

Beijing Liuhe Greatness Technology co., Ltd.

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+86 10-63753083 / liuhe@liu-he.com / www.liu-he.com

BLDG 39, 12th Zone No 188 Southwest 4th Ring Road, Beijing China

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New R&D Product Introduction

EM-MWD

Overview

The main data transmission modes of MWD are mud pulse and electromagnetic channel.

Pulse transmission is the most widely used technology, but there are many disadvantages, such as slow data transmission rate, small amount of information transmitted, easy to be affected by the quality of drilling fluid and pump non-uniformity, and high requirements for drilling fluid (sand content $\leq 1\%$, gas content $\leq 7\%$).

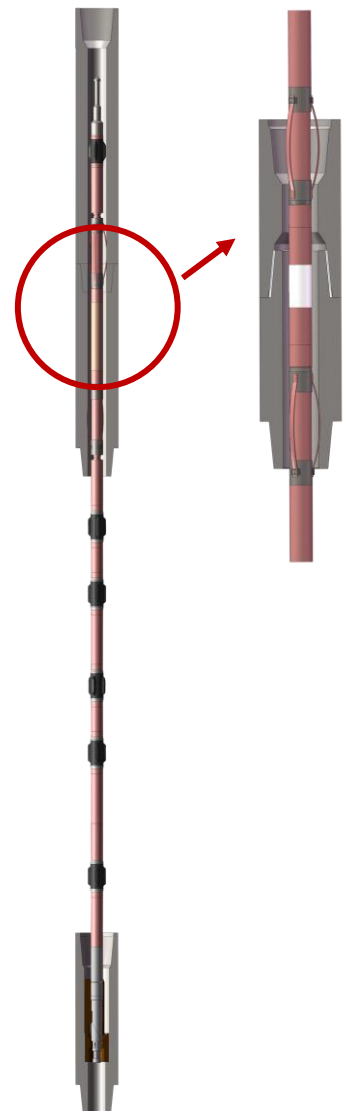
Electromagnetic wave transmission mode is to transmit downhole data to surface in low frequency electromagnetic wave signal. It does not need mud as signal carrier, and requires less mud quality and mud pump uniformity, so the data transmission capacity is stronger, and the transmission rate is higher than mud pulse. It has the advantages of no mechanical receiving device, good system stability and better adaptability to the unbalanced drilling process.

Features

- ◆ Underbalanced drilling engineering
- ◆ Dual mode of mud pulse and electromagnetic wave
- ◆ Minimum OD is 38mm
- ◆ The maximum baud rate is increased to 8bps

Application

- ◆ The existing tools could be connected with EM-MWD to realize dual mode, giving customers more choice
- ◆ Solve signal transmission problem of complex downhole mud situation
- ◆ Solve slow uploading of downhole data when connect with Drilling Dynamics Monitor and Near-Bit.
- ◆ Compatible and modular design reduce operation and maintenance costs



