

Gulf of Mexico

# PowerMag® casing magnets deliver unmatched debris recovery during deepwater window milling operations

More than 7,500 lb of metal removed

## CHALLENGE

- Excessive swarf and ferrous debris generated by milling window operations in heavyweight 14-in. casing in deepwater well

## SOLUTION

- 7 5/8-in. OD PowerMag® casing magnets to maximize downhole debris recovery

## RESULTS

- An average of 94% of debris recovered downhole
- More than 7,500 lb of metal removed during four window milling/cleaning runs

## Overview

A deepwater well at a depth of more than 3,000 ft required a cased hole sidetrack at approximately 23,000 ft in 14-in. heavyweight casing. The first sidetrack was run using a competitor's whipstock and milling assembly and PowerMag® casing magnets. This operation was ultimately considered unsuccessful after subsequent drilling runs were unable to pass through the window. This was despite a dedicated cleaning run to condition the window exit area in the casing.

After the failed window milling operation, the operator engaged a different service provider to mill a new window approximately 200 ft above the first window drilled previously. Two separate window milling runs were completed using PowerMag casing magnets for debris recovery, which allowed the operator to begin the sidetrack and continue drilling.

## Challenge

An excessive amount of large swarf and ferrous debris were generated by the milling window operations in the heavyweight 14-in. casing.

## Solution

Halliburton recommended 7 5/8-in. OD PowerMag casing magnets to maximize downhole debris recovery. These casing magnets can be run in any casing size from 9 5/8 to 14 in. Designed to collect ferrous and non-ferrous material that has become magnetically charged during pipe rotation and other movements, a PowerMag casing magnet is equipped with 20 collection areas armed



HAL-41891

PowerMag® Casing Magnet

## CASE STUDY

with neodymium bar magnets and has a recovery capacity that exceeds 250 lb/run. The integral body water coursing provides a large external total flow area, even when the tool is at capacity with debris. The total recessed collection surface area is 2,800 square inches to maximize both flow and surface area, and the tool will not pack off the annulus even when full. PowerMag® casing magnets are built from an integral drill collar bar stock to provide high-tensile, high-torsion strength and are ideal for applications, such as window milling or displacement where large amounts of debris are expected or being generated.

Additionally, the PowerMag casing magnets can be quickly cleaned with a custom cleaning tool that allows them to be quickly rerun, if necessary. The capability to clean the magnets quickly is critical during window milling operations because, as demonstrated in this well, a window cleaning/polishing run might be necessary, or milling equipment can be under gauge once measured on the surface, which requires an additional run and further increases operational costs.

### Results

An average of 94% of the debris was recovered downhole and more than 7,500 lb of metal was removed during four window milling/cleaning runs. This highlights the efficiency of the PowerMag casing magnet design for ferrous debris

recovery. Maximizing debris recovery downhole helps minimize debris at the surface (using ditch magnets) and can prevent metal from remaining in various points of the mud system as operations continue beyond window milling.

As demonstrated, PowerMag casing magnets provide unmatched performance for downhole debris recovery when large amounts of ferrous debris are present or being generated.



» Swarf collected downhole by PowerMag® casing magnet

### Debris Recovery Summary

WHIPSTOCK	RUN TYPE	NO. OF POWERMAG® CASING MAGNETS RUN	TOTAL RECOVERY (LB)	SURFACE RECOVERY (DITCH MAGNETS) (LB)	DEBRIS RECOVERED DOWNHOLE (%)
Provider 1	Window Milling	9	2,533	99	96
Provider 1	Window Cleaning	4	785	0	100
Provider 2	Window Milling	9	2,286	343	87
Provider 2	Window Cleaning	9	1,560	0	100
	Total	31	7,164	442	94
	Average recovery per PowerMag® casing magnet across all runs		231		

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