

Turbomill Scale Removal Enables Ecopetrol to Access Two Formations in Colombia

Through-tubing milling using two-phase fluid cleans out 858 ft of 4½-in liner at average rate of 163.43 ft/h

CHALLENGE

Remove scale buildup restricting production in Colombia well.

SOLUTION

Mill scale using Neyrfor TTT* thru-tubing turbomill run on 2-in coiled tubing.

RESULTS

- Cleaned out production liner to TD.
- Reduced torque on coiled tubing.
- Minimized HCl expense.
- Provided access to producing formations.
- Removed scale buildup from 858 ft of production liner at an average rate of 163.43 ft/h.

“The many advantages of using the thru-tubing turbomill in our cleaning applications included higher liquid and gas circulation, effective flow rates and smaller cutting sizes, which lowered the risk of a stuck BHA.”

Daniel Segura

Well intervention company man
ECOPETROL



Remove scale buildup to improve production

When scale buildup in a well in Colombia's Cupiagua Sur field restricted production from the Mirador and Barco formations, Ecopetrol attempted to resolve the problem using a scale removal service with more than 300 bbl of 5% hydrochloric acid (HCl). After cleaning out calcium carbonate from 315 ft of production liner at a rate of 36 to 60 ft/h, the jetting assembly was unable to gain further access. Thus, Ecopetrol cancelled the operation and sought another way to complete the scale removal and improve production.

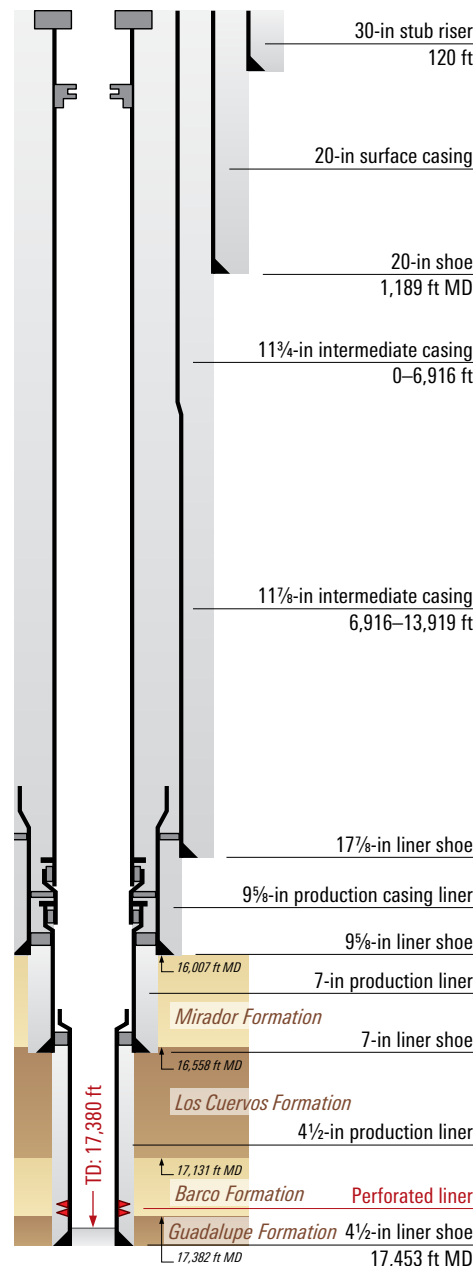
Clean out production liner to TD

A 2⅞-in Neyrfor TTT thru-tubing turbomill attached to a 2-in coiled tubing and driving a high speed mill at more than 2,200 rpm were used in two runs to clean out the 4½-in, 3,958-in ID production liner to TD, giving access to the formations. Two-phase fluid—water-base mud (WBM) injected with N₂ and 5% HCl—was used on both runs at a flow rate of 2 bbl of WBM and 1,100 ft³ of N₂ per minute. The equivalent flow rate on bottom was between 2.47 and 2.5 bbl/min.

On the first run, which began at 16,472 ft, the turbomill driving a 3¾-in i-MILL* PDC whipstock mill was used to mill 81 ft of scale at an average rate of 54 ft/h before being pulled out of hole. On the second run, a customized 3⅞-in turbomill was used to mill 777 ft of scale—from 16,553 ft to a TD of 17,330 ft—at an average rate of 207.2 ft/h.

Save time and HCl expense

The Neyrfor TTT turbomill removed scale buildup from 858 ft of production liner in 5.25 h at an average rate of 163.43 ft/h. Only 60 bbl of 5% HCl were pumped during the turbomill runs, which when compared with the 300 bbl pumped during the jetting operation, resulted in a lower rate of 36 to 60 ft/h. The turbomill also put less torque on the coiled tubing than the jetting operation did.



The Neyrfor TTT turbomill successfully removed scale buildup from the 4½-in production liner, enabling Ecopetrol to access the Mirador and Barco formations.

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Drilling