



# Performance and Value of the inVision System : Offshore in Coiled Tubing Operations

## Case Study #0004

### Date

November 01–21, 2017

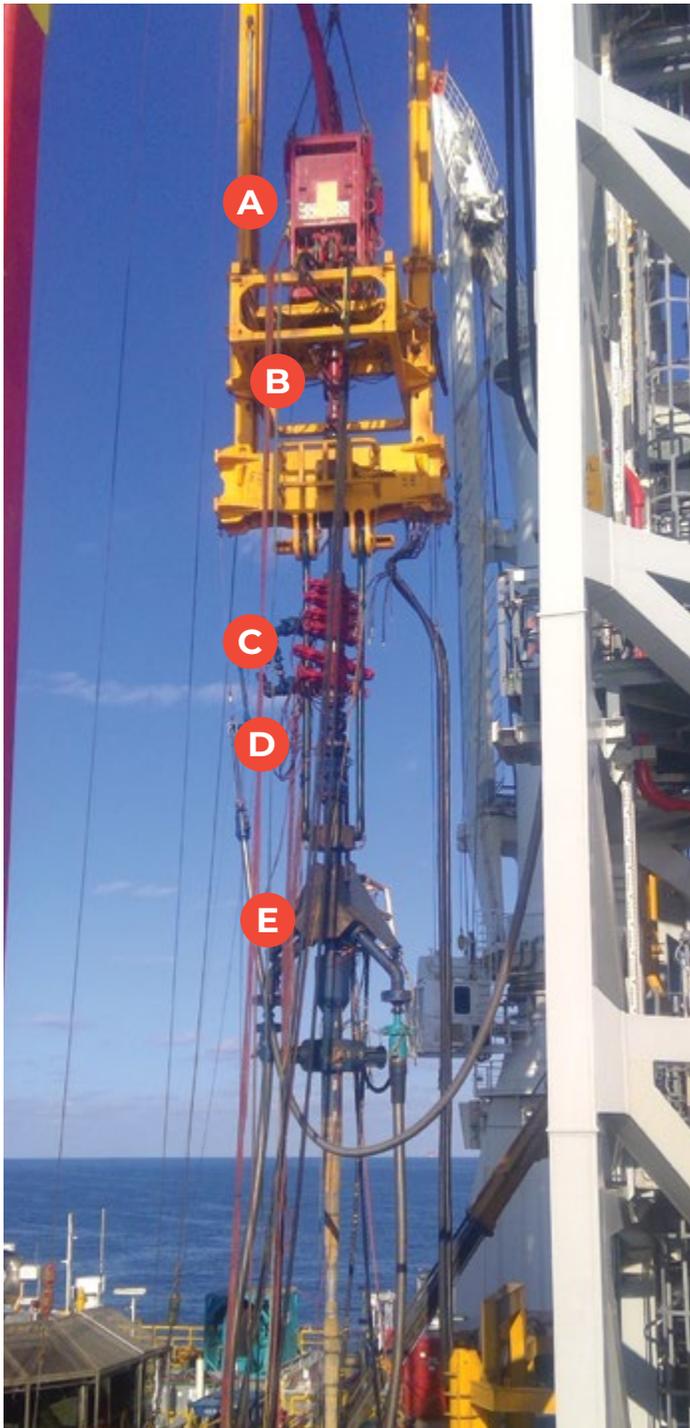
### Location

Gulf of Mexico,  
Deep Water

## Introduction

Intelligent Wellhead Systems (IWS) agreed to field trial one of their Offshore Intervention Systems for an operator on a MODU, Well Intervention Vessel. IWS's job was to support coiled tubing operations during a stimulation treatment. After consultation between IWS, the client, and the contractors, the rig in position of the inVision Spool was above the flow head swab valve (FSV) and below the coiled tubing BOPs. This position enabled the rig operators to see when the coil BHA would be completely clear of the FSV, deeming it safe to close.

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**Figure 1.** Complete Rig Up during coil operations: Coiled Tubing Injector (A), Coiled Tubing Dual Stripper BOP (B), Coiled Tubing BOPs (C), inVision Spool (D), Flow Head Swab Valve(E)

## RIG UP DETAILS

The IWS control system for the inVision Spool was rigged up on the main deck, outside of the red zone and drill floor area. The deck space used for rig in of the system was 36 ft<sup>2</sup> and the overall weight of the system when off loaded from the supply boat was 9000 lbs.

