Mission Statement

Our Mission

To help our clients make quantified, informed, substantial improvements in their drilling efficiency, hydrocarbon detection and reservoir characterization.

To constantly build a leading edge service company that attracts, develops and retains exceptional people.

To respect and improve the highest safety and environmental standards whilst actively participating in the development and know-how of the countries in which we operate.

Company Overview

Geolog International (GEOLOG) is a world leader in oilfield services delivering solutions and expertise to National, International and Independent Oil, Gas and Geothermal operators globally. Since its founding in Milan, Italy, in 1982, GEOLOG has developed effective and cost-effective alternative solutions to complex and expensive downhole measurement tools. Through the optimisation of formation, fluid and reservoir analysis, well construction is improved, well delivery optimised and production delivery accelerated. By utilising these in or near real-time rigsite applications, operators are able to mitigate risk and reduce cost. As part of its strategy to become the global supplier of choice, GEOLOG has gained experience in over 70 countries worldwide, performing services and assisting operators onshore and offshore, during exploration, development and appraisal programs in shallow to ultra-deep water, HP/HT, unconventional oil and gas and geothermal wells.

GEOLOG maintains a committed focus on research and development, innovation and the implementation of proprietary technologies through continual investment in novel solutions to industry challenges. This robust commitment to continuous research and development has enabled GEOLOG to develop and deploy an extensive suite of wellsite Drilling and Formation Evaluation solutions. GEOLOG holds a significant number of patents, and targets the introduction of new patents annually. In parallel to delivering technical excellence, GEOLOG strongly prioritises its HS&E commitments, recently marking five years without a Lost Time Incident, while continuing to implement and refine its internationally recognized QHSE and CSR standards. In addition to being the global market leader in hydrocarbon evaluation at wellsite through its extraction, analysis and interpretation of gasses from drilling fluids, GEOLOG also provides a uniquely comprehensive, proven and market leading suite of drilling and formation evaluation solutions. Together, these technologies have the primary goal of reducing drilling time and costs, improving operational safety and greatly enhancing the understanding of formations and reservoirs during drilling. More recently, through its Milan-based Laboratory and R&D company GeiTech, GEOLOG has developed geochemical focused laboratory services for reservoir characterisation aimed at oil and gas production optimisation in both pre and post drilling phases, enabling a fully integrated approach to reservoir evaluation and understanding. Thanks to its independence and provision of surface solutions, GEOLOG has become a trusted advisor for operators looking at ways to reduce their expensive downhole measurements and optimise drilling programs.
Company History
Over thirty five years of field experience

GEOLOG was founded in Italy in 1982 to provide mud logging services to AGIP on geothermal, oil and gas wells. From its early years, GEOLOG’s strong technological and R&D culture led to the development of a number of innovative solutions and highly technological patents in the mud logging arena. The Italian crisis of 1994, during which the company moved abroad, opening bases in Tunisia, Congo and Venezuela, servicing AGIP’s international operations, acted as a catalyst for the company’s international expansion. Current management acquired the company in 2001 and has been able to develop its innovative solutions and technological patents into commercial products and services, thereby significantly growing the customer base across not only international oil companies but also across national oil companies worldwide. Whilst retaining its R&D and production facilities in Milan, Italy, in 2016 the company reorganized its corporate structure under GEOLOG Surface Logging DMCC, based in Dubai, UAE.

Under current management, GEOLOG has consistently grown organically by delivering value, expanding its operations from its established footholds in Europe, North and West Africa and Central America and by opening new bases in the Middle and Far East, South America, the North Sea, USA and Australasia. Today, GEOLOG remains privately owned and has grown to become one of the largest international independent surface companies in the world offering a full spectrum of services from Surface Logging to Drilling Solutions, as well as Laboratory studies and R&D partnerships.

Client References

GEOLOG’s experience covers over 8,000 wells globally and includes national and international oil companies across multiple continents. Our services are in demand with traditional oil & gas operators and extend to small and large integrated service providers.

