



Investigation of the Sealing Node of the Pipe Holder of the Mobile Lifting and Lowering Device

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April 1, 2021

Investigation of the sealing node of the pipe holder of the mobile lifting and lowering device

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Abstract— Continuation of the working process in windy weather conditions and wind speeds exceeding 5 m / s with the application of a sealant to the pipe holder handles of mobile lifting equipment used in drilling and repair of research wells, increasing the reliability of the pipe holder and preventing plastic deformations. , dedicated to increasing longevity.

In order to ensure the safety of the lifting and lowering process during drilling and repair of wells, and even to continue such a process of wind speed between 5-10 m / s, a new design proposal was proposed to apply a pipe holder to the lifting and lowering device of mobile units.

Drilling plugs are safely lifted and lowered at the expense of the pipe holder. The applied handles prevent the pipe from tilting from the wellbore. However, in this case, the rubber element of the pipe holder handle is exposed to shocks due to the dynamic wind force of the pipe. This can cause the rubber element of the handle to wear out and break down quickly, crushing the pipes. In order to eliminate the fatigue of the elastic element in the structural structure of the pipe holder, its material consists of 3 details in the design structure with the choice of double-panel matrix rubber, and each detail is completed in the form of a cylindrical tube. In this case, when the compression process occurs in contact with the pipe handle, the deformations in the rubber will fill the cavity, which reduces the amplitude of cyclic plastic deformation, delays the formation of local stresses, regulates the pressure distribution and increases fatigue resistance, delays the process of fatigue. ensures that it retains its ability.

Keywords— elastic element, pipe holder, plastic deformation, fatigue, microchat, macrochat, fatigue, loading

I. INTRODUCTION

During drilling and repair of wells, in windy weather conditions, the drilling rig, including drill bits and drill pipes, is subjected to dynamic forces due to wind. The working process is completely stopped when the wind speed exceeds 5

m / s. Due to the dynamic force, its parts and nodes vibrate during operation. The execution of the drilling process becomes dangerous [2].

II. RELEVANCE OF THE CASE

In order to prevent deformations in the pipe as a result of contact of the pipe with the handle under high force, an elastic element is applied to the handle. One of the important issues is the high efficiency and longevity of this element. Improperly applied elastic elements, as well as incorrect determination of the distance between the pipe and the handle, can lead to its rapid failure due to mechanical stress. From this point of view, it is important to prevent the impact of the elastic element at this node of the equipment (handles).

In order to ensure the safety of the lifting and lowering process in the facilities, we have proposed to apply a pipe holder against the wind to the lifting and unloading unit of mobile units according to a new design proposal to continue such a process even at wind speeds between 5-10 m/ s. Performs the process of safe lifting and lowering of the spark plugs. The applied handles prevent the pipe from tilting from the wellbore. However, in this case, the rubber element of the pipe holder handle is exposed to shocks due to the dynamic wind force of the pipe. This can cause the rubber element of the handle to wear out and break down quickly, resulting in crushing of the pipes [5-10].

III. THE PURPOSE OF THE WORK

It is to increase the resistance of the elastic element and the drill pipe to dynamic forces by applying an elastic element of a new thesis material to the inner surface of the pipe holder handles.

The sealants applied to the pipe holder must be resistant to mechanical shocks and mechanical friction. We recommend the use of mechanical wear-resistant double rubber panel matrices in these nodes. These double-matrix rubber seals are placed in the inner slot of the pipe holder (Fig. 1).

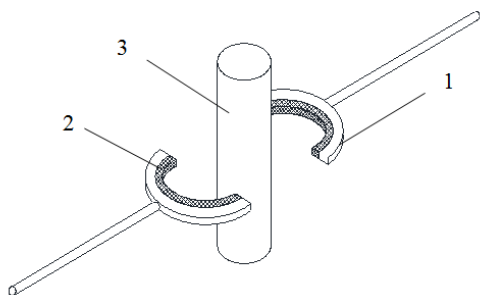


Fig. 1 Pipe holder handles.
1-Pipe holder, 2-sealant, 3-drill pipe

It is expedient to apply the proposed Pipe Holder to AZINMASH-37 [2] mobile unit.

The pipe holder handles on the AZINMASH-37 prevent the drill plugs from tilting at high speeds, protecting the drill bits from the wind. The material was selected from a double-matrix rubber of its material to increase the durability of the elastic element while preventing possible crushing in the pipe by preventing metal-metal (handle-pipe) contact during the inclination of the pipe to the handle. It is important to select the optimal distance between the sealant and the pipe to minimize damage to the sealant due to impact and to prolong the service life, as well as to examine the sealant against plastic deformation when the pipe comes in contact with the sealant.

Pipes act on the elastic element of the pipe with a force F . It is clear that the value of the force also varies with distance. The force causes an elastic deformation in the sealant has a role in elongation (Fig.2).

