



Digital Downhole Camera Technology

Using the camera technology to optimize wellbore performance

Wellbore

- Optis™ E-line
- Optis™ Coil



OPTIS™ E-LINE

- **Industry leading electric line camera system**
- Compatible with any mono-conductor or hepta-cable line
- 1 11/16" OD (43 mm) string - Easily fit through any profile
- Light where you need it with independent light sources
- 125C temperature rating with max exposure of 24hrs, 135 C for over 5 hours (8 hours exposure coming in 2013)
- 15,000 PSI pressure rating
- High side indicator with inclinometer



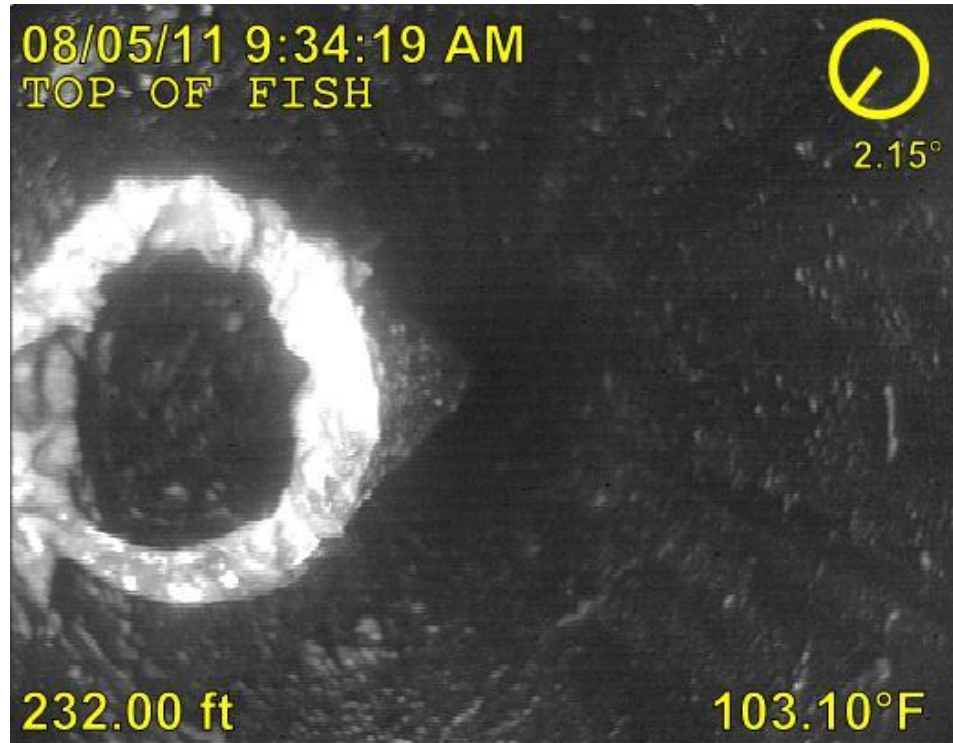
OPTIS™ E-LINE

- **LED lights** reduce power requirements as you are not lighting up the spectrum that you can not see (UV and IR). Full control of the lighting allows the operator to reduce shadowing and increase light where needed resulting in better pictures in difficult environments. **No Stone Age** filaments from **100 watt** bulbs to blow.
- Largest Field of View on the market
- Over **200 Kbps telemetry** at 25 frames/sec on e-line and 30 frames/sec on memory in HD Color!! Real high speed digital telemetry with a camera not an analog system like competitors.
- High side indicator with inclinometer allows the operator to accurately pinpoint where the operator is looking within the wellbore. This allows the camera to be compared with other caliper and corrosion data sets for accurate wellbore analysis. **No guessing what is high side or low side!**