New R&D Product Introduction

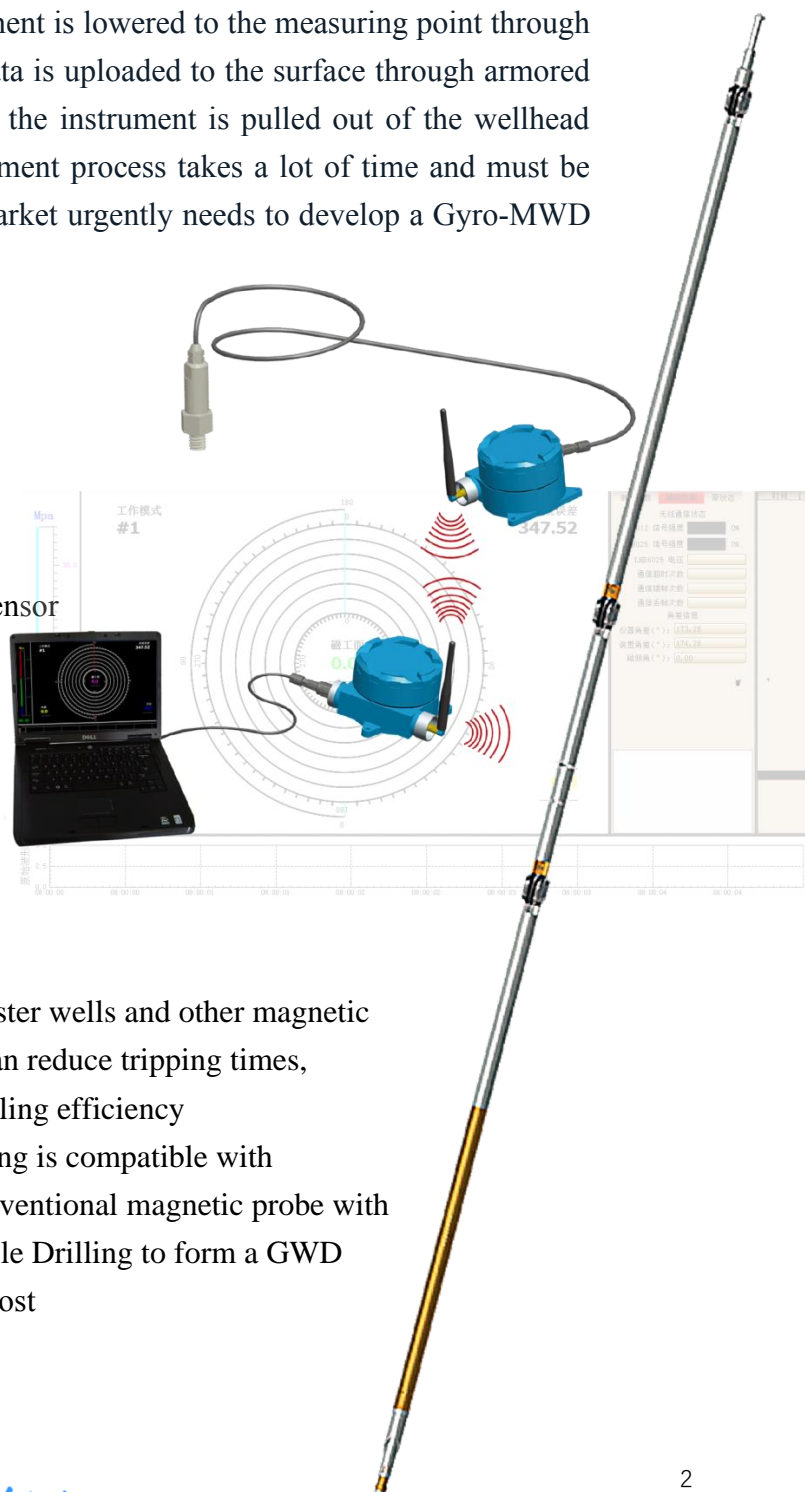
LHE621501 FOGWD

Overview

Fiber Optic Gyroscope (FOG) probe are widely used for attitude measurement under the condition of magnetic interference due to high measurement accuracy and free from magnetic interference, including the operations of cluster wells, casing wells, side drilling, window opening and so on. However, fiber-optic gyroscope probes are all used in wireline logging. During the measurement, the instrument is lowered to the measuring point through armored cables, and the measured original data is uploaded to the surface through armored cables. After the measurement is completed, the instrument is pulled out of the wellhead through armored cables. The whole measurement process takes a lot of time and must be equipped with cable winch. Therefore, the market urgently needs to develop a Gyro-MWD that can be measured while drilling.

Features

- ◆ Measuring while drilling
- ◆ Aerospace quality fiber-optic gyroscope sensor
- ◆ Referable dynamic gyro high side
- ◆ Anti-vibration : 20G sine
10G random



Application

- ◆ In the side drilling window opening, cluster wells and other magnetic interference environment operation, it can reduce tripping times, shorten operation time, and improve drilling efficiency
- ◆ The Fiber Optic Gyroscope While Drilling is compatible with LHE6101 MWD series. Replace the conventional magnetic probe with the probe of Fiber Optic Gyroscope While Drilling to form a GWD system, reducing customers' operation cost

New R&D Product Introduction

Gamma Integration Test Platform

Overview

To realize multi-sector azimuth gamma measurement, the azimuth gamma measurement device and test method must collocate corresponding testing equipment. With kinds of gamma ray tool is rising, difficulty of azimuth gamma imaging is deepening. The early gamma calibration device is not adapt to present calibration and testing of gamma while drilling. Our company developed the integration test platform, which is of simple test, wide application, and accurate gamma measurement.