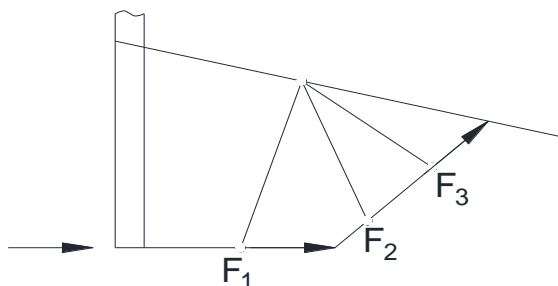


Fig. 2 Power distribution scheme

In the structural structure, the pipe is deformed by the central force due to the inclination of the pipe under the force of the handle manifests itself differently in the upper and lower parts of the sealant. Thus, more compression is observed in the lower part of the sealant than in the upper part. Damage accumulates in the material in microcontacts (Fig. 3).

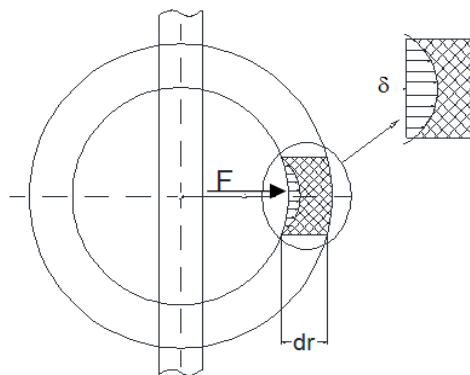


Fig. 3 Scheme of the force acting on the compactor

As a result of repetitive force, cracks form in the sealing material as a precondition for tireless disintegration, which results from the irreversible (ie irreversible) decomposition of the atomic compound as the strength inside the sealant exceeds the local allowable value.

Changes in the state of the material of the elastic element during fatigue are reflected in its mechanical properties, macrostructure, microstructure. These changes occur within stages. At a certain stage, irreversible events such as fatigue damage occur in reducing the resistance of the material to collapse. First, microcracks appear on the structural organizers of the material and on their joint surfaces as the initial stage of tireless disintegration. At this stage, the kinetics of the change in the state of the material is accompanied by the formation of dislocations and vacancies (micro-gaps), as well as a sliding line. Mechanically, the hardness, elastic-plastic parameters of the material, as well as macrophysical properties (electrical, magnetic and acoustic resistance, density) change. At a later stage, these microcracks grow into macrocracks that completely destroy the element of the sealant or cause great damage to it.

Accumulation of damage in the later stages of fatigue failure results in a decrease in the growth rate of macrochats and resistance of the material to static loading, leading to material fragmentation.

In order to eliminate the fatigue of the elastic element in the structural structure of the pipe holder, its material consists of 3 details in the structural structure by choosing a double-panel matrix rubber, and the contact area with each detail is completed in the form of a cylindrical tube

(Fig. 4). In this case, when the compression process occurs in contact with the pipe handle, the deformations in the rubber will fill the cavity, which reduces the amplitude of cyclic plastic deformation, delays the formation of local stresses, regulates the pressure distribution and increases fatigue resistance, delays the process of fatigue ensures that it retains its ability.

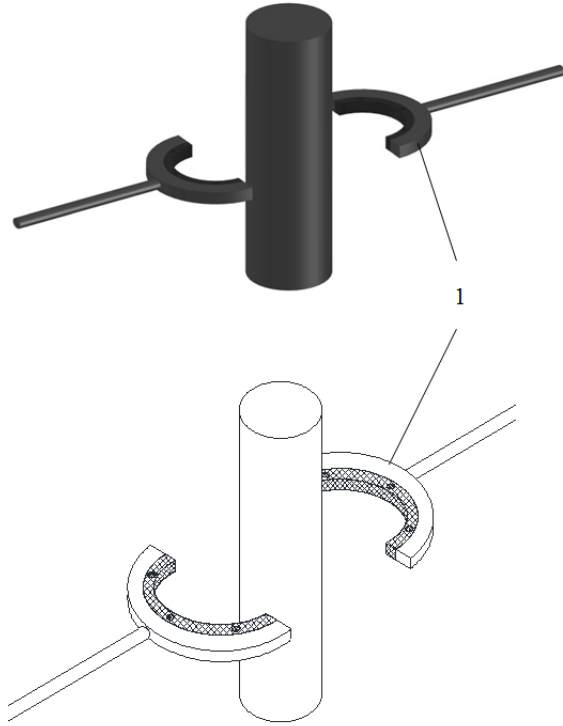


Fig. 4 The position of the holes (1) in the seal of the pipe holder.

Consider the deformations and stresses that occur under the influence of force in the sealant. It is known that a tense situation is obtained when the force acts in one direction.

