Use of Swellpacker® Zonal Isolation System Behind Casing Helps Ensure Successful Top of Cement Zonal Isolation

Location: Europe

CHALLENGE – A major operator was experiencing poor cement jobs on many of its 13 3/8-in. casings in a field being developed in the Caspian Sea area. The planned top of cement (TOC) for the 13 3/8-in. casing was inside the 16-in. liner. However, the presence of a low-pressure zone in the open hole below the 16-in. shoe often led to cement losses and an inability to place cement entirely into the casing above. In this case, failure to obtain a good cement job could lead to sustained casing pressure issues and expensive remedial operations. The operator's internal requirements specified a pressure-free annulus. Therefore, it was mandatory that a backup isolation method for this zone be identified and designed without compromising the primary cement job. In addition, the team had only four weeks to find and deliver a solution to this challenge since drilling operations were ongoing.

Challenge Summary

- Obtain isolation of a problematic fluid loss zone behind the 13 3/8-in. casing
- Meet operator's four-week time frame for delivery of a solution

SOLUTION – A Halliburton team worked together with operator personnel to develop a solution that would help ensure reliable zonal isolation of the entire section even if cement losses to the low-pressure zone were experienced. The solution chosen by the operator incorporated cement as the primary zonal isolation method and introduced a Swellpacker® system run high on the 13 3/8-in. string to seal inside the 16-in. liner. Should the cement fail to reach the planned TOC, the Swellpacker system would swell in the oil-based mud (OBM) system and isolate the formation below from the well.

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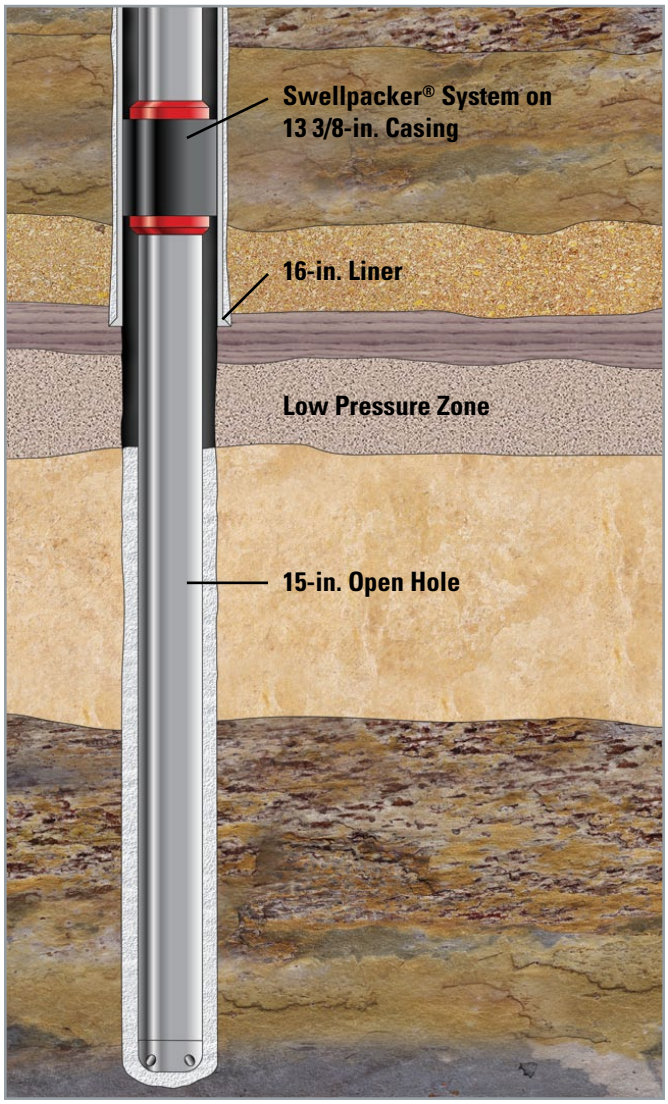
During the design phase of the Swellpacker system, several factors were taken into consideration. First, the outer diameter (OD) and length of the packer had to be tailored to hold the 2,000 psi pressure change and yet not increase the equivalent circulating density (ECD) to keep the risk of losses during the cement job minimized. In addition, the swelling time had to be engineered to allow for run-in-hole and cementing operations with a minimal increase in packer OD. Swell testing on the operator's OBM system was done so that a suitable delay mechanism for the operation could be engineered. Halliburton designed a Swellpacker system to obtain a swelling delay of 14 days. The chosen solution required that pipe be shipped to Norway where the packer was built and then the completed packer be shipped back to the well location—all within the required four-week time frame.

Solution Profile

- A Swellpacker system was designed to be run on a 13 3/8-in. casing joint. The element OD and length was tailored to suit the pressure change requirement, yet not affect the ECD.
- Parallel testing on customer fluids were required to develop a suitable delay system for the solution chosen.
- Logistic hurdles had to be overcome to deliver the solution on time.

RESULT – Installation of the 13 3/8-in. casing with the Swellpacker® system was trouble free. Heavy losses were experienced during cementing and as a result, the planned top of cement, which was well inside the 16-in. shoe, could not be reached. Therefore, zonal isolation of the upper part of the liner and shoe relied on the Swellpacker system backup solution. The packer swelled in the OBM above the TOC and provided a pressure seal inside the casing shoe, thus preventing the operator from having to perform expensive remedial work to solve the cementing problem. As the rig continued drilling subsequent sections, the annulus showed a pressure buildup due to thermal influences during drilling. When the pressure was bled off, only a small volume was detected with no further inflow or pressure buildup, thus indicating the packer was sealing. After the well was completed, the customer decided to run evaluation logs to verify whether the Swellpacker system was functioning. Well annular flow logs (WAFL) were run and activity was seen behind the 13 3/8-in. casing, confirming that the cement job had been unsuccessful. The logs confirmed that the Swellpacker system was sealing as there was no flow above the point where the packer was set.

Based on the success of this job, the operator expressed plans to utilize Halliburton's Swellpacker system technology on similar wells in the future.



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