly in the well by applying the method of metal magnetic memory. It is shown that the unit can be used to assess the tubing state and its connections inside the well, to detect pipes and couplings, where corrosion and fatigue processes are the most intensive. Besides identification of tubing pipes sections with developed defects, usage of the unit is tended to prevent sudden fatigue damages. Control can be performed both with the disabled electrical submersible pump and in its operational mode. Periodic monitoring provided by the unit makes it possible to increase the time between wells overhaul and to perform the repair according to tubing actual state.

Key words: diagnostics; tubing; oil production; metal magnetic memory; coupling.

FIELD TESTING OF TECHNOLOGY DEVELOPED BY "VETEK" COMPANY DIRECTED TO INCREASE PRODUCTIVITY OF MECHANIZED WELL STOCK (p. 76)

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JSC "Samotlorneftegaz", supplementary office of JSC "NK-Rosneft", successfully developed activities aimed at increasing of oil base production in the sector of mechanized production without performing wells overhauls. The article describes the process of oil recovery enhancement based on the effect of forced pressure decrease in wells annulus and, correspondingly, by the decrease of its constituent of a well bottom pressure.

Some advantages as well as examples and results of the technology application are given.

Key words: oil recovery enhancement; mechanized oil production.

SOME ASPECTS OF CHOOSING TECHNOLOGY PROVIDING PROTECTION OF UNDERGROUND EQUIPMENT FROM SAND WITH ACCOUNT OF DYNAMICS OF THE SAND REMOVAL WHILE PUTTING WELLS INTO OPERATION AT SAMOTLOR OIL FIELD (p. 81)

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The paper presents data on monitoring of composition and dynamics of mechanical impurities removal while putting wells into operation at Samotlor oil field after underground repair. Categories of wells with different dynamics of mechanical impurities removal are identified. Some cases of sand blowout release and their underlying causes are described. Some recommendations on the choice of technologies, providing protection of the equipment from sand removal with account of dynamics of its removal while wells starting-up, are made. The assessment of the areas of the most efficient usage of sand protecting devices is fulfilled.

Key words: protection of equipment from mechanical impurities; sand protecting devices; increase of wells operational time between overhauls; reduction of and underground equipment wear-out; brining wells on to the stable production.

DEVELOPMENT OF THE ALGORITHM PROVIDING CALCULATION OF OIL WELLS FLOW-RATES OPERATED BY MEANS OF USAGE OF ELECTRICAL SUBMERSIBLE PUMPS (p. 90)

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Some trend witnessing intellectualization of production, gathering and treatment of oil and gas was being developed in oil industry during the last few years. This fact inspired the necessity of getting the reliable information about the current ESP unit discharge, value of fluid dynamic level, pump intake pressure, motor windings temperature, etc.

The development of the algorithm of indirect determination of a well flow-rate, operated by means of ESP unit, which was successfully tested at the oil fields of Western Siberia is presented.

Key words: oil production; intellectualization of wells; unit of electrical submersible pump (ESP); producing well; measurement of flow rate; pump discharge; control station.

EXPERIENCE OF JSC "SAMOTLORNEFTEGAZ" OF CHOOSING ELECTRICAL SUBMERSIBLE PUMPING UNITS FOR WRELLS WITH REDUCED INFLOW (p. 92)

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The paper presents data on reduction of inflow out of wells in time after various types of geological and technical activities aimed at stimulation of oil production in Samotlor oil field. Some activities with different time of stable inflow are identified. Some experience of JSC "Samotlorneftegaz" of choosing equipment for oil production after these activities is described. Assessment of the most efficient method of the equipment calculation and maintenance in conditions of decreasing inflows is made.

Key words: reduction of inflow from the well; extension of the pump operational life time; increasing of wells operational time between overhauls; calculation of the equipment after carrying out geological-technical activities; method of characteristics prolongation.

RESULTS OF PILOT TESTING OF HALITE INHIBITORS IN FIELD CONDITIONS OF VERKHNECHONSK FIELD (p. 96)

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Waters of Verkhnechonsky field operated by JSC "Verkhnechonskneftegaz" are referred by their mineralization to brines (more than 250 g/dm³) and their composition mainly contains halite (NaCl). This fact is an exception in the field of oil production in the Russian Federation.

Mechanized oil production at Verkhnechonsky field is virtually impossible without application of additional activities that exclude probability of NaCl sedimentation on the surface of the downhole pumping equipment.

The technology of halite removal, applied at Verkhnechonsky oil field, means periodic washing by fresh water, thus providing mechanized oil production but negatively affecting not only operation of electrical submersible pumping units (ESP), but also geological-operational characteristics of a well.

Optimum technology of halite occurrence prevention means application of scale inhibitors. Up to now Russian oil and gas companies haven't got any experience of inhibitor protection of oilfield equipment from the above-mentioned inorganic sediments.

For the first time in Russia pilot testing of previously selected effective scale inhibitors for specific conditions of Verkhnechonsky field was successfully conducted by JSC "Verkhnechonskneftegaz".

Key words: inhibition of salt sediments; halite (NaCl); pilot testing of scale inhibitors.

APPLICATION OF "SQUEEZE" TECHNOLOGY FOR PROTECTION OF WELLS FROM SALT SEDIMENTS AT EM-EGOVSKY AREA OF KRASNOLENINSKY SET OF FIELDS (p. 99)

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The main causes of salt sedimentation on the underground equipment while operating wells at Em-Egovskaya area of Krasnoleninsk set of deposits of JSC "RN-Nyaganneftegas" are considered. Calculations are made according to forecast of scaling probability. Core material was taken for studying of effective scale inhibitor selection for "SQUEEZE" technology. Assessment of a formation permeability reduction while processing is made. The selected reagent was used for squeezing into a formation, followed by assessment of technical efficiency of equipment protection from scaling. Comparison of efficiency of various technologies, applied for inhibitor protection, is made.

Key words: activities for salt sediments prevention; protection from scaling by means of using inhibitors; "SQUEEZE" technology.

STUDYING OF ADSORPTION-DESORPTION ISOTHERMS EFFECT OF PHOSPHONATE-CONTAINING SCALE INHIBITOR ON ROCK OF SAMOTLOR FIELD FORMATIONS (p. 104)

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The ability of a formation rock to hold adsorbed inhibitor

appears important information for the technology of preventing scaling in producing wells by means of scale inhibitor squeezing into the formation. The paper presents results of physical modeling of scale inhibitor injection using natural cores of AB2-3 and AB1-3 formations of Samotlor field.

The results of experiments conducted to determine saturation of the formation rock by scale inhibitor and its further removal out of the core served the basis for determining of adsorption isotherms of phosphonate-containing inhibitor.

The results obtained are required for calculation of optimal injection volumes of inhibitor solution, providing the most possible long-term protection of a well from scaling.

Key words: scale inhibitors; adsorption isotherm; Freundlich equation; scale inhibitor squeezing into a formation.