The main HDMI screen was left in place at the control system container and the other interfaces with coil unit operator and driller's cabin are communicated with via wireless connection. Electrical power was supplied 120 V × 60Hz to the system.



**Figure 2.** Transport container and redundant control/communication system

IWS zone compliant tablets were set up in the coil operator's cab and driller's cabin.

The interface gives the operators real time information as to diameter and lateral position of tubing/BHA at the location of the InVision Spool. The system also provides audio and visual indicators when diameter changes, or the spool senses that there is no object across it (Out of Hole).

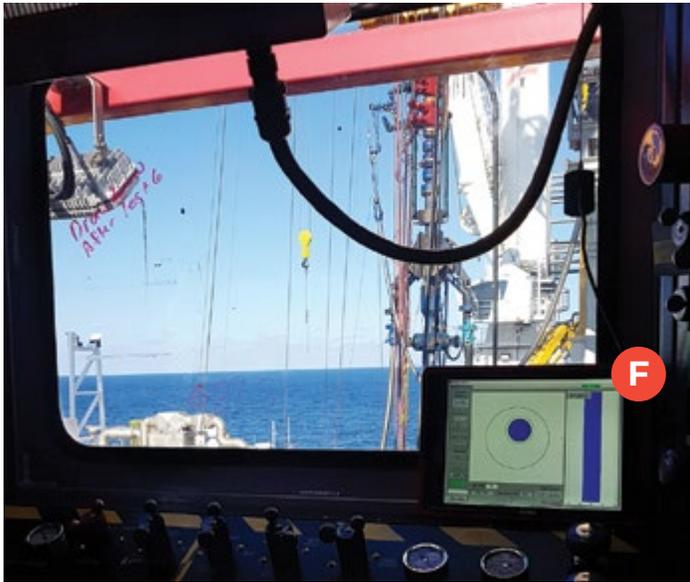


Figure 3. Coil operator's screen (F)



Figure 4. Wireless screen (G)

## OPERATION DETAILS

A 1.75" acid injection BHA was ran on 1.75", QT1300 coiled tubing. An acid stimulation was performed, and the coil unit began pulling out of hole with a surface pressure of approximately 1200psi.

During retrieval of the string, a pin hole was discovered in the coiled tubing with the BHA approximately 10,000' from surface. The coil was then recovered until a valve on the Lower Riser Package (LRP) could safely be shut in. Once the subsea valve was closed, the riser was bled off and coil continued to be recovered to surface.

The coil crew followed their standard operating procedure (SOP) for pulling to surface, which involves stepping down pulling speeds incrementally with the first stage being 60ft/min recovery until 800ft from surface. The retrieval speed is then reduced to 30ft/min until 500ft from surface, at which time the recovery is reduced again to 20ft/min until a tag out of the CT connector with the bottom of the stripping head is detected by over pulling.

As the end of the BHA passed the inVision Spool, the display screen in the coiled tubing cab, as well as the driller's cabin, clearly identified the end of the BHA. Both displays indicated an "out of hole" condition and confirmed the FSV was safe to close. This was at approximately 12:00 noon as logged by the IWS data system (See Figure 5). The coiled tubing crew continued to follow their SOP and attempted to tag out into the bottom of the stripper head with the CT to BHA connector. An over pull of 4000 lbs was observed but it was not definitive.

The BHA was lowered again and the inVision Spool located the bottom of the BHA a second time. This was also logged at approximately 12:18 on the log. As the string was raised again the InVision Spool indicated "out of hole" and the crew continued up to the previous tag out height, but no over pull was observed.

A crew member was sent up in a man basket to check the top of the stripper in case the CT to BHA connector had come through it. The crew member observed that the end of the coil had pulled through the stripper and the connector and BHA was missing. The IWS log showed that there was nothing across it beginning from the time stamp of 12:19. At this point it was assumed that the BHA and coil connector had been left downhole during the stimulation operation.

An investigation began into the cause of the failure. During which time, Intelligent Wellhead Systems could verify that the BHA had not fallen down the well during the tag out, as no 'dropped objects' had been detected. The injector was removed to inspect the end of the coil, leaving the stripper on the well. The well was flow checked, and the FSV closed. Speculation on the whereabouts of the fish were discussed. Stimulation, flowback, supply vessels and other operations were in a holding pattern until a forward plan could be determined. Braided line fishing personnel and equipment were being readied for deployment.

Approximately 2 hours after the realization that the BHA was missing, the crew in the driller's cabin noticed something measuring 1.75" OD at the time stamp of approximately 14:18 (see Figure 5) suddenly appeared on the IWS screen.

