H2S Coiled Tubing Velocity String

Case Study #0006

Date
April 02–05, 2017

Client
Shell Canada

Location
Rocky Mountain House, Alberta

Contractor
Mountain Coiled Tubing

Executive Summary

In April of 2017, Intelligent Wellhead Systems (IWS) mobilized one of their inVision Systems to the Rocky Mountain House area of Alberta to assist on a coiled tubing job for Shell Canada.

The job involved pulling out a velocity string for inspection on a 2% H2S live gas well. The velocity string had a downhole data acquisition system installed. The client wished to a add layer of protection to the job by utilizing the inVision System during the job to confirm position of the BHA during retrieval. The job was performed over a 3-day period in the spring of 2017.

Well and Equipment:

- 80 K × 2" Coiled Tubing Unit.
- Well Depth: Confidential
- Surface Pressure: Confidential
- Surface Gas Content: 2% H2S gas to surface.
- PCE: 130mm (5.125") × 70 MPA (10M) Quad BOP stack.
- inVision 130mm (5.125") × 103Mpa (15M) pancake system with crossovers to the other PCE equipment.

The inVision System provided information that allowed the coiled tubing unit operator to improve efficiency and safety during the retrieval of the velocity string.

Author: Brad Martin
Chief Technology Officer
Brad@IntelligentWellheadSystems.com

RIG UP DETAILS

The zone rated DAS control system for the inVision spool was spotted near the coil unit and wellhead. The inVision spool was installed between the quad BOP and the wellhead master valve. This placement enabled the coil operator to positively identify the diameter of components such as the mini hanger, velocity string and ultimately a clear indication of the end of the coil BHA clearing the wellhead master valves, with no risk of pulling out of the stripper head.

Figure 1. The inVision DAS and Skid System (**A**); the inVision Spool (**B**)

The main zone rated HDMI screen was left stationed at the DAS skid. Power was supplied to the unit and system checks were performed.

Figure 2. The inVision Tablet Display (**C**) in coiled tubing cab

The information from the inVision spool was also relayed to tablets in both the Coiled Tubing unit cab as well as the OCR's office on location. These screens provide audio and visual indicators of diameter changes and when the spool senses that there is no object across it (Out of Hole).

OPERATION DETAILS

This well represented the first time the inVision System was used for Shell Canada on an H2S well. IWS personnel were on location to guide and assist the Mountain Coil crew with the setup and use of the system.

Prior to the coiled tubing mobilization, two plugs were set near the bottom of the velocity string in profile nipples.

The Coil operations were to rig up all equipment, retrieve velocity string hanger, and remove velocity string and downhole data system.

Following normal SOPs, the coil crew rigged in over 11m (36') of riser beneath the injector. This space was to allow the crew to have a spacer to allow the velocity string to be pulled up, stop, and then cycle the manual master valve to see if the string has cleared the wellhead valves. This is an industry accepted system of clearing valves on a wellhead when there is no system such as inVision to indicate the wellhead is clear.

Figure 3. Overall rig up

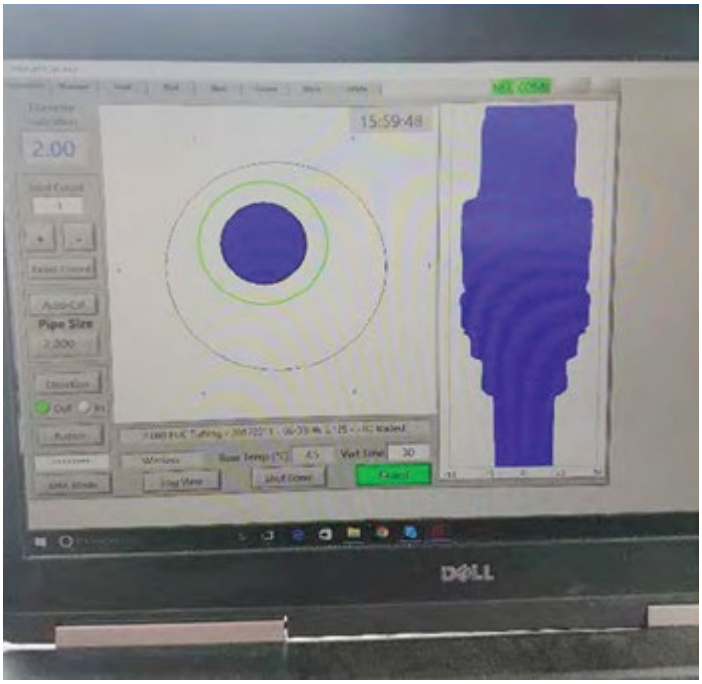

Figure 4. inVision Display of mini hanger

After rig up and completing pressure tests on all of the PCE, the crew connected with the mini hanger and staged it out of the wellhead. The inVision System allowed the coil crew to see a clear picture of the hanger which helped ensure proper placement during the staging and string hang off process.

