

General


KAPPA

PRODUCTION LOGGING TOOLS

Module #4 TOOLS GENERAL


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Typical PL Toolstring

- Fishing neck & sinker weight bars
- Battery & memory
- Pressure (& temp)
- Gamma ray
- CCL
- Temperature
- Centralizer
- Inline spinner
- Capacitance
- Centralizer
- Continuous Spinner




No.	Tool Length (meters)	Outside Diameter (inches)
1	0.4670	1 11/16
2	0.476	1 11/16
3	0.306	1 11/16
4	0.675	1 11/16
5	0.468	1 11/16
6	0.171	1 11/16
7	0.316	1 11/16
8	0.171	1 11/16
9	0.613	1 11/16
10	0.440	2 1/8
11	0.664	2 1/8
12	0.613	1 11/16
13	0.557	2 1/8

Sondex MPLT string

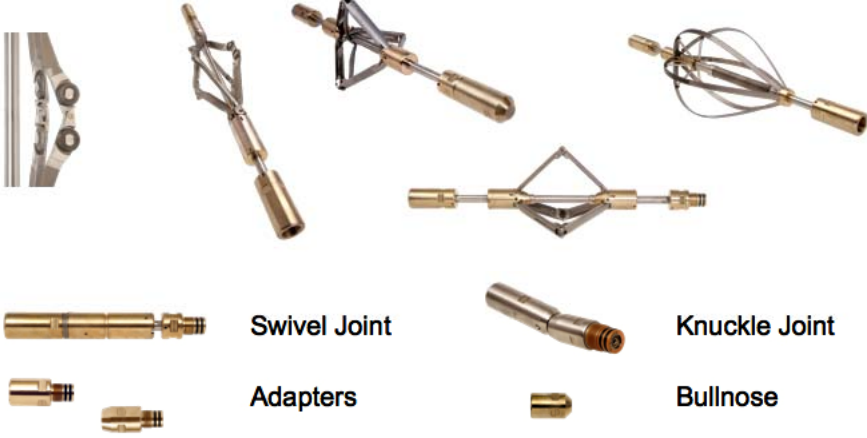
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Adapters

Courtesy: Sondex







Swivel Joint



Knuckle Joint




Adapters

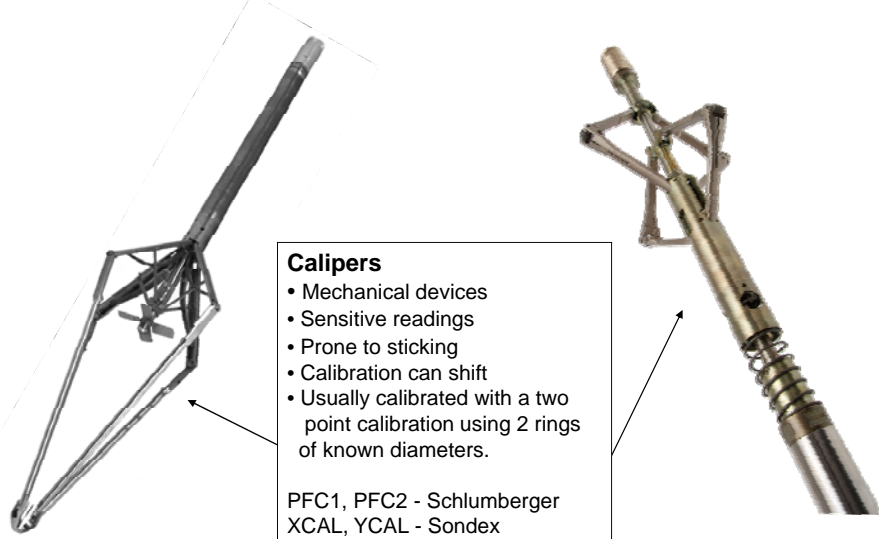


Bullnose

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Calipers




Calipers

- Mechanical devices
- Sensitive readings
- Prone to sticking
- Calibration can shift
- Usually calibrated with a two point calibration using 2 rings of known diameters.

PFC1, PFC2 - Schlumberger
XCAL, YCAL - Sondex

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Tool Summary Auxiliary Measurements

Basic Measurements

- Caliper – measures diameter of the wellbore
- Deviation – realtime measurement of deviation at the tool
- Head tension – tension or compression at the logging tool head
- Cable tension – tension in the logging cable at surface


Depth control

- Gamma Ray – counts GR's with an unfocussed detector
- Casing Collar Locator – responds to changes in metal thickness