1. Carriage 2. Slide rail 3. Pulley

Features

- ◆ Drill collar can be rotated at a speed of 40r/min~100r/min to simulate drilling rotation
- ◆ Simulate that the pipeline carry pulley to move forward and backward. Simulate different gamma values of the formation
- ◆ It can supply power and transmit data through slip-ring during rotation in the measured drill collar, and collect data in real time.

Application

- ◆ It can carry out effective calibration and simulation test for the azimuth gamma drill collars and similar products, which can simulate the drilling conditions such as the rotation of drill pipe and drilling when the gamma sub is in the drilling process. It displays the real speed, azimuth and other information, can be calibrated and compared with the data measured by the azimuth gamma sub, so that the formation data read by azimuth-gamma sub is more accurate.

Overflow Monitor System

Overview

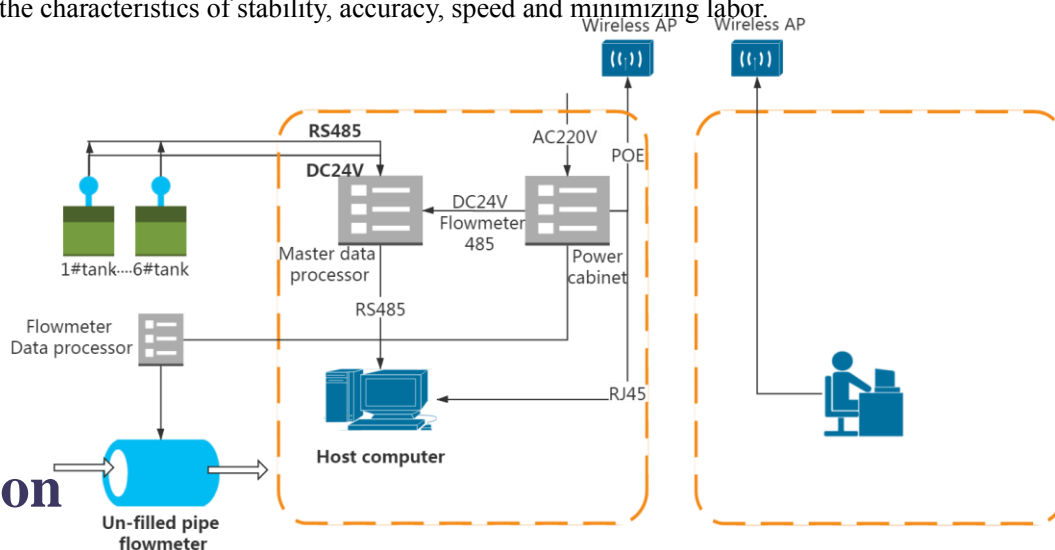
In drilling operation, blowout and well leakage will not only affect the normal drilling construction schedule, but also cause a variety of safety accidents. At present, all oil fields use manual recording of drilling fluid volume and mud outlet flow data of field grouting tank to judge and detect blowout and well leakage phenomenon, but the workload is relatively large, and there are data deviation problems.

Overflow Monitor System adopts the most advanced electronic detection instrument, through the software real-time monitoring to determine the occurrence of blowout or well leakage phenomenon. When abnormal phenomena are found, timely remind the personnel on duty in the field in the form of software interface and external sound and light alarm to prevent further expansion of the problem and reduce the loss. However, the current monitoring method is all based on the judgment of surface drilling fluid. By upgrading this system, our company can obtain more downhole related data, so that we can find the leakage and overflow phenomena earlier.

