

# ReSOLVE Instrumented Wireline Intervention Successfully Releases Stuck Deep-Set Bridge Plug

Real-time monitoring of downhole forces characterizes the downhole pressure differential

**CHALLENGE**

Pull a deep-set high-pressure, high-temperature (HPHT) bridge plug at an unknown pressure differential that a mechanical jar on slickline had been unable to release.

**SOLUTION**

Deploy ReSOLVE\* instrumented wireline service configured as the linear actuator tool because it is the strongest mechanical pulling tool available and also measures the applied forces and other parameters for understanding the situation downhole.

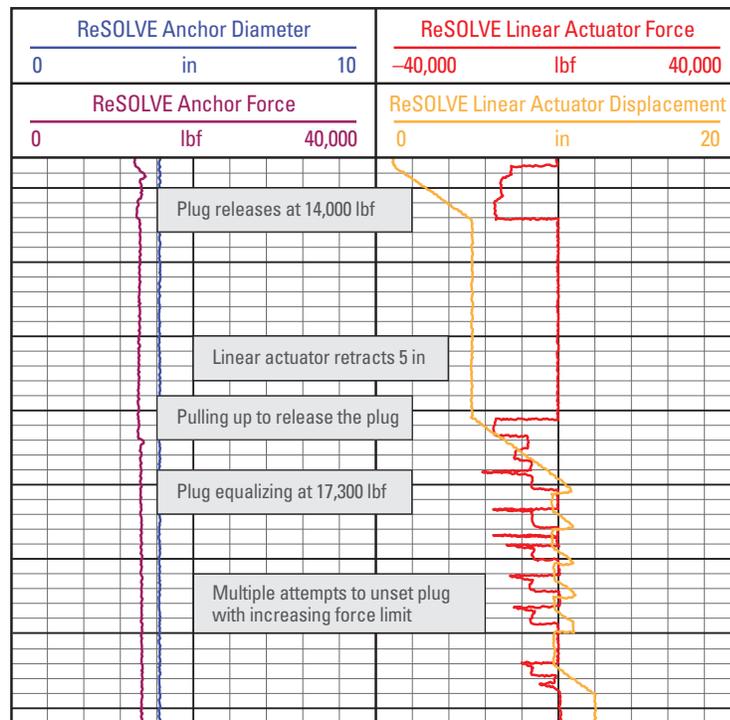
**RESULTS**

Successfully released the stuck plug and pulled it through several restrictions.



**Stuck deep-set bridge plug**

An operator needed to pull a stuck deep-set HPHT bridge plug in the North Sea. Although 7,800 lbf had been specified for the equalizing force and 10,400 lbf for the release force, the initial attempt to equalize and release the plug with a mechanical jar was unsuccessful. The force applied by the mechanical jar as an instantaneous shock was estimated to be about 33,000 lbf, not including attenuation of the force from the fluid and 45° deviation of the well profile. In addition to removing the plug, information was needed about the downhole forces to better understand the situation for this and future possible intervention operations.



Real-time monitoring of the plug release by the ReSOLVE system verified the operation's progress and documented downhole pressure conditions.

### Maximum achievable downhole force for anchoring and actuation

The ReSOLVE linear actuator tool is ideally suited for removing the plug. Its maximum actuation force of 45,000 lbf is the industry's highest. Because ReSOLVE service is conveyed on wireline, it brings additional efficiencies to logistics, rigging up, and deployment of the modular system, especially offshore.

In addition to its mechanical superiority, the ReSOLVE system incorporates numerous sensors that digitally measure the progress of operations in real time for optimizing dynamic tool control from the surface.

### Information-rich plug pulling

Once the ReSOLVE system arrived offshore, it was tested at the surface offshore to ensure that it could build the high force necessary. The ReSOLVE tool is hydraulically powered, providing a reliable, low-risk alternative to the conventional use of explosives. The plug was then equalized at 17,300 lbf and released at 14,000 lbf—values that are more than 220% and 135%, respectively, of the quoted forces. Measurement of these steps of the operation by the ReSOLVE sensors provided critical information to the operator about the downhole differential pressure. The ReSOLVE system also measured the force applied to the tool—rather than the force applied by the tool—to enable close monitoring of the well's stabilization.

Retrieval of the plug had to negotiate several difficult obstacles, including a wireline entry guide and gauge carrier. The ReSOLVE system's anchors were engaged at each restriction and the linear actuator was used to pull the plug through. However, the plug could not be pulled through a chemical injection mandrel. The real-time monitoring quickly made it clear that even at 40,000-lbf pull that the plug was not moving, supporting an early informed decision to end the pulling attempt. The plug was sheared off the ReSOLVE tool and pushed out the restriction with several 40,000-lbf strokes. The plug was then pushed to total depth with a mechanical jar.

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### "We are impressed in several ways with the ReSOLVE technology and the quick response from the Schlumberger personnel.

- Technical capabilities of the technology are excellent.
- Response time and competence level locally were outstanding. This led to a short, but effective, planning sequence which produced detailed operating plans and risk assessment.
- Real-time surface readout of all critical parameters gives a new, direct insight to what takes place in the well. We learned that the bridge plug behaved significantly differently than expected when subjected to downhole conditions.
- No problems were recorded during the operation."

Leader, Well Technology Operation

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