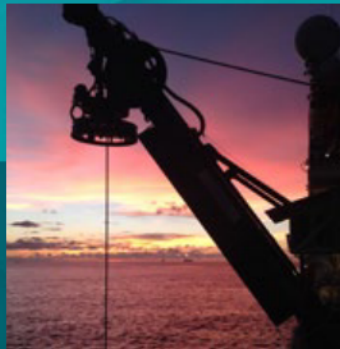


# SAExploration



Safety. Acquisition. Experience.



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*SAExploration believes providing a safe and healthy work environment for all employees globally is not only possible but essential.*

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# Worldwide Geophysical Services

SAExploration is a global geophysical services company focused on providing leading seismic data acquisition services and technology to the oil and gas industry.

Delivering a full range of solutions for onshore data acquisition from survey design and pre-planning through field operations including surveying, drilling, recording and field data quality analysis to camp mobilization and demobilization, environmental assessment, community relations, and logistics.

In the marine environment, SAExploration provides geophysical acquisition services specializing in ocean bottom seismic (OBS). Our OBS capabilities ranges from tidal zones, transition zone, shallow-water and deep-water to operational depths of 3,450 meters.



Established in 2006, SAExploration has expanded to address the changing landscape of the upstream oil and gas industry. Our vision of SAExploration and our growth is based on the importance and vision of our prime relationships, which allows SAExploration to position our services in our client's principal regions. Prime relationships are based on mutual trust and understanding; which allows both parties to share/optimize time, effort and resources to plan and manage projects that will result in delivering a safe high-quality project that minimizes the impact on the environment.



SAExploration believes that providing a safe and healthy work environment for our employees globally is not only possible but essential. In concert with our environmental stewardship efforts, our team of professionals focus on the personal safety and health of our employees, customers and general public all while operating in some of the most challenging areas around the globe. Risk management is a key facet throughout our operation as we continue to deliver TRCF and LTIF statistics in accordance with industry (IAGC) standards. Our Operating Management System (SAE-OMS) is designed and based off the industry standard IOGP 510 model. This allows SAExploration to link Client and internationally recognized management systems such as ISO 9001 (Quality), 14001 (Environmental) and 45001 (Occupational Health and Safety).

SAExploration maintains offices and/or operations in the United States (Stafford, Texas and Anchorage, Alaska), Canada, Colombia, Peru, Bolivia, Brazil, United Kingdom, Norway, Cyprus, Egypt, Saudi Arabia, India, Malaysia, and Singapore.



# Land Seismic Acquisition Services

At SAExploration, we bring decades of significant and specialized expertise borne from our work in a variety of unique and logistically challenging environments around the world. We have an exceptional track record across harsh terrain and heavily cultured areas. In all environments and in every professional scenario, we strive to reduce risk to all parties involved where a client's project is being acquired by recognizing and respecting that both the local communities and the local environment are stakeholders in the project.



SAExploration is a trusted provider of innovative vibroseis methods and technologies. The combination of our broadband sweep technology BassIQ™, Source-Driven-Shooting techniques and extensive 3D design expertise with the flexibility of node-based recording equipment, enables SAExploration to deliver high-density broadband seismic data to our customers at exceptional value. Improved sampling with trace densities exceeding 5M/km<sup>2</sup> and bandwidths upwards of 6 octaves, facilitate our ability to better record the seismic wavefield resulting in both improved subsurface imaging and rock property estimation. With our fleet of vibrators ranging from 15,000 to 80,000 pounds in buggy, track and truck-mount configurations, SAExploration can meet the challenges across all operational theaters from remote arctic to urban seismic acquisition environments.

SAE has further proven expertise with all manner of helicopter supported seismic operations including remote heli-portable and heli-assist projects. Our helicopter management procedures, based on IOGP 420 and 390, promote effective management of helicopter operations and establish standards for all SAE entities, including contractors and subcontractors.