The material of the elastic element makes a connection between the properties of the double-panel rubber matrix and the relative strain stresses $x, \delta y, \delta z$ and stresses and characterizes the following structure [1].

The decelerating property of the main special vector of matrix anisotropy-sealing deformation is determined by stops. Deformation anisotropy of the matrix $E = (E_{mn})$ (square matrix of the second rule) determines the real map of the two-dimensional vector plane with real numbers on the real area or in itself. The described image, defined relatively in the plane $\mathcal{E}_1, \mathcal{E}_3$, is related to the vector $\vec{\mathcal{E}}$, the relations given in the

vector coordinates $\mathcal{E}_1, \mathcal{E}_3$ and the coordinates σ_1, σ_3 (1, 2 and 3) [1-4].

$$E_{33} = a_0^q - a_1^q S_0, \quad q = 1, 2, 3 \quad (1)$$

$$\sigma_1 = E_{i,j} \mathcal{E}_j \quad (i, j = 1, 3) \quad (2)$$

they can be written in the form of a vector-matrix:

$$\vec{\sigma} = E \vec{\mathcal{E}} \quad (3)$$

The effect of the expressions (1, 2 and 3) on the deceleration property of the generalized matrix is determined by the characteristic roots of the deformation anisotropy of the matrix λ_1, λ_2 .

$$\lambda_{1,2} = \frac{1}{2} \left(E_{11} + E_{13} + \sqrt{(E_{11} - E_{33})^2 + 4E_{13}^2} \right) \quad (4)$$

By solving the equation,

$$(E_{11} - \lambda) \mathcal{E}_1 + E_{13} \cdot \mathcal{E}_3 = 0 \quad (5)$$

$$E_{11} \mathcal{E}_1 + (E_{33} - \lambda) \mathcal{E}_3 = 0$$

Two special vectors (E_{mn}) of the matrix were found for $\lambda = \lambda_1$ and $\lambda = \lambda_2$. For $\lambda = \lambda_2, \lambda = \lambda_1$ and $\lambda = \lambda_2$ the determinant of the system (20) disappears, in which case one of the coordinates, for example, \mathcal{E}_3 , takes arbitrary values:

$$\mathcal{E}_1 = -\frac{E_{13}}{E_{11} - \lambda} \cdot \mathcal{E}_3; \quad \mathcal{E}_1 = -\frac{E_{33} - \lambda}{E_{13}} \cdot \mathcal{E}_3 \quad (6)$$

For $\lambda = \lambda_1$ and $\lambda = \lambda_2$, a special pair of orthogonal vectors of the matrix (21) is determined.

Figure 5 shows a characteristic representing a special unit vector that characterizes the direction of the deformation anisotropy of the matrix with stops [4].

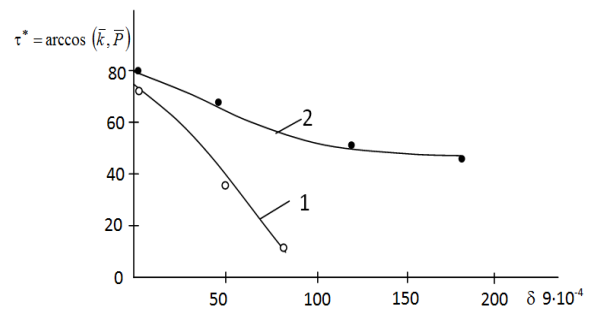


Fig. 5 Changing proper loading trajectory for retardation 1-samples, №2, 2- samples. №3.

It can be seen from the graphs that as the length of the δs axis increases, the direction of the special vector of

deformation anisotropy of the matrix tends to be in the direction of the loading trajectory, ie in this case there is a deceleration property.

It was found from the result that when the length of the δs axis increases, the direction of the special vector of deformation anisotropy of the matrix tends to the direction of the loading trajectory, ie in this case there is a deceleration property.

Thus, the direction of the deceleration property of the main special vector can be considered quite common. This increases its resistance to eating under conditions of highly aggressive eating.

Therefore, the choice of the material of the elastic element of the pipe holder with a double-panel matrix rubber material increases its durability by increasing its resistance to forces.

IV. CONCLUSION

1. In order to ensure the safety of the lifting and lowering process during drilling and repair of wells, and even to continue such work process with wind speed between 5-10 m / s, it is proposed to apply a wind pipe holder to the lifting and lowering device of mobile units.

2. In order to eliminate fatigue in the elastic element in the structural structure of the pipe holder, its material consists of 3 parts in the structural structure by choosing a double-panel matrix rubber, and the contact area with each detail is completed in the form of a cylindrical tube. In this case, when the compression process occurs in contact with the pipe handle, the deformations in the rubber will fill the cavity, which reduces the amplitude of cyclic plastic deformation, delays the formation of local stresses, regulates the pressure distribution and increases fatigue resistanceprovides storage.

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