Our services have been performed both onshore and offshore for:

- Exploration Wells
- Development Wells
- Geothermal Wells
- Unconventional Reservoirs
- Extended Reach Drilling
- Narrow Mud Weight Windows
- Underbalanced Managed Pressure Drilling

GEOLOG has logged over 500 wells in Deep and Ultra-Deep Water operations in:

- Angola
- Australia
- Brazil
- Congo
- Egypt
- Ghana
- Gulf of Mexico
- Guyana
- India
- Italy
- Malaysia
- Mauritania
- Mozambique
- Namibia
- Sri Lanka
- Tanzania
- Timor Leste
- Togo
- Trinidad
- Tunisia
- Turkey
- Uganda
- Venezuela
- Kuwait
- Mexico
- Mozambique
- Netherlands
- Norway
- Romania
- Saudi Arabia
- Sri Lanka
- Turkey
- United Arab Emirates

HP/HT Well Experience includes:

- Argentina
- Austria
- Bolivia
- Brazil
- China
- Ghana
- India
- Kuwait
- Mexico
- Mozambique
- Netherlands
- Norway
- Romania
- Saudi Arabia
- Sri Lanka
- Turkey

Extreme Weather Environments:

North Africa +55°C
Arctic -50°C
Published Technical Papers

Innovation in Surface Logging & Drilling Services

Thanks to its strong commitment to innovation and constant improvement of its services, GEOLOG continuously conducts R&D projects in collaboration with its clients. GEOLOG stands today as a leader in advanced surface logging technologies with unique solutions dedicated to drilling optimization and advanced rock and fluid characterization.

The following is a list of some of the technical papers GEOLOG has written in collaboration with its clients over recent years:

1. **Carbon Isotopes from Mud Gas: Lab IRMS or Wellsite Laser-Assisted Technologies?**
   - 29th International Meeting on Organic Geochemistry (IMOG), Gothenburg, Sweden, September 2019
   - The objective of the study is to screen differences in carbon isotopic analysis between laboratory GC-IRMS and one of the possible alternative solutions for onsite deployment, Cavity Ring-Down Spectroscopy (CRDS). Comparison examined advantages and disadvantages of two approaches and technical performances in terms of LOD, precision and accuracy.

2. **Quantification of Uncertainties of Fracture Permeability via Mud Loss Information and Inverse Stochastic Modeling**
   - 81st EAGE Annual Conference and Exhibition, London, UK, June 2019
   - Fracture characterization of NFRs plays an important role in hydrocarbon production estimation. Uncertainty propagation from input parameters to model outputs is quantified through a Monte Carlo framework. Stochastic inverse modelling with field data is performed to evaluate posterior probability densities of fracture aperture and to simulate drilling fluid invasion in fractures in quasi-real-time during drilling.

3. **Integrated Reservoir and Source Rock Characterization: Refined Downhole Analyses through Advanced Surface Logging Technology**
   - SPWLA-2019-PPP (SPWLA Annual Symposium, Woodlands, June 2019)
   - This study shows how the integration of several advanced technologies and software for real-time analysis at井site to characterize a complex reservoir system compartmentalized by an active structural setting. Among these applications, advanced mudlogging brings new opportunities to explore what barely is achievable with conventional logs.

4. **High resolution geochemistry at well site, a new emerging tool**
   - Aapg Hedberg, Houston, March 2019
   - The recent improvements in analytical chemistry made possible new portable and more robust instruments, able to replace bulky and complex instruments used in the labs that have been adopted in mud logging units and this trend is still ongoing, offering new opportunities to get in quasi-real-time additional high-value data.

5. **H2S Detection While Drilling: A New Approach**
   - Oil and gas reserve contamination by acid gas is a growing issue and H2S occurrence is more and more frequent. The use of organic scavengers in drilling mud prevents the application of techniques routinely used for H2S detection. GEOLOG has set up an innovative methodology to highlight H2S distribution in the reservoir, even in the presence of these scavengers.

