

RestrictionVA

UNDERSTANDING WELLBORE HOLD-UP ISSUES

EV's Intergrated Video Caliper (IVC) tool incorporates qualitative & quantitative measurements to identify the root cause of restricted wellbore access.

WELLBORE DEFORMATION

Wellbore deformation can occur at any stage in the life of a well. Whether a result of changes in temperature, pressure or tectonic forces, wellbore deformation may result in serious downhole issues such as restricted access for interventions or the loss of well integrity, and could ultimately lead to premature well abandonment.

With no symptoms presented at surface, operators often discover deformation issues the hard way - during interventions. However, proactive diagnosis of well deformation enables operators to understand the cause and severity of the issue, enabling them to adjust their strategy and overcome it before a critical stage is reached.

HOLD-UP DETECTED

The operator was mid-way through a routine plug-and-perf frac operation when they suddenly held up while pumping down the plug and gun assembly for their next stage.

The hold-up depth was close to the liner hanger and initial thoughts were that this assembly may have been damaged. However, with live guns involved and the frac operation on standby, the operator sought to understand the problem and how to overcome it.

EV's 24 arm Integrated Video Caliper was deployed on e-line to help identify the cause of the hold up. The IVC tool combines industry leading Optis camera technology with multi-finger caliper technology to provide measurements of internal tubing and casing diameters.

This combination of video with multi-finger caliper data leads to enhanced interpretation and provides invaluable 360° pipe coverage to compliment the limited radial coverage available from a stand-alone mechanical caliper.

⚠️ THE CHALLENGE

A US operator encountered problems mid-way through a routine plug-and-perf frac operation when they suddenly held up while pumping down the plug and gun assembly for their next stage. With live guns involved and the frac operation on standby, the operator sought to understand the problem and how to overcome it.

💡 THE SOLUTION

EV's Optis[®] IVC-24 tool was deployed on e-line to help identify the causes of the hold-up. The Integrated Video Caliper tool combines industry leading Optis camera technology with multi-finger caliper technology to provide measurements of internal tubing and casing diameters.

✅ THE RESULTS

The liner top was inspected and the geometry was confirmed to be normal. A Pipe Deformation Analysis (PDA) was undertaken based on data from the caliper (**Fig.1**), confirming the presence of helical buckling above the liner hanger. A drift analysis was provided to understand the limits for access and identify the optimal BHA to pass the restriction (**Fig.4**). This enabled the operator to modify the design of their plug and perf string to pass through the deformation, helping put the intervention back on track.

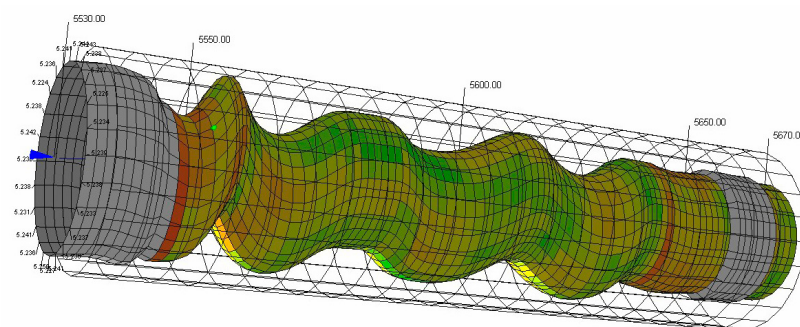


Figure 1: PDA 3D View of Helically Buckled Casing

UNDERSTANDING THE SEVERITY

The liner top was inspected and a full 360-degree 3D model was provided (**Fig.2**). No visible signs of damage were identified and the geometry is confirmed to be normal. However further up the casing, the caliper data processed on MIPSPro indicated that the casing was helically buckled above the liner hanger (**Fig.3**).

Further RestrictionVA analysis was carried out based on data obtained from the multi-finger caliper. Firstly, a Pipe Deformation Analysis (PDA) was undertaken to define and quantify the 3D geometry of the tubulars that may have been sheared, buckled or deformed by other mechanisms (**Fig.1**).

