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## TECHNOLOGY DESCENT IN ONE STEP INTERMEDIATE COLUMN, WEIGHT OF WHICH EXCEEDS LOAD CAPACITY OF DRILLING RIGS

*Decrease quantity of sections of the casing saves time and money in the process of fastening of the well. The need to use the sectional descent columns caused by a not sufficient capacity drilling rigs, mainly. In addition, casings domestic and imported can not withstand the loads created by the weight of its own huge casing. In general, to address the issue of development reduce the quantity of sections descent columns are developing in two directions: increasing the carrying capacity of drilling rigs, the creation of special jacks for running casing; increasing buoyancy force acting on the column in the wash liquid. The first way allows for the descent into the well casing heavy and has only one limitation on unscrews loads in threaded connections. In applying of welded columns is limiting the tensile stresses along the pipe. The second way is more technically difficult and needs of additional equipment casing and introduces additional limitations. The first method shutter casing at one time is limited and the real unscrew load. In the second method sectional casing shutter is reduced by 30 – 60%.*

**Keywords:** drilling column, borehole, drilling fluid, centralizer.

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## ТЕХНОЛОГІЯ СПУСКУ В ОДИН ПРИЙОМ ПРОМІЖНИХ КОЛОН, ВАГА ЯКИХ ПЕРЕВИЩУЄ ВАНТАЖОПІДЙОМНІСТЬ БУРОВИХ УСТАНОВОК

*Розглянуто спосіб спуску проміжних колон, котрий дозволяє подолати обмеження за вантажопідйомністю бурових установок за рахунок перенесення ваги колони, яка спускається на зацементовану колону як на фундамент. Зокрема, розроблено технологію, коли кожна додаткова вага колони при її нарощуванні еквівалентна додатковим силам тертя, які виникають на нарощеній ділянці. Така технологія спуску не залежить від вантажопідйомності бурової установки, не створює навантажень на основу веж, а також додаткових розтяжних навантажень у колоні при збільшенні її довжини. Доведено, що якщо така умова виконується, то всі відомі обмеження для спуску проміжних колон будь-якої довжини в один прийом знімаються. Авторами встановлено вагу обсадної колони, що спускається, котра розподіляється на раніше встановлену і зацементовану колону.*

**Ключові слова:** колона, свердловина, буровий розчин, центратор.

**Introduction.** Reducing sectional casing makes saving time and resources in the mounting wells. The need for launching a sectional columns caused mainly insufficient carrying capacity drilling rigs. In addition, used casings domestic and imported sometimes can not withstand loads generated by its own weight long casing.

Today technology known descent of heavy casing using hydraulic jacks that are installed on the orifice. However, with only solved part of the problem because it does not limit removed the maximum allowable length for the string buoyancy load.

**Analysis of recent research and publications of sources.** In economically developed countries, deep drilling is the use of drilling rigs, heavy-duty, allowing lower heavy columns at once. For example, well № 1 Rozhers Bertha (USA) lowered 426-millimeter casing weight of 6580 kN at a depth of 4202 m [1].

In case of excess weight carrying capacity of columns using special mobile equipment, is equipped with powerful hydraulic jacks with a large swing its load-bearing supports. With this facility in the well № 1 Medoip (USA) was successfully lowered at once 508-millimeter casing length 3800 m and weighing in air kN 9500 [2]. Limit the depth and weight of the column that descends on this equipment are determined buoyancy load threaded connections.

In our country developed and applied methods of launching heavy casing through facilitation mainly due to increased pushing power. There are a number of technologies descent heavy casing afloat.

The simplest of these is the descent casing replacing drilling mud in it for simplified partial emptying of liquid. However, in this case the recovery of circulation of drilling fluid is a violation of hydrostatic balance well. In the annulus drilling fluid density decreases, and the presence productive horizons, the conditions of formation fluid inflow and passing it to the surface, and therefore water gas oil manifestation conditions and related complications. With this inevitably linked infringement stability of the borehole walls.

