

Well Intervention

Reservoir Analysis System (RAS)

Expro's Reservoir Analysis System (RAS) reveals and quantifies what lies behind your casing. The system provides information on saturation of water, oil and gas behind the casing.

The RAS uses a neutron generator that emits a controlled bombardment of high energy neutrons (14-MeV). The tool measures gamma rays that are induced by the interactions of the neutrons with the fluids in the hole, the pipe, the cement, the matrix and porosity occupied by fluids. These reactions are described as inelastic scattering, thermal neutron capture and activation. The RAS system has a diameter of 1.69" and can be used through the production pipe inflowing or static wells.

The tool offers saturation monitoring, contact movement identification, recognition of bypassed gas / oil. It also indicates the flow behind the casing (water flow), fluid delay analysis and open hole records emulated through the casing.

One of the main characteristics of RAS is its short length; with GR-CCL and telemetry, the length is 15.7ft (4.8m). This short extension makes it easier to place the tool at the wellhead (less of a pressure increase and lubricators, more



space for other sensors in the string, etc.). It also increases the range of the downhole analysis and can be combined with other tools such as production logging tools, SGR, CBL and calipers.

The tool contains three pulse neutron detectors providing a programmable start generator and spectrum register. It is a versatile in Sigma detections, carbon / oxygen, gas, water flow and can be run in memory mode or real time.



	Tool	OD	Length	Temp	Det	# Det	Gen Life	Gas Det	Combo	Memory	Petrophysics
	RPM	1.69"	25.6'	350°F	NaI	3	600 h	Y	PLT	Y	Y
	RMT	2.13"	20.7'	300°F	BGO	2	250 h	N	PLT, Array, RBT	Y	Y
	RST	1.69"	31.2'	300°F	GSO	2	600 h	N	PLT, Array, RBT	N	Y
	CRE	1.69"	21.3'	325°F	LaBr ₃	4	1000 h	Y	No	N	Y
EXPRO	RAS	1.69"	15.7'	320°F	LaCl₃	3	1000 h	Y	PLT, Array, RBT & SGR	Y	Y

Features and benefits

- Production optimisation
- Unlocking the value of your subsurface assets potential
- Maximising reservoir potential
- Maximising value from existing wells
- Maximising value from new wells

Applications

- Quantifying formation oil, gas and water saturations
- Locating bypassed reserves in mature wells
- Classification of hydrocarbon types
- Assessing enhanced oil recovery performance
- Determining fluid contacts
- Determining pressure-depleted zones

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Technical specifications		
Temperature rating	160°C	320°F
Pressure rating	103.4MPa	15,000psi
Diameter	43 mm	1 11/16"
Length	3350 mm	132"
Length with GR/CCL and telemetry	4610 mm	183"
Weight	20 kg	44 lb
Tool zero to measure point	2134 mm	84"
Measure point - long	2565 mm	101"
Vertical resolution	610 mm	24"
Maximum logging speed (Sigma)	6 mpm	18 fpm
Maximum logging speed (C/O)	1.8 mpm	6 fpm
Depth of investigation (Sigma)	229 mm a 305 mm	0 a 12" *
Depth of investigation (C/O)	127 mm a 152 mm	5 a 6" *
Precision Sigma	<0.5 c.u.	
Precision C/O ratio	5% of full scale**	
Porosity rating	10 – 45%	

*Depends on wellbore porosity

**Preliminary result with 5.5" casing, 22 p.u. sandstone

Water flow

As part of the inelastic reactions of oxygen create a radioisotope with seven seconds of half-life. The movement of activated oxygen in the water can be detected by the detectors below and above the neutron generator. With the gamma ray sensors below and above the RAS, the flow velocity can be determined from 10 to 400 ft/min to determine the speed of reverse flows, the inverted tool must be run.

Properties

- Shorter length / easy positioning at the wellhead
- Lanthanum chloride (N/F) detectors for Sigma and C/O measurements
- Detector of sodium iodide (long) that is sensitive to gas and porosity
- Sigma and C/O standard logs in the industry
- Suitable for logging in memory
- Combinable with production logs and new technologies

Measurements

- Sigma: pulsed neutron capture
- C/O: oil saturation of the inelastic coal and oxygen
- Water flow: calculated from the activation of oxygen
- Gas saturation: calculated from the long spacing detector
- Silica activation: visualise sands behind the casing/packer