6. **Quantifying Hole Cleaning in Real-time Optimizes Drilling Performance and Demonstrably Reduces NPT and ILT in a Complex Multilateral Well**
   - SPWLA-1826 (SPWLA, Bogor, November 2018)
   - The use of the DrillClean service along with real-time software for interpretation and analysis has identified borehole cleaning and wellbore stability issues encountered while drilling. The results of this service provided several real-time applications defining ideal flowrates and drilling parameters to optimize drilling performance and saves NPT throughout the well.

7. **Integrated Reservoir Characterization aids target selection, production fluid prediction and completions optimization in the Southern Delaware Basin Resource Plays**
   - URTEC-2902718 (URTEC, Houston, July 2018)
   - This publication illustrates the potential of Integrated Advanced Mudlogging data sets to aid in reservoir characterization in the Southern Delaware Basin. A range of cost-effective technologies utilized in this study include the services G8, GeoIsotopes, GeoFracture, GeoRox, GeoSource, OIQuant and G9+

8. **Thermo-Desorption on Cutting Samples: a Real Case Study of Hydrocarbon Identification while Drilling**
   - IMOG-2017-P184 (IMOG, Florence, September 2017)
   - This paper reports the application of the G9+ service at wellsite during an exploration well and the favourable comparison of G9+ results with post-mortem GC-MS analysis from a geochemistry laboratory. The wellsite analysis was also able to deliver real-time results when downhole evaluation tools failed.

9. **Helium Detection at Wellsite: a powerful geochemical tool**
   - This paper illustrates the application of helium detection at wellsite, ranging from instrumental performance to interpretation. Case studies show the potential use of helium as a tracer of fractures and the good match with the light hydrocarbon concentrations and lithologic changes.

10. **Cost-Effective Reservoir Characterization from Advanced Surface Logging Technologies in Unconventional Reservoirs**
    - URTEC-2460893-MS (URTEC, San Antonio, August 2016)
    - This paper has been written in collaboration with Southwestern Energy to evaluate a number of cost effective services that can be used to understand the vertical and horizontal heterogeneity in organic tight rock formations. These early, real-time measurements can then be used to characterize the reservoir rocks for optimizing and designing completions.

11. **The Application of Well-Site Isotopic Analysis for Reservoir Evaluation**
    - SPWLA-2016-1VV1 (SPWLA Annual Symposium, Reykjavik, June 2016)
    - Joint paper written with Kuwait Oil Company which demonstrates the applications and benefits of GeoIsotopes and shows how the carbon isotopic ratio analysis performed on site, while drilling, is a technique that generates an unprecedented isotopic data density across reservoir and source rock intervals.

12. **Evaluation of a Fractured Tight Reservoir in Real-Time: The Importance of Detecting Open Fractures While Drilling with Accurate Mud Flow Measurement**
    - Aapg-2102787 (Aapg, Denver, May 2015)
    - Joint paper prepared with Repsol shows how an accurate Mud Flow Measurement is able to identify and evaluate in real-time an open fracture while drilling. The paper summarizes that monitoring while drilling of micro-losses associated to fractures provides important data to characterize fractured reservoirs, to identify pay zones and to support testing decisions.

13. **The Application of Mud Gas Analysis in the Evaluation of a Complex Carbonate Reservoir**
    - SPWLA-2014-EEE (SPWLA Annual Symposium, Abu Dhabi, May 2014)
    - Joint paper written with Chevron describes how GEOLOG has performed characterization and evaluation of formation fluids while drilling with its advanced gas detection system. The technique provided solutions for fluid characterization, reservoir zonation, fluid contacts identification and validation of potential vertical flow barriers. It also found a positive impact in geosteering of drain holes. Additionally, the comparison with PVT sample data obtained post-mortem confirmed the reliability of GEOLOG’s advanced gas detection system as a fluid character indicator.
HSE & Quality

Health, safety, the environment and quality are fundamental to everything we do.

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To respect and improve the highest safety and environmental standards whilst actively participating in the development and know-how of the countries in which we operate.

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GEOLOG 7X7 Life Saving Rules

GEOLOG 6&X Life Saving Rules are introduced as fundamental rules every employee has to follow. The aim of these HSE Golden rules is to enhance safety culture by providing basic guidance to carry out work in a safe manner and ensure that individuals are aware of these rules and act accordingly. Noncompliance to the rules may result into a serious injury or even death.

