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Study of Oil and Gas Well Drilling Process Scheme and Optimal Modeling System

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Abstract: Drilling well design optimization reduces the overall cost allowance by reducing well construction time and costs. Well design is not a constant pattern throughout the life cycle of a mine. It should be optimized through continuous improvement for all aspects of well redesign based on actual field conditions and challenges. The main objective of this study is to provide an overview of well design optimization processes and to present existing research and applications for using well design optimization to solve well design problems so that economic efficiency and excellent well performance can be achieved. Well design optimization processes include unconventional design (thin holes) compared to casing construction, in addition to casing depth selection and casing string load optimization. Finally, we show the well trajectory design and optimization. The aforementioned optimization process significantly reduces drilling cost and time, as a fine hole design with a smaller casing and hole size reduces mud volume, steel costs and pump fuel costs. Optimum selection of casing seats can eliminate serious problems such as kicking and losses, which increase downtime without considering kicking tolerance and downhole pressure regime. Anticipating the optimal stress loads in the casing design is the most effective way to reduce the cost of casing strings, avoiding the additional cost of designing under unprofitable worst-case conditions. Optimizing the well trajectory with geomechanical considerations is important to reduce the problems associated with high torque, drag, formation collapse, resulting in pipe plugging and downtime.

Keywords: Drilling scheme, optimization of drilling processes, oil and gas well models, geomechanical effects, drilling mechanism, geometric dimensions, mechanic features, oil and gas well design.

Introduction

Before starting drilling operations in oil and gas production enterprises when there is a forest, the area is cleared of foreign objects, trees pruning and tree felling are carried out. If drilling if the work is carried out in a swampy area, roads are prepared. Construction materials are collected at the site, under the drilling rig swamp will be destroyed. The construction site will be leveled, electricity, communication, and water will be provided. When the local terrain or distance is close, the drilling rig is dismantled without execution - further digging on special chain carts or sliding sleds and pneumatically controlled methods installed in the starting well. After transporting and installing the drill the assembly of the rest of the equipment begins, that is, with

a diesel-driven piston pumps or electric pumps; cleaning the drilling mix system, electrical switches, well surface equipment (rotor, prevention, hydraulic weight indicator), drilling closure of tower structures, etc. If drilling is started in a new area, then all equipment, pumping unit from the drilling tower, treatment facilities, etc separately brought to the drilling site, here a drilling rig and other equipment will be assembled. Device and all start drilling the well after the equipment is installed preparations are underway. Drills for drilling according to the drilling plan, drilling pipes are assembled. Drilling has started at the drilling site kitchen wagons, recreation and special clothes drying wagons, chemical to analyze the composition and quality of drilling fluids laboratories are established. The tool area around the drill site, storage of drilling mixtures, warehouses for chemical reagents will be placed. Drilling of the well is planned after the launch conference starts from the base. In the process of drilling wells, it enters the well continuously drilling fluids are pumped. Special drilling rigs for drilling oil and gas wells drilling rigs are complex machines from the collection: mechanisms, tools, made of metal consists of constructions, control measuring devices and management tools found. The structure of the drilling rig includes: tal system, suspension and drill pipes are placed, (the tower) raises and lowers tools equipment, devices that transmit and rotate tools, washing solutions transportation of pumps, energy systems, preparation of washing solutions and cleaning mechanisms, mechanisms for automation and mechanization of loading and unloading processes, control-measuring devices and auxiliary devices are included. According to the above instructions, the type of vehicles (diesel, electric or other), the installation and transportation schemes of the drilling rig are selected. Each one transportation, assembly and assembly-transport base of drilling rigs characterized by schemes. Oil and gas well drilling equipment itself divided into mobile and stationary devices. Oil in our republic drilling gas wells using stable drilling rigs isdone. Installation and transportation of mobile drilling rigs classified by the following three methods: aggregate (individual), small block and big block. Aggregate Method - When each aggregate is first assembled transportation and installation of the device is done separately. Again and in the next assembly, aggregate-type devices are attached to aggregates and divided into nodes and in special transports to the new drilling site transported, equipment and facilities are reassembled. Carrying out a number of complex works in the aggregate method (construction, carpentry, plumbing, etc.) should be increased, that is, when separating (dismantling) and the duration of assembly and assembly work at the new location will be reduced. Currently, the aggregate method is rarely used, mainly for main wells in drilling, heavy loads, installation of devices and large devices it is used for long distance transportation. The pipe lies and the flow of washing solutions from the initial lock of the section is slanted to the pipe side of the pump to ensure set at the lowest point of the run. Drilling the upper part of the vertical part of the pipeline garnet and flange for connecting the hose and the lower part of the washers and with a short pipe to connect the manometer with short pipes joint lock installed. Pressure and consumption of the washing solution in the pressure pipeline a sensor is installed for measurement. Pressure pipes are thickwalled steel with a diameter of 120-250mm made of pipes and the sections are welded together. Flange or mounting compensators and elevated parts connected by pressurized rubber hoses. After the pressure pipes are assembled to half of the working pressure will be tested. Start Interlock - Starts the drill pump from idle and pressure pipe relief service when the pump stops intended to do. Pressure pipes are limited in the use of drilling pumps overpressure occurs. Such a situation is a pressure system and damage the pump itself and injure service personnel. to every borehole pump to prevent such accidents a special device designed for precise front protection pressure plate is installed. This device is attached with a preexisting drainage tube when the protective plate is removed, the washing solutions are discharged into the receiver. A drill is a piece of equipment that works to break up (erode) rocks in the process of drilling wells, the task of deepening the bottom is carried out increases. Drilling according to physical and mechanical properties of rocks have different effects. The same rocks are better than impact or crushing breaks, the second in shear or shear, and the third in mixed motions decomposes well. Heavy duty drill bit for hard rock drilling using; for soft

