

# Hejian Deris Petroleum Drilling Equipment Co., Ltd

## Drill bit application instructions

### 1bit selection

1. Please reading lithology description and bit records of adjacent wells carefully, and analyzing formation characteristics.
2. Selecting appropriate type in accordance with lithology.

### 2 Preparation before drilling

1. Inspect previous bit for body damage, lost cutters or inserts etc. Make sure there are no any junk on bottom hole, and clean the bottom hole if necessary.
2. Bit must be handled with care in order not to damage cutters and hard substances.
3. Check if there is any damage on bit cutters and if there any foreign matter inside the bit.
4. Check if installing nozzle meets requirements, and replace nozzles if necessary.

### 3 Marking up the bit

1. Clean bit threads and apply grease on threads.
2. Fit the breaker to the bit, lower the drill string onto the pin and engage the threads.
3. Locate the bit and breaker in the rotary bushing, and make-up the bit to be recommended torque.

## 4 Tripping in

1. Remove the breaker and carefully lower the bit through the wellhead device in order not to damage it.
2. Shrinkage, shoulder, dogleg and key seat of borehole should be cautious when bit through blank hole.
3. Start pump and cycle drilling fluid to wash bottom hole when drill to a point about 30 meters to bottom of the hole, and rotate drill string at the low speed not more than 60rpm.
4. Approach the bottom approximately half meter. Circulate for 5 to 10 minutes with full flow.

## 5 Reaming

1. Reaming long sections of undergauge hole is not recommended.
2. If reaming operation is necessary, it is strongly recommended that the reaming operation should be done with maximum flow rate circulation, specific weight on bit not exceed 90N/mm (diameter), rotary speed not exceed 60 rpm where stuck was encountered when tripping in.

## 6 Bit break-in

1. Overusing display instruments when bit approach bottomhole. If the WOB and torque increase, that shows bit have arrived at bottomhole. Use not more than 90N/mm, weight on bit and 40 to 60rpm to establish the bottomhole pattern at least half meter.
2. Bit break-in is finished and should be adjusted RPM to obtain optimal

drilling parameter combination.

3. Drilling parameters adjustment should be selected within the limits of the recommended parameters refer to recommended drilling parameters optimization method.

## 7 Normal drilling

1. Drilling situations should be monitored and analyzed during, so that we can judge complex condition and take corresponding measures.

2. See the table of complex circumstance in this manual for any conditions and treatment action.

### Optimal test method for drilling parameters:

1. Drill for 5 minutes with initially selected proper WOB and moderate RPM (60~100r/min) and record the ROP (as shown in the table below).
2. Moderately increase WOB and keep the same RPM and drill under this WOB for 5 minutes and again record the RPO (as shown in the table below).
3. Decrease WOB by the same extent and repeat step 2.
4. Find the WOB in the two groups of test that can yield highest ROP.
5. Properly change RPM under optimal WOB and record the ROP (as shown in the table below).
6. Select the RPM at the highest ROP.
7. Set the drilling parameter at the best combination: 60KN    RPM: 120r/min

Times	RPM:100r/min		WOB:60KN	
	WOB (KN)	Drilling hour (Min/m)	RPM (r/min)	Drilling hour (Min/m)
1	80	8	100	7
2	100	9	120	5.5
3	60	7	80	8
Select	60	7	120	5.5

### Comparison of downhole situation and related measures

Item no.	Surface behavior of downhole problem	Possible cause	Corrective measure

1	Torque increase	Formation becomes harder Not optimum WOB & RPM Well inclination increase Filter cake increase Drill stem washout	<p>Corrective actions for bit balling are:</p> <ol style="list-style-type: none"> <li>1. Pick up off approximately half meter, and circulate for 10 to 15 minutes with full flow;</li> <li>2. The bit was swiveled by using different means according to drill rig. Waste matters adhered on the surface of a bit threw off by using centrifugation.</li> </ol> <p>Corrective actions for bit bouncing are:</p> <ol style="list-style-type: none"> <li>1. Drilling parameters can be changed to shop the bit bouncing caused by formations. If the problem is not resolved and ROP still decreased after drilling parameters are changed, trip out can be considered;</li> <li>2. Following measures can be taken to stop the bit bouncing caused by fallen matter, broken tooth or lose tooth, etc.:             <ol style="list-style-type: none"> <li>(a) The bit is put up to 0.5 meter from bottomhole, the high-duty mud circulated and the bit ran about 5 minutes under low RPM (40~60 r/min);</li> <li>(b) The high-duty mud circulated continuously and the bit with low RPM is slow put down the bottomhole;</li> <li>(c) Above steps are repeated after the bit is put up again. Then the bit drilled 0.5</li> </ol> </li> </ol>
2	Torque decrease	Formation becomes softer Not optimum WOB & RPM Well inclination decrease Filter cake decrease Bit balling	
3	Standpipe pressure increase	Flow rate increase Well plugging Bit wear or cored Mud density or viscosity increase Bit balling	
4	Standpipe pressure decrease	Drill stem washout Flow rate decrease Mud density or viscosity decrease Air fill into mud Gas kick Mud lost in broken formation	
5	ROP decrease	Formation becomes harder Mud density increase or performance deterioration Bit wear Not optimum WOB & RPM Cleaning effect decrease Bit balling Drilling tool washout	
6	RPO is instability	Laminar formation Soft and hard interbed Broken formation Bit balling	
7		The bit can be resulted in	

	Bit bouncing	<p>an uneven oscillation due to large friction torque during drilling in plastic formation, cracked formation and broken formation and therefore, bit bouncing can occur. In addition, any lost subject in the hole, including bit's cutting elements broken or lost in the hole, can also lead to bit bouncing.</p>	<p>meter under low RPM (40~60 r/min) and low WOB (5~10KN), so that fallen matters are crushed to sidewall;</p> <p>(d) The bit can drill continuously after the bit bouncing is resolved. Please consider trip out and fishing.</p> <p><b>Corrective actions when drill to hard stringers, hard abrasive or hard muddy sandstone formation:</b></p> <ol style="list-style-type: none"> <li>1. If it is forecasted that the stringer is not thick, then lower RPM and drill through the stringer in order to extend the bit's service life.</li> <li>2. If it is forecasted that the stringer is thick, then it is better to reselect the best suitable drilling parameters after the bottom hole pattern is formed in the stringer or hard abrasive formation.</li> </ol>
--	--------------	--	--