INtegrity Injection Valves Reduce Capital Expenses for Injection Wells

Case study: Prevented reservoir backflow without requiring an external control system in West Africa and Brazil deepwater wells

Challenge
Maintain reservoir pressure in injection wells through high-volume flow while preventing backflow.

Solution
Installed INtegrity* water injection subsurface valves, which have a larger inner diameter than through-tubing injection valves, resulting in increased rates and allowing reservoir pressure to be maintained.

Results
Protected the wells from backflow and saved substantial running time and capital costs since no external control system was required.

Maintaining reservoir pressure and safeguarding the formation
Deepwater offshore projects, especially those involving floating production, storage, and offloading (FPSO) vessels, require massive commitments in planning, detailed product selection by recognized product experts, and reliable, efficient execution to achieve the system performance that stakeholders demand. Many of these applications require injection wells to maintain reservoir pressure as the hydrocarbons are extracted. During the completion design for wells located in deep waters off West Africa and Brazil, two operators performed rigorous evaluations to determine the value of their completions’ valve designs, both in effectiveness and in the reliability of the installations over the life of the wells. Both companies needed to reliably safeguard their formations and cost-effectively maximize injection flow rates for reservoir pressure maintenance.

Switching to valves with larger inner diameters
Both operators had separately identified that injection flow rates through the smaller inner diameters of traditional through-tubing-injected injection valves were inadequate to support the reservoir drawdown rates required. Therefore, a larger inner-diameter valve design was necessary to achieve production goals.

After thorough engineering evaluations, the operators concluded that the Schlumberger tubing-retrievable INtegrity injection valve provided the best capabilities for their projects.

The INtegrity valve design is based on the field-proven subsurface safety valve technology gained from Schlumberger’s decades of experience in designing and manufacturing more than 36,000 valves.
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This valve’s larger inner diameter allowed increased flow, along with efficient, reliable operation, without the need for a separate control mechanism, making the valve attractive for their water-injection applications. In addition, the through-tubing integral choke replacement allowed the valve to operate effectively within a wide range of injection rates.

In May 2005, one of the operators began developing a field located offshore Port Harcourt, Nigeria. The field development plan called for 22 producing wells, 20 water-injection wells, and 2 gas-injection wells, tied back to an FPSO vessel.

The other operator’s deepwater Nigeria project, which uses the largest FPSO vessel of its type, is located off the central Niger Delta. The project’s 2 rigs, 11 producer wells, and 7 injector wells have been completed, with full capacity production expected within 1 year of startup.

The development concept selected for the operator’s field offshore Brazil consists of horizontal production wells with vertical water injection wells that include INtegrity valves to maintain reservoir pressure. The wells will be individually tied back to an FPSO vessel when completed in 2009.

**Saving time and money**

To date, Schlumberger has supplied 20 INtegrity injection valves to the three projects, with 13 more on order. Each valve has protected the wells from backflow as designed and successfully met the evaluation criteria for protecting the environment and the companies’ assets and reserves. Use of the valves has therefore saved the companies substantial running time and capital costs.