homogeneous mobile – decomposer power and long sharp drill etc. are used. According to the application, drills are divided into three types:

- installed drill bits - on the radial surface of the bottom of the well does not rot;
- drilling leaving the middle part of the well to get the main drill bit;
- a drill for special work - a cement stone in a ridge, an inclined column, a well it is used to correct the curvature of the well and expand the column.

Drills used in drilling solid and pillar deep wells designed for drilling. Drills of this type are used in a variety of ways and drills of the required size can be selected from among them. The main parameters of the drilling mode are the axis of the drill bit loading; rotation frequency of the crown; washing solution and basic consumption includes parameters. In the technological drilling mode - the drilling process is controlled a high penetration index is achieved. Technical capabilities of drilling equipment and tools were insufficient and the quality of the flushing solutions to achieve an optimal drilling regime if it does not give an opportunity, it is necessary to set the economical drilling mode. Axial loading-crown cutters of downhole rock decides to go deeper. Crowns rotate under axial load violates gender. The magnitude of the axial load depends on the physical and mechanical properties of the rocks, depends on the quality and geometric dimensions of the cuttings. Of stones the greater the stiffness, the greater the axial load. Cutters are sharp if it has an angle and a large cross-section during the drilling process does not pass and the dining area increases. So it is immutable the drilling speed begins to decrease under axial load. Drilling speed increases with increasing rotational speed. Practice and mechanical drilling of many crowns based on experience the value of rotation speed to the maximum speed value is 1.4:1.5 m/sec. it is determined when it is achieved crown rotation speed and physical-mechanical properties of rocks depending on the characteristics and depth of the well, the machine and to the technical capabilities of the processes, to the combination of drill pipes is installed taking into account its strength. Hard, cracked and abrasive rocks the rotation frequency in drilling and the rotation speed in calculations are reduced the smallest value is accepted. To maintain the same rotational speed it is necessary to reduce the diameter of the crown, increase the rotation frequency. When the depth of the well increases, the rotation frequency should be reduced. Free rotation and torsion of the pipe joint for stress and bending power consumption increases.

Conclusion

After reviewing many studies and documents on the optimal well design method, we can conclude that well design should be optimized at various stages of well planning to achieve drilling efficiency and reduce drilling costs without reducing well productivity. The thin-bore design is one of process optimization and is more cost-effective and less hazardous than the traditional (fat) design. Slim Hole Drilling offers new opportunities for the oil industry and can significantly reduce field development costs. In addition, the casing seat selection process must be optimized in such a way that safe well control requirements and well integrity can be achieved. A good practical route profile and planning will help to avoid related problems. A casing design framework that takes into account all expected loads ensures the mechanical integrity of the well.

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