



# Production Logging



# Introduction

Real Time Flow (RTF) toolstring consists of:

- Gamma Ray
- CCL
- Pressure
- Temperature
- Continuous Spinner or Full-bore Spinner
- Dielectric
- Gradiomanometer



# Specifications



# Gamma Ray & CCL

- Sensitive sodium iodide scintillation crystal
- Photo multiplier tube
- Detects naturally occurring and artificially induced gamma ray radiation
- Correlates surrounding lithology
- Signal digitized for transmission or storage
- Direct diagnostics communications with PC
- 0.1 second update rate



## Pressure

- Incorporates a quartz pressure sensor
- Pressure sensor has built-in temperature compensation
- Bellows and buffer of silicone oil isolates sensors from wellbore fluids
- 0.02 psi (0.14 kPa) pressure resolution
- $\pm 3.2$  psi ( $\pm 22$  kPa) pressure accuracy (equal to 0.02%)



# Temperature

- Temperature sensor is an RTD resistor housed within a thin inconel probe
- 0.018°F (0.01°C) temperature resolution
- ±1.6°F (±1°C) temperature accuracy
- 0.36°F (0.2°C) temperature repeatability



# Continuous Spinner

- Impeller is integrated into tool body
- Effective in restricted boreholes, tubing, and high flow velocity
- Available in 1.375 in. and 1.6875 in. diameters
- 0.037 rps/ft/min (0.12 rps/m/min) spinner response
- 0.083 rps flow resolution
- $\pm 2\%$  flow accuracy



# Real Time Flow Tool



OD	<b>1.375 in. (3.5 cm)</b>
Length	<b>27.2 in. (69 cm)</b>
Weight	<b>7.8 lb (3.5 kg)</b>
Temp. Rating	<b>350°F (175°C)</b>
Pressure Rating	<b>15,000 psi (103.5 MPa)</b>





# Dielectric

- Measures fluid capacitance (ie: “water hold-up” or “water cut”) between probe and tool body
- Measurement determines water percentage



# Dielectric



OD	<b>1.375 in. (3.5 cm)</b>
Length	<b>26.8 in. (68 cm)</b>
Weight	<b>6.6 lb (3.1 kg)</b>
Temp. Rating	<b>350°F (175°C)</b>
Pressure Rating	<b>15,000 psi (103.5 MPa)</b>



# Gradiomanometer

- Derives fluid density in a well
- Transducer measures differential pressure over a 24 in. column of fluid
- Column height and gravity are constants - fluid density is easily calculated and presented (in Premier Logging)
- Sensitive response



# Gradiomanometer

- Measurements can be obtained while the tool is continuously moving up or down the well
- 0.001 g/cc (1kg/m<sup>3</sup>) resolution
- ±0.03 g/cc (±30kg/m<sup>3</sup>) accuracy
- 0-2 g/cc (0-2,000 kg/m<sup>3</sup>) range



# Gradiomanometer



OD	<b>1.375 in. (3.5 cm)</b>
Length	<b>26.8 in. (68 cm)</b>
Weight	<b>15.6 lb (7 kg)</b>
Temp. Rating	<b>350°F (175°C)</b>
Pressure Rating	<b>15,000 psi (103.5 MPa)</b>



# Applications

- Water entry locations & sources
- Non-Performing Perforations
- Flow behind casing or tubing
- Cross-flow identification
- Leaks in tubing or casing
- Identify unproductive intervals for simulation
- Packer Leaks
- Lost circulation zones