

Case study: Middle East

Dump flood operation using an inverted ESP mitigates cost of drilling a water injection well system, enhances productivity

An operator in the Middle East drilled a well more than 24 years ago and completed it as an open-hole oil producer. When the well watered out, the old casing was plugged with a cement plug and 7-in. casing was extended to surface. Several acid stimulation jobs were unsuccessful and the operator decided to drill a sidetrack from the existing hole to a new reservoir and convert the well to a water injector.

The operator approached Baker Hughes for a solution. Baker Hughes designed an inverted electrical submersible pumping (ESP) system to inject water into the deeper oil reservoir to improve productivity from the formation.

This dump flood operation required a different configuration for the motor and seal. The seal had to be redesigned to allow for inverted, or upside down installation, keeping the main characteristics of isolation, expansion, absorption, and equalization of the seal.

The motor had to be modified to allow sensor data to be transmitted over the main power cable lines configured with hanging tubing. This is a significant change to typical configurations for data transmission.

The system uses a Baker Hughes **SureFLO™ 298EX downhole flowmeter**, which offers real-time production data without affecting recovery potential. This is the industry's first full wellbore access downhole electronic flowmeter. The unrestricted access enables full production and highly accurate measurements. This technology has been installed worldwide since 1995 with the first prototype installed in the North Sea.

Baker Hughes now has more than 230 units operating with over 98% accuracy. Over the last 18 years, Baker Hughes has improved on the design and functionality of this flowmeter to provide highly accurate data measurements.

This complete inverted ESP system solution from Baker Hughes saved the operator the additional costs related to surface injection equipment required with typical injection methods.

Challenges

- Operator required a solution for direct wellbore injection
- New configuration would require redesign of a typical ESP string (which produces fluid upward) to inject fluid down into the reservoirs

Results

- Successful installation of inverted
- ESP system with a total calculated injection rate of 11,000 BPD during the well function test
- Eliminated the cost of surface injection equipment