If you are representing GEOLOG, recognize your following responsibilities.

1. Be aware of GEOLOG 7X7 LSR
2. Always lead by an example
3. Discuss and disseminate these rules
4. Recognize at risk and positive behavior and intervene when there is an opportunity.

HSE Capabilities

Our vision at GEOLOG is to ensure we meet or exceed all health, safety and environmental (“HSE”) expectations of our stakeholders and strive to improve our H, S & E performance on a continuous basis.

Since 2010 GEOLOG Management System (MS) has been certified by Det Norske Veritas (DNV). Currently GEOLOG Environment Management System (EMS) is certified to ISO 14001:2015 and Occupational Health and Safety Management System to ISO 45001:2018 both for office/base and rig site activities. This demonstrates that GEOLOG operations are managed safely and responsibly, providing reliable services to our clients free of risks associated with HSE matters.

Executive Management is fully committed to our H, S & E vision through constant personal involvement, including review meetings, audits and the provision/assignment of resources. The GEOLOG corporate HSE policy statement is issued directly by the President of the Company, Mr. Antonio Calleri. The HSE function meets with operations managers and support staff for their operations and strategies with ten universally accepted principles in the areas of human rights, labour, environment and anti-corruption, as detailed here:

1. Businesses should support and respect the protection of internationally proclaimed human rights and make sure that they are not complicit in human rights abuses.
2. Businesses should uphold the freedom of association and the effective recognition of the right to collective bargaining, the elimination of all forms of forced and compulsory labour, the effective abolition of child labour, the elimination of discrimination in respect of employment and occupation.
3. Businesses should support a precautionary approach to environmental challenges, undertake initiatives to promote greater environmental responsibility and encourage the development and diffusion of environmentally friendly technologies.
4. Businesses should work against corruption in all its forms, including extortion and bribery.

GEOLOG supports local charitable initiatives and actively works with projects that benefit communities around the world.

Maintaining outstanding QHSE Performance that follows the ISO & OHSAS standards is a core expectation of GEOLOG. Our successful QHSE performance has been made possible through the teamwork and commitment of all employees. GEOLOG’s QHSE Standards are based on the continual improvement of the QHSE Integrated Management System.

Corporate Responsibility

GEOLOG is committed to advancing its policies and systems to ensure it addresses all aspects of social responsibility that are relevant to its business. For these reasons GEOLOG is not only an Active member but also a Signatory Partner of United Nations Global Compact (UNGC) - a strategic policy initiative for businesses that are committed to aligning their operations and strategies with ten universally accepted principles in the areas of human rights, labour, environment and anti-corruption, as detailed here:

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GEOLOG publishes its annual COP (Communication on Progress) report in May of each year. The latest copy of which is available on GEOLOG’s website as well as the UNGC website.

Quality Capabilities

The GEOLOG Quality Management system is certified ISO 9001:2015 by Det Norske Veritas (DNV). This allows GEOLOG to integrate its certificates in ISO 14001:2015 and ISO 45001:2018. This integration between the three standards helps GEOLOG to have a fully operational QHSE Management system with the objective of achieving and demonstrating excellence in QHSE performance. To ensure the QHSE Management system is in place in the certified bases, GEOLOG has a team of internal auditors in the ISO standards in which GEOLOG is certified.

Our Integrated management system has all been reviewed against the API Q2 standard and a comprehensive GAP analysis performed to ensure compliance. Apart from the ISO certificates, GEOLOG is also registered in both Achilles and the 1st Point databases (FPAL), helping reduce the risks in its supply chain and serving as further confirmation of GEOLOG’s commitment and adherence to standards.

Some of the major benefits of having an integrated certified system worldwide are:

- To provide effective and consistent operational service to our clients.
- To provide efficient and consistent support to our rig site operations.
- To have standardized planning and procedures worldwide, enabling GEOLOG to work consistently at the highest standards.
- To encompass the participation of both office and rig site personnel.
- To have an active system for continuous improvement.