Our teams share best practices across all regions to ensure maximum efficiency and consistent quality for our client projects. Most key SAExploration team members are cross trained on different projects in different regions, enabling them to bring a unique depth and diversity of experience to a given project. We are widely recognized as one of the most knowledgeable and innovative geophysical contractors in the world.

Our comprehensive geophysical acquisition services span the spectrum from planning, design and front-end services to recording and data processing. No matter the given region or challenge, we've got the most demanding client requirements covered.



## PROGRAM DESIGN

The optimization of survey design for increasingly diverse and demanding geologic objectives is critical to a project's success. Many projects are complicated by environmental, operational and geologic encumbrances. Our expert team brings years of experience and consideration of the latest acquisition geometries, methods and processing tools to ensure the most efficient and technically sound design is employed to meet your objectives.

## PLANNING & PERMITTING

Any successful geophysical program begins with a comprehensive project plan. At SAExploration, it is our mission to help our clients reduce the risk and cost of exploration by collaborating to develop solid strategies from the ground up — regardless of scope, geographic region or technical challenge.

## LOGISTICS

Our crews excel at resources planning and logistics to ensure the best possible performance. We pay special attention to details including budget, timing, and equipment requirements to make the best geophysical survey possible, maintain high standards, and deliver superior data.



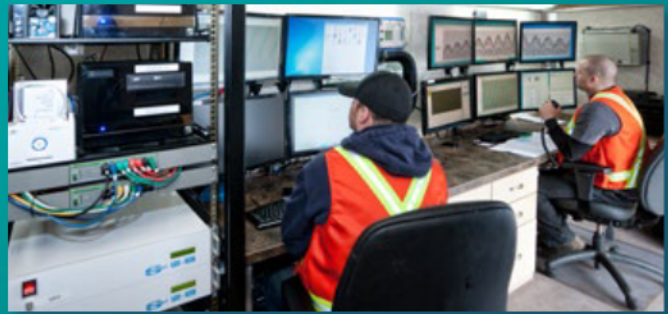
## CAMP SERVICES

With many geophysical acquisition projects being undertaken in remote areas, SAExploration has streamlined processes for setting up and dismantling field camps. Camp facilities meet or exceed industry standards providing safe, comfortable working environment and accommodations for staff and clients. Qualified mechanics and technicians keep the necessary infrastructure such as communications, generators and water treatment plants operating safely and efficiently.



## SURVEY

SAExploration has extensive experience in survey and line cutting services utilizing the latest tools and technologies to ensure data accuracy, safe access for field crews and minimal environmental impact. On-site GIS staff and survey crew provide updated information and maps to support drilling and recording operations as well as project advance reporting.



## DRILLING

SAExploration's specialized and experienced seismic drilling teams deliver by using innovative drilling techniques along with the most versatile equipment and efficient means possible.

## RECORDING

With expertise developed across all manner of difficult and sensitive areas and by maintaining close relationships with equipment manufacturers and suppliers our teams come with the tools, training and methodologies designed to meet a vast spectrum of program requirements. SAExploration concentrates on using the specific technologies that best meet the needs of each project for our customers.

# Marine Seismic Acquisition Services

For more than 10 years, SAExploration have developed a comprehensive acquisition portfolio exploiting the most advanced Ocean Bottom Node (OBN) technologies that are required for enhanced reservoir identification, delineation, characterization and monitoring, whilst delivering the most sophisticated subsurface data in the geophysical industry today.

SAExploration provides safe, accurate, eco-responsible and seamless full-wavefield geophysical surveying services for all aquatic environments; transition-zone (surf and tidal zones); shallow-water and deep-water. Our commitment to an uncompromising HSE program, offers decades of knowledge and expertise garnered from operating in unique and logistically challenging environments all around the world.

SAExploration excels in the methods and techniques of acquiring 2D, 3D and 4D full-azimuth and full-wavefield geophysical datasets that will meet or exceed your subsurface imaging requirements by extending data bandwidth with improved signal-to-noise performance coupled with the collection of data rich with increased offsets and azimuths through the appropriate design and implementation of these nodal technologies. 4D-Grade data can be acquired with either single or one-component (1C), two-component (2C) or four-component (4C) sensing technology, in water depths from 1 to 3,450 meters.

