



RMR® saves 9 days per well and gives zero discharge compliance

PROJECT *Enhanced Drilling provided RMR® services to Elvary Neftegaz (BP joint Venture) offshore Sakhalin Island in 2006*
KEY WORDS *RMR™ * Zero Discharge * Environmental regulation * Reduce risk in drilling * Reduces tophole drilling time * Safety improvement * Shallow Gas Control*

Background

Elvary Neftegaz, a joint venture between Rosneft and BP, is drilling remote exploration wells with semi-submersibles off Sakhalin Island. Russian environmental protection regulations forbid any discharge of cuttings after the conductor is set. Cuttings, therefore, need to be returned to the rig while drilling the service hole. This could be done with the rig marine riser plus pin connector, but then the rig diverter is the only protection against shallow gas flow. The dangers of this method were shown in a blowout and explosion on the West Vanguard, in the North Sea, in 1985.

RMR®: the best solution

After a number of risk reduction studies by the operator, Enhanced Drilling's Riserless Mud Recovery (RMR®) system was chosen as the most suitable method to use given the issues encountered. It achieves the well environmental objectives while minimising the risk from shallow gas. In practice, RMR® also provides operational advantages and saves rig time compared to the other methods (which is very useful in the short ice-free season).

Achieving environmental objectives

The RMR® system provides a 'closed loop' mud system before the BOP or rig riser is run. RMR® pumps the mud and cuttings from the Suction Module (SMO), attached to the Low Pressure Wellhead on the 30" conductor, back to the rig. Cuttings are removed by the rig shakers before mud is returned to the pits for recirculation, as in conventional drilling. The SMO is open to the sea but the precise control provided by the RMR® pump ensures there

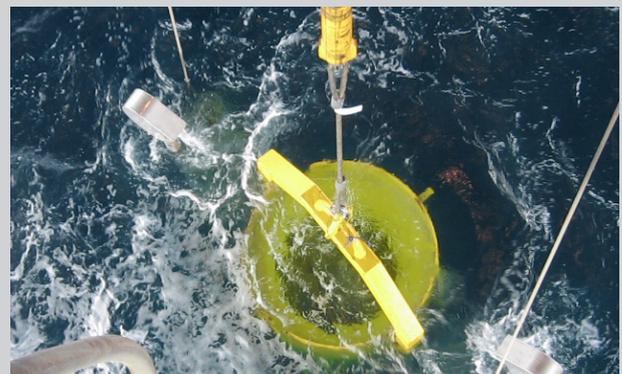
"The RMR® system delivered its anticipated safety and environmental benefits while improving operational efficiency by 9 days per well without use of the marine riser".

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is no leakage of mud or cuttings in the water.

Combating Shallow Gas

Drilling the surface hole with mud reduces the risk of shallow-gas flow because a higher mud weight can be used. Drilling with a full column of mud back to the rig makes lost circulation more likely, which could lead to flow. In the event of a gas flow with a rig riser but no subsea BOPs there is a route back to the rig for any shallow gas encountered. The rig-diverter system is meant to deflect gas away from the rig floor but the pipe work may erode, causing a gas cloud. A pilot hole could be drilled to identify shallow gas; this reduces, but does not eliminate,



DEPLOYMENT: The SMO launching



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RMR® Case Study 3 – BP, Sakhalin Island

the risk. Drilling with seawater and sweeps without the riser attached would allow the rig to move off location, away from any shallow gas plume.

RMR® provides the best of both worlds. A high-specification mud is used to drill the section, making a shallow gas flow less likely. Also, the rig can be immediately moved off location in the event of a flow. If there is a shallow gas flow, the valve on the mud-return line is closed with no gas coming back to the rig. The Bottom Hole Pressure (BHP) is provided by mud from TD to mudline and seawater above (Dual Gradient Drilling). Because RMR® pumps the mud across the air gap, the BHP can be equal to seawater hydrostatic, or greater, as needed.

An additional safety feature of the RMR® system is that, in the event of a shallow gas flow, an increase in pump speed will trigger an alarm within approximately 15 seconds (SPE 102579). Contingency procedures, such as pumping kill mud, can be started very quickly. The flow will be identified long before the gas reaches the mudline, so no gas will enter the mud-return line. When drilling without RMR®, the first indications of a flow would be when gas bubbles are seen by the ROV in the sea.

Operational advantages with RMR®

Because full-specification mud is used in the surface hole a stable, near-gauge hole is drilled. This removes the need for a wiper trip before running casing. It means that the casing can be run to depth without problems. A better cement job in a gauge hole gives a more stable wellhead.

When seawater/sweeps are used, the hole is washed out as shown by the cement volumes required, top-up jobs are often necessary and large volumes of cuttings obscure the wellhead and need jetting away.

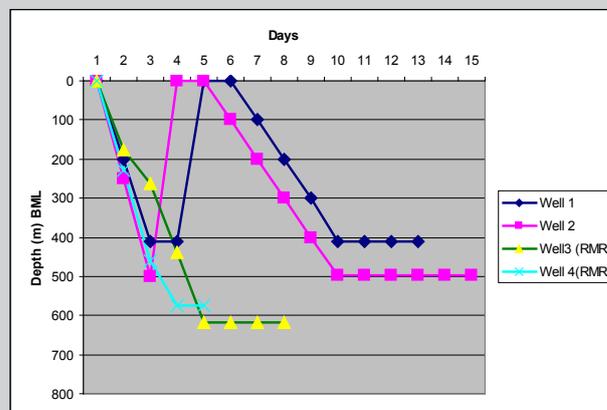


Figure 1: Drilling Time Curves

Operational experience

Two wells were drilled with RMR® in 2006 and compared to wells in 2004/2005 without RMR®. The major time saving (average nine days) with RMR® was due to (1) not drilling a pilot hole, and (2) not running the marine riser. Secondary benefits:

- NOT making a wiper trip
- NOT having to wash casing to bottom
- NOT setting a top-up cement job
- NOT jetting wellhead clear of cuttings.

	Days	Metres	
2004 well	13.45	562	Pilot+26" hole in 2 passes
2005 well	15.33	644	Pilot+26" hole in 2 passes
2006 RMR wells	7.01	769	No pilot hole 17-1/2" hole
2006 RMR wells	4.85	728	No pilot hole 17-1/2"

Table 1: Comparison of days & section lengths

There was only seven hours RMR® installation/removal time on the critical path. Some time was lost with a generator cut-out and problems caused to the Mud Return Line by the high current. The RMR® wells were easier because a 17-1/2" hole was drilled but exactly the same equipment would be used with a 26" hole, as the RMR® is designed to handle the volume of mud and cuttings generated.

For further information contact solutions@enhanced-drilling.com
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