

Flexible Completion with ESP Improves Recovery and Water Injection Project Cost in Egypt

ESP system achieves sustainable water injection from dumpflood, eliminating costs of drilling new water source well

CHALLENGE

Improve field recovery using water injection with minimal cost.

SOLUTION

Divert dumpflood water from an upper producing zone through a reversed Y-tool and bypass system with an ESP for pressure support and maintenance and a Phoenix xt150* high-temperature ESP monitoring system with the Lift IQ* production life cycle management service to optimize pump performance.

RESULTS

- Improved production from target wells by nearly 5,650 bbl/d [898 m³/d].
- Saved USD 2.65 million compared with cost of drilling a new source well.



Overcome field depletion

The Emery Deep field, a recent development for Agiba Petroleum, started to experience some depletion, and the reservoir pressure required some maintenance. As a result, a new water injection well, ED-16 ST, was drilled to support the northern part of the field. However, the 16,500-bbl/d [2,623-m³/d] capacity of the available water source wells was not sufficient to feed the new injector well. Therefore, an additional source of compatible water was required.

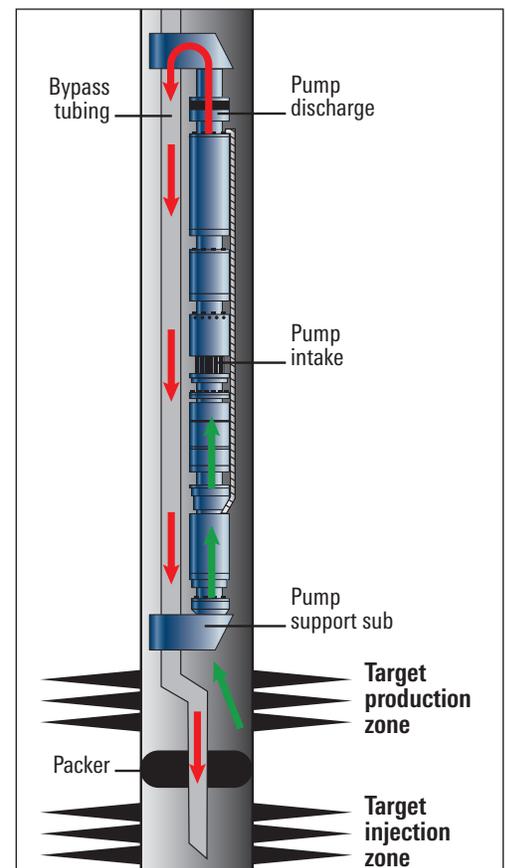
Two solutions were considered to address this issue. The most obvious solution was to drill another additional water source well. However, drilling and completing a new well, and installing new flowlines would incur substantial costs.

Another option was to rely on a natural dumpflood. The ED-16 ST well has access to both the injection and water source (producing) zones of the field. The producing zone has higher pressure than the injection zone. Therefore, by perforating both zones, a natural crossflow would occur, providing some pressure support. However, the pressure difference was found to be inadequate to provide the flow rate required.

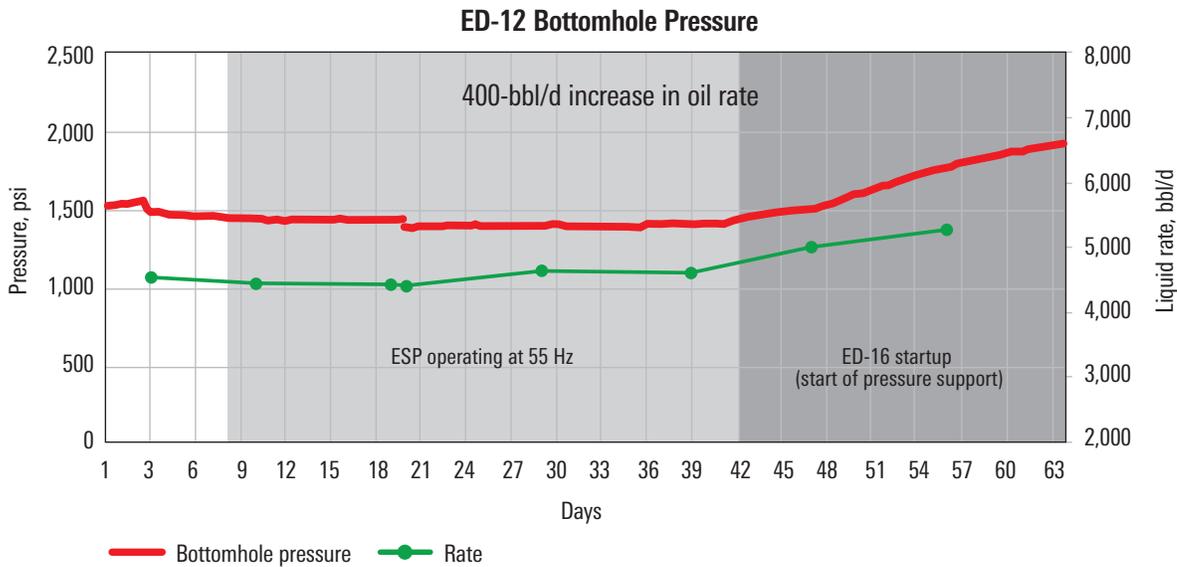
A new approach was required to assist flow and achieve the required injection rate.

Improve pressure with an ESP

Engineers designed a new system to achieve both the water supply and pressure issues. The solution involved an ESP to enhance the pressure of the water produced from the upper zone, and a Y-tool and bypass system to divert the higher-pressure water back to the lower injection zone. A Phoenix xt150 system was also installed to monitor pump performance. Finally, the Lift IQ service, already used to monitor performance of offset wells, was extended to the new injection well, improving observation of changes in downhole pressure across the field.



Water flows from the low-pressure water-producing zone to the pump intake; after the ESP boosts the pressure, the high-pressure water flows through the reversed Y-tool and bypass system tubing to the target injection zone.



Downhole pressure increases in the ED-12 offset well after starting the ESP in the ED-16 well.

Immediate pressure response in offset wells

After installing the system and starting the ESP, an increase in reservoir pressure was seen. Downhole pressure readings of the offset wells clearly demonstrated that the water injection was successful. Target wells experienced improvements in downhole pressure and overall production. The combined gain in production from the target wells was nearly 5,650 bb/d [898 m³/d].