

Case study: Offshore, Malaysia

# WindowMaster system with PathMAKER mill performed dual casing exit in single trip, saved \$1.5 million USD

Casing exits serve a critical process for operators to sidetrack a well from its original path. To create a quality window for smooth future operations, the casing exit needs to be created at the optimal depth and the desired orientation. With the ever-increasing challenges such as deeper wells, high operating costs, and working in sensitive environments such as deepwater and remote areas, the need to perform the anchor setting and window milling effectively in one trip often proves difficult.

A major operator in Malaysia needed to perform a dual casing exit operation through 9<sup>5</sup>/<sub>8</sub>-in., 40 lb and 13<sup>3</sup>/<sub>8</sub>-in., 68 lb casing because the preferred depth for sidetracking was at the depth where both casing was set and cemented. Adding to the challenge, information on the well was limited and data such as casing collar depth and cement bond behind the casing can only be determined during wireline run prior the actual whipstock operation.

The Baker Hughes Wellbore Intervention team proposed using the hydraulic **WindowMaster™ G2 whipstock system** with the **PathMAKER™ formation mill** to minimize trips and rig time and to maximize savings. The WindowMaster G2 system can be run in hole oriented to the new hole direction, anchored in place and a window completely milled, all in one trip.

To drill the rathole, the PathMAKER mill enables a one-trip casing exit and extended rathole in hard and abrasive formations, such as sandstone,

anhydrite, limestone, and dolomite. Certain hard formations that used to require two trips to mill the window can now be done in one trip, saving rig time and cost.

After a simulation run, the bottomhole assembly (BHA)—consisting of the WindowMaster G2 system and the PathMAKER mill—was tripped in at a rate of two minutes per stand to reach the target setting depth of 6,725 ft (2050 m). The whipstock was oriented successfully with measurement-while-drilling (MWD). The **TorqueMaster™ retrievable whipstock anchor** was set successfully as per the project plan. Sufficient weight was added to the BHA to shear the anchor bolt. The milling string was picked up to clear the whipstock and milling parameters were recorded. With the PathMAKER mill in position, the fluid was displaced to milling fluid and the window milling began afterwards.

The entire casing exit operation was executed flawlessly. The dual casing window was successfully milled in seven hours and the 35-ft (10.6-m) rathole in one hour. The Baker Hughes team incurred no nonproductive time (NPT) and experienced no health, safety and environmental (HSE) issues. The customer was so impressed with the Baker Hughes solution that it increased the orders for the WindowMaster system.

## Challenges

- Perform dual casing exits through 9<sup>5</sup>/<sub>8</sub>- and 13<sup>3</sup>/<sub>8</sub>-in. casings
- Identify casing collars to set whipstock in a casing collar-free area
- Improve milling and overall efficiency in a whipstock casing exits operation

## Results

- Milled dual casing window in seven hours and 35-ft rathole in less than one hour
- Saved operator rig time with single trip whipstock system, an estimated \$1.5 million USD
- Reduced operator cost by eliminating the need for 9<sup>5</sup>/<sub>8</sub>-in. casing cut and pull
- Created perfect window and eliminated damage to drilling BHA while entering the window with rotation
- Experienced no HSE issues or NPT