



# Weatherford®

## REAL RESULTS

### DTS Warmback Survey Allows Operator to Identify Injectivity Loss without the Added Costs and Risks of Openhole Wireline Logging

#### Objectives

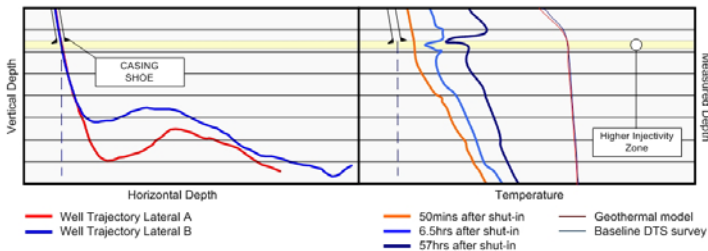
- Determine relative injectivity profiles across a horizontal water-injector well's 6,000-ft (1,829-m) openhole section without running wireline logging tools.

#### Results

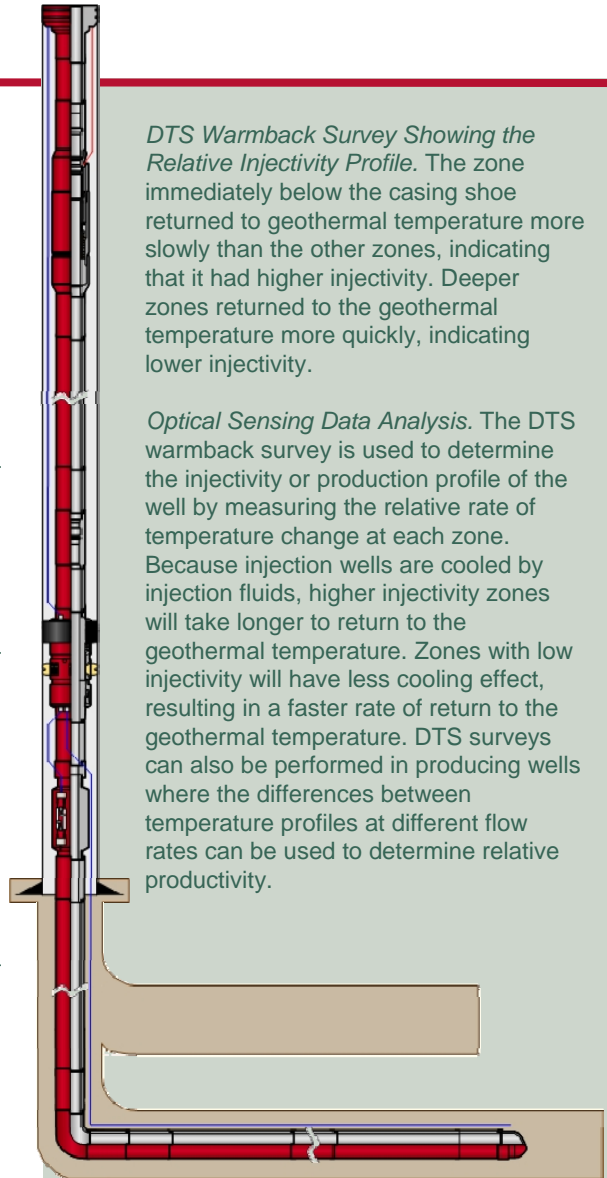
- Weatherford performed a distributed temperature sensor (DTS) warmback survey by installing fiber optic cable attached to the outside of a 2 7/8-in. stinger into the open hole below the casing shoe. Weatherford's warmback analysis used DTS modeling and interpretation software, evaluating temperature measurements from each zone at periodic time intervals after well shut-in following injection.

#### Value to Client

- Information from the DTS survey enabled the operator to locate a thief zone immediately below the casing shoe that was taking the majority of the injected fluid.
- Remedial action was taken based on this DTS data to improve injectivity distribution
- The DTS survey allowed the operator to avoid the additional costs, risks and time required for openhole wireline logging.



DTS service allows interventionless monitoring of the injection profile across the well and can be measured continuously or periodically.



*DTS Warmback Survey Showing the Relative Injectivity Profile.* The zone immediately below the casing shoe returned to geothermal temperature more slowly than the other zones, indicating that it had higher injectivity. Deeper zones returned to the geothermal temperature more quickly, indicating lower injectivity.

*Optical Sensing Data Analysis.* The DTS warmback survey is used to determine the injectivity or production profile of the well by measuring the relative rate of temperature change at each zone. Because injection wells are cooled by injection fluids, higher injectivity zones will take longer to return to the geothermal temperature. Zones with low injectivity will have less cooling effect, resulting in a faster rate of return to the geothermal temperature. DTS surveys can also be performed in producing wells where the differences between temperature profiles at different flow rates can be used to determine relative productivity.

#### Location

Offshore, Middle East

#### Well Type

Dual-lateral, openhole horizontal water injector

#### Products/Services

DTS service using fiber optic cable