This process confirmed the presence of helical buckling in the casing and the reason why the original plug and perf string was unable to descend to the target depth. Then, by simulating the passage of multiple BHAs through this 3D geometry, a drift analysis was provided to understand the limits for access and identify the optimal BHA to pass the restriction (**Fig.4**).

PUTTING THE INTERVENTION BACK ON TRACK

The quantified information provided by RestrictionVA enabled the operator to design their plug and perf string to fit through the casing deformation, helping them put the operation back on track and deliver the well successfully with minimal disruption.

By combining qualitative and quantitative information, RestrictionVA delivers rapid and comprehensive evaluation of downhole restrictions, identifying their root cause and determining their severity. Through visual assessment and advanced computer modelling techniques, RestrictionVA provides the definitive, proactive service for de-risking well interventions.

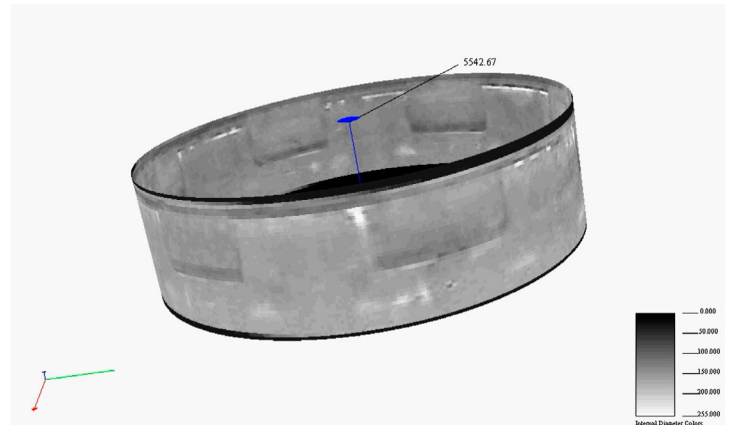


Figure 2: 3D Model of Liner Top

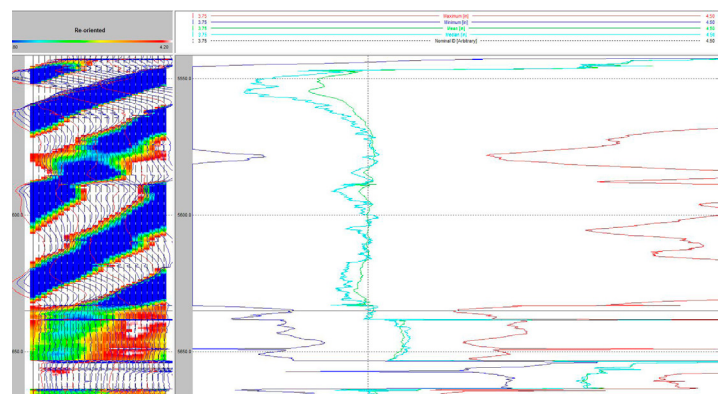


Figure 3: Caliper Data Processed on MIPSPro[®]

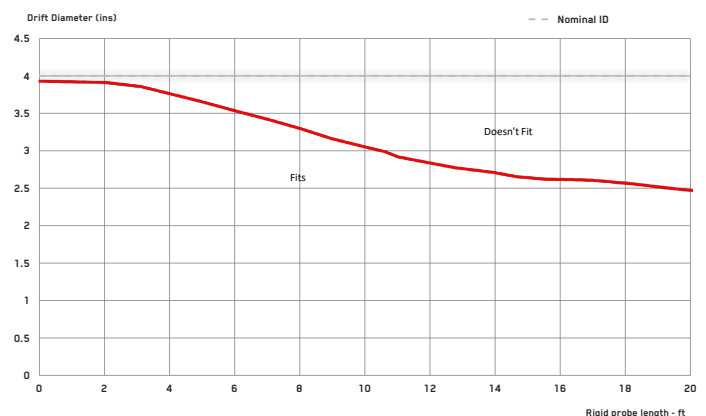


Figure 4: Drift Chart