Gained by OBN system and survey design flexibilities, it is very common for the ultimate OBN survey design be constructed and tuned to address multiple geological and geophysical objectives during the same survey, some of which are;

- New prospect identification, de-risking and mitigate uncertainty with both new and existing targets;
- Better recorded signal through imaging through acoustic shadowing zones (gas, salt, carbonates, etc.) as a result of near-surface and over-burden geologic properties, geo-hazards or shallow elements such as mud volcanos, shallow channels or shallow gas reservoirs, which acoustically mask the targeted deep reservoirs;
- Subsurface velocity definition for full-waveform inversion;
- Better illumination of subsurface fault patterns and fractures through improved spatial data sampling and resolution;

## Field (Asset) development and EOR (4D)

- Improved structural imaging and seismic characterization to the reservoir's depth;
- Well-planning development and well-placement optimization;
- Full data bandwidth with enriched high-frequency and improved low-frequency data content below 8 hertz;
- Better illumination of the reservoir structure, including below salt and/or steep flanks;
- Better understanding of the reservoir compartmentalization and lateral connectivity;
- Identification of undrained hydrocarbon compartments and Gas/Water contacts;
- Improved understanding of the prospect's geologic properties.



## DEEP-WATER OBN

In the deep-water environments, SAExploration configures a typical survey crew with a single certified DP-2 classed Construction Support Vessel (CSV) staffed and equipped for twin work-class ROV operations, which is supplemented with an industry seismic source vessel configured and tuned to specific source signature requirements. All vessels will comply with industry and customer HSE standards and are fully manned with highly experienced crew. These vessels are supplied survey-ready to meet geophysical industry standards for 4D-Grade data recording.

In all cases, each work-class ROV is supplemented with the most advanced survey instrumentation for extremely accurate and precise subsea positioning of each OBN unit deployed. Twin ROVs enable multiple receiver line deployment and recovery during a single vessel traverse. The seismic source vessel or vessels are equipped for either single, dual or triple source firing techniques and all arrays can be additionally outfitted with the latest near-field hydrophones and steering capabilities for controlled source positioning.

A standalone OBN survey will compliment any legacy seismic dataset or OBN techniques can be deployed concurrently using the seismic source during a towed hydrophone array seismic acquisition to capture near-offsets with nodes surrounding surface obstacles (natural or man-made) or sparse receiver design specifically

to capture extended-offsets and azimuths for improved subsurface velocity definition for Full-Waveform Inversion techniques, augmenting the towed-array image.

Our crews are commonly equipped with additional oceanographic instrumentation such as; Pressure-Inverted Echo Sounder (PIES), Sound Velocity, CTD, Current and/or Tide instruments to gather a variety of Metocean data measurements.



# Marine Seismic Acquisition Services

## SHALLOW-WATER OBN

Our expertise in multiple shallow-water settings, prepares our team members with tools, training and methodologies designed to meet a vast spectrum of surveying requirements and operating safely and respectfully of the environment.

For the typical offshore OBN survey, tuned airgun arrays, which release high-pressure compressed air into the water column, are used as the acoustic energy source and a quantity of OBN units consisting of 4-components (hydrophone + 3 orthogonal geophones) are deployed to record the minimum survey offset requirements.

Typically, these types of surveys require several thousand nodes because these areas are either, sizeable in scope or the image requires denser receiver spatial sampling, or both, so the nodes are typically deployed and recovered tethered to a high-strength synthetic rope (NOAR, Node-On-A-Rope) for handling efficiency purposes. For additional crew efficiency gains, multiple specialized node handling vessels and/or multiple purposed-built source vessels can be incorporated into the operation.

