

# GEOgas Analyzer™

## Innovative Hydrocarbon, H<sub>2</sub>S & CO<sub>2</sub> Gas Analysis

The GEOgas Analyzer is the Oil and Gas Industry's most Innovative, Versatile and Easy to use Gas Detection System capable of detecting Total Gas, Methane (C1), Ethane (C2), Propane (C3), Butane (C4), Pentane (C5), High Range Hydrogen Sulphide (H<sub>2</sub>S) and Carbon Dioxide (CO<sub>2</sub>).

### Use GEOgas for Full Analysis:

In Full Analysis Mode GEOgas can detect and export all C1-C5 Hydrocarbons, H<sub>2</sub>S & CO<sub>2</sub> gases in parts per million (ppm) every second compared to several minutes for gas samples from a Gas Chromatograph.

### Use GEOgas for Total Gas Detection:

When only Total Gas Data is needed GEOgas can Detect & Export only TG with/without CO<sub>2</sub> or H<sub>2</sub>S. This TG data is still the sum of C1, C2, C3, C4, and C5. Other Industry TG Detectors do not detect C3 to C5 accurately so GEOgas provides a more accurate TG Value.

## Wireless CSA Class 1 Div 2 Groups C&D Approved GEOgas Analyzer™



### GRS Patent Protected

- GEOgas Analyzer is engineered in a tough Explosion Proof Approved Enclosure to handle the Hazardous location and rough environment of the drilling rig.
- Compact weighing just 35 Lbs the GEOgas Analyzer is easier to rig up.
- New Status Indicating lights lets rig personnel know when the unit is initializing, heating up, operating properly or experiencing a fault from sample flow blockage to offline status.
- Heating and Cooling Systems ensure proper operating temperature from -40c to +50c.

### Innovative:

GEOgas uses a New Highly Advanced Infra-Red Spectral Analyzer or Spectrometer. Calibrated for real life gas mixtures the GEOgas Analyzer isolates each hydrocarbon type out of a mixture as accurate as a Gas Chromatograph. Unlike a Gas Chromatograph the GEOgas Analyzer does not require carrier Helium Gas and a column to separate the hydrocarbons thus making the GEOgas unit much quicker to sample and convenient to operate and maintain. The reliable Infra Red FTIR Spectrometer does not degrade in accuracy over time compared to Catalytic sensors and remains Accurate, Consistent and Repeatable from well to well.

### Versatile:

The GEOgas Analyzer can be used as a TG Detector from Spud to Sample point then switched to Full Analysis Mode from Sample Point to TD. This provides a cost effective way to provide Rig Personnel with Kick Detection and TG tracking and easily enabling Full Analysis mode for the Wellsite Geologist upon arrival. The GEOgas Analyzer provides this one piece of equipment solution rather than running a TG Detector and independent Gas Chromatograph.

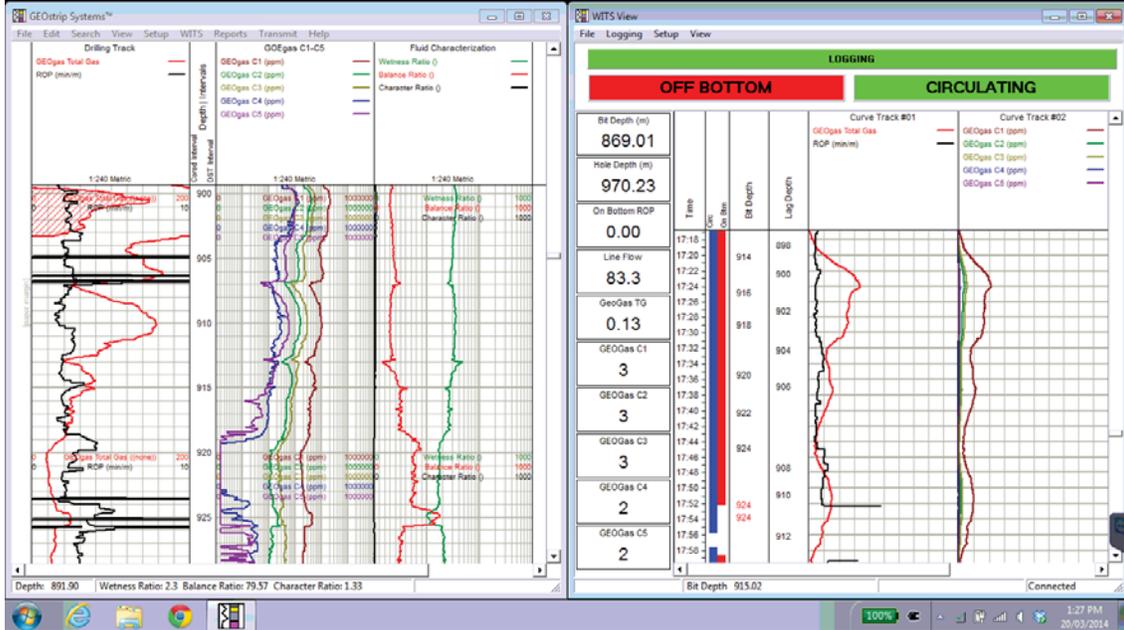
### Easy to use design:

