Short Radius Drilling Technology Enhances Production in Depleted Fields

Location: Mature offshore field, South Asia

OPERATOR’S CHALLENGE – The operator of a mature offshore oil field was seeking an economical solution for their field redevelopment project to access bypassed reserves and increase oil production.

HALLIBURTON’S SOLUTION – Halliburton deployed Sperry Drilling services’ Short Radius Drain Hole (SRDH) drilling system. Short radius drilling technology allows 3-3/4” to 6” diameter drain holes to be kicked off and landed while consuming significantly less true vertical depth compared to conventional long or medium radius wells. SRDH technology is often used in re-entry wells where the internal diameter of existing completions liners may also restrict the size of drilling tools that can be used.

ECONOMIC VALUE CREATED – The depleted reservoir was invigorated, delivering a production increase from the existing wells up to three times the previous rates. Several non-producing wells were also put back on production.

BROWNFIELD REJUVENATION – A redevelopment plan was launched by an operator eager to enhance and increase oil recovery on one of their mature offshore fields. The operator needed to sidetrack existing sub-optimally producing wells, keeping considerable offset from oil/water and gas/water contacts to avoid early water and gas break through, essential for sustained clean oil production. The high costs involved in medium radius horizontal drilling, and the necessity to target by-passed oil, led to their search for alternative cost-effective technologies.

SHORT RADIUS DRILLING TECHNOLOGY – Sperry’s innovative SRDH system incorporates an articulated positive displacement motor (PDM) to resolve drilling problems where precise directional control of inclination and hole azimuth is highly emphasized. Unstable or problem formations above the reservoir can be isolated and a major portion of the curve can be drilled in the reservoir section.

Real-time tool face orientation and hole direction while drilling for precise wellbore placement can be determined using a combination of the steerable downhole motor and articulated measurement-while-drilling (MWD) sensors. The SRDH system uses the articulated PDM to drill the short build section by kicking off a whipstock, and is capable of achieving build rates from 65°/30 m (65°/100 ft) to 125°/30 m (125°/100 ft). The articulated MWD system consists of a positive pulse, with directional and gamma probes interconnected by special flex-bulkheads to allow the system to handle the high build up rates.

A 4-3/4” SRDH system and a 2-7/8” drill pipe were used for this operation due to the high doglegs. Six-inch drain holes were drilled achieving build rates up to 100°/30 m (100°/100 ft) with horizontal sections in excess of 250 m (820 ft) long.

MWD data were transferred in real time to the onshore base and the InSite Anywhere® service at the client’s office, facilitating
real-time communication and intervention from the client’s key personnel to control hole trajectory.

THREE-FOLD PRODUCTION INCREASE – Over 100 short-radius wells have been drilled in this field re-development. Substantial gains in production were delivered after the introduction of SRDH technology whereby production rates have increased up to three times the previous rates. Even some wells that had completely ceased to produce are now producing significant amounts. The customer has acknowledged that SRDH technology has been a cost effective solution, requiring no additional surface equipment or stimulation techniques to significantly enhance production and has now awarded a three-unit contract for additional redevelopment programs to Halliburton.