

# Operator saves USD 8.1 million, optimizes milling performance using PowerMag® casing magnet

## PREMIUM MAGNET OUTPERFORMS COMPETITOR'S RECOVERING DOWNHOLE DEBRIS

ASIA PACIFIC

### CHALLENGE

- » Remove ferrous debris during milling for multilateral completions
- » Recover 70% theoretical steel value to avoid pulling BOPs for cleaning
- » Highly deviated, nearly horizontal wellbores, and two different casing sizes

### SOLUTION

- » Deploy PowerMag® casing magnets to collect ferrous debris
- » PowerMag neodymium magnets can hold more than 250 pounds (113 kg) per run
- » Magnet surface area is 2,800 square inches for maximum capacity

### RESULT

- » Recovered approximately 4,000 pounds (1,800 kg) of metallic debris in six wells
- » Outperformed competitor's magnets 3-to-1 when run head-to-head
- » Eliminated cleanout runs and pulling BOPs to surface for cleaning and inspection
- » Saved operator 470 hours of rig time valued at USD 8.1 MM

### OVERVIEW

A major operator in Asia Pacific engaged Halliburton to provide wellbore cleanup with a focus on collecting ferrous debris. The configurations of the wells precluded the use of tools that could be rotated at high speeds to mill casing windows while providing the necessary string weight and collecting the debris. Halliburton successfully tackled the challenge using its PowerMag® casing magnet.

### CHALLENGE

Tasked with field development wellbore cleanup, Halliburton was challenged to remove the metallic swarf produced by milling casing windows for multilateral operations. But the shallow vertical depths and high deviations of the wells precluded the use of any tool that could be rotated at high enough speeds to mill good windows, and provide the string weight and metallic retention necessary to collect all the produced debris.

### SOLUTION

Halliburton deployed its CleanWell® PowerMag casing magnet to remove the downhole milling swarf. A competitor's star-design magnets were also run to compare the debris retention capacities.

Designed to collect ferrous material and non-ferrous material that has become magnetically charged during pipe rotation and other movements, the PowerMag magnet is equipped with 20 neodymium bar magnets with a recovery capacity exceeding 250 pounds per run. The recessed magnets have a total surface area of 2,800 square inches for maximum collection, and the same unit can be run in casing ranging from 9 5/8-in. to 13 5/8-in.

The tool is built from an integral drill collar bar stock to provide high-tensile, high torsion strength, and the integral body water coursing provides large external total flow area even when the tool is at capacity with debris. The PowerMag magnet is ideal for applications such as window milling or displacement where large amounts of debris are expected.



**RESULT**

Using the PowerMag magnets, the operator successfully recovered the metallic swarf from the milling and eliminated the need to pull the blowout preventers back to the surface for cleaning and inspection. The tool yielded a direct savings of more than 400 hours of rig time valued at USD 6.8 million, and an additional 72 hours (USD 1.3 MM) by eliminating the need for cleanout runs — with no debris-related nonproductive time.

The PowerMag magnets consistently outperformed the competitor’s magnets on every run, regardless of tool position in the bottomhole assembly. Moreover, the 9 5/8-in. PowerMag magnet was run against the competitor’s 13 5/8-in. magnet, demonstrating the flexibility of a single PowerMag unit in a wide range of casing sizes without compromising its performance.

All recoveries were below the theoretical per-run maximum, indicating the PowerMag magnets removed all the debris and still had additional collection capacity.

**Window Milling Debris Results**

Casing/Window Size (in.)	Recovery Tools	Recovery* lb (kg)
9 5/8	2 x 9 5/8-in. PowerMag® Magnet	452 (205)
	2 x 9 5/8-in. Competitor Magnet	121 (55)
9 5/8	1 x 5 1/2-in. Mag Tech® Magnet	22 (10)
	2 x 9 5/8-in. PowerMag Magnet	353 (160)
13 3/8	2 x 9 5/8-in. PowerMag Magnet	437 (198)
	2 x 9 5/8-in. Competitor Magnet	51 (23)
13 3/8	2 x 9 5/8-in. PowerMag Magnet	553 (251)
	2 x 9 5/8-in. Competitor Magnet	179 (81)
13 3/8	2 x 9 5/8-in. PowerMag Magnet	551 (250)
	2 x 9 5/8-in. Competitor Magnet	163 (74)
	1 x 13 3/8-in. Competitor Magnet	99 (45)
9 5/8	3 x 9 5/8-in. PowerMag Magnet	461 (209)
	2 x 9 5/8-in. Competitor Magnet	117 (53)
9 5/8	1 x 5 1/2-in. MagTech Magnet	13 (6)
	3 x 9 5/8-in. PowerMag Magnet	406 (184)
	2 x 9 5/8-in. Competitor Magnet	11 (5)
* Window mill cutting runs only		



PowerMag® magnet after milling run



PowerMag® magnet being cleaned on rig floor after milling run with cleaning tool

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