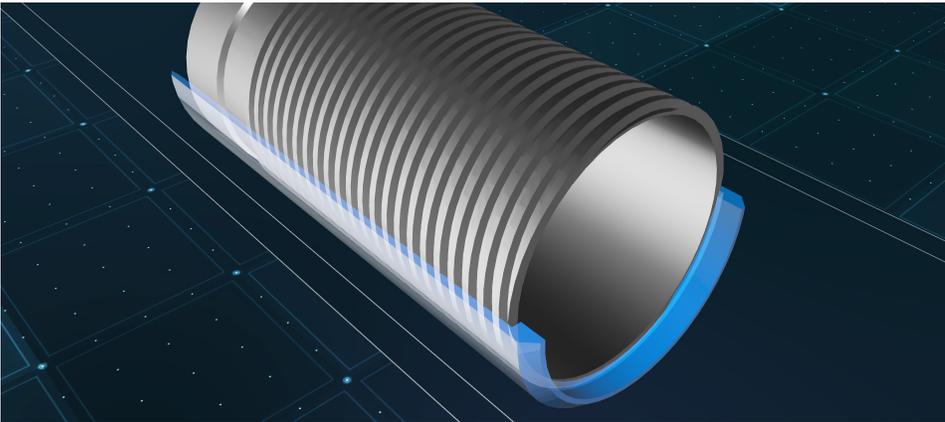


LOCATION: CAMPOS BASIN, OFFSHORE BRAZIL

**BAKER
HUGHES**
a GE company



EQUALIZER HELIX ICDs delivered uniform injection across lateral well, improved water/oil ratio



A customer with three adjacent producer wells in the Campos basin was experiencing uneven reservoir drainage and water breakthrough was imminent. Looking to manage reservoir pressure and to improve sweep efficiency and recovery, the customer contacted Baker Hughes, a GE company (BHGE) about implementing an effective water injection program.

Although bullheading is a common approach, simply pumping fluids across a wellbore allows them to take the path of least resistance, often resulting in uneven injection. Natural reservoir pressures and formation characteristics can also contribute to uneven injection, ultimately causing water channeling and/or accelerated water breakthrough.

To overcome these challenges, BHGE recommended installing **EQUALIZER HELIX™ passive inflow and injection control devices** (ICDs) to create a uniform injection profile across the well. The ICDs feature helical flow channels that generate a pressure drop based on surface friction levels to balance inflow or injection from heel to toe. Often used in high-rate producer wells to delay water breakthrough and improve production, EQUALIZER HELIX ICDs can also be used to equalize injection, and in the case of this application, evenly distribute acid treatments as well.

A total of 57 EQUALIZER HELIX ICDs were quickly and easily deployed in the 2300-ft (700-m) openhole wellbore, which was situated below an oil leg in the lower portion of the reservoir. Acid was pumped

Results

- Created a uniform injection profile that enabled a more effective reservoir pressure management program
- Boosted production and lowered water cut in adjacent producer wells
- Increased injectivity index through improved filter cake removal
- Delayed water breakthrough
- Reduced water handling costs

Challenges

- Managing reservoir pressure and sweep efficiency to improve drainage in three adjacent producer wells
- Avoiding water channeling and preventing water breakthrough
- Implementing an effective injection program across a horizontal wellbore

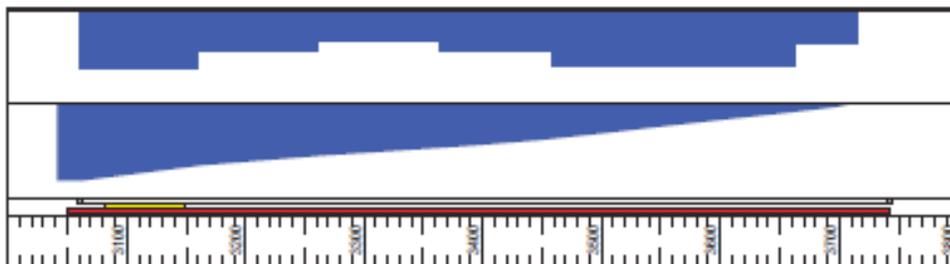
BHGE solution

Installed EQUALIZER HELIX ICDs to enable uniform injection profile across the lateral

down and out through the ICDs which evenly distributed the treatment across the lateral, enabling fast and effective filter cake removal. To quickly boost reservoir pressure and push the oil toward the producer wells, water injection was initiated at a rate of 5,000 m³/day, and was maintained between 2,000 to 5,000 m³/day to help maximize drainage. With the largest cross-sectional flow area in the industry, the EQUALIZER HELIX ICD can support high-rate, high-volume flow for extended periods without succumbing to erosion or plugging.

Shortly after the water injection program concluded, the customer noticed that the water/oil ratio had improved in the neighboring producer wells. In addition to enabling a more effective injection program that enhanced production, the EQUALIZER HELIX ICDs also minimized water channeling and breakthrough, helping the customer to improve sweep efficiency while reducing water handling costs.

To confirm the injection performance of the EQUALIZER HELIX ICDs, the customer ran logs which clearly showed that the ICDs had created an even injection profile across the entire horizontal section. The log results also revealed a high injectivity index, confirming the effectiveness of the acid job.



Production logging tests confirmed that the 57 EQUALIZER HELIX ICDs created a uniform injection profile across the lateral wellbore.

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