Given the fact that the weight of the column increases the weight pour fluid volume, while moving up the resistance added (10 – 15% for vertical wells). There are difficulties undermining the column at the time of build-up another pipe. Leaving the carrying capacity of the drilling rig, necessary after the circulation again empty column to the values previously achieved using a compressor and tubing down [3].

Valid values emptying the descent of columns not full fill limited by fourfold safety factor pipes to jam. These limitations do not allow you to lower the heavy columns below the load in one step.

**Bold still unsolved aspects of the problem.** To reduce the weight of the column offered to hook the device to create additional friction forces when lowering the string into the hole [4]. Friction is governed by backfilling sand or other granular material that fills the annular space between the casing that goes down and the cylinder. Sand is poured into the open top of the cylinder funnel and poured at the lower end of the range through narrow openings. Speed is regulated by eruptions of sand compressed air. At the top of the cylinder is provided hydraulically operated telescopic possible to reduce the cross section annular space, if the rate of descent of the column increases.

Creating a considerable friction forces provides the necessary downforce [5].

At its compliance with the weight of the column adaptation must be considerable length, which is difficult to achieve.

Significant reduction of sectional casing made laboratory equipment and technology mounting holes State Research Institute of drilling technology. So spent downhill 340-millimeter intermediate column to a depth of 4600 meters in three sections instead of five for the project. Summarized and analyzed the existing methods of facilitating casing during their descent into the well and cementing options. Custom-designed technologies descent

columns, whose implementation is promising but technically challenging and has some limitations [6, 7]. These technologies include «pontoon» method of launching heavy casing and down the column by increasing the density of the fluid in the annulus.

**Setting objectives.** In general, the development on reducing sectional descent columns developed in two directions:

- Increasing capacity drilling rigs, creating special jacks for launching casing;
- Increasing the buoyancy force acting on a column of drilling fluid.

The first way allows you to perform difficult descent into the well casing and has only one restriction on buoyancy load in threaded connections. When using welded columns - is stretching the limit stress on the pipe.

The second way is technically complex and requires additional equipment casing, which introduces additional restrictions.

The first method shutter casing in one step is a real buoyancy and limited loads. In the second method sectional shutter casing is reduced by 30 – 60%.

**Basic research and results.** We suggested another way of lowering intermediate columns, which can overcome the limit load capacity drilling rigs by transferring the weight of the column that descends on cemented column as the foundation.

This approach to the task in one step downhill intermediate columns whose weight exceeds capacity drilling rigs, there are no restrictions on carrying capacity as drilling rigs and for buoyancy loads. Thus, the weight of the column hook may be only some portion of its actual weight.

The implementation of such technology can be implemented by various technical means.

The essence of the technology is that each extra weight of the column in its capacity equivalent to additional friction forces that arise in the area of extension. This technology does not depend on descent-duty drilling rig, does not create pressures on the basis of the towers, as well as additional tensile stress in the column by increasing its length. If this condition is met, all the known limitations for the descent intermediate columns of any length in one step removed.

In this approach, the weight of the casing, which descends allocated to previously established and cemented column buoyancy action moves down under load clog previously installed larger diameter columns. Changes diagrams of tensile stresses in the column.

Consider the technology of launching heavy casing on the example of a hypothetical well.

