

# Thru-Tubing AMT step mill opened nickel alloy AR nipple to deploy straddle system in a single run

An operator in the UK sector of the North Sea needed to mill out a 3.688-in. ID nickel alloy AR nipple located at 18,147 ft (5,531 m) to 3.875 in. ID. This would allow the deployment of a 3.70 OD **Thru-Tubing straddle assembly**, from Baker Hughes, a GE company (BHGE), below the restriction without removing the completions.

The **Thru-Tubing AMT™ (advanced milling technology) step mill** designed specifically to open restrictions made of exotic materials, was chosen for this application. The multiple steps and specially designed AMT inserts on the mill enable nipples to be milled up in small increments without over-torquing the drilling motor while producing a polished, gauged bore for reliable access to the lower completions.

The 3.875 in. OD AMT step mill was positioned at the bottom of the 2.875 in. bottomhole assembly (BHA) that included a BHGE **Navi-Drill™ X-treme**

**workover motor**, fixed blade centralizer, dual circulation sub, boot basket, hydraulic disconnect, coiled tubing jar, dual back pressure valve, and coiled tubing connector.

The BHA was deployed on 1.5 in. OD coiled tubing. At 10 ft (3 m) above the nipple, milling parameters were established. After the AR nipple was tagged at 18,137 ft (5,528 m) the BHA was picked up 6 ft (1.8 m) and milling began.

Only 38 minutes of milling time was required to fully mill through the nickel alloy AR nipple. This result was remarkable as, historically, nickel alloy requires several hours to mill.

Post-job inspection of the mill confirmed that it was full OD and that the AMT cutters had effectively no wear, proving that full-bore access through the restriction—without removing the completions—had been achieved to enable the operation to deploy the straddle system.

## Challenges

- Mill nickel alloy AR nipple located at 18,137 ft depth
- Deploy a 3.70 OD straddle system through a 3.688 ID without removing completions

## Results

- Efficiently milled through nickel alloy AR nipple in only 38 minutes, allowing access to lower completions
- Completed with one bottomhole assembly run, saving the operator approximately \$2.6 million USD in rig costs

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