**Case Study**

**Neyrfor TTT Turbodrill and Jet Blaster Clear 5,860 ft of Production Tubing Averaging 7.8 ft/min**

Heavy FeS deposits completely cleared from production tubing in two runs

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**Challenge**
Remove hard iron sulfide (FeS) deposits from 5,860 ft of heavily scaled 4½-in production tubing to restore production and wellbore access.

**Solution**
Run a 2¾-in Neyrfor TTT* thru-tubing turbodrill system with a D2 TT Turbomill* thru-tubing mill to make a pilot hole and perform a Scale Blaster* cleanout run with a 2¾-in Jet Blaster* tool system and non-damaging Sterling Beads* to remove remaining scale from the tubing wall on a second run.

**Result**
On the first run, the Neyrfor TTT turbodrill successfully drilled through 5,860 ft of heavily scaled production tubing to complete a 3½-in pilot hole at an average rate of 7.8 ft/min. On the second run, the Scale Blaster cleanout run completely cleared the 4½-in tubing of heavy FeS deposits at a rate of 2.6 ft/min.

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**An efficient method for scale removal needed**
Operators working in the Middle East have found that their gas production wells are vulnerable to hard scale deposits, consisting of various forms of FeS. The collection of these deposits on the walls of production tubing forms an ever increasing restriction that results in declining production rates.

Finding an efficient method to remove scale deposits from production tubing and liners, to regain well access for further stimulation, has often eluded operators. Restrictions in the ID of the tubing string above the cleanout zone limit the mill cleanout size. When used in combination with positive displacement motors, low ROP, short mill life, and blockage of the tubing perforations with larger cuttings have been observed. Plugged perforations or formation damage has also been seen when using dissolving chemicals for the cleanout.

**New combination offers a solution**
An operator whose well lost its production capability, due to heavily scaled completion tubing, requested a solution. Hard scale is best drilled at high speed and with a non-aggressive mill. For this reason, the suggested solution was to drill a pilot hole with the 2¾-in Neyrfor TTT turbomill in combination with a 3½-in Schlumberger D2 tungsten carbide insert mill to initiate de-scaling operations, generating up to 2,400 rpm and 60 hp. The combination of the Neyrfor TTT turbodrill and the TT Turbomill enables efficient milling rates in high-pressure, high-temperature (HPHT), underbalanced drilling (UBD), and when specialty fluids are present.

To remove the remaining scale from the completion tubing walls and profiles, a Scale Blaster cleanout was performed with a 2¾-in Jet Blaster tool system and 6,250 bbl of Sterling Beads slurry on a second run. Scale Blaster is a proven, non-damaging cleanout technique for hardest inert scale deposits. It combines high efficiency jetting performance of Jet Blaster systems with Sterling Beads, an artificial blasting material that breaks scale on impact, however is non-damaging to steel tubular and completion. Being based on the jetting principle, Scale Blaster cleanouts are not limited by tool OD or completion restrictions.

5,860 ft of 4½-in tubing cleaned in two runs at average of 7.8 ft/min
The scale cleanout operation was performed on 2¾-in coiled tubing. After dry tagging the top of the scale, the 2¾-in Neyrfor TTT cleanout was conducted with good progress: advancing the coil at 8 ft/min. The 3½-in pilot hole was cleaned to the bottom of the production tubing in a single run. On the second run, the Jet Blaster tool with Sterling Beads removal system completely cleared the 4½-in tubing of heavy FeS deposits at a rate of 2.6 ft/min. The two run solution with the Neyrfor TTT turbodrill and Scale Blaster service efficiently removed the FeS scale by reducing it to powder cuttings, which were easily lifted from the wellbore with slick water.

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