Satisfy customers with superior quality, value and services

Congratulations and thank you to all our field engineers, technicians, operations managers and support staff for their unwavering commitment to GEOLOG’s HSEQ culture and objectives.

[1] A Lost Time Incident (LTI) is a work-related incident, injury or illness to an employee in which a physician or licensed health care professional recommends day(s) away from work due to the incident.
[2] The Lost Time Incident Frequency rate (LTIFR) is measured as the number of Lost Time Incidents per million hours worked in the period analysed.
[3] The Lost Time Incident Gravity Rate (LTIGR) is the number of cumulative lost work days (resulting from a LTI) multiplied by 1 thousand divided by the cumulative man hours worked.

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In 2019, GEOLOG achieved an outstanding HSE milestone of 10 Million LTI Free man-hours and glorious 5 consecutive LTI free year.

To comply with ISO standards, GEOLOG constantly monitors and adjusts adherence to standards.

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Deep and Ultra-deep Water

Drilling in deep and ultra-deep water poses many formation evaluation challenges for operators including increased costs, remote locations, complex formation pressures which in turn may lead to borehole instability and unplanned well-control situations and drilling muds cooled by long riser sections. Use of services such as KickAlarm help mitigate non-productive time by carefully identifying only true fluid influxes and losses. The DrillClean service provides accurate assessment of the volumes of returned cuttings, identifies borehole instability and monitors hole cleaning efficiency in real-time. Our GeoPressure services help identify, monitor and analyse the presence of formation overpressures and assist in the drilling of wells with narrow safe-drilling margins. Our G5, G8, G9+ and GeoIsotopes services provide the broadest range of data analyses available to analyse the hydrocarbon composition and origin in real-time at the wellsite. This allows the optimal use of other techniques such as wireline formation testing and sampling that require specific use of extended periods of rig-time.

Industry Challenges

Integrated and proven surface solutions

GEOLOG’s services help to reduce drilling costs through the innovative use of non-invasive and therefore low risk surface measurement of drilling parameters and formation/fluid analytics, thereby improving operational safety while optimising well construction and delivery. By monitoring and analysing fluid movements our KickAlarm and GeoFracture services respectively assist in the immediate and accurate identification of losses/influxes for safe drilling, and in real-time identification and characterisation of fractures for optimising testing and completion.

GEOLOG offers a range of services that drive improved drilling efficiency in real-time, including BitLife, our patented near real-time bit condition monitoring service, and DrillVibe for immediate stick-slip detection and mitigation, both of which provide very early warning of high-risk drilling issues, and so can help prevent low ROP and potential catastrophic bit/BHA failure. In addition, DrillBest is used in designing and monitoring operating metrics against key performance indicators (KPIs) for identification of invisible lost time and non-productive time in support of continuous improvement towards technical limits.

Our DrillClean service focuses on real-time volumetric measurement of solids removal to ensure adequate borehole cleaning and early warning of borehole instability to avoid potential pack-offs. Our GeoPressure services are used in areas where moderate to severe formation pressures require careful evaluation, and we also offer standard real-time and offline well engineering including torque-and-drag, hydraulics and vibration.

Our formation evaluation suite of services such as G5, G8, GeoIsotopes, G9+, GeoSource and GeoRox provide the most detailed analysis of all aspects of the formations drilled, and their contents. By using only surface data analysis and interpretation techniques such as G5, G8, GeoIsotopes, G9+, GeoSource and GeoRox we are not constrained by down-hole temperature and pressure limitations of our tools and are able to evaluate data from any temperature or pressure regime. Our BitLife, DrillVibe, DrillClean and GeoPressure services are able to assist in the efficient drilling of wells in these complex environments.
Unconventionals

Our range of services tailored to the drilling of unconventional gas and oil wells, such as GeoRox, G5 and G8, enable cost effective geosteering to allow accurate well-placement in extended horizontal and high angle wells and develop a better understanding of the geology through chemostratigraphic interpretation and correlation. Our GeoRox, GeoSource, G5, G8, G9+ and GeoFracture services identify “sweet spots” for stimulation and the composition of the hydrocarbon types present. The real-time availability of these services at the wellsite means that lengthy delays waiting on laboratory turn-around are completely removed and timely decisions on how to complete wells can be made effectively and in a far more cost effective manner. By using GeoIsotopes and G9+ we are able to provide a laboratory quality service, at the well-site to identify hydrocarbon origin and maturity and help rapidly build up a more complete understanding of the results from the wells.