Features

- ◆ The un-filled pipe electromagnetic flowmeter is used to monitor the mud flow rate and mud height in the pipeline in real time, and the actual flow is calculated to ensure the accuracy of the mud flow in the pipeline.
- ◆ Ultrasonic level gauge is used to monitor the change of mud tank level in real time, and the variation of mud can be calculated in real time
- ◆ With the use of wireless transmission technology, the computer desktop data can be displayed across the network bridge on the technician's computer desktop
- ◆ With sound and light alarm device to ensure the timely and eye-catching abnormal alarm.
- ◆ The product has the characteristics of stability, accuracy, speed and minimizing labor.

Application



- ◆ Solve the problem of heavy workload of manual recording and easy deviation of data, reduce labor cost, avoid errors, realize the discovery of abnormal phenomena such as well leakage and overflow in advance, and prevent production safety accidents.

MWD Connector Upgrade

Overview

MWD system is an important part of the oil drilling, stability of MWD performance directly affect the work efficiency of the drilling crew, in which the connector performance between each sub directly affects the stability of the instrument. Ten-pin connector is usually used between each sub of traditional instruments, the connector is difficult for connection, and after repeated use and downhole high temperature vibration, the performance of the connector will seriously decline, and connection is easy to loosen, then affects the communication quality, or even cause the instrument work abnormal.

On the basis of the original instrument, this project improves the overall stability of the connector by upgrading the connector, so as to improve the stability of MWD.



Features

- ◆ Performance is stable is reliable
- ◆ Total length is same with original tool. Simple assembly, convenient and reliable connection.
- ◆ Tool accuracy is not affected.

Application

- ◆ Simple operation, avoid repeated connection difficulty
- ◆ Reduce centralizers and decrease cost
- ◆ Stability and usability are improved

New R&D Product Introduction

260℃ Thermodetector

Overview

The existing HTHP Electronic Survey System can provide the measurement of the parameters in the insulation sleeve, but the external temperature of the instrument cannot be directly measured. It is now necessary to add downhole real temperature gauges that can be widely used for geothermal projects in future. The independent thermodetector designed by our company can meet the external temperature measurement requirements under 260℃ high temperature and high pressure environment.

Features

- ◆ Imported temperature sensor components are adopted
- ◆ Equipped with high pressure insulation cover, can work in high temperature and high pressure environment
- ◆ Data storage, available for option
- ◆ Temp. range : 0-260℃ ±2.0℃ (continuous work 4h)
- ◆ Max. Pressure : 150MPa
- ◆ Temp. measurement : 2000 points
- ◆ Dimensions : φ45×1570

Application

- ◆ 260℃ Thermodetector, can be used with Electronic Survey System, mainly used to measure the environmental temperature at the bottom of geothermal wells, applied to the development of geothermal projects.



Engineering Change

Structure Change

1. LHE6518-02e 175℃ Probe Control Circuit Structure Upgrade

Version upgrade: from d to e

Solution: Change the battery model to reduce the probability of failure under high temperature and improve product stability.

Product Upgrade

2. LHE6150C Drilling Dynamic Monitor Structure Upgrade

Version upgrade: a

Solution: Increase the bending flexibility of long cover plate, reduce the screw fracture risk of cover plate, and improve product stability.

Product Upgrade

Hardware Change

1. LHE6118-20a/LHE6518-20a Probe Control Board Upgrade

Version upgrade: a

Solution: In the case of use with turbine generator, raise the starting voltage threshold of power supply chip to ensure stable output voltage.

Product Upgrade

Firmware Change

1. LHE6149.304.V1.0.2 Probe-type Azimuth Gamma Firmware Upgrade

Version upgrade: from V1.0.1 to V1.0.2

Solution: Improve upload speed of azimuth gamma. Upload API value instead of count value to upload.

Must Do

2. DEES-deep earth exploration system Setup.303 Software Upgrade

Version upgrade: from V1.1.0 to V1.1.1

New features:

