**ResFlow Inflow Control Device and Other Schlumberger Solutions Revive Production from Aging Safanyia Oilfield**

**Challenge**

Quickly identify reasons that 24 wells were dramatically underperforming and replace them with newly designed wells.

**Solution**

Use ResFlow* inflow control device to control flow, stimulate less-productive zones, and reduce risk of early water breakthrough; use screens appropriate for the formation; install shorter zones to control pressure, minimize stoppage, and optimize flow.

**Results**

After just 4 months, completed 32 new wells, greatly increasing production and saving Aramco millions of dollars.

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**Failed wells, wasted investment**

To improve productivity and long-term recovery in the aging Safaniya formation, the world’s largest offshore oilfield, Saudi Aramco had recently completed 26 wells in a revitalization project. However, all but two of the wells were dramatically underperforming—that is, producing no oil or only a very small amount. Neither Aramco nor the company that had installed the wells understood why the wells had failed. Schlumberger learned that Aramco was on the verge of abandoning the wells and drilling new one using conventional cased-hole perforating methods unsuitable for the horizontal wells and highly permeable, poorly consolidated sandstone—and offered to provide an alternative solution.

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**Integrated solution, quick turnaround**

After Aramco and Schlumberger technical experts met to discuss the issues and schedule for turning production around, Schlumberger was given one week to identify problems and provide solutions. Four critical problems were identified:

1) The conventional Dutch-weave sand screen used had mesh gaps that were too small for the oil to flow into the completion without clogging during the filtercake clean-up process. Moreover, the thin mesh stretched to accommodate the curves in the horizontal wellbores, thus constricting the flow even more.

2) The original helix inflow control device pressure-drop system was not appropriate for the heavy oil found in the Safaniya formation.

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*Saudi Aramco gave Schlumberger exactly one week to analyze formation data and provide a detailed solution for the Safanyia project.*
Case study: Saudi Aramco restarts production and saves millions of dollars

3) Each well had only five or six independently controllable inflow sections, but the sections were too long to accurately control pressure into and along the well from one section to the next, which reduced the flow of oil. 4) The company that had drilled the wells had been able to place the drill bit within the formation’s hydrocarbon pay zone only 40% of the time, thereby reducing the wells’ chances of success.

The Schlumberger solution, presented just one week later, included a number of components. The robust LineSlot® shrink-fitted, wire-wrapped screen with slot gaps sized to keep out the sand but let in the oil would maintain gap size through the wellbores’ twists and turns, thus ensuring uniform flow. The ResFlow inflow control device with nozzles would be placed at intervals along each 38-ft section of wire-wrapped screen to automatically balance flow and stimulate less productive zones while reducing the risk of early water breakthrough. The new wellbores would have many more, much shorter compartments: instead of six long zones of 500 ft each, there would be more than 30 short zones, each only 80 ft long. More zones would mean greater control of the pressure and oil flow throughout the wellbores and less risk of flow stoppage in one of the zones.

Other Schlumberger technologies were also involved: the PeriScope® bed boundary mapper to ensure proper well placement, StethoScope® formation pressure-while-drilling service to optimize ICD design, MudSolv® formation damage removal treatment, and FIV® formation isolation valve, combined with the QUANTUM® packer to allow future ESP workovers without killing the well.

The biggest challenge Schlumberger faced was coordinating the manufacture and delivery of the many integrated components, including 85,000 ft of custom-made completion systems, in an extremely short time. The team members involved in planning the project were aware of the risks, however.

Saudi Aramco accepted the proposal, even though it meant that the company would have to abandon all the wells already drilled and the huge investment already made with the previous service company.

Successful collaboration, dramatic results
Within just a few months, Schlumberger delivered all 32 new wells and greatly increased production from the aging Safaniya field. Moreover, because Saudi Aramco did not need to drill other previously planned wells, the company saved millions of dollars.

ResFlow ICDs are part of the Transcend® family of openhole sand management services. Transcend services include screens and injection and inflow control devices, AquaPac® integrated water packing technologies, OptiPac® Alternate Path† gravel-pack systems, and IntelliPac® measurements in real time.

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