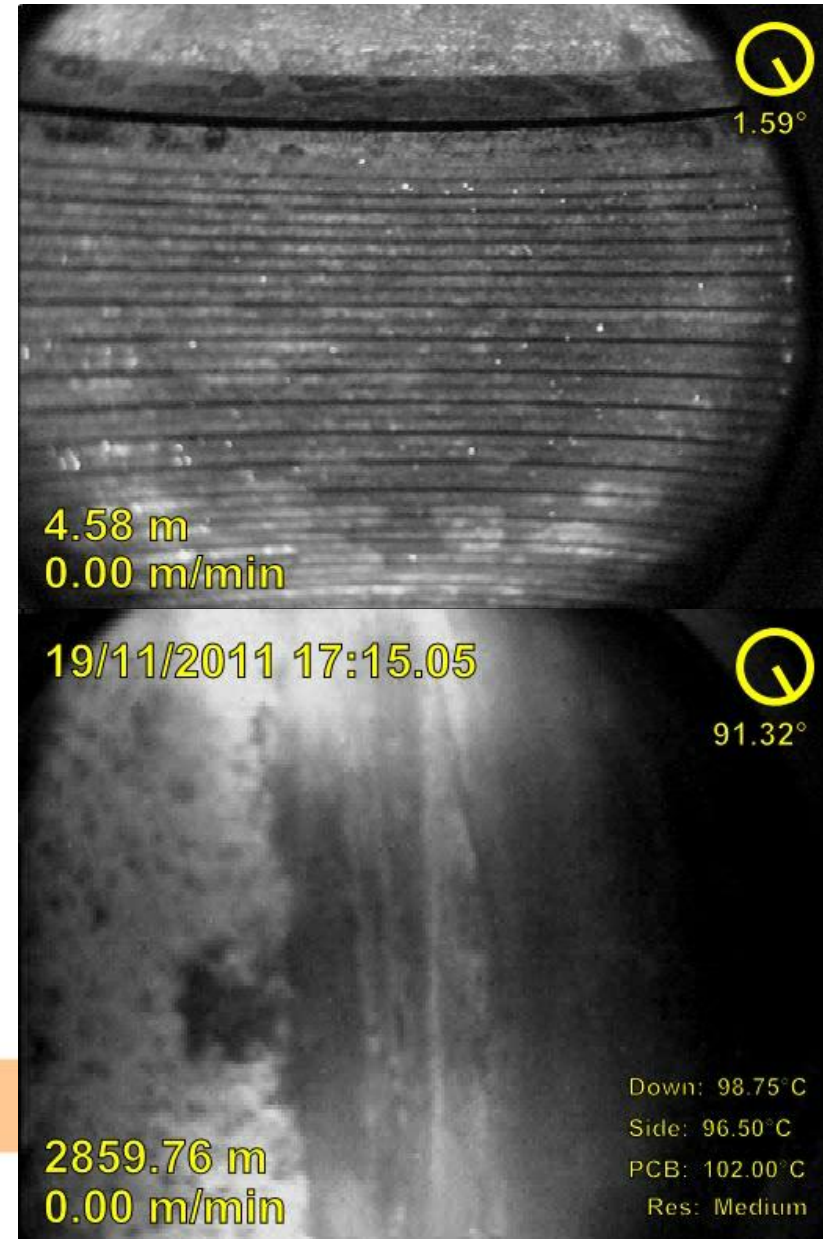
OPTIS™ E-LINE DOWNVIEW

- High intensity LED lights – no 100watt bulbs from the Stone Ages
- Surface control of light intensity
- Inclinator with high side indicator
- Internal temperature digitally transmitted to surface
- Ability to depth correct after the job



OPTIS™ E-LINE SIDEVIEW

- High intensity LED lights dedicated to Sideview
- Surface software control of tool rotation allows for a continuous or stop and start rotation of the sideview camera
- Deviation and high side indicator allows the operator to accurately identify the position of the camera view in the wellbore
- Focal length from 1” to 8”



Case Study- Post Frac Issues

ISSUE:

The client had an urgent issue where a frac treatment had not performed up to expectations and there was an upper set of zones that were in question with regards to completion.

