

# METAL MUNCHER AMT removed restriction in wellbore, avoided redesign

A customer in the Gulf of Mexico identified a restriction in the wellbore while completing a deepwater well. The intended completion equipment required a 9.000-in. minimum inside diameter (ID) through the wellhead, but a 33-in. section of the dummy hanger retrieval sub had a smaller 8.569-in. ID. Leaving as is would require changes to the desired completion design while also complicating future operations. To avoid such measures, the operator reached out to Baker Hughes, a GE company (BHGE), for a solution to remove the restriction without damaging the casing.

Working closely with the operator, BHGE designed a customized step mill dressed with **METAL MUNCHER™ Advanced Milling Technology (AMT) carbide** to meet the required criteria. The final milled profile needed to be concentric with an ID between 9.000 to 9.356 in. to ensure completion equipment would drift while also preserving wellbore integrity. This was critical to the success of the operation as milling too much or milling an eccentric ID could result in recompletion or even well abandonment.

The AMT step mill featured a pilot stabilizer dressed with wear-resistant material to hold a tight tolerance gauge relevant to the hanger ID. The pilot guaranteed the mill was completely centralized as milling initiated; a crucial factor to maintain concentricity. To maximize performance, two steps were incorporated into the design. The lower

step was sized to 8.785-in. and the upper to 9.000-in. to allow for minimal material removal per revolution. The mill was designed using a combination of shaped AMT carbide inserts so that the mill would remain concentric and not taper while boring the ID, while also leaving an optimal finished surface.

In order to evaluate the effectiveness of the AMT step mill before deploying offshore, BHGE conducted a design validation on a test rig that replicated the operator's well conditions. The testing was successful, removing the restriction with a final profile ID of 9.046, well within the acceptable range of 9.000 to 9.365.

Confident with the results from the validation test, the customer approved deployment. The bottomhole assembly (BHA) was run in hole to locate the hanger at a depth of 8,111 ft (2472 m). The milling operation was executed flawlessly and efficiently in just over one hour. The area was reamed several times to remove any burrs before successfully drifting the 9-in. BHA through the profile. After returning to surface the mill showed negligible wear and was gauged to 9.000-in.

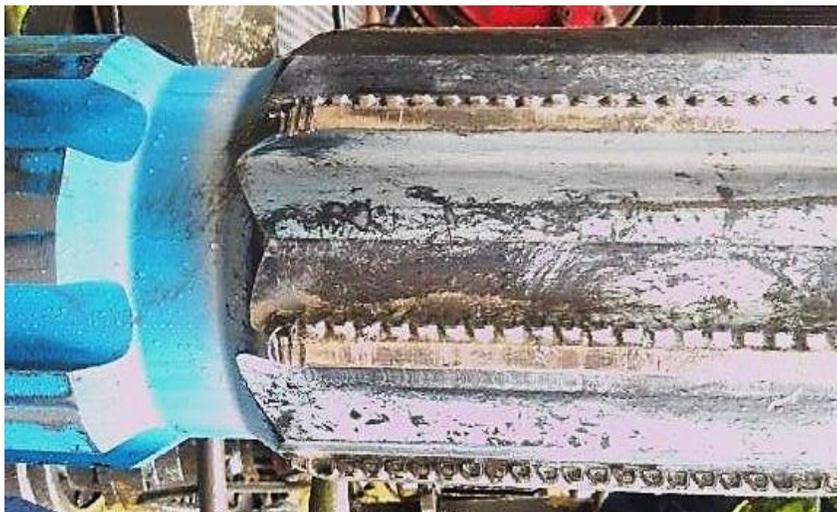
A final wellbore integrity assessment was performed, successfully testing the wellbore to 7,500 psi. The customer was able to continue with planned completion design and avoid any future risks.

## Challenges

- Remove 33-in. long restriction in deepwater well without compromising well integrity
- Avoid an eccentric ID that could result in recompletion or possible loss of well

## Results

- Flawlessly removed restriction without compromising well integrity
- Avoided risks related to future operations
- Eliminated need for completion redesign
- Efficiently milled out restriction in one hour



The AMT step mill showing negligible wear after milling out restriction.

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