

Fit-For-Purpose Tubing-Conveyed Perforating Technique Increases Well Production by 250%

Dynamic underbalance strategy reduces perforation damage, lowers skin factor to a value below 1

CHALLENGE

Increase well productivity with deeper perforation tunnels while minimizing reservoir damage in a mature oil field.

SOLUTION

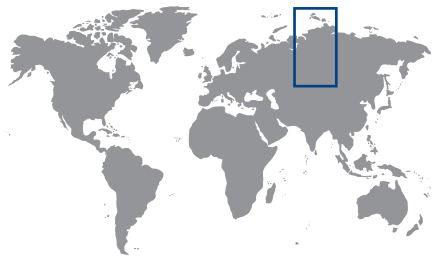
Use PowerJet Omega* deep penetrating perforating shaped charges and PURE* clean perforations system to minimize damage and skin.

RESULTS

Reduced skin factor from nearly 6 to values below 1, resulting in a 250% increase in oil production.

“The TNK-BP Wells division employs a holistic view of screening our wells to assess opportunities for improving production efficiencies. This combined technology has proved applicable and effective, with good results based on field trials conducted and will be considered for further implementation under our Wells Technology program.”

E. Liron
Vice President Wells
TNK-BP



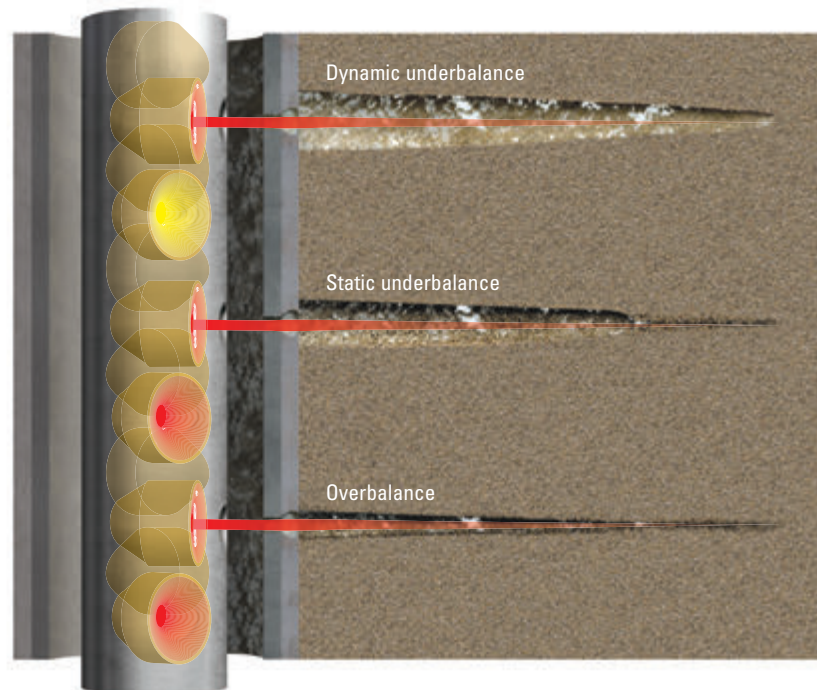
Avoid reservoir damage to optimize production

TNK-BP had three production wells in a mature oil field in western Siberia that needed to be worked over. To aid in maximizing the reservoir's output, the company decided to re-perforate the wells to efficiently communicate between the reservoir and the wellbore. This completion technique posed a challenge, as successful communication—and ultimately production—largely depends on the cleanliness of the perforation, and reservoir damage and skin can negatively affect a well's production.

To maximize the wells' production, two key strategies were implemented for tubing-conveyed perforating (TCP): PURE clean perforations system, which obtains clean perforation tunnels that improve production or water injection, and a nondamaging viscoelastic surfactant- (VES-) based pill after perforation to avoid reservoir damage during the well-kill stage.

Custom solution of deep charges and clean perforating

TNK-BP consulted with Schlumberger regarding their objective to achieve higher well productivity by minimizing perforation damage, and a custom strategy was proposed.



Graphical comparison of perforation tunnels obtained with different perforating techniques. The Schlumberger PURE system created a dynamic underbalance, resulting in clean perforations and reducing the skin value of TNK-BP's reservoir from nearly 6 to less than 1.

CASE STUDY: Fit-for-reservoir PURE system increases Siberian well's production 2.5-fold

PowerJet Omega charges, which provide on average 20% deeper tunnels compared to conventional charges, would be used to increase the probability of passing through the damaged zone. A dynamic underbalance condition would then be created with the PURE system to improve production. After perforating, a nondamaging pill was used to avoid reservoir damage during well-kill operations. This approach successfully protected the new, clean perforation tunnels against damaging kill fluids for an additional 3–5 days of workover operations.

250% production increase from minimized skin

Results from the fit-for-purpose TCP strategy showed negative skin for reperforated intervals and a slightly positive skin for the new layer interval. After spotting the pill, loss control was improved. Postjob production data indicated a 2.5-fold oil production increase compared to the preworkover rate. The custom-engineered combination of PURE system perforations, the VES-based pill, and PowerJet Omega charges helped bring the skin value down from nearly 6 to less than 1, resulting in optimized production and meeting the client's objectives.

"These new technologies have made it possible to obtain clean perforation channels, reducing the skin factor and greatly enhancing well productivity. Subsequent operation of previously subcommercial wells perforated with PURE system has boosted flow rates by 2.5 times. The technology will be recommended for further implementation."

K. Gobert
Senior Manager, Well Productivity Assurance
TNK-BP

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