

# Analysis of the application of a ball suspension in a core project

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**Annotation.** This paper presents an analysis of core sampling and the effectiveness of using the BOSH-100.02 ball hanger. The article compared and summarized the used ball suspensions that are used in UKR-185/100 and analyzed the economic aspects of the further use of this equipment in production. The tasks of increasing the efficiency of the ball suspension were analyzed. A comparative analysis of the use of hangers during core sampling was carried out. Calculated economic benefit in use.

## 1 Introduction

The relevance of this work lies in the need to address the issue of reducing costs, time, resources when using a ball hanger to increase the removal of the core and save its entire structure to the surface.

Core is a direct source of knowledge about the properties of rocks (Figure 1). Without high-quality sampling of core material, it is impossible to obtain reliable information about the properties of rocks. In connection with the complication of research objects, namely loose, cavernous-fractured, shale and other reservoirs, the role of the core sampling technologies used is increasing.



**Fig. 1.** Core sample

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The main goal of each operation for the selection of cores from all types of wells is to obtain direct information about the rocks that make up the objects of interest in the fields. All collected information is used to solve a complex of problems of prospecting, exploration and production of hydrocarbons. Based on the core, it is possible to conduct a study for oil saturation or gas shows, the integrity of the formations for further lithology. Therefore, improving the quality of core sampling is an important task of exploration drilling.

A rock sample extracted from a well gives information that seems to be almost the ultimate truth - some reservoir characteristics cannot be obtained by other methods.

## 2 Materials and methods

Scientific research is carried out by core sampling. Prospects for estimating oil reserves in the Tomsk region at the Kazan oil and gas condensate field should be formed taking into account: the complexity of the geological structure of deposits; deposit sizes; gas content in oil reservoirs; the need to ensure the safe environmental development of deposits by the underground method; mining technologies; ecological situation of the region.



**Fig. 2.** Core from the Kazan field.

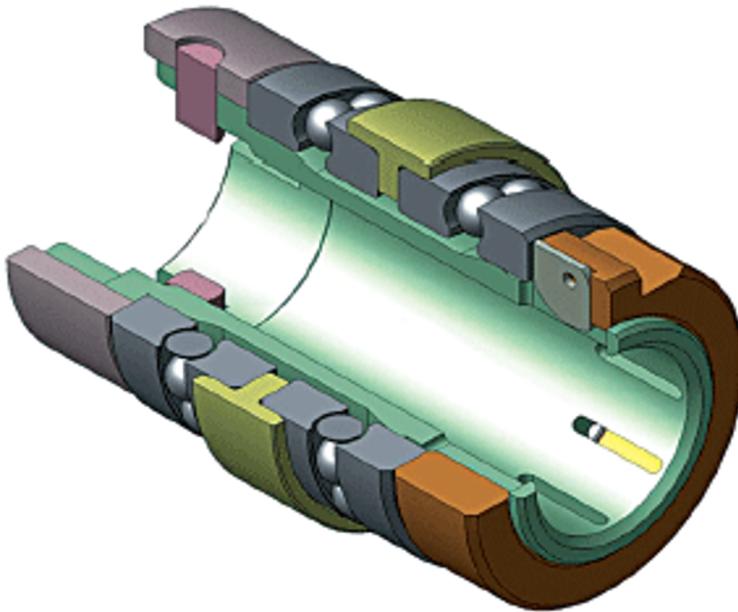
## 3 Results

To solve this problem, hard chromium coating was applied to both ball bearing races for the UKR-185/100 coring tool (Table 1) and tested at well No. 23R of the Kazan oil and gas condensate field in the Tomsk region in 2022. All parts of the ball suspension without bearings are protected against corrosion by a phosphate coating with oiling.

**Table 1.** Technical characteristics of the coring projectile

Core receiving device	Outer diameter of the case, mm	Outer diameter by centralizers, mm	Selected core diameter, mm	Device length, mm	Number of sections, pcs.	Connecting threads up/down
UKR 185/100	185	211,1	100	24940	2	3-133/ 3-171

The requirements for the coring projectile is that its design contains a ball suspension, where a bearing is used - 40X2MA without spraying. Chrome plating increases the resource of the metal itself. In terms of their scientific and technical level, the used ball suspension of UDOL LLC, VNIIBT-BT showed pronounced rapid wear during core sampling in strong cemented rocks: Paleozoic and weathering crust. Because of this, it does not allow to significantly increase the efficiency of the UKR-185/100 coring projectile. In addition, during the work, the ball suspension constantly occurs, which leads to lifting and replacement with a new ball suspension, and a small percentage of core removal.

**Fig. 3.** Ball suspension (R. BAGAUTDINOV, «Burservice» SPE» JSC)

It should be noted that the performance of existing ball bearings does not fully meet the technical requirements, and this has shown that using a ball bearing with hard chrome coating increases its service life, reduces the number of runs, and also increases the integrity of the bearing and wear resistance, which gives a greater result.

With the use of the developed BOSHP-100.02 ball suspension to the UKR-185/100 projectile, it was shown that the wear and bearing liner is practically absent. As a result of the work using the developed ball suspension, 200 meters of core were drilled - without replacing it. 60% increase in bearing performance. Wedging does not occur due to the high-

temperature and elastic lubricant Mobil XHP 222. Currently, such lubricants have begun to be used, analogues of Mobil XHP 222: Chevron Delo Grease, Elit M Li Grease and Gazpromneft Grease. These lubricants are used for any drilling: PDM, rotary, vertical and horizontal. Rotor and top drive are efficient drilling.

Consider the result obtained when working at the fields of the Tomsk region at the well No. 23R of the Kazan field.

**Table 2.** Results of coring at well No. 23 Kazanskaya

Date	Flight number with coring	Drilling with core sampling (along the borehole), m				Core removal			
		From	Before	For flight	Rising	Per flight, m	Per flight, %	Growing along the well, m	Average for the well, %
18.07 2023	1	2484	2493	9	9	9	100	9	100
19.07	2	2493	2511	18	27	18	100	27	100
20.07	3	2511	2525,4	14,4	41,4	14,4	100	41,4	100
20.07	4	2525.4	2543.4	18	59.4	18	100	59.4	100
21.07	5	2543.4	2561.4	18	77.4	18	100	77.4	100
21.07.	6	2561.4	2570	8.6	86	8.6	100	86	100
24.07	7	2616	2634	18	104	18	100	104	100
24.07	8	2634	2650	16	120	16	100	120	100

## 4 Discussion

The use of a new version of a ball suspension in a core sampler pursued two goals: reliability and durability of this product.

The economic benefit is that the hard chromium coating on the ball cage allows you to increase core sampling, reduce additional trips and get an economic effect.

## 5 Conclusion

When using a conventional ball hanger, the bearing is wedged when working in a well already at 18-27 meters, and the use of a chromium-coated bearing developed in a ball hanger for core sampling equipment made it possible to increase the percentage recovery and increase the meter-long core sampling, which helps to obtain a more vivid analysis in laboratory tests. studies of the core itself raised to the surface of the rock.

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