Case study: Offshore Malaysia

GeoFORM system, EQUALIZER SELECT ICDs enabled single-trip dual zone lower completion, saved $2 million

After a long hiatus due to the economic downturn of the industry, an operator decided to revive an offshore campaign designed to extract additional reserves from the aging oil and gas reservoir. For this well, the top reservoir was unconsolidated with high fines, while the bottom reservoir was heterogeneous. The original plan was to sidetrack and recomplete the top zone with conventional cased-hole gravel pack (CHGP) and use inflow control devices (ICDs) in the bottom zone. The biggest challenge involved the requirements of selective dual-zone production—requiring complex operational installation—which would result in substantially high well costs.

During the process of designing the new lower completion campaign, the same operator experienced success in a separate field using the **GeoFORM™ conformable sand management system** that uses a revolutionary material that conforms effortlessly to complex well profiles, multilaterals, and ultrafine sand formations, delivering a new level of sand control performance with fewer operational requirements. In that installation, the GeoFORM system showed superior performance over a CHGP and saved a significant amount in well costs. The operator considered applying the GeoFORM system to the revived field hoping for similar results. The only obstacle was temperature. The GeoFORM system performs well in operating envelopes of 200°F (93°C). In the revived field, the temperature of the top reservoir was 210°F (99°C).

Baker Hughes engineers conducted additional laboratory tests to determine the effects the elevated temperatures might have on the GeoFORM system. After a careful review of the risks vs. rewards, the engineers concluded the GeoFORM screens could be used to complete the top zone.

A key consideration for deploying GeoFORM screens was that they eliminated the requirement of gravel pack equipment to be present at the rig, as well as the logistics of shipping the equipment to the offshore rigs and the subsequent reduction of health, safety and environmental (HSE) exposures. Additionally, the GeoFORM screens are run into the wellbore like a conventional standalone screen, allowing the lower completion design to be a single-trip assembly conveyed together with the ICD. The elimination of the gravel/proppant pumping requirement enabled the sand control packer system to be changed to a liner hanger system, giving the string more durability while running in hole.

To mitigate uneven inflow due to the heterogeneity of the bottom reservoir, Baker Hughes recommended the **EQUALIZER SELECT™ inflow and injection control device** that features a unique tortuous path geometry that equalizes flow across the lateral and reduces erosion risks to enhance production and improve recovery—with no interaction from the surface. The **multi-tasking (MTV) hydraulically activated device** was incorporated to allow full circulation

Challenges

- Aging oil and gas field
- Unconsolidated sands with high fines.
- Top reservoir temperature at 210°F (99°C), above the standard application range
- Bottom reservoir heterogeneity

Results

- Installed GeoFORM screens in top reservoir to control sand production
- Deployed Equalizer SELECT ICDs to control production inflow from horizontal bottom oil reservoir and optimize recovery
- Enabled full circulation with MTV device without the need for wash pipe, saving rig time
- Reduced the weight of the string and lowered the risk of downhole conveyance in the horizontal section
- Eliminated large footprint associated with sand pumping equipment
- Scaled down the mobilization of logistics and personnel
- Saved $2 million USD in costs associated with simplifying all operations
- Experienced no HSE issues or nonproductive time (NPT)

without the requirement of wash pipes, reducing the weight of the lower string, and mitigating the risks of being stuck while running in hole.

After meticulous pre-operation planning, the Baker Hughes solution was deployed in the revived offshore field and it generated significant results, yielding 15 to 20 MMSCFD as expected.

This project resulted in a few firsts for the technology. It was the first installation of the GeoFORM system and Equalizer Select ICDs in South East Asia, the first dual-string well to combine both GeoFORM screens and Equalizer SELECT ICDs with the MTV device in a single string. And it proved to be the first installation of the GeoFORM system in an environment at 210°F (99°C).

The simplified operation streamlined the job and mitigated HSE risks. By eliminating certain aspects of a conventional operation—elimination of sand pumping equipment, reduction in mobilization logistics for personnel, and fewer rig days—the operator saved $2 million USD.

The operator was pleased with the effectiveness of the technology and the relative ease of operation, making the GeoFORM screens and Equalizer SELECT ICDs with the MTV device a preferred choice to use in applicable future wells.