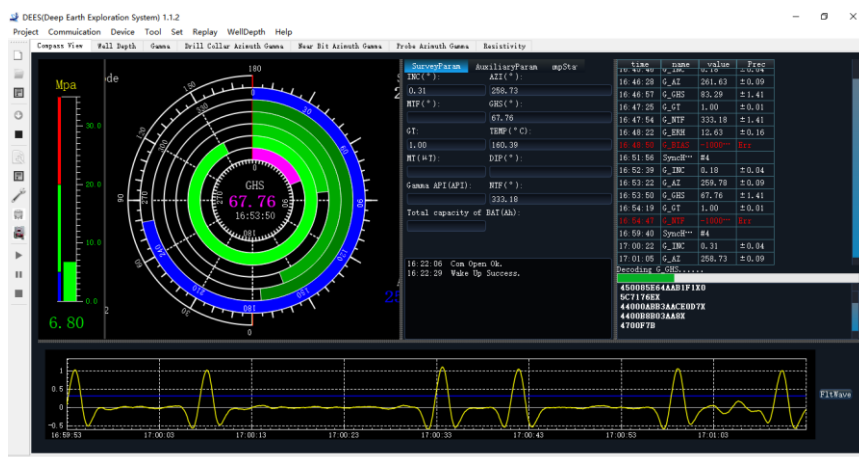
1. Dial is divided into partitions. Data is more clear and more intuitive.
2. Filter data and original data could be switched for display.
3. Decoding threshold and pump-pen threshold could be adjusted automatically or manually.
4. Natural gamma and probe-type azimuth gamma could be plotted.

Product Upgrade

LHE621501 FOGWD

Introduction

The Fiber Optic Gyroscope While Drilling (FOGWD) includes gyroscopic probe, mud pulser and surface equipment, etc. The gyro probe adopts aerospace -grade precision fiber-optic gyroscope (FOG) sensor coupled with high-precision MEMS accelerometer. The probe supports self-seeking. It can stop the pump to measure borehole attitude data, and can control the mud pulser to transmit data to the surface when the pump is started.



Case

- ◆ **Date:** Dec. 2019
- ◆ **Place:** NanYang
- ◆ **Crew:** 40506
- ◆ **Well No. :** GAO02
- ◆ **Tool No. :** LHE5518 Gyro Probe+LHE6101MWD
- ◆ **Description:**

Work Period: Dec. 15-18, 2019

Working hours: 3 days

Tracking depth: 200m-1769m

Max. Downhole Circulating Temp. : 60°C

Other parameters: Gyro inclination, Gyro GHS,
Gyro azimuth, Gyro North tool face

◆ **Conclusion:**

1. Compared to conventional MWD, this tool can realize azimuth measurement under magnetic interference.
2. Compared to wireline gyro, this tool can realize wireless measurement while drilling, which reduce time and save cost.
3. The vibration resistance can meet the strength while drilling.
4. The static measurement parameters are normal