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<tr>
<th>Challenges &amp; Solutions</th>
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<td>GeoSource</td>
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<td>Finding Source Rock Sweet Spots</td>
<td>GeoRox</td>
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<td>Hydrocarbon Fluids Typing (Composition)</td>
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<td>Onsite Lab Results for Improved Turn-Around Time</td>
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<td>Hydrocarbon Origin and Maturity</td>
<td>GeoIsotopes</td>
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Exploration

Exploration drilling comprises a whole range of challenges, the primary of which is obtaining the maximum amount of information from the well in a cost effective and safe manner. By utilising our suite of formation evaluation services, G5, G8, G9+, GeoIsotopes, GeoSource and GeoROX, we are able to acquire the maximum amount of data possible, with no risk of loss, or later availability. These services cover the entire range of likely exploration scenarios from biogenic to thermogenic gas, condensate to heavy oil, clastic, carbonate or even granitic basement reservoirs. Our drilling related services, KickAlarm, DrillClean, DrillVibe, DrillBest and BitLife will help deliver a safe and economic well.

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<td>Stuck pipe from Cuttings Accumulation</td>
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Development

Development wells require the optimization of formation evaluation, improved drilling efficiency and the ability to identify all pay effectively. The combination of G5, G8, G9+ and GeoROX gives operators the opportunity to optimize their LWD and wireline evaluation programs effectively using surface data analyses and interpretations to help reduce costs across many wells and still acquire excellent formation and fluid characterization. The combination of G8 and GeoIsotopes enables hydrocarbon origin to be determined, and assist in evaluating complex reservoirs with multiple different geologic compartments. Complex structural and stratigraphic correlations are enabled by performing detailed chemostatigraphic analysis at the wellsite, ensuring that results and the geological model are understood. The DrillBest, DrillClean, DrillVibe, BitLife and KickAlarm services all enable optimal safe drilling practices.

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<td>Minimizing Costly Downhole Tool for Fluids Characterization</td>
<td>G8 G9+</td>
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Horizontal and Extended Reach

Our experience in horizontal and extended reach drilling in both conventional and unconventional wells has enabled GEOLOG to be a leading provider of surface logging solutions in these wells. The G5, G8, G9+, GeoIsotopes and GeoROX services help determine hydrocarbon types and origins, stratigraphic position for effective well-placement and identify geologic sweet spots and potential barriers to production along the well-path. By using a combination of surface drilling data we are able to optimize the use of more problematic LWD and Wireline services. Drillbest, BitLife and DrillClean all assist in improving drilling and hole cleaning efficiency.

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<td>Well Placement</td>
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Geothermal

The drilling of geothermal wells introduces a different range of challenges but, by utilising GeoFracture and GeoROX we are able to identify natural fracture patterns and characterise complex mineralogy and make stratigraphic correlations. Our KickAlarm and DrillBest services enable the implementation of performance drilling, NPT reduction and the careful monitoring of losses and micro-losses for both safety and potential reservoir identification. The measurement of hazardous non-hydrocarbon gases is performed using specific technologies for a range of gases, which may include H2S or CO.

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<th>Challenges &amp; Solutions</th>
<th>Essential</th>
<th>Value Added</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Fracture Identification</td>
<td>GeoFracture</td>
<td>GeoROX</td>
</tr>
<tr>
<td>Stratigraphic Interpretation &amp; Correlation</td>
<td>GeoROX DrillClean</td>
<td></td>
</tr>
<tr>
<td>Characterizing Mineral Alterations</td>
<td>GeoROX DrillVibe</td>
<td></td>
</tr>
</tbody>
</table>
GEOLOG’s lab and innovation activities have been spun off into a dedicated company/brand, GEOLOG TECHNOLOGIES (GeoTech), which operates in partnership with clients and academia. GeoTech utilises a multidisciplinary team of subject matter experts and seeks, via collaboration with a wide range of partners in academia and industry, to leverage advances across a broad spectrum of technologies to create new paradigms for the Oil & Gas and Geothermal sectors. GeoTech strives to make today’s laboratory technologies the field services of the future.