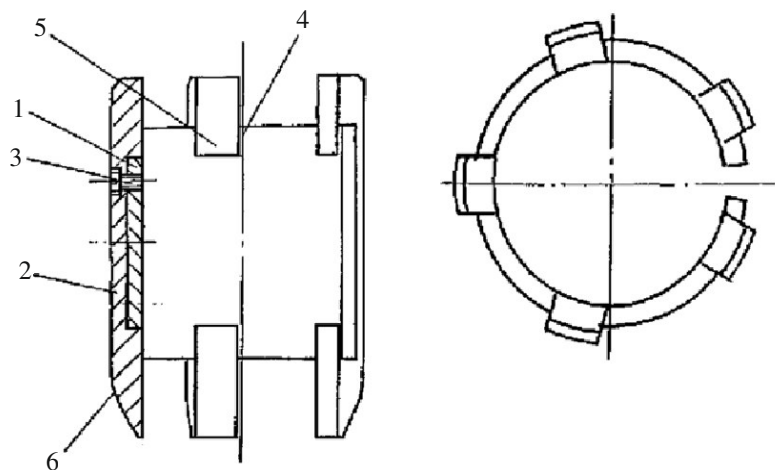
In the well to a depth of 6800 meters must pull a column diameter of 245 mm with wall thickness of 12 mm group Strength M, whose weight in the air 4760 kN. The column consists of a casing OTTM1 normal diameter couplings, acceptable load 3870 kN tensile and limit weighing thrilled 4350 kN. The descent is carried out drilling machine with capacity of 2000 kN installed in a borehole 324-millimeter casing at a depth of 3600 m.

Descent 245-millimeter column weighing 700 kN in the air performed by standard technology in depth, such as 1000 m.

Further down is performed on hard elastic centralizer (Fig. 1), each of which calculations show that the gap in columns with diameters of 245 and 324 mm is able to keep the weight of 12 – 16 kN with a coefficient of friction «metal – metal» 0.17.

Centrators setting while building columns, the rest can relieve the weight on 324-mm column.

To make it possible disruption columns with wedges set telescopic connection of 245-mm column with the progress of up to 0.5 m. The weight of the column in the telescope must be zero or less than the estimated depth, that column has quite hang on centralizers.



**Figure 1 – Centralizer discharge pipe for the columns in the well:**

1 – a spring element; 2 – guides cover; 3 – screw; 4 – grooves; 5 – performances; 6 – trim [6].

You can not install a telescopic pipe connection and use string tension for removal of wedges due to its extension. This will only lengthen the part of the column, the weight of which is on the hook, and the lower part will be unloaded at centralizers.

When you exit the clog 245-millimeter column of 324-millimeter trunk in the open weight 245-millimeter column to increase the value of the column that hangs on centralizers. Centrators not work in the trunk with a nominal diameter of 295 mm.

Increasing the column with the installation center tors can compensate for the weight of the column in the open barrel length of 3200 m and left hook column weight, easy to operate, of 200 – 300 kN.

It should be noted that the actual depth of the descent of the 245-millimeter column is buoyancy exercise in the open trunk from the 324-millimeter column.

In the case under consideration we can pull in one step 245-mm column weight of 6390 kN in the air (3870 kN clog from the 324-millimeter columns plus 2,520 kN to 324-mm column) length 9100 m.

In addition, due to the strength eject drilling fluid density of  $1200 \text{ kg/m}^3$  length of the column can be increased by 15,28%. If you use a pipe steel grades P-110 in the open trunk, the weight of the column, launched at once drilling rigs carrying capacity of 2000 kN, 8710 kN can be up in the air, the equivalent of 12,443 meters.

In the Kola ultradeep wells could pull the 245-mm column at once to a depth of 14,344 meters drilling fluid with a density of  $1200 \text{ kg/m}^3$ .

A necessary and sufficient condition for launching columns at once resistance is the borehole during descent.

**Conclusions.** This method allows lower hard casing into the well in one step. Limit the weight of the column is independent of duty rigs. Weight buoyancy columns limited load in threaded connections of the column, which is in the open trunk, plus the weight of the column to the bottom launched earlier column.

The benefits of lowering casing in one step include: no need to use permissible tool that restricts its weight weight section; no need to equip the column docking devices and the use of disconnectors; reduce wear columns in docking areas, where it reaches the highest value; alignment of columns create normal conditions for cementing; change diagram buoyancy loads in the column; favorable conditions to ensure the tightness of the column; no need for tension columns; shortening the mounting hole. A major shortcoming is the lack of opportunities «walking» column. A necessary condition for success is preparedness mounting hole to shutter columns.

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Received 25.05.2016