PRIMARY OBJECTIVE:

Deploy an electric line camera on E-coil to investigate the wellbore in the area of interest to see if there was a blockage due to a ball, casing failure. Secondary objectives were to identify any anomalies within the port system above the zone of interest.



E-line Camera on Coil in Horizontal

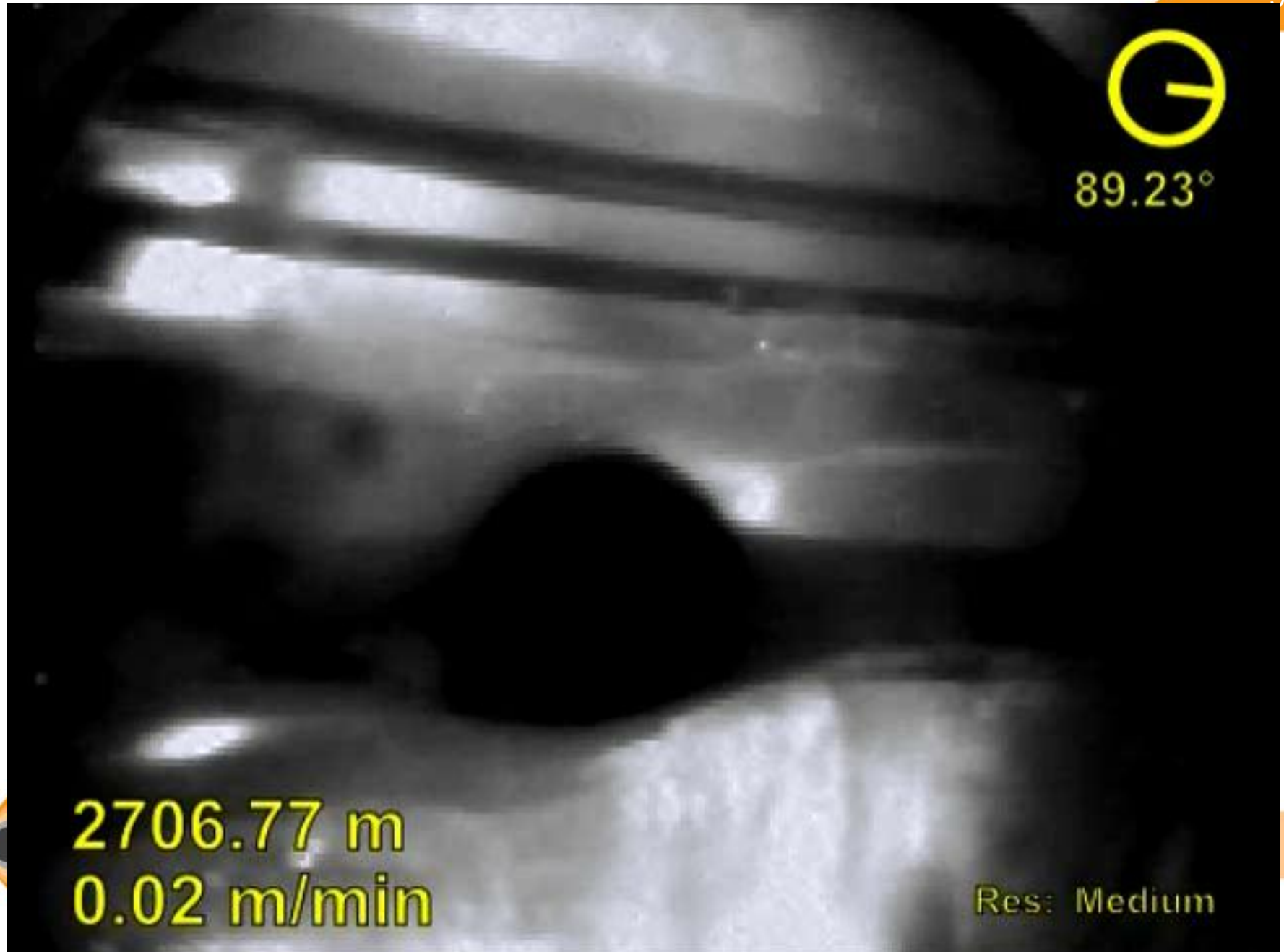


92.99°

2745.82 m
10.67 m/min