The GEOgas Analyzer has been engineered to operate as conveniently as a Total Gas Detector. The Analyzer is hung on the Mud tanks hand rail next to the Shale Shaker and connected via Explosion Proof plugs to rig power and Gas Trap. The Gas Trap with New Low Maintenance Heated Dryer System is installed in the Shale Shaker. The GEOgas Comm. Link and Laptop are installed in the Geologist Shack. On power up the GEOgas Analyzer connects to the Laptop Comm. Link, warms up to operating temperature and enables the sensor and gas sample pump.

# GEOgas Analyzer™ & GEOstrip Advantage

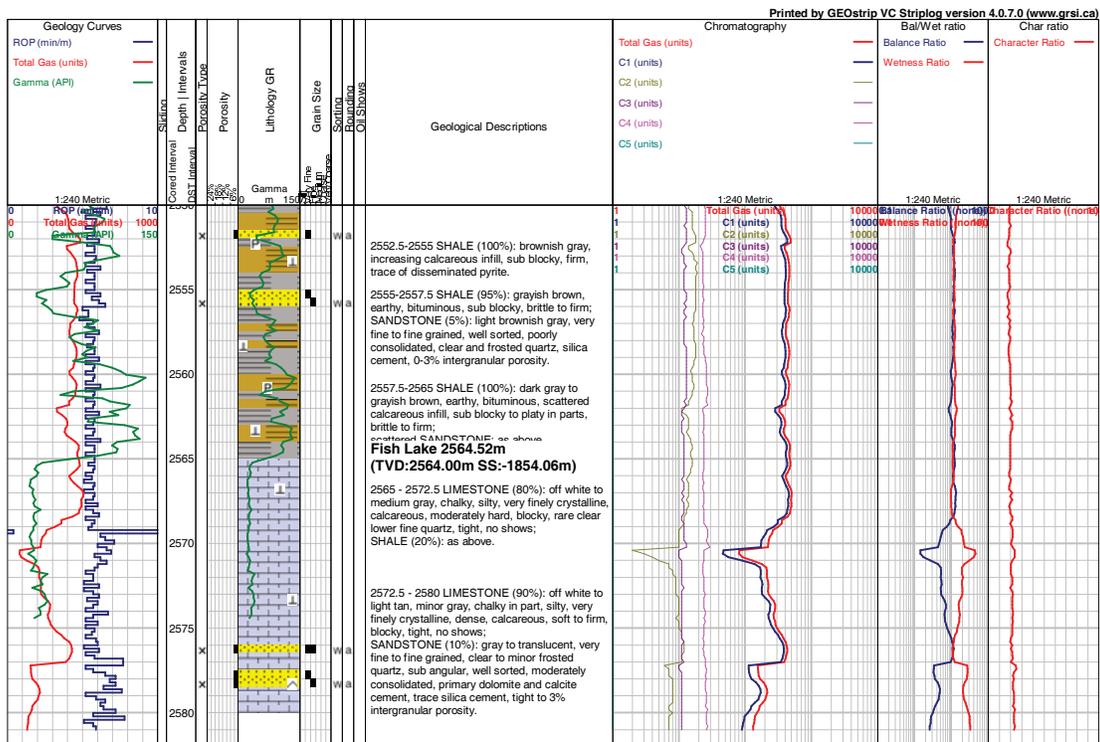
## Using GEOstrip's WITS Link Capability