**Innovation & Research**

GeoTech recognises that ongoing advances in analytical techniques will have a fundamental impact upon the future of decision making within the oil, gas and geothermal industries: enabling multiple high-density data sets generated at the rigsite to replace the high-cost, limited data sets previously utilised post-drilling. The availability of enhanced accuracy analysis of samples using technologies formerly restricted to laboratory environments will reinforce this trend, fusing geochemistry with mudlogging formation evaluation to produce new methods of understanding formations in real-time.

As such, GeoTech’s innovation and research are focused to:

- Make available new analytical tools for field applications (towards the future full equipped upstream lab at wellsite)
- Squeeze maximum value from acquired data, to address and solve key industry issues

**Examples of laboratory studies include:**

- **Oil-Oil and Oil-Source rock correlations**
  - Biomarkers studies on oil and extracts
  - Isotopic analyses (GC-IRMS)

- **Source rock characterization and maturity assessment**
  - TOC
  - Pyrolysis
  - Vitrinite reflectance
  - AFTA
  - Fluid inclusions

- **Gas characterization**
  - Complete chemical analyses, including contaminant gases
  - Carbon and deuterium isotopic analyses
  - Gas - oil correlations
  - Head space analyses
  - Residual gas (gas still present in cuttings)

- **Rock analyses and characterization**
  - XRD diffraction for mineralogical analyses
  - XRF chemical analyses for major, minor and trace elements
  - SEM studies

**Laboratory**

GeoTech laboratory services are focused on helping clients to:

- Plan and optimize future wellsite activity, through preliminary tests
- Complete and integrate activity performed at wellsite, by using tools not yet available for field applications
- Test new experimental tools before moving them to wellsite
Based inside the innovation hub “Fondazione Filarete”, the research incubator facility of the University of Milan (Università Statale di Milano), GeoTech is ideally situated to leverage exposure to multiple fields of advanced technology research to enable the development of novel solutions to the challenges of the oil, gas and geothermal industries.

In addition to the Milan Research Laboratory, GeoTech also has satellite operational laboratories in Houston, USA, Neuquén, Argentina and Doha, Qatar.

Partners

The laboratory seeks, via collaboration with a wide range of partners in academia and industry, to leverage advances across a broad spectrum of technologies to create new paradigms for the petroleum and geothermal sectors.

GeoTech actively seeks to collaborate with the industry on new projects to drive forward the state of the art in geochemical and physical techniques. Recent projects include the following partners:

GeoTech is also carrying forward research projects with a number of leading academic institutions and industry partners, including:
Manufacturing and R&D
Reliability, performance and quality delivered through our unique production line

GEOLOG prides itself on manufacturing all of its oilfield services equipment and mobile laboratories at its production facility in Milan. By taking ownership of the entire manufacturing process in-house, GEOLOG is the only global surface logging supplier to provide the complete surface logging process to its clients from design of equipment through to interpreting the results of service provision. From design to physical assembly, full control and accountability is maintained for the quality and the highest standards being implemented for all cabins, computing hardware, gas acquisition and detection equipment, advanced geochemical analytical tools and specialist drilling technologies. By providing hardware of the highest possible standard, our field engineers and crews are able to focus on providing an exemplary service, acquiring, analysing and interpreting data, communicating results and delivering as much value from the wellsite as possible. Component selection is based upon technical features as well as customer and internal user feedback, ensuring that lessons learned in the field are incorporated into future production and operational technical support processes.