Res: Medium

Sideview- Partially Shifted Frac Sleeve



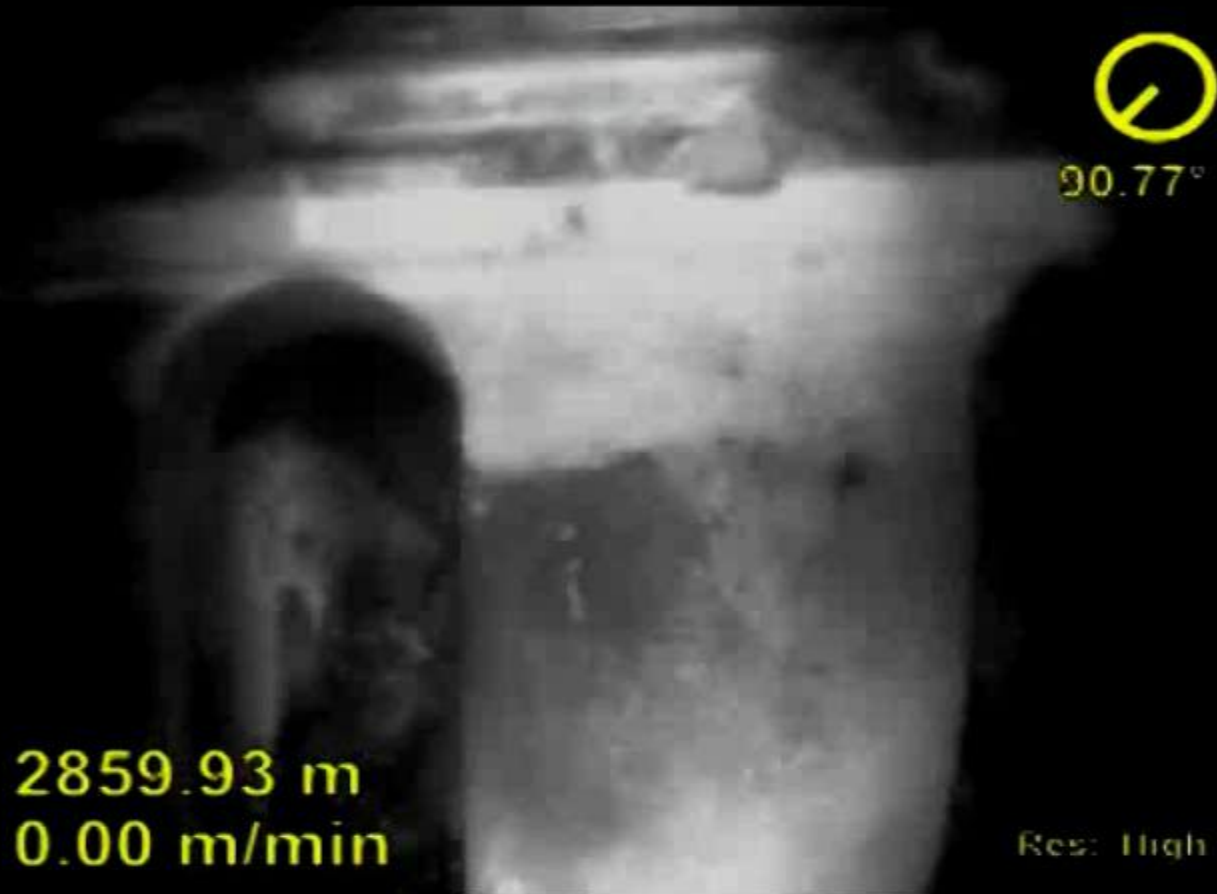
89.23°

2706.77 m
0.02 m/min

Res: Medium

Sideview- Inspection of Frac Port

10



Case Study – Post Frac

ISSUE:

The client had an urgent issue where a frac treatment had not performed up to expectations and there was an upper set of zones that were in question with regards to completion.