The GEOgas Analyzer exports its data directly to any EDR using the WITS communication protocol. You will be able to see the GEOgas data on any EDR workstations and you can also export the data from that workstation. With GEOstrip Systems™ Striplog any data including GEOgas data can be imported automatically and plotted to a time based log similar to a EDR workstation and then be automatically imported into the depth based Striplog.



## Using GEOstrip's WITS Calculation Capability

Linked WITS data can be applied in up to 10 WITS Calculation Formulas. These formulas can be Gas Ratio formulas such as Wetness, Balance, Character Ratios or Oil Indications Formulas. These values then can be automatically plotted in the Striplog.



# GEOgas Analyzer™ & Gas Ratios

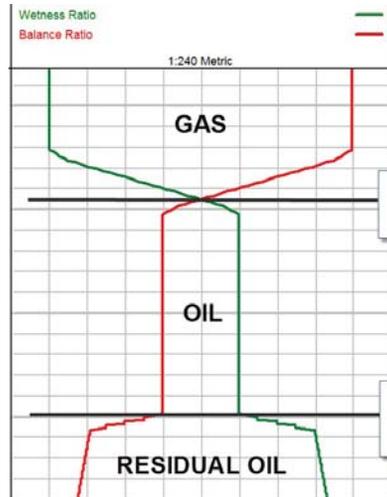
The value in the GEOgas Analyzer over Total Gas Detectors is in the extra hydrocarbon data isolation from C1 to C5. With these hydrocarbon values properly isolated and detected then they can be used in Industry derived Gas Ratio Formulas to help indicate the Characterization of the Hydrocarbon you are drilling thru and any Hydrocarbon and Water contact Points. Industry standard Gas Ratios have been used since the 1980s and include Wetness, Balance and Character Ratios.

$$\text{Wetness Ratio} = \frac{C2+C3+C4+C5}{C1+C2+C3+C4+C5} \times 100$$

$$\text{Balance Ratio} = \frac{C1+C2}{C3+C4+C5}$$

$$\text{Character Ratio} = \frac{C4+C5}{C3}$$

In order for the Gas Ratio formulas to work properly you must have accurate C1 – C5 values included in the Gas Ratio Formulas.



## Fluid Characterization Using Wetness & Balance Ratios

If the Balance Ratio is greater than the Wetness Ratio, gas is being predicted. The closer the curves are to each other, then the denser the gas and more likely it is to be productive.

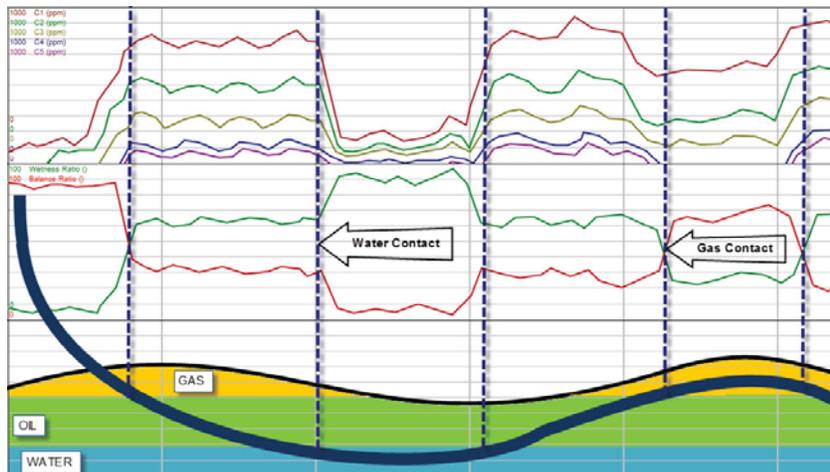
The Gas-Oil-Contact (GOC) is defined by the cross over point of the two ratio curves.