Complete control over the entire manufacturing process sets GEOLOG equipment apart, in terms of quality of material, performance, reliability and traceability. Designs are modular, with acquisition and analytical components being suitable for all mobile laboratories. Through this process, GEOLOG is able to offer standard and optional extended warranties for its equipment, supported by a global 24/7 network of technical support from its production and operations teams. GEOLOG has in place a dedicated network of operational support bases with qualified, competent resources to provide local technical assistance. It is through this network and with assistance from our Milan Manufacturing Centre that we are also able to provide thorough installation and commissioning of all of our products and services and guarantee the availability of spare parts and upgrades to avoid obsolescence. Frequent and regular refurbishment and upgrading occurs to ensure continued reliability in the field and for our crews to be able to maintain their focus on performing their services. Comprehensive training is also provided for local technical support personnel to ensure that assistance is available in as timely a manner as possible.

Our manufacturing and design teams are able to provide detailed drawings, plans and certification to a variety of standards, addressing all customer concerns about the specifications of our unit. Our mobile laboratories can be built according to various international standards, summarized in the following table:

<table>
<thead>
<tr>
<th>Available Unit Lengths</th>
<th>20 ft, 25 ft, 30 ft and 40 ft. Custom length on request</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offshore Container Certification</td>
<td>DNV 2.7-1 (Det Norske Veritas)</td>
</tr>
<tr>
<td>Offshore Electrical Certification</td>
<td>DNV 2.7-2 (Det Norske Veritas)</td>
</tr>
<tr>
<td>Thermal Protection Certification</td>
<td>SOLAS A0 (20 mins) and A60 (60 mins) for Zone 1 - (Safety of Life at Sea)</td>
</tr>
<tr>
<td>Helicopter Transportation Certification</td>
<td>NATO-STAUS 3542</td>
</tr>
<tr>
<td>Norwegian Petroleum Industry Certification</td>
<td>NORSOK D-101 (Norsk Sosetel Konkurranseplosjon)</td>
</tr>
<tr>
<td>Winterized Unit</td>
<td>A0 and A60 down to – 20 °C (– 4 °F)</td>
</tr>
<tr>
<td>Winterized Alaska Model Unit</td>
<td>A0 down to – 50 °C (– 58 °F)</td>
</tr>
<tr>
<td>Combo Unit</td>
<td>A0 and A60 for Zone 1 (LWD, MWD)</td>
</tr>
</tbody>
</table>

As a global oilfield services provider, we have extensive experience in developing, building and using equipment in harsh high temperature and extremely low temperature environments. We offer “winterized” components and systems proven to operate consistently in temperatures below -20 degrees C. In hot climates we provide dual air-conditioning units to ensure redundancy. Our full range of equipment and services have been tried and tested in temperatures up to 50 degrees C. We are also able to provide a range of specialty service cabins, including “Advanced Service” cabins designed to be used alongside other surface logging companies providing only standard services (deployed for example in Brazil for Petrobras, in Senegal for Cairn Energy and in Tanzania for Statoil) and with assistance from our Milan Manufacturing Centre that we are able to provide thorough installation and commissioning of all of our products and services and guarantee the availability of spare parts and upgrades to avoid obsolescence. Frequent and regular refurbishment and upgrading occurs to ensure continued reliability in the field and for our crews to be able to maintain their focus on performing their services. Comprehensive training is also provided for local technical support personnel to ensure that assistance is available in as timely a manner as possible.

Our manufacturing and design teams are able to provide detailed drawings, plans and certification to a variety of standards, addressing all customer concerns about the specifications of our unit. Our mobile laboratories can be built according to various international standards, and in a variety of configurations, summarized in the following table:

GEOLOG Surface Logging Equipment Characteristics:
- All equipment manufactured in our Milan facility
- Fully certified equipment by Det Norske Veritas (DNV)
- Customized equipment according to customer/project needs
- Equipment quality independent of 3rd party suppliers
- Fully modular and upgradeable Surface Logging Unit & Equipment
- Efficient and fast implementation of upgrades

With our equipment GEOLOG:
- Guarantees the availability of spare parts
- Offers Global Support 24/7
- Provides commissioning and start-up
- Provides a wide network of locations with support personnel and equipment
- Provides manuals, drawings, certification and other critical production information