Source Rock Analyzer

Laboratory services
- Coalbed methane
- Core photography
- Core storage
- CT scanning
- Enhanced oil recovery
- Fluid-phase behavior (PVT)
- Formation damage evaluation
- Fracture studies
- Geochemistry
- Oil & reservoir characterization
- Petrographic analysis
- Reservoir flow studies
- Rock mechanics
- Routine core analysis
- Sedimentology
- Shale rock properties
- Sorption properties
- Source richness & maturity
- Special core analysis
- Wellsite stabilization & transport

Higher standards
Identify and characterize source and reservoir rocks at the wellsite and in the lab to make valid operational decisions.
Better decisions

The Source Rock Analyzer (SRA) pyrolyzes rock samples to deliver accurate source rock and reservoir data, such as total organic carbon (TOC), thermal maturity (Tmax), free oil content ($S_1$), and source potential ($S_2$). The SRA is a lab services instrument as well as the oil and gas industry’s first routine wellsite pyrolysis instrument that can be used in both active and previously drilled wells for a variety of applications, including identifying net pay zones and bypassed pay. The SRA is particularly valuable in long, horizontal well sections where it helps characterize zones of optimal production.

Unique features of the SRA include its compact design and ruggedness, which translate to more accurate results and longer service life in adverse drilling environments.

Faster Results

Prior to development of the SRA, pyrolysis calculations could be conducted only in off-site laboratories. The compact design of the SRA brings the lab to the wellsite. And, weighing just 40 lb (18.1 kg), it is easily transported from well to well.

The SRA’s size opens up a whole new realm of wellsite applications for characterizing potential source and reservoir rocks.
SRA applications

Environment

All environments

Identify bypassed pay by analyzing rock chips in the drilling fluid as the well is being drilled to target. Assess reservoir potential earlier in the development process by providing operators an estimate of how much oil resides in the reservoir.

Shales and tight sands

Optimize hydraulic fracture placement by pinpointing the location of oil in shale plays and tight sands. Save money by identifying optimal zones for fracturing.

Heavy oil

Identify sweet spots to determine the best location in the heavy oil column (highest API gravity).

Deep water

Identify deepwater asphaltene zones that can damage equipment and result in significant lost time and related costs.

SRA Measurements

Source Rock Characterization

Organic carbon content
Oil content
Remaining hydrocarbon-generation potential
Thermal maturity
Organic CO₂

Reservoir Rock Characterization

Oil yields
Viscosity and API predication
Tar, bitumen, pyrobitumen content
Pay zone identification

Site Remediation Studies

Total petroleum hydrocarbons (TPH)
Total organic carbon (TOC)
Better design

Beyond its compact size, the SRA incorporates a number of unique features to enhance reliability and accuracy.

A new take on a proven process

The SRA characterizes source rock and reservoir rock through pyrolysis—thermochemical decomposition of geologic samples such as outcrops, cuttings, conventional cores and sidewall cores to a programmed temperature in a stable, inert atmosphere.

Rock pyrolysis has been used for many years to evaluate organic richness, kerogen type, thermal maturity and generative potential, and to identify hydrocarbon-producing horizons. The SRA provides a cost-effective means of performing this analysis at the wellsite.

Streamlined, durable build

The SRA is streamlined and highly durable and it incorporates a single-oven and dual-infrared (IR) cells for constant monitoring of carbon monoxide and carbon dioxide. A solitary USB port facilitates instrument control and data acquisition and simplifies communication between the SRA and the computer data system.

At the heart of the SRA is an electronic circuit board that measures just 5½ in. × 9 in. (14 cm × 23 cm).

The SRA’s simple design contributes to its dependability in the field. The SRA has successfully endured adverse operational environments to provide reliable, reproducible data on-site in the Middle East on more than 94 wells, representing more than 10,000 man-hours over several years.

SRA Calculations and Measurements

- $S_1$ – the amount of free hydrocarbons (oil)
- $S_2$ – the amount of hydrocarbons generated through thermal cracking of nonvolatile organic matter, such as kerogen
- $S_3$ – the amount of CO$_2$ produced during pyrolysis of kerogen
- $T_{max}$ – the temperature at which the maximum release of hydrocarbons from kerogen cracking occurs during pyrolysis
- TOC – total organic content
- HI – Hydrogen Index
- OI – Oxygen Index
- PI – Production Index
- SI/TOC – oil or contamination indication
Accurate, reproducible measurements

The SRA is designed to ensure accurate and consistent results. A unique pedestal feature enables samples to be purged at lower temperatures, thus preserving more volatile components. A double-seal further protects sample integrity. Purging does not begin until samples are securely sealed in the oven, minimizing the potential for loss of volatile components and enhancing measurement accuracy and reproducibility.

In addition, the SRA’s flame-ionization detector (FID) significantly improves sensitivity, linearity, dynamic range and reproducibility relative to conventional pyrolysis instruments; as a result, samples with elevated $S_1$ or $S_2$ concentrations are more accurate.

Safer method of determining TOC

The SRA does not require the use of dangerous acids to determine TOC. Instead, it uses a pyrolysis and oxidation cycle with the latest solid-state electronic technology. Not only is the process safer, but it reduces the need to store hazardous material such as used acid, which makes it more effective in a wellsite trailer.

Time-saving recalibration

The SRA design enables users to recalibrate IR cells in less than 30 minutes in their own laboratories, eliminating months of downtime associated with sending a unit back to the manufacturer for recalibration.
Better options

The SRA can be configured in a variety of ways to meet specific needs and well conditions. The basic unit is the SRA-TPH (total petroleum hydrocarbon), which provides $S_1$, $S_2$, and Tmax calculations, including whether or not a particular zone is hydrocarbon-bearing.

The SRA-TPH/TOC configuration performs automated analysis of source and reservoir rock to evaluate organic richness, kerogen quality, thermal maturity and organic facies, and enables TOC calculations.

The SRA-TPH/TOC provides answers to critical questions about your reservoir

- Does a rock in a particular zone contain sufficient organic matter to generate hydrocarbons?
- Will the rock in this zone generate oil, gas or both?
- Have the rocks already generated oil, gas or both?
- Where are the source rock “kitchens” in relation to plays?
- What is the oil saturation index within a conventional reservoir?
- What are the trends in the reservoir for oil-water or gas-oil contacts?
- What is the thermal maturity of the rock?
Better formation evaluation

Weatherford Laboratories is a global network of more than 40 laboratories that performs a range of advanced formation evaluation services, including geochemical analysis and core handling, storage and analysis. Our capabilities range from assessing the potential of shale plays to quantitatively allocating production from multiple zones in a commingled production stream. Mobile labs bring our offerings directly to your wellsite.

Weatherford is the only company that offers a full suite of formation evaluation services—including logging-while-drilling, surface logging and wireline services—in conjunction with a global network of geosciences laboratories.

Bringing the lab to your wellsite

Our wellsite geoscience services incorporate four core technologies—including our proprietary SRA and GC-TRACER® surface gas detector, and X-ray analysis instruments—to enable in-depth analysis of formation rock and gas samples at wellsite.

Applications include assessing reservoir potential and identifying brittle zones to optimize hydraulic fracturing and production in shale.
To learn more about the **Source Rock Analyzer** and other laboratory products and services that can help you build a rock-solid understanding of your reservoir, contact a Weatherford representative at SRAInstrumentation@weatherfordlabs.com or visit sranalyzer.com.