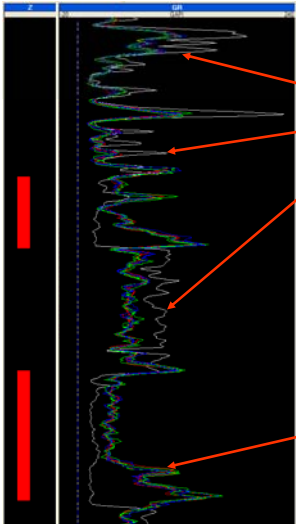
Other

- Pulsed Neutron – Oxygen Activation
- Noise log
- Tracer

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Open hole GR



White Open hole GR is higher than the PL GR curves
Normal response for calibrated GR

Coloured PL GR curves are higher than the white Open hole GR
Probably due to there being radioactive scale deposits in front of the perfs.
(Indicative of water production)

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Tool Connections



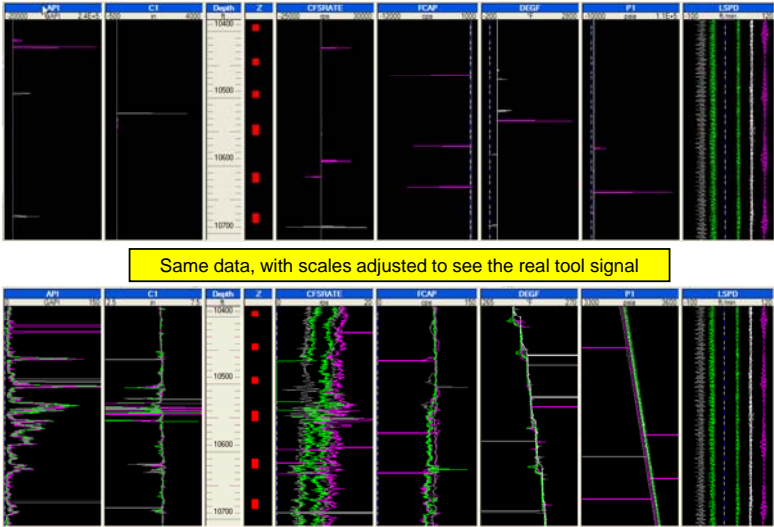
Telemetry errors
Tool communication problems
Spikes on data

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Signal vs Noise


Note: Track scales indicating noise spikes on top of data



Same data, with scales adjusted to see the real tool signal


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	<h2>Tools Summary</h2>
Flowmeters	- Fluid Velocity
Density	- Fluid mixture or hold up
Capacitance	- Water holdup
Pressure	- Pressure profiles & Pseudo-density & SIP
Temperature	- Variations from the gradient (flow analysis) Input to pressure measurement (gauge calibration)
Press &Temp	- Needed to compute fluid properties - PVT

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	<h2>Tool Summary Main Measurements</h2>
Single phase profiles	<ul style="list-style-type: none"> • Temperature (for PVT) • Pressure (for PVT) • Spinner/flowmeter • Caliper
Multi-phase profiles	<ul style="list-style-type: none"> • Density, Gradiomanometer • Capacitance • Gas holdup • Imaging/probe/array tools • Direct velocity measurements

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QA/QC: Caliper

- Check for repeatability
- Try to identify perforation position – sometimes slight swelling/enlargement of casing at perfs
- Verify tool calibration – in known completion ID
- Compare caliper readings with relative bearing where available – is casing really ovalised?
- Always present all calipers C1, C2 & C1C2 on same scale for comparison purposes
- Check changes in caliper against changes in spinner response
- Make sure a caliper is inside the interpretation node, or in the General Well Data in EMERAUDE

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QA/QC: CCL

- Check for repeatability
- Confirm CCL against wellsketch, completion diagram, tubing shoe, pipe tally, packers, reference CCL log, etc
- See if perfs show on CCL
- Stuck tool - Use CCL background noise to see if tool is moving downhole (analog signal)
- Adjust the scale to show sensitivity
- Does not respond in non-magnetic tubulars
- Sensitivity will depend on casing size, centralizing of the tool and logging speed.

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QA/QC: Gamma Ray

- Check for repeatability between passes
- It is the first level of lithology indicator.
- Check for dynamic range of GR .. normally 0-120API +/-
- Verify that perforation depths agree with the GR log
- Often use the first slow UP pass for correlation with OHGR
- Check depth control with open hole GR reference.. Adjust depths if necessary
- Compare PL GR vs Open hole GR
- Above normal GR could be due to deposits of radioactive salts/sulphates – check caliper for buildups on ID – possible indicator of water production
- Low values of PL GR compared with OH GR could be due to extra hardware between tool and formation

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QA/QC: Gamma Ray (contd)

- GR will show sensitivity with change of metal thickness.. eg multiple tubulars, inside packer sealbore.
- Look for RA pip tags – Repeatable spikes of very high API
- Try to confirm perforation zones have some “agreement” with the GR log
- Slow passes should show better definition/resolution
- Do not correlate on peaks - Correlate on large “shoulders” of GR contrast
- Tool sensitivity could be affected by a cracked measure crystal.
- High temperatures could affect the performance of the detector

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