

Flash Point Liner Top Packer Sealed Losses and Saved Steam Injector

Experienced and responsive NOV Completion Tools team provides rapid solution to customer despite challenging and ongoing COVID-19 restrictions.

Background

During the installation of a competitor's 7-in. liner in a horizontal steam injector well for a customer in Germany, the liner top packer of the competitor did not pass the required pressure test, and a leak was observed at the liner top.

The existing 7-in. screen liner was anchored inside a 9 $\frac{5}{8}$ -in. host casing at 69° inclination and deployed inside a 90° horizontal 8 $\frac{1}{2}$ -in. open hole. Two injection zones with sand screens were each straddled with thermal swellable open-hole packers above and below. The liner top packer was required to seal at temperatures of up to 600°F (315°C) during steam injection through a specialized completion to comply with production requirements.

The integrity of the 7-in. liner top packer was vital in this horizontal multiple zone steam injector, and further completion of the well was not possible until pressure integrity could be re-established at the 7-in. liner top. With no immediate solution or secondary tieback packer system available from the competitor, the customer had to place the drilling rig on standby until a viable and practical solution became available that could solve the problem in a feasible timeframe.

Considering this occurred amid the global COVID-19 pandemic, this created additional challenges in terms of the supply chain, manufacturing, and logistic options.

Case study facts

Location: Germany

Products

- Flash Point™ thermal liner top packer
- BST with high-temperature seal stacks
- NOV hydraulic pusher tool
- HRC hydraulic setting tool

General well information

- Host casing size/weight: 9.625 in. 40 ppf VM95S
- Liner size/weight: 7 in. 32 ppf VM95S
- Top of liner: 3,159 ft (963 m)
- Temperature: capable of up to 600°F (315°C) during steam injection
- Deviation: 69° inclination at liner top



Solution

The customer approached our local NOV Completion Tools team for their input on possible solutions to repair the leaking liner top and establish pressure integrity. The lead time was critical as it was the deciding factor on whether the well would be completed or placed on standby. To repair the leaking liner top, a tieback packer, including a tieback seal stem, liner top packer, hold down slips, and polished bore receptacle (PBR), was required.

To meet the 600°F (315°C) temperature requirements of this application, specialized elastomers capable of operating in this environment had to be considered. Due to shallow setting depth and 69° inclination at setting depth, a hydraulic pusher tool was selected to ensure the required setting forces would be transmitted to the packer.

After careful evaluation of the application, NOV offered the customer a complete system solution ready for installation in two weeks. Due to the complexity and temperature requirements of this installation, equipment was not readily available on shelves in-country.

To realize this commitment of two weeks:

- NOV mobilized a Flash Point thermal liner top packer and hydraulic packer pusher tool via airfreight to Germany.
- NOV sourced a custom tieback seal stack capable of sealing in the high-temperature steam environment expected during injection.
- A modified bottom set assembly with hold-down slips and seal extension was designed and produced in Germany specifically for this application.
- A custom installation procedure was finalized with the customer, based on their actual well conditions.

In addition to the thermal tieback packer, NOV Completion Tools provided the customer with:

- 7-in. retrievable packer to set inside the existing 7-in. liner for testing purposes
- 9 $\frac{1}{8}$ -in. casing scraper to clean the tieback packer setting area
- 7-in. PBR top dress and polish mill to clean existing 7-in. PBR
- String magnets to capture debris from the cleanout trip

Results

After receiving approval from the customer to move forward, NOV completed the project within two weeks as planned with a complete system solution ready to run in hole.

- The Flash Point thermal packer and pusher tool were airfreighted from Canada and assembled and tested in Germany.
- Special tieback seal stacks were produced in the United States and delivered on time.
- Design and production of the seal assembly and hold down slips were completed within the timeframe.
- The final assembly and stab up of setting tools were completed in Germany.

After the 7-in. retrievable packer was installed and cleanout trips performed, the thermal tieback packer was run in hole and installed as per plan. Before setting the tieback packer, the integrity of the seal stacks and the 7-in. retrievable packer was confirmed. The tieback packer was then hydraulically set with the pusher tool before the hydraulic HRC setting tool was released. The tieback thermal packer was successfully pressure tested from surface with 1,450 psi (100 Bar) for 30 minutes with the packer seeing approximately 2,175 psi (150 Bar) of pressure during this test. Setting tools were retrieved back to surface and in good condition.