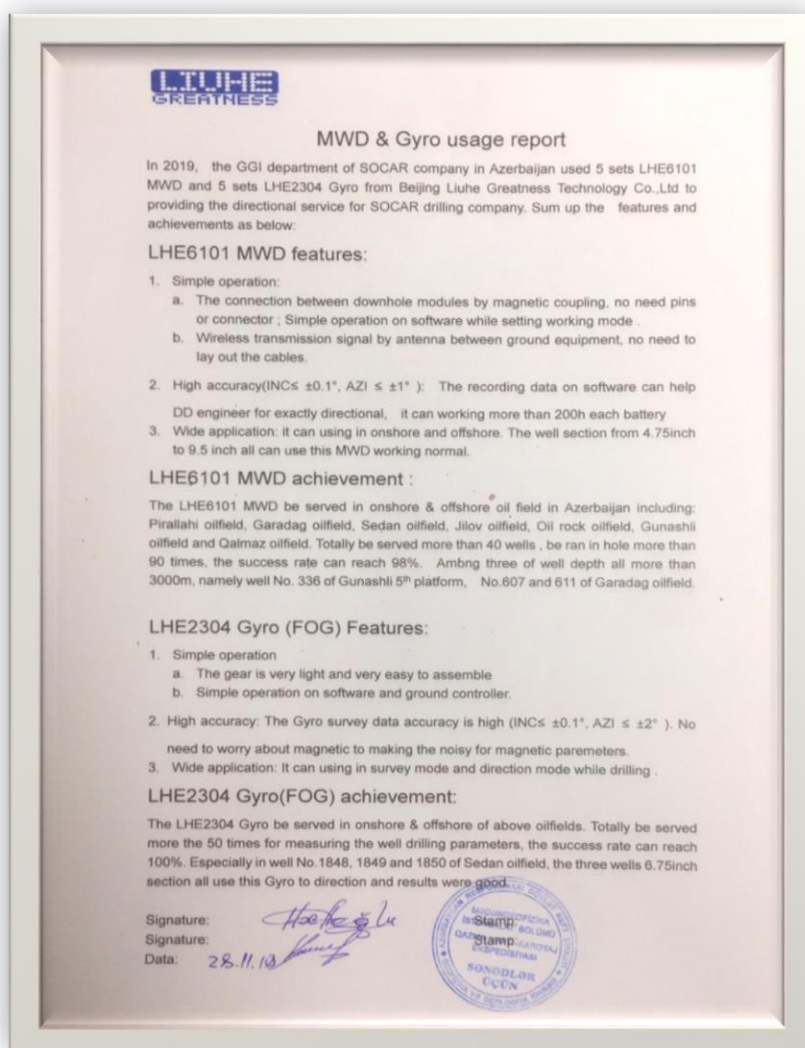


Application Cases

Recognition from SOCAR on MWD & Gyro

Introduction

Beijing Liuhe Greatness Technology co., Ltd. started its technical services business in Azerbaijan in 2018. LHE6101 Wireless Measurement While Drilling (MWD) and LHE2304 Self-seeking Gyroscope (Gyro) were approved by Azerbaijan State Oil Company (SOCAR) by the end of November 2019.



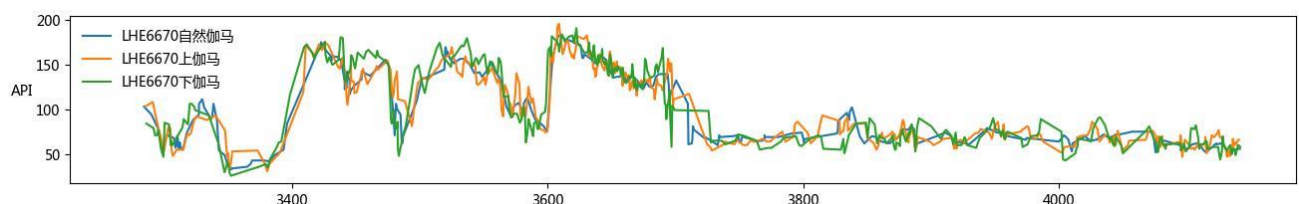
- ◆ All major oil fields in Azerbaijan have used the MWD of Liuhe, with success rate of 98%.
- ◆ The North-seeking Gyroscope Inclinometer has served for 50 times, the accuracy is in full compliance with the requirements, the success rate is 100%.

Application Cases

Azimuthal Gamma (Collar-based)

Introduction

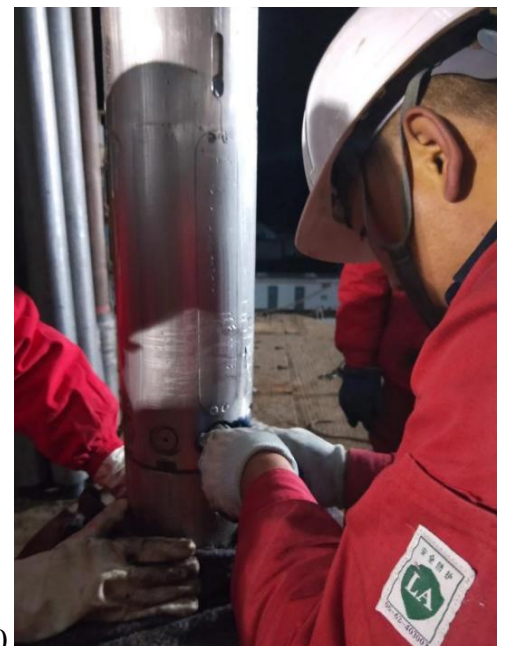
At present, most of the azimuth gamma detection instruments in practical application belong to the probe-based azimuthal gamma. The ray from the formation will attenuate to some extent when passing through the drill tool, resulting in weak measurement signal. The drill collar-based azimuthal gamma contacts the formation directly, which makes the measurement signal stronger and the top and bottom gamma resolution is obvious, which can accurately locate the position of oil reservoir and improve the exploitation and utilization of oil resources more effectively.



