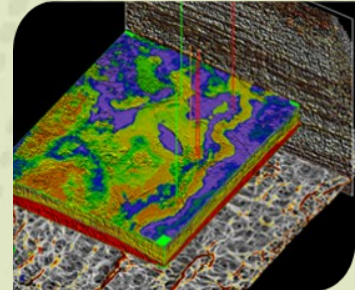


Delivering Full-wave

CHALLENGES

With world demand for energy growing at ever increasing rates, the oil and gas industry is facing numerous challenges in the quest to meet consumer demand. As the easy reserves have already been found, exploration for new reserves has become more difficult, time consuming, and expensive. Much of the focus is shifting from conventional to unconventional plays that require new acquisition and processing techniques to maximize production in an efficient and environmentally friendly manner. Full-wave data can help meet these new demands by delivering a more complete measurement of the seismic wavefield. ION provides E&P companies with full-wave data and information necessary to optimize production while meeting health, safety, and environment requirements (HSE).



WHAT IS FULL-WAVE?

Full-wave seismic is a way of acquiring and processing seismic data that maximizes the geologic and geophysical information by utilizing full azimuth and multicomponent data. Full-wave can provide high resolution P-wave and C-wave data, fault and fracture information, lithology information, fluid detection and more. Using full-wave data is about getting the information necessary to solve exploration business challenges and reducing drilling risks; having information on where and how to drill, and improving the overall understanding of the reservoir.

How is Full-wave data acquired?

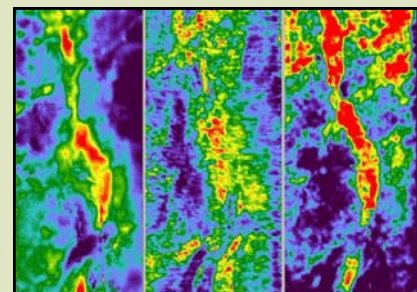
In order to harvest the benefits of full-wave data, the following guidelines for acquisition and processing should be considered:

- High fidelity multicomponent, single point sensors such as VectorSeis®
- Wide-azimuth survey designs
- Faithfully recording and preserving the maximum seismic bandwidth
- Full range of offsets
- A properly sampled image of the reservoir in both P-wave and C-wave domains

HOW CAN ION DELIVER FULL-WAVE VALUE?

Efficient Acquisition

ION offers a portfolio of innovative land acquisition technologies to address customers' needs for efficient, properly sampled wide azimuth, multicomponent



P-wave Structure P-wave Amplitude C-wave Amplitude

Joint Interpretation for Risk Reduction
Capturing both P-wave and C-wave data can provide interpreters with useful information for joint interpretation. In the example above, the C-wave amplitudes allowed interpreters to distinguish between gas and water to improve their overall drilling successes.

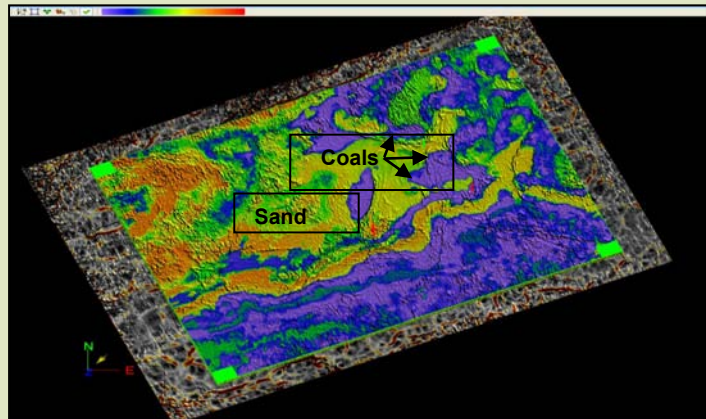
acquisition. ION partner INOVA's FireFly® cableless and Scorpion® cable-based acquisition systems are efficient, reliable choices for any acquisition environment. FireFly is a light-weight cableless acquisition system that enables customers to focus on achieving the best imaging quality of their reservoir, without being constrained by cables when designing the survey. With no channel count limits, integrated survey capabilities, and processing-ready data, FireFly can help reduce overall seismic cycle time and delivers superior data quality. Scorpion is a cable-based acquisition system which provides field-proven software and hardware that ensures the channel capacity and features required by today's increasingly complex survey designs. Both FireFly and Scorpion deliver image quality advantages with INOVA's VectorSeis – the most accurate receiver on the market today. VectorSeis is a tilt-insensitive, broad-bandwidth, digital multicomponent receiver whose accuracy makes possible the use of advanced imaging technologies, such as improved noise reduction processes, fault and fracture analysis, and lithology discrimination.



INOVA'S VectorSeis Digital 3C Sensor
Ideal for recording enhanced P-wave and converted wave data, VectorSeis records broad bandwidth seismic and captures azimuthal variations in seismic

Processing with Your Goals in Mind

ION's GX Technology (GXT) group is the leader in providing advanced imaging solutions for full-wave data in both conventional and unconventional reservoirs. Class-leading technologies such as AZIM™ azimuthal velocity analysis, reverse time migration (RTM), and advanced converted-wave processing techniques provide superior high resolution seismic images that can also deliver fluid, fracture, and lithology information. Such information can increase our customers understanding of the reservoir and help improve overall productivity.



Better Reservoir Understanding with Full-wave
Full-wave delivers the information you need to solve your business challenges. Here, full-wave data help interpreters find geologic boundaries which are crucial to choosing optimal well locations.

Pulling It All Together

GXT's Reservoir Solutions group is a team of experienced geoscientists and engineers who offer a wide range of interpretation solutions to match customers' business and exploration requirements. The team can provide high resolution P-wave, C-wave and S-wave data, fault and fracture information, lithology information, fluid detection, and more. The Reservoir Solutions team can help extract maximum value from your full-wave.

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