

CoilFLATE and Water-Shutoff Systems Restore 75 m³/d Oil Production in Wells

CT-conveyed inflatable packers and chemical barriers isolate water production zones, enabling oil production in two wells after 10-year shut-in, West Africa

CHALLENGE

- Restore production to two horizontal openhole wells that had been shut in for more than 10 years due to over 90% water cut.
- Reduce water breakthrough in each well without permanently plugging production.

SOLUTION

- Use AllSeal* water and gas conformance service to create a custom solution for water breakthrough.
- Set CoilFLATE* coiled tubing through-tubing inflatable packers as mechanical isolation devices.
- Place OrganoSEAL* organic crosslinked gel or SqueezeCRETE* remedial cementing solution to seal leaks in the water-producing sections of the wells.

RESULTS

- Water cut levels dropped from 90% in both wells to 70% in well A and 80% in well B.



Minimize risks of improper chemical barrier placement

Shortly after being put onto production, two wells in West Africa were producing less than 10% oil because of high water cut. After unsuccessfully trying to control the water, the operator made the decision to shut in both wells prematurely.

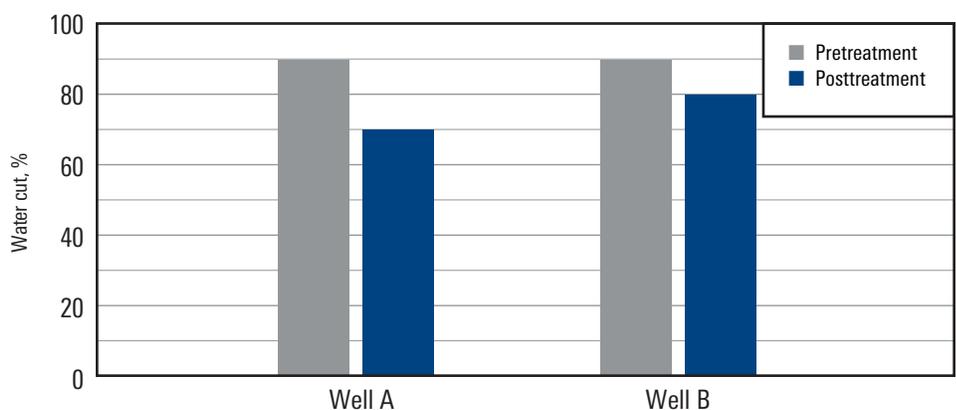
Well A is a horizontal producing well completed with a slotted liner. According to the diagnostic from the RST and production logs, there was water producing from a 43-m [141-ft] portion of the center section. The well's history revealed that during the drilling phase there were severe losses, the location of which was identified by combining mud logging geology and temperature logging.

Well B is a serpentine well completed with three sections of standalone screen. It was producing with 90% water cut within just a few days of production. Water was thought to be coming from the bottom 170-m [558-ft] section of the well at the depth where there was no fault. The operator placed a plug in the annulus and packers outside the completion above this section to prevent water from migrating through the completion from the shoe, which is below the water-oil contact. It did not succeed.

Seal off the target zones and leak with a combination of mechanical and chemical technologies

Schlumberger identified the root cause of the incoming water and used the AllSeal service—a service that integrates a wide portfolio of shutoff technologies—to design an optimal water shutoff service specific to each well.

Schlumberger determined that the issue of incoming water in well A was in the near-wellbore area and proposed setting CoilFLATE packers at the top and bottom of the screened section of the water-producing zone. Then OrganoSEAL gel was pumped down the coiled tubing into the annulus.



Reducing the water-cut levels of well A and well B from 90% to 70% and 80%, respectively, allowed these nonproductive wells to be put back online.

The OrganoSEAL gel entered the near-wellbore area through the screens, plugging the water in the formation matrix.

The main challenge was ensuring that the packers were placed at the right depth. When water shutoff treatment is pumped inside a reservoir, it plugs the formation matrix in that zone, preventing further fluid breakthrough. The CoilFLATE packers needed to be placed above and below the 43-m [141-ft] water-producing section and the chemical barriers pumped into the center of this section to isolate it without shutting off oil production from the surrounding areas. The slotted liners added an extra layer of complexity because if the treatment spreads beyond the water zone, it could get into slots of the liners and potentially damage parts of the reservoir.

Reduced water cut in both wells

A detailed assessment with logging data was made of well B, and it was determined that the bottom zone of the well was producing water. It was suspected that there was a leak in one of the swell packers that had been previously placed by the operator. The decision was made to deploy a CoilFLATE packer above the screens at the top of a blank section at 1,775 m [5,823 ft] to isolate the bottom section of the well. The packer was set and the wellbore was cleaned in preparation to be filled with SqueezeCRETE solution. The cleaning prevented the cement from sticking to the inside of the completion and the surrounding formation matrix. The SqueezeCRETE solution was pumped through the coiled tubing below the CoilFLATE packer, filling the completion and annulus between the formation matrix and the completion. The precise placement of the CoilFLATE packer prevented the chemical barrier from seeping above the packer and into the producing zone of the annulus.

Prior to treatment, both wells had a water cut level of above 90%. Four months after the treatment, the water cut for well A had decreased to 70% and well B had a water cut of 80%, leading the operator to evaluate the potential of similar treatments for other wells shut in prematurely because of excessive water cut.

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