CONCLUSION:

The camera was able to see how much sand deposition was within the wellbore much higher than expected indicating a severe sand off (even after clean outs). The camera was unable to get right to the port to diagnose the failure, within 3 meters, due to a bridging off of the wellbore with sand and the coil pulling over. Secondary issues were positive with all the above ports being closed properly, The camera was able to identify flow regimes within the well as slug flow conditions (sand deposition). Also the oil was coagulating due to reactions within the wellbore fluids, The client was able to confidently frac the upper zones without incident and only lost one zone out of 16.





OPTIS™ COIL

OPTIS™ COIL

Why run a camera on coil?

- Can't get down
- Fishing
- Before milling
- Post milling
- Pre / Post scale clean-up



The normal challenge for wellbore video is needing a clear fluid. Deployed on coil you can always get a picture, just pump a clear fluid!



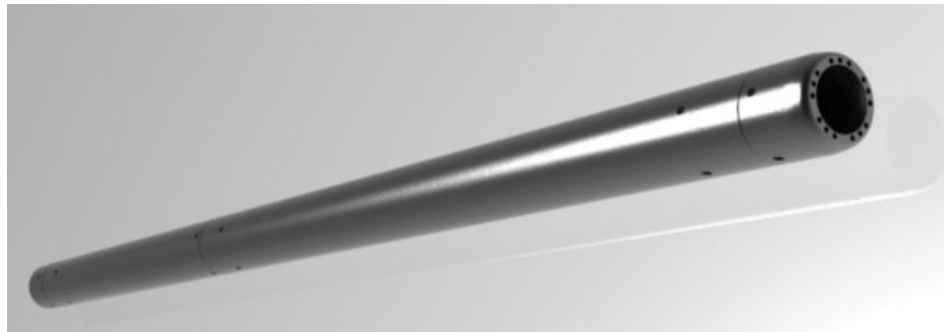
OPTIS™ COIL MEMORY

- 720p HD Colour video at up to 30 frames per second
- 5 hours of recording with multiple settings for stopping and starting
- 135° C and 15K psi
- Well deviation, tool topside and internal temp
- Down view only



OPTIS™ COIL MEMORY

- Coil Tubing Running and Flushing tool
- 58mm and 78mm shrouds
- 15 downward and 5 sideward ports
- Up to 800 litres per minute
- 2 3/8" PAC standard connection



Case Study – Production inflow?

ISSUE:

Client had issues where they could not diagnose water inflow even after deploying conventional wellbore logging tools due to some conflicting wellbore tubular design issues. Conventional coil was the cheapest alternative and availability was immediate.

PRIMARY OBJECTIVE:

Deploy a memory camera on conventional coil to pinpoint the source of the water inflow and gas producing areas. Secondary objectives were to identify any anomalies within the wellbore.



OPTIS™ SLICKLINE- Production Survey

17

High-Side : 062.2°
Deviation : 088.1°

115°F



12/04/2012 13:43:41

01:54:06

2962.82ft

High-Side : 346.9°
Deviation : 090.1°

118°F



12/04/2012 13:53:50

02:04:15

3228.71ft

OPTIS™ Coil Camera–Production Surveys

19

- Horizontal gas well
- Optis™ Slickline deployed on bottom of SLB FSI tool on coil



OPTIS™ Coil – Production (Calcification)

20

05:04:2011 16:20:16



Case Study – Production inflow?

ISSUE:

Client had issues where they could not diagnose water inflow even after deploying conventional wellbore logging tools due to some conflicting wellbore tubular design issues. Conventional coil was the cheapest alternative and availability was immediate.

Conclusion:

Memory camera was able to clearly define the areas of gas and water production within the zones. The camera was able to show the client that they had also landed their perforated tubing across the production zone in the casing restricting flow. 24 more wells were investigated with similar results showing 1-3 perforations producing water within a gas zone and identifying corrosion/calcium deposits.

