

# Application of Integrated Tool for Flushing and Fishing in Bohai Oilfield

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**Abstract:** *A wellhead flushing and fishing Integrated tool has been designed to address the technical challenge of traditional flushing and fishing of wear-resistant sleeves for core axis casing hangers, which requires only 1 drill and saves 2 drills. Field use has shown that each well saves at least 2 hours, which is 66% faster than traditional methods and greatly shortens the time for flushing the wellhead and fishing sleeves. It has significant improvement in quality and efficiency, and has great promotion value, providing valuable operational experience for related projects.*

**Keywords:** Integrated tool for flushing and fishing, Bohai Oilfield, On site application.

## 1. Introduction

At present, the commonly used oil/casing hangers in offshore oil fields are generally divided into two categories: core shaft type and slip type. Different types of hangers have different application ranges due to their own characteristics; When using the Kava type hanger, there is no need for precise length matching, just avoid the coupling position and sit on the Kava; However, before installing the slip, it is necessary to remove the four-way casing from the wellhead to raise the riser, in order to have enough space for the slip operation [1-4]; After sitting on the slip, it is necessary to perform thermal cutting on the excess casing above the slip and finely cut and polish the cutting edge; Therefore, although the Kava type hanger does not require precise length matching, there are many safety hazards before and after the installation of the Kava. The use of the core shaft hanger is similar to a casing coupling, and there is no need to dismantle the wellhead or cut the casing when sitting and hanging. The operation is relatively safe, but precise length matching of the downstream pipe string is required; The core shaft hanger has high requirements for the hanging position inside the four-way sleeve, and special protection should be given to the hanging position during operation. Therefore, the hanging position needs to be flushed before and after retrieving the wear-resistant sleeve. In order to improve the success rate of the anti wear sleeve and the sealing requirements of the core shaft hanger, the on-site operation generally follows the following steps: 1. Lower the flushing tool, flush the core shaft casing hanger and the four-way coupling of the casing, and lift and shake the flushing tool; 2. Assemble the anti wear sleeve drilling tool, the anti wear sleeve, the lifting anti wear sleeve, and the drilling tool; 3. Reassemble and flush the drilling tools again, flushing the mud and sand at the core shaft casing hanger and casing four-way seat hanger, as well as the blowout preventer group; At least 3 drilling trips are required to retrieve the anti wear sleeve before each casing is inserted, which seriously affects the efficiency of offshore oil drilling. To solve this problem, a comprehensive tool for flushing and salvaging the anti wear sleeve is designed, which not only has the function of retrieving the anti wear sleeve, but also has the function of flushing the inner hanging position of the casing four-way; Integrating flushing and retrieval into a single drill can save at least 2 hours of time and effectively improve the efficiency of offshore oil drilling.

## 2. Design of Tool Structure Principle

The integrated tool for wellhead flushing and fishing mainly consists of a female buckle, body, snap ring, sealing seat, sealing ring, sealing groove, mushroom head, central rod, spring, nut, shoulder, central cone hole, flushing hole, fishing ear, etc; The upper/lower ends of the body are equipped with female buckles, which are API drill pipe buckles or special buckles that can be processed according to the requirements of Party A and connected to the drill pipe; Two sealing ring grooves are set in the middle of the body for installing sealing rings; The upper end of the body is equipped with a shoulder for installing a sealing seat; The main body is provided with a through-hole, and its lower end shape is a central conical hole, which can form a throttling and boosting effect; The card spring is installed in the card spring groove of the body to prevent axial movement of the sealing seat upwards; The outer surface of the sealing seat is equipped with two sealing rings for installing the sealing rings; The inner surface of the sealing seat cooperates with the outer surface of the mushroom head to form a metal seal; The lower end of the sealing seat is located on the shoulder of the main body; The shoulder restricts the downward axial movement of the sealing seat; The mushroom head is shaped like a mushroom; The upper end of the central rod is connected to the mushroom head through threads; The spring passes through the central rod and is in a compressed state; The nut is connected to the central rod through threads, causing the spring to compress; The spring, central rod, nut, and sealing seat work together to ensure that the outer surface of the mushroom head and the inner cover of the sealing seat are always in contact, forming a metal seal and thus forming a one-way valve; The body is equipped with three flushing holes located near the lower end, evenly distributed along the circumference of the body; The number of fishing ears is 3, which are connected to the body through threads and evenly distributed along the circumference of the body; When pressure testing is required, the lower end of the drill pipe connecting tool is threaded, and due to the one-way throttling effect of the one-way valve, the drilling fluid flushing hole flows out, thereby achieving pressure testing of the blowout preventer group; When it is necessary to clean the casing, the upper end of the drill pipe connecting tool is threaded, and the drilling fluid flows through the central cone hole along the arrow through the single flow valve. Under the throttling and pressurization

effect of the central cone hole, some drilling fluid flows out from the flushing hole and some flows out from the lower end threaded. The two work together to clean the mud and sand at the four-way seat seal of the casing. After cleaning, the fishing ear is inserted into the wear-resistant sleeve, and the drilling tool is rotated 45° to lift up the drilling tool and remove the wear-resistant sleeve, thus achieving a one-time flushing of the mud and sand at the four-way seat seal of the casing and retrieving the wear-resistant sleeve, greatly improving the sealing performance of the core shaft casing hanger and the four-way seat seal of the casing; At the same time, at least 2 hours of operation time can be saved, effectively improving the efficiency of offshore oil drilling.