The IWS technician was notified and confirmed this information by going through a series of system checks. The checks verified the presence of something with an OD of 1.75" was in fact across the InVision Spool and did appear at the timestamp 14:18. The appropriate BP personnel were notified that the BHA may have been located.

The decision was made to send a crew member to look down the coil pressure containment stack to get a visual, but due to the height of the equipment rigged up above the FSV, it was too far to see if the BHA was there or not.

A lead impression block was ran and an imprint of the top of the fish was retrieved. This confirmed without a doubt that the BHA was now sitting on top of the FSV, and that the top of the fish was inside the InVision Spool which was showing the diameter of the BHA of 1.75".

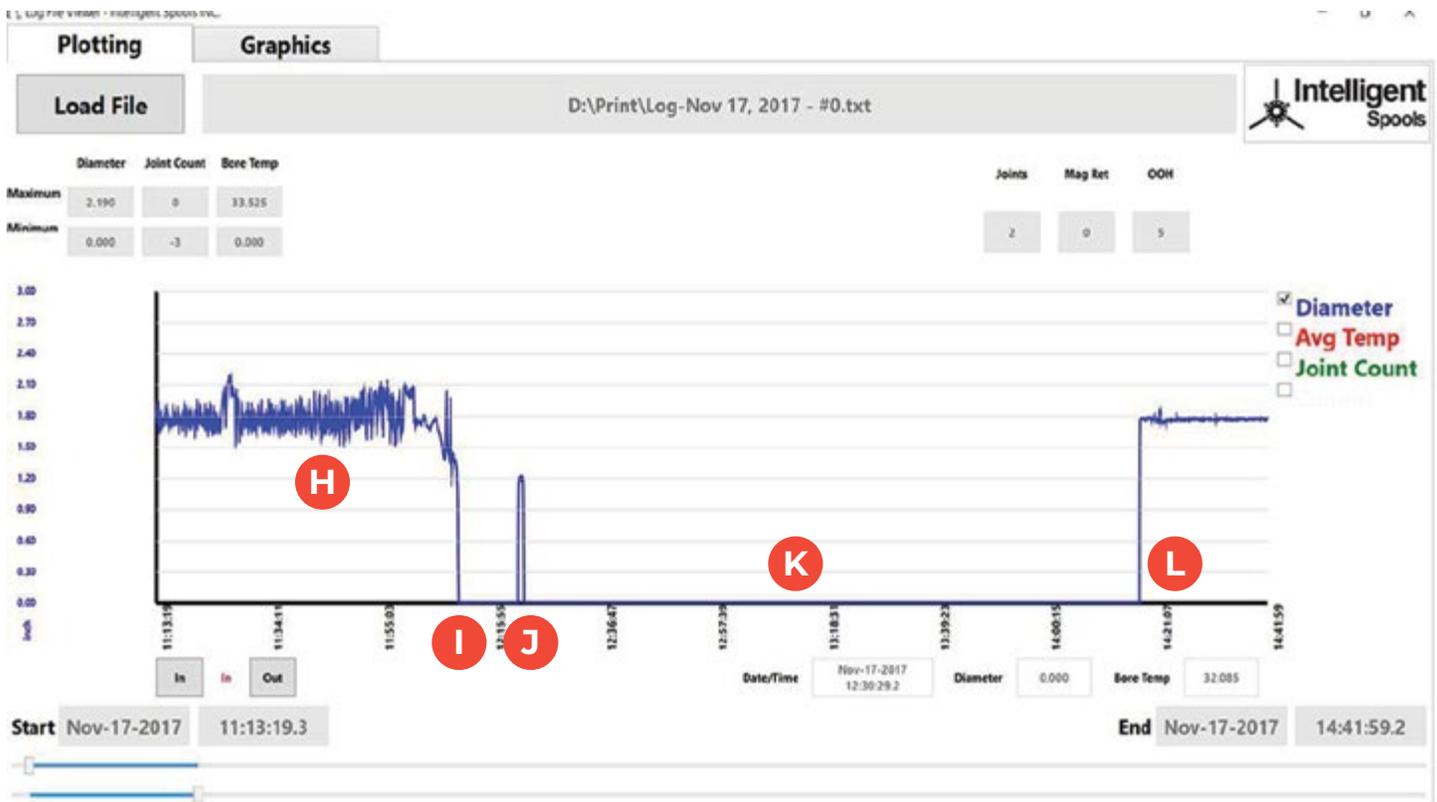


Figure 5. Signature of the trip out of hole (H), signature of the first "Out of Hole" condition (I), signature of the second "In/Out of Hold" condition (J), signature of 2 hour "Out of Hole" data, BHA assumed to be lost (K), signature of 1.75" BHA suddenly appearing (L).