The hanger was removed and the velocity string was connected to the retrieval coil. The unit then proceeded to remove the velocity string from the well. The inVision System allowed the operator to see detailed dimensional data on the string during the trip out of the hole.

Once near surface, the unit operator indicated the crew would start trying to close the master valve when the shallowest depth indicator (this unit had three separate depth indicators) in the coiled tubing cab indicated 30m (100') from surface. With this lubricator length in use, the SOP would be to raise the string approximately 4–5m (13–16') and then attempt to close the master valve. This meant there was the need to repeat this process over seven times to find the end of the tubing. Once reaching this depth, and averaging the variance of the three indicators, the crew followed their SOPs and did multiple closure attempts.

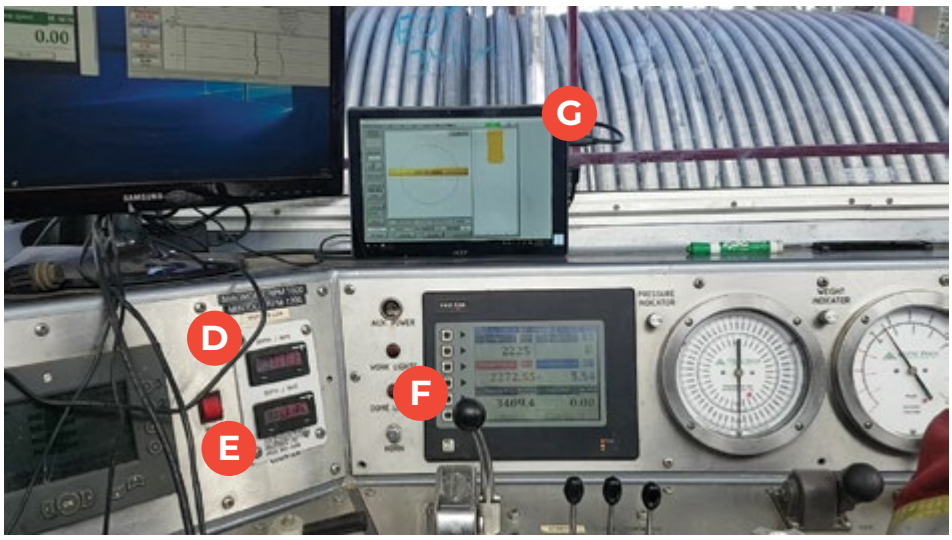

Figure 5.
Three different sensors, three different lengths 3391m (**D**), 3430m (**E**), 3409m (**F**) while the inVision System Display (**G**) correctly confirms an Out of Hole state.

The inVision System showed a clear indication of an out of hole condition on the seventh attempt to close the master valve. As indicated in the picture above, the three depth indicators of the coil unit showed a variance of 39m (127').

DELIVERABLES

- IWS inVision System clearly displayed end of tubing during retrieval of the velocity string.
- The inVision System could have saved multiple attempts on the master valve closure, however because this job was the first exposure to the technology, normal SOP's were followed.
- Potential time savings of approximately 1.2 hours.
- The inVision System proved reliable and robust during winter operations during severe weather.

RISKS MITIGATED

- Pulling the end of string out of stripping head, sour gas release and/or loss of control of tubing string.
- Damaging BOP/wellhead components.
- Confirmed string component placement thus avoiding potential problems due to differential pressures.
- Provided time stamped logs of the trip time.
- The inVision System provided a technical solution that potentially mitigates human error and fatigue.
- inVision mitigates reliance on uncalibrated or conflicting information provided by mechanical or electronic systems such as depth indicators in this situation.

inVision System

CONCLUSIONS

During the course of this job, the ability to transfer information to the crew in real time during the string retrieval lessened stress and could have increased speed of the operations. This was especially important when very close to the end on the string. Having visual and audible alerts to confirm the end of the string added value to the overall process.

FINAL THOUGHTS

Intelligent Wellhead Systems would like to thank Shell Canada and Mountain Coiled Tubing for having the trust and vision to utilize our systems.

Your commitment to the systems have allowed us to continue to develop and refine the inVision System to the benefit of the industry.

To learn more about how the inVision System can assist your coiled tubing operations, visit our website at www.IntelligentWellheadSystems.com

Intelligent Wellhead Systems

IntelligentWellheadSystems.com

Corporate Head Office
403-3rd Ave SW
Calgary, AB, Canada T2P 4H2
1-866-776-6578

Development Office
2600-TWP Rd 544, #52
Sturgeon County, AB, Canada T8T 0B6
Info@IntelligentWellheadSystems.com