When the Wetness Ratio is greater than the Balance Ratio, Oil is predicted. The closer the curves are to each other, the lighter the Oil. The greater the separation of the curves then the heavier the Oil and likely to be unproductive or residual.

The Oil-Water-Contact (OWC) is determined when a sharp increase in Wetness Ratio accompanied with a greater separation of the two curves, reflects a greater proportion of heavier hydrocarbons associated with residual oil.

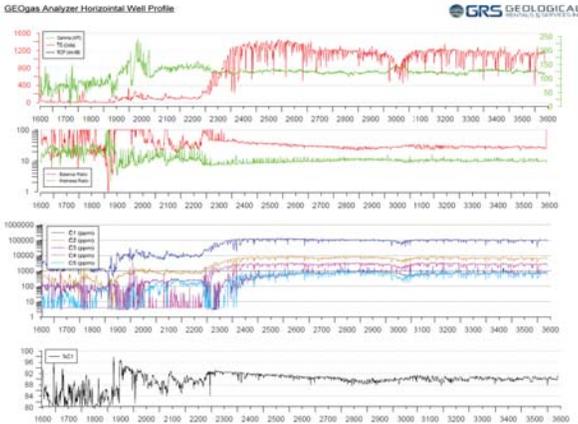
## GEOsteering using Gas Ratios

Accurate fluid characterization and the determination of contact points can provide a mechanism to steer horizontal wells through zones of interest. This is especially valuable in reservoirs of the similar Lithology. Steering by gas detection can provide a method of keeping the well's trajectory within the pay zone. In the figure below the zone of interest of high gravity oil is defined by the higher gas levels and by the balance ratio being slightly less than the wetness ratio. A lateral section can be drilled within this zone by maintaining this ratio profile and separation of ratio curves. These ratio signatures can establish contact points and controls for steering the lateral section. If the Balance Ratio was to decrease and Wetness Ratio increase and both curves showing rapid separation then the bit has passed through the oil-water-contact and the well path needs to be corrected in an upward direction.



The value of using the GEOgas Analyzer over a Gas Chromatograph is a significant rental dayrate savings, no mud logger required to operate unit and quicker sample interval data providing quicker data on well fluid characterization and well contact points.

# GEOgas Analyzer™ Package



## Well Profile

At the end of every well GRS will download the Gas Data from the GEOgas unit and process the data into a Well Profile Presentation in a letter sized format so the client can view the trends of hydrocarbon state changes throughout the well and identify areas of interest within the well. Some clients may use this well profile to assist on decision making on prioritizing completions, to placement of fracking intervals and identifying potential secondary zones of interest."

## Low Maintenance Gas Trap

The GEOgas Analyzer System agitates its sample gas with an Industry Standard Quantitative Gas Measurement Gas Trap. Due to the long reliability of the GEOgas calibration the Gas Trap is equipped with a Stainless Steel Bar assembly for much longer life mud agitation over plastic beater bars. GRS is deploying its New and Improved Heated Gas Sample Dryer System that is able to run for 30 plus days between changing filters. This removes the requirement of Calcium flake and Glycol bubble jars to dry the sample thus reducing the requirement of the Wellsite Geologist to change the calcium flakes and glycol regularly.



**24/7  
Technical  
Service &  
Support**

## 24/7 Technical Service & Support

Geological Rentals & Services Inc. provides 24/7 Technical Service and Support for GEOgas Analyzer units from Calgary and is adding Field Services Technicians to provide support throughout Western Canada. Presently GRS Inc. is rigging up the GEOgas Analyzer units Free of charge and using this opportunity to demo the GEOgas Analyzer System rig up and operating features.

## Affordable

The GEOgas Analyzer Package comes with The GEOgas Analyzer with Wireless link to EDR, Laptop & GEOstrip Systems™ Striplog Time Log. The GEOstrip Systems™ Striplog will provide the WITS link Capability to indicate all GEOgas and EDR data, Gas Ratio calculations and ability to export a LAS file.

## GEOgas Analyzer™ provided by: Geological Rentals & Services Inc.

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