An Automatism Device of Casing Ware Monitor Used on Slurry Buffer

China University of Petroleum - Beijing
Casing ware has always been a problem in petroleum drilling industry. The ware of casing decreases its thickness, weakens its intensity, and will, if the problem comes serious, discard the oil well, even lead to accidents. So it’s necessary to monitor the ware of casing while drilling, and take measures to reduce the ware problems according to the monitor results.
However, there are no effective devices to do this job nowadays. Now I will introduce a device that can monitor the ware status of casing automatically. This device is called automatism device of casing ware monitor used on slurry buffer.
As we know, ware between casing and drill stem forms abrasive dust in circulating mud; monitor of the content of abrasive dust in circulating mud helps study the ware status of casing. The automatism device of casing ware monitor used on slurry buffer can monitor the content of abrasive dust automatically, thus it can monitor the ware status of casing automatically. The circulating mud system is shown in figure 1.
Figure 1 Circulating Mud System
Figure 2 Slurry buffer
The automatism device of casing ware monitor used on slurry buffer is shown in figure 3. When it works, the screw goes down, and pushes the magnet bars to the vertical position, then the magnet bars immerge into the mud; after a fixed time, when some abrasive dust is adsorbed onto the magnet bars, PLC controls the screw to move up, and pull the magnet bars to the horizontal position.
During this process, the blades move towards the bottom of the magnet bars, which is a non-magnetic area, and makes the abrasive dust fall into the trough under it. Then the weight sensor measures the amounts of the abrasive dust. Finally, the wireless communication blocks send the values the computer far away. When the next cycle comes, the measured abrasive dust falls out of the trough, preparing for the new abrasive dust.
Figure 3 The Automatism Device of Casing Ware Monitor Used on Slurry Buffer
The control system is to control the motion of the motor, which drives the screw to move up and down. It consists of control buttons, travel switches, DC SSR (direct current solid state relays), AC (alternating current) SSR, a motor and a PLC, as shown in figure 4. In the control system, position control, timing control, as well as auto-manual switch is concerned, so programmable logic Controller (PLC) is used in the system. In terms of different signals from control buttons and travel switches, PLC determines which DC SSR to act, when to act and stop; according to different actions of DC SSR, AC SSR drives the motor to rotate clockwise or anticlockwise, and the screw then moves up or down. All the control logic is programmed in PLC, thus the work of the device is automatic.
Figure 4 Control System
The device takes 3 magnet bars as a magnetic unit to collect abrasive dust from the circulating mud, as shown in figure 5.

Concerning the high temperature (70-80°C) of the mud in the slurry buffer, N40H is taken as the magnetic material, which works fine under high temperature. In order to acquire strong magnetic field, axial magnet is placed as shown in figure 5.
Measurement and communication system measures and displays the amounts of abrasive dust collected in the trough, and transmit the weight data to a computer by wireless communication blocks. The weight of the abrasive dust is measured by the weight sensor and displayed on the display meter. By RS232, the weight data is transmitted from display meter to wireless transmitting block, and to Wireless receiving block in the monitoring room tens of meters away. By RS232-USB interface, the weight data is last transmitted to a computer, and recorded by software.
Figure 6 Measurement and Communication System
In order to record weight data efficiently, data acquisition software is developed. When the device works and transmits data to the software, it will automatically record the data, and display it in the form of chart. By viewing the chart, people can find out the ware status of the casing. When it comes abnormal, proper measures should be taken to avoid accidents.
Figure 7 Data Acquisition Software
This device uses magnetic methods to separate the abrasive dust from the mud and measure its amounts. It’s convenient to monitor the ware of casing while drilling. As while as the ware rule is studied, people can judge whether the ware problem is serious, and take certain measures to solve the problem. Experiments show that monitoring result of the device is accurate, which can be used in the drill site.
Thank you!