Case

- ◆ **Date:** Aug. 2019
- ◆ **Place:** 628 county road, etoke qianqi, Ordos city, Inner Mongolia Autonomous Region
- ◆ **Crew:** ChuanQing 50567
- ◆ **Well No. :** SU 14-0-10XH1
- ◆ **Tool No. :** LHE6670 Azimuth Gamma (Collar-based)
- ◆ **Description:**
 - Work Period:** Aug. 21-29, 2019
 - Working hours:** 9 days
 - Tracking depth:** 3891m-4590m
- ◆ **Conclusion:**

1. It is easy to operate and widely applicable to instruments. It only needs to configure the receiving sub in the pulse to decode the value through wireless transmission.
2. The software operation process is fast, simple and free of tedious settings.
3. The MWD gamma probe was used to compare the LHE6670 collar-based azimuthal gamma data, which effectively proved the authenticity and reliability of the decoded data.
4. During the passage of the instrument through the rock, the top-bottom gamma reaction was accurate and timely. Because it is closer to the bit position, the data returns to the surface in the form of pulses at a better rate than the others.



Application Cases

LWD Resistivity Measurement System

Introduction

LWD Resistivity Measurement System, based on the theory of complete electromagnetic field, adopts 2MHz and 400KHz operating frequencies. When the instrument passes through different resistivity formation, the amplitude and phase difference of the receiving coil are changed, and then converted to the resistivity information of the formation. The application of this instrument greatly improves the efficiency of reservoir detection and reduces the engineering cost. The combination of directional survey and geological parameters improves the measurement efficiency of petroleum engineering. It takes drilling engineering services to a new technical level and provide new technical support for the exploitation of complex geological reservoirs.

Case

- ◆ **Date:** Oct. 2019
- ◆ **Place:** NanLiang Block, Huachi Town, GanSu Province
- ◆ **Crew:** Chuanqing 30122
- ◆ **Well No.:** Wu 292-004
- ◆ **Tool No.:** LHE7310A Resistivity Measurement System
- ◆ **Description:**

Work period: Oct. 17-20, 2019

Working hours: 47h

Tracking depth: 258m-1217m

- ◆ **Conclusion:**

1. Upload data is accurate, and it can plot in real-time.
2. After the tool is out of well, the stored data are complete. It can plot and export LAS file.
3. The measurement is accurate, and layering is much clear. The target zone resistivity is 20 Ω m. which matches the formation resistivity.
4. Through real-time data uploading by the resistivity system, directional engineers can accurately judge the formation where the drill is located and whether it has entered the target zone, providing accurate resistivity data for geosteering.



Rotary Pulser MWD

Introduction

Rotary Pulser MWD using high power brushless DC motor, can cut off LCM which might jam pulser. Through one-way drilling fluid flow and anti-interference treatment. It outputs signal in the form of positive mud pulse, which largely reduce the probability of signal interference and valve head congestion. Therefore, the applicable scope of mud weight and downhole conditions is wide, and the Rotary Pulser MWD has excellent applicability.

Case

- ◆ **Date:** Oct. 2019
- ◆ **Place:** Fengqiao Village, YongChuan District, ChongQing
- ◆ **Crew:** 70837XN
- ◆ **Tool No. :** LHE5616 Rotary Pulser+Azimuth GR
- ◆ **Description:**
 - Work Period:** Oct. 5-28, 2019
 - Working hours:** 22 days
 - Tracking depth:** 5428m-6070m
 - Max. Downhole Circulating Temp. :** 140℃

- ◆ **Conclusion:**

1. Compared with the common bottom-mounted tool, the rotary pulser tool adopts the upper suspension fixation mode. After the well deviation exceeds 90°, there is no problem that the instrument will lose its signal due to the off-key. With rotary pulser tool, sand sticking is not easy to occur.
2. Rotary pulse signal is strong. Data measurement is stable and accurate.
3. Top and bottom GR can accurately map the formation.