It is believed that at the end of the two-hour window, the pressure on the stripper element either bled off or the friction hold that the stripper had on the BHA let go. This allowed the BHA and coil connector to fall down the lubricator and land on the closed FSV. Due to the placement of the InVision Spool in the stack, the BHA was registering on the system screens while sitting on the FSV.

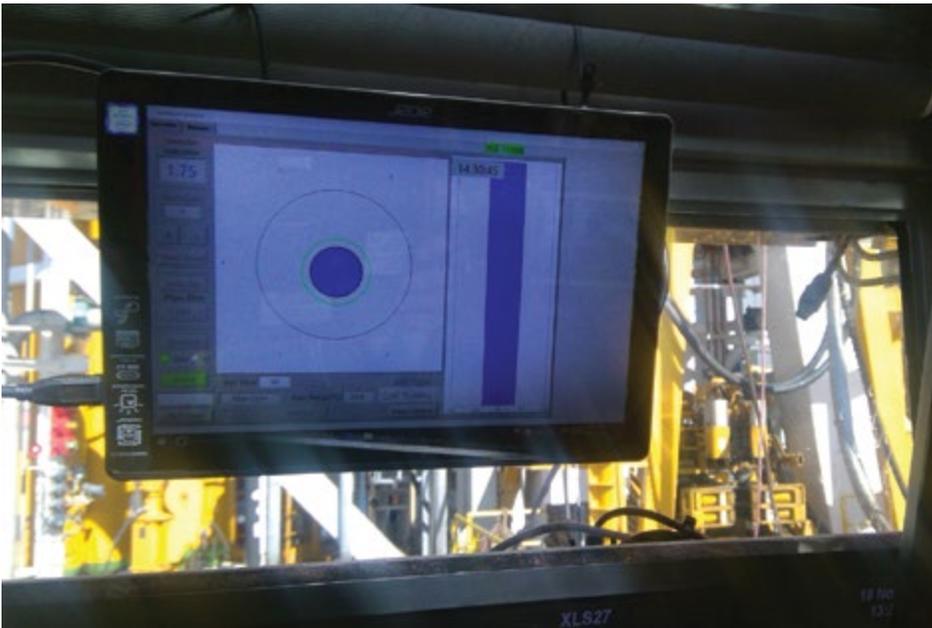


Figure 6. Top of fish sitting inside of the inVision Spool's sensor field

With the fish located, deciding on the forward plan was simplified. Stimulation operations commenced without delay. Planning then commenced for safe BHA retrieval. Once a plan was in place and the stimulation vessel completed its work and was released, the BHA was recovered. The InVision Spool once again showed the end of the BHA pass it and that the bore was clear. A time stamped log of the events was produced at the client's request, to help with the explanation and investigation of this event.



Figure 7. The recovered BHA



Figure 8. The inVision Spool installed in the stack

## DELIVERABLES

- Provided information that removed an unsafe condition caused by unknown location of the BHA
- Real time information provided allowing critical path time to be saved
- Prevented operation of FSV with the fish sitting on the gate
- Potentially prevented dropping BHA downhole
- Provided time stamped log of events

## SUMMARY

Even with all the precautions taken by industry leading operators and service companies in the offshore environment unplanned events happen. Prior to this job, a sample coil connector of same make, model and size was pull tested to 78,000 lbs., to determine failure load. It did not fail. The connector on this job was pull tested as per procedure, staged up from 12k lbs to 25k lbs prior to running in the hole. Bumping up against the stripper to confirm an 'out of hole' condition had worked in the past but did not work this time. The coiled tubing connector released from the string in this situation.

Luckily the BHA was lodged in the stripper in this instance and did not fall onto the subsea equipment, which could have resulted in a complex operation to remedy.

## CONCLUSIONS

During this job, the ability to gather information from above the FSV was proven to be extremely useful. Having a 'virtual window' into the pressure containment vessel allowed decisions to be made from information that has never been available before. In this instance, the effects of these decisions reached across multiple offshore vessels, supply chains, service suppliers and offices, with a net result of saved critical path time, cost, and removal of unknown and unexpected risks.



To learn more about how the inVision System can assist your offshore operations, visit our website at [www.IntelligentWellheadSystems.com](http://www.IntelligentWellheadSystems.com)