PRIMEHORIZONTAL

Rotating Magnet Ranging System

The HDD RMRS System and the production of Coal Bed Methane

In recent years, the production of coal bed methane (CBM) with a combination of vertical and horizontal wells has become cost effective, especially when used with HDD methodologies.

Visit our website to see our FAQ #9 for a discussion of Coal Bed Methane and our FAQ #10 for a discussion of Drilling for CBM.

Accurate horizontal to vertical well intersections

The Rotating Magnet Ranging System (RMRS) system as supplied by Prime Horizontal is a cutting edge magnetic downhole ranging system for use in Vertical/Horizontal and Horizontal/Horizontal well intersects. When being used for a Vertical/Horizontal well intersect the particular advantage it has over other technologies is the ability to locate the drill bit up to 60m before the intersect point has been reached. This enables the necessary changes in direction to be made before reaching the intersect point and increasing significantly the possibilities of a successful intersect on the first attempt.

All other current downhole ranging technologies rely on the use of a pass-by, in which the downhole assembly in the horizontal well must be drilled past the vertical well to locate it. Once the horizontal well has been located it must then be pulled back and sidetracked for a second attempt, causing lost time, and possibly introduce hole quality issues. Being able to range directly to the bit significantly increases the possibility of a first attempt intersect. Success rates for first time CBM intersects run at around 90%.

The signal can be detected from 50-60 m away and a corrected vertical target location can be calculated. This technique is different from the technique using a single wire conventional HDD source, where the steering tool is located in the vertical well, because the rotating magnet at the bit is the source and the steering tool is located in the horizontal well. The steering tool works independently of the MWD system used in the drill string. The rotating magnet has minimal effect on the magnet field of the MWD tool as it is located far behind the motor with adequate spacing. If the directional driller has concerns about the interference then a full BHA roll test can be performed to calculate the BHA flux.

The RMRS sub is located just behind the bit in this picture of a conventional, cantilever drilling rig. You can see the eight slots that contain the bar magnets. When the bit spins, the spinning magnets create the AC magnetic field.

Smart tools, precise and efficient operations, proven results

Prime Horizontal's RMRS system is unique in its design and its ranging precision. It uses Prime Horizontal's RM or AM sub, near-bit subs that have a number of magnets aligned in the sides of the sub. When the bit spins, the magnets create an AC magnetic field which can be detected from a reasonable distance to allow correction of the trajectory for vertical well intersection without doing an initial ranging pass by as required by all other technologies. This geometry is diagrammatically shown in above and the RMRS sub is shown on the right.

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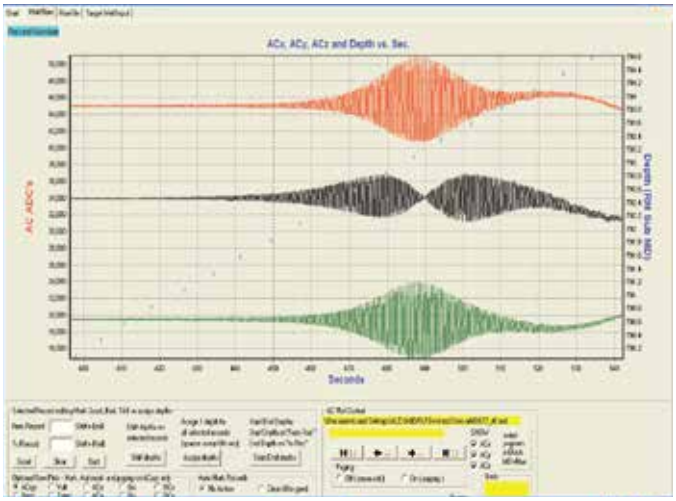
Benefits

- Ability to reduce costs associated with drilling and intersecting vertical wells
- Intelligent ranging tool – can steer to the target from distances of 70m
- Can intersect well cavities of 4" and greater
- Slim tool will fit in casing from 2 7/8 and greater – assembly diameter is 1¾"
- Modular vertical well tool, can be assembled slick or with centralisers when required
- Simplicity with different MWD systems – no data is required from the MWD tool, can work with EM or Mud Pulse tools
- Captures data while drilling, no need to shut down pumps to collect data
- Can work to any depth without complications from wireline loop resistance
- Potential to intersect vertical wells without having to pass by and sidetrack
- Uses AC Active Magnetic Ranging technology, works in formations with existing magnetic distortions
- Prime Horizontal is an experienced company in intersection technology in vertical and horizontal wells.



Shown are 3-component magnetic data from the rotating magnet sub. These data are analyzed for range and azimuth information for a single "shot."

Specifications

Nominal tool OD	44.45mm (1.75")
Minimum target well ID	50.8-22.2mm (2-7/8")
Sonde length	1.4m (55.12")
Weight bar length	1.2m (3.9')
Centraliser length	0.4m (1.3') each
Typical length of assembly	**3.4m (11.2')**
Magnet bit sub connections	2-3/8" Reg and up
Operating temperature range	85°C (185°F)
Max operating pressure	1034 bar (15000 psi)
Accuracy 0-15m	2-3%
Accuracy 15-25m	2-3%
Accuracy beyond 25m	5%
Max operating range	70m (229.7')

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