

Case study: Latin America

Electric intelligent completion, fiber optic monitoring for water injector well a world first

To improve oil recovery, an operator in Latin America had used traditional water injector wells in a field with multiple injection-production zones. The operator was unable to gauge the amount of water that flowed into the different production zones. Because of the differing permeability and porosity of the multi-segmented zones, the water injection could not be optimized to manage the waterflood front that would maximize sweep efficiency and oil recovery.

To help optimize the water injection and decrease lost production, the operator turned to Baker Hughes to install the **MultiNode™ all-electric intelligent well system** and the **SureVIEW™ distributed acoustic sensing (DAS) system**. The combined systems enabled controlled and monitored water injection into the individual zones, previously impossible with traditional water injection completion equipment.

Throughout the project, Baker Hughes worked seamlessly with the customer's team of engineers, incorporating

the strengths of local personnel and mobilized global experts from the intelligent production systems engineering, product line, and operations team.

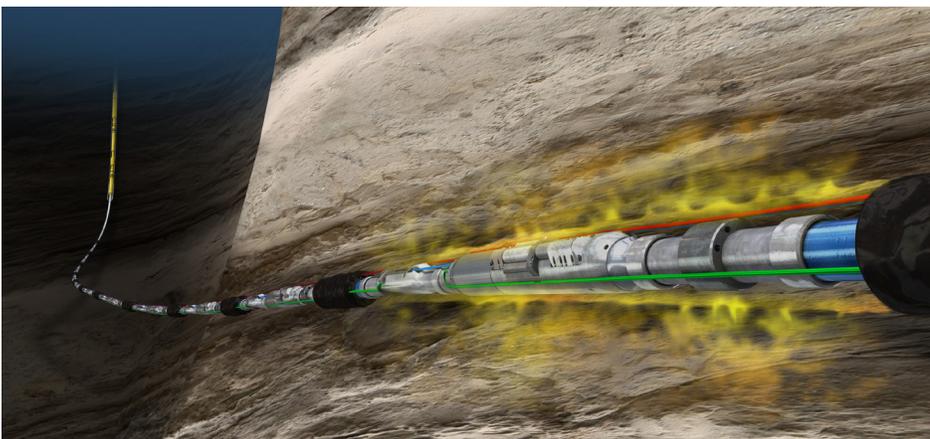
The intelligent completion design for this mature reservoir application consisted of a cased-hole well separated into four individual zones for water injection. A **MultiNode™ electronic flow control valve (eFCV)** was installed in each of the four injection zones along with a SureVIEW fiber optic DAS system deployed throughout the completion for real-time dynamic injection flow allocation and monitoring into each of the four zones. The eFCV valves can be incrementally opened or closed from the surface without well intervention to alter the injection profile, increase recovery from hydrocarbon-rich zones, and delay water breakthrough. Remotely controlling injection rates into the multi-segmented zones improves the service life of the injection operations, eliminates future intervention costs, and increases ultimate recovery.

Challenges

- Control and monitor water injection across four individual zones of a depleted field with differing water injection profiles
- Deploy emerging technology, previously unused for water injection applications
- Install equipment into narrow downhole production zones with very tight space-out requirements
- Manage operational complexity and cost of water injection

Results

- Increased production from corresponding producer wells by 62% and reduced operating costs by 30% after one year
- Delivered first four-zone, intelligent injection completion system in the world
- Enabled the operator to measure injection into each zone and estimate how a change to the choke position would alter the injection operations



By installing a MultiNode all-electric intelligent completion system coupled with the SureVIEW DAS system, the operator can now remotely control and monitor water injection in all four individual zones. In addition, the intelligent completion provides the ability to continuously acquire, aggregate, transmit, store, process, analyze and visualize gigabytes of surveillance data from a variety of multi-sensors for real-time monitoring and optimization of the intelligent injection well operations.

The Baker Hughes team performed thorough cleanout runs and deployed the completion without rotation or circulation.

Baker Hughes deployed the precise combination of innovative products and expertise to ensure the success of this completion installation. Experienced and knowledgeable, the crew delivered an innovative, reliable, and versatile intelligent completion system that will increase production rates, reduce workover costs, and enhance recovery over the life of the well.



MultiNode equipment layout prior to installation