In areas with deeper waters that comprise of production facilities or environmentally sensitive areas, remotely operated vehicles can be also utilized for a more precise and safer deployment and recovery of the ocean bottom nodes. In other shallow-water regions where shallow-water shoals or islands exist, it may be necessary to incorporate SAExploration's transition-zone techniques to achieve the required image and objectives.

## TRANSITION-ZONE

In these areas where land and water join, the elements of both onshore and offshore surveying techniques are employed. Transition-zone seismic data acquisition is similar to shallow-water applications in that both hydrophones and geophones are deployed with small, purposely built shallow-draft vessels and our specialized source vessels and the acoustic source would be configured to address the depth variations typical in these shallow-water settings.

Due these shallower water depths, the use of many small handling vessels and manual labor are required to deploy and retrieve receivers. For these reasons, extensive survey planning is required to ensure a cost-effective operation so that all aspects are orchestrated in a safe and homogenous manner.

In transition-zone areas consisting of areas with an extended beach, swamp or marsh, explosives can be applied as an acoustic source to contribute to image offshore or combining the deployment of land sensors are also a possibility to extend imaging onshore through the transition-zone. SAExploration has a vast amount of experience in these types of environments which will translate to a savings in both time and money.





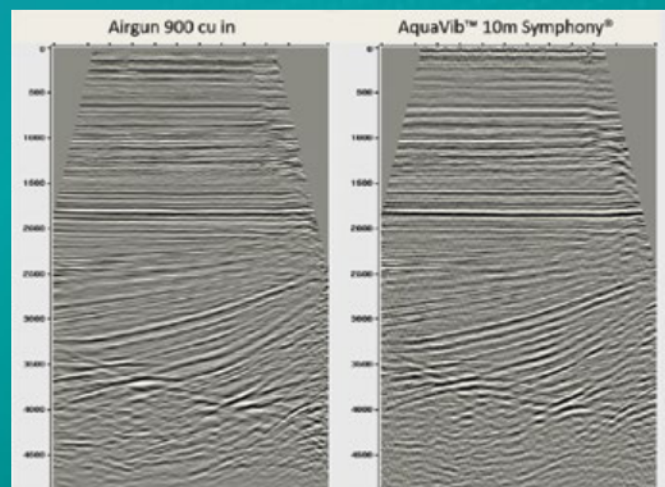
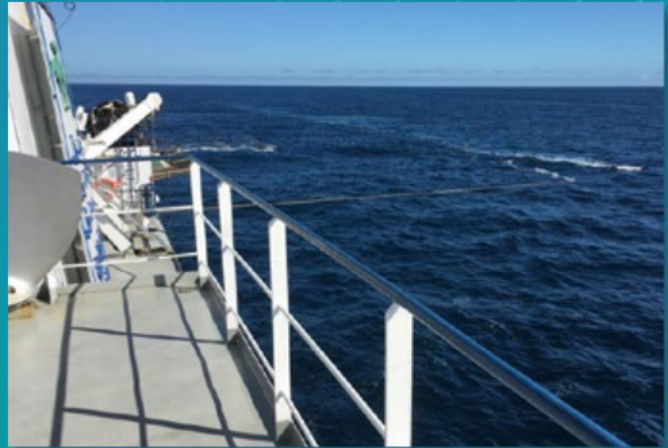
# Marine Technology

## SAE MARINE VIBRATOR

The SAE Marine Vibrator is a towable marine source that generates seismic energy equivalent to airguns, at significantly reduced sound pressure levels, and at frequencies below the hearing range of most marine species.

The Marine Vibrator subarray consists of two Triton vibrators and one lower frequency Subtone, each with different response characteristics and resonant frequencies. Advanced controller systems can enable precise acoustic output, while providing real-time feedback to ensure high levels of acoustic quality control. Marine Vibrator is designed for water depths as shallow as one-meter, delivering performance and reliability in challenging transition-zones, lakes, and shallow-water OBN surveys.

- Bandwidth control enables overall lower signal level output.
- Multiple-second sweep duration markedly reduces instantaneous sound pressure levels.
- Meets updated NOAA guidelines for TTS and PTS.









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