Prime Horizontal Ltd

Rotating Magnet Ranging Service Procedure

Setup Operations

1. Calibrate the RMRS near bit sub. Collect a sample of magnetic data for use while ranging and to verify the magnetic field being generated from the sub. The Magnet sub will be installed after in the inseam BHA.

2. Log the vertical target well using the RMRS receiver. The log should include markers in the well like the casing shoe and the total depth of the well. If the rat hole is deep it may not be practical to run in to the bottom.

3. Run the tool to the sensor depth. The best signal will be obtained when the receiver tool is 21m above or below the planned intersection depth. The depth of the casing shoe must also be taken into account – it is still possible to run the system with the Sonde at similar depth to the target depth. A distance of at least 3m from the casing shoe to the sensor on the tool must be taken into account.

4. Setup the radio telemetry back to the rig site and test using data from the RMRS receiver.

Intersection Operations

1. Ensure that radio-link communication has been established between the RMRS receiver in the vertical well to be intersected and the rig so real-time ranging calculations can be made.

2. The rotary magnet behind the bit is expected to be detected by the receiver in the vertical well once the separation between the wells reduces to 60 m, however at this offset the signal may not have sufficient strength to accurately define the intersection target. To improve the signal to noise ratio, turn down the EMWD power as much as possible before this point.

3. If it is clear that a turn to the left or right will be required when the first ranging data is detected at about 60-70 m separation, then start to steer left or right while drilling ahead. Otherwise continue on the current trajectory.

4. Drill ahead 30 m to close the separation between the wells to 30 m, obtaining course correction data from the RMRS system at connections and at any time between connections if required. Correct the course by steering towards the vertical well target. Keep rotating at maximum allowable rate and circulating at maximum flow rate while trying to detect the signal and analyzing the data.

5. When the separation between the wells has reduced to 30 m, an assessment will be made about whether it is possible to achieve intersection. The likelihood of intersection increases if minimal steering will be required from about 30 m out.

6a. If the intersection is considered unlikely, then drill straight ahead without further course correction to about 30 m past the vertical well, acquiring ranging data at each connection.
to better define the target location. Plan and implement a sidetrack to the target location, pulling back sufficient distance prior to kick-off to provide a 50 m tangent section prior to intersection. Do not apply any additional corrections to the survey data on the sidetrack based on the first set of ranging data. Repeat the ranging procedure on the sidetrack, correcting the course as indicated by the new ranging data rather than the previous target location.

6b. If intersection is considered achievable from the wellpath position at 30 m separation, then drill ahead and correct the course as indicated by the RMRS system. At 3 m separation between the bit and the vertical well, raise the receiver tool in the vertical well as directed by the Prime Horizontal Engineer.

7. Drill ahead and intersect the vertical well. Monitor the pressure gauge on the vertical well for a wellhead pressure change and watch for a sudden increase in pressure. If the wellhead is not installed, look for a sudden change in the head of water in the vertical well.