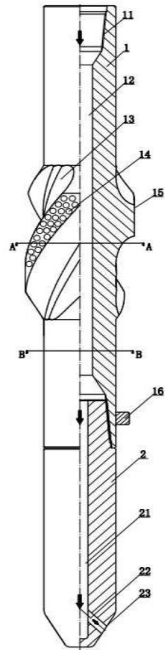
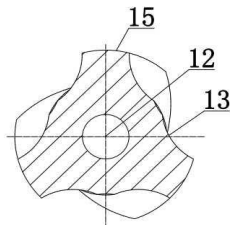
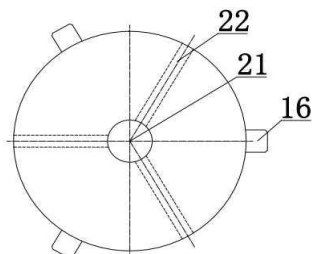


Figure 1



A-A

Figure 2



B-B

Figure 3

### 3. On Site Applications

#### 3.1 Introduction to the basic Situation of a Certain Well

The Penglai 19-3 Oilfield is located in the central southern

part of the Bohai Sea, in the 11/05 contract area, at longitude 120°01' -120°08'E and latitude 38°17'-38°27'N. It is approximately 216km northwest of Tanggu and 80km southeast of Penglai City. The average water depth within the oilfield is 27-33m. In terms of regional structure, the Penglai 19-3 Oilfield Group is located at the northeast end of the middle section of the Bohai South Low Uplift Zone in the eastern Bohai Bay Basin, developed on the Tanlu Fault Zone. The Bohai South Low Uplift is adjacent to the Bohai Central and Bohai East Sags to the north, and is surrounded by the Yellow River Mouth and Miaoqi Sags to the southwest to southeast. It is one of the favorable oil and gas accumulation areas in the Bohai Sea, with superior geological conditions for oil and gas accumulation. The drilling of Penglai 19-3 Oilfield/25-6 Oilfield mainly reveals the Cenozoic and Mesozoic strata. Based on lithology, electrical characteristics, paleontological analysis, and regional stratigraphic correlation, they can be divided from top to bottom into the Neogene Plain Formation, Minghuazhen Formation, Guantao Formation, and Paleogene Dongying Formation. The main oil-bearing strata are developed in the lower section of the Minghuazhen Formation and the Guantao Formation of the Neogene.

#### 3.2 Analysis of Test Results

The integrated tool for wellhead flushing and fishing was tested on site in the PL19-3 oilfield in May 2024. During the flushing operation of the fishing sleeve, the upper end of the drill pipe is connected to the tool's female buckle, and the drilling fluid flows out from the flushing hole along the arrow. When the drilling fluid flows through the flushing hole, it can act as a booster to quickly flush the mud and sand at the four-way seat seal of the casing. After flushing is completed, the fishing ear is inserted into the wear-resistant sleeve, and the drilling tool is rotated 45° forward to lift the drilling tool and catch the wear-resistant sleeve. Then, the flushing hole is placed in the hanger seat seal position for secondary flushing, thereby achieving a one-time flushing of the mud and sand at the four-way seat seal of the casing, the retrieval of the wear-resistant sleeve, and secondary flushing, greatly improving the flushing effect and ensuring the success of retrieving the wear-resistant liner. Rate and meet the requirements of the core axis suspension system for seat hanging; At the same time, at least 2 hours of operation time can be saved, effectively improving the efficiency of offshore oil drilling.



Figure 4: Wellhead combination diagram of integrated tool for wellhead flushing and fishing



**Figure 5:** Integrated tool for wellhead flushing and fishing, drilling flushing and fishing sleeve diagram



**Figure 6:** Diagram of the integrated tool for wellhead flushing and fishing with a fishing sleeve out of the well

#### 4. Conclusion

The traditional flushing and fishing anti wear sleeve of the core shaft casing hanger requires 3 drilling trips, while the integrated tool for wellhead flushing and fishing only requires 1 drilling trip, saving 2 drilling trips; According to data statistics, each well saves at least 2 hours, which is 66% faster than traditional methods; As of now, the integrated wellhead flushing and fishing tool has been used in the booming area for a total of 36 well operations (10 on platform G, 12 on platform K, 13 on platform L, and 1 on platform N), saving a total of 72 hours. Compared with the traditional flushing and anti wear sleeve operation mode of the core shaft casing hanger, the integrated tool for wellhead flushing and fishing only requires one drill to flush and remove the sleeve, saving two drills, reducing the number of times workers change drilling tools, and lowering the risk of labor intensity. The operation process is less risky. After 36 well applications of integrated wellhead flushing and fishing tools by the Pengbo regional drilling and completion project team, a set of technical specifications for the "Operation Guide for Integrated Wellhead Flushing and Fishing Tools of Core Shaft Casing Hangers" has been developed through summarization and refinement. The integrated tool for wellhead flushing and fishing integrates flushing and fishing into one drill, saving two drills. This tool is safe, simple, efficient, and effective, greatly shortening the time for flushing the wellhead and fishing, improving quality and efficiency significantly, and has great promotion value. It also provides valuable

operational experience for related projects. The Bohai Oilfield uses a core axis casing hanger to drill about 100 wells per year. The promotion of this tool to the Bohai Oilfield will effectively improve the efficiency of offshore oil drilling.

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