

Driving home the repeatability



Julie Marshall - Product Champion, Advanced Spread Control assisting a player of 'The Repeatability Challenge' at the SEG in New Orleans.

Visitors to the WesternGeco booth at the recent SEG convention in New Orleans were invited to enjoy 'The Repeatability Challenge'. In this way they got a personal experience of the repeatability provided by the source and streamer steering of the Q-Marine technology (GEO ExPro No. 3,2006).

Sophisticated seismic tech-

niques have been the cornerstone of the consistent increase in the E&P industry's exploration success rate. These days the industry is looking beyond exploration and applying seismic technology to reservoir management tasks. Time lapse or 4D seismic surveys have thus become a significant segment of the marine seismic market, in particular in the North Sea. Repeatability from survey to survey through a 4D project is critical for the quality of the information resulting from a time-lapse project.

Participants in the game were invited to steer the seismic vessel with the source and streamer spread through a pre plotted track close to islands, rigs and moving vessels with varying directions of currents. Success was measured by the resulting closeness to the pre plot and streamer collisions meant 'going back to start'. In the first round the 'pilot' could only steer the vessel and had to take into account the expected movement of the source and

streamer spread. In the second round the source and streamer steering system was activated to help the player to keep the spread on track.

Q-Marine is a member of the WesternGeco family of Q systems together with Q-Land and Q-Seabed. A unique feature for Q-Marine is the source and streamer steering which allows Q-Marine surveys to be significantly more repeatable than conventional acquisition according to WesternGeco. Q-Marine streamers contain the Q-Fin steering device, remotely controlled wings that enable both precise depth control and horizontal steering. Horizontal streamer steering provides feather correction, safe streamer separation control, active steering for optimal coverage and 4D repeatability.

The GEO ExPro representative at the SEG, having had a chance to play the game, can confirm that the WesternGeco repeatability message will not be forgotten! If you missed it at the SEG you will have a new chance at PETEX in London in November.

ABBREVIATIONS

Numbers

(U.S. and scientific community)

- M: thousand = 1×10^3
- MM: million = 1×10^6
- B: billion = 1×10^9
- trillion = 1×10^{12}

Liquids

- barrel = bbl = 159 litre
- boe: barrels of oil equivalent
- bopd: barrels (bbls) of oil per day
- bcpd: bbls of condensate per day
- bwpd: bbls of water per day

Gas

- MMscfg: million ft³ gas
- MMscmg: million m³ gas
- tcfg: trillion cubic feet of gas

LNG

Liquefied Natural Gas (LNG) is natural gas (primarily methane) cooled to a temperature of approximately -260 °C.

NGL

Natural gas liquids (NGL) include propane, butane, pentane, hexane and heptane, but not methane and ethane.

Reserves and resources

P1 reserves:
Quantity of hydrocarbons believed recoverable with a 90% probability

P2 reserves:
Quantity of hydrocarbons believed recoverable with a 50% probability

P3 reserves:
Quantity of hydrocarbons believed recoverable with a 10% probability

Oilfield glossary:
www.glossary.oilfield.slb.com

CGG wins SEG Award

The Society of Exploration Geophysicists (SEG) has honored CGG with its Distinguished Achievement Award.

This prestigious award is awarded from time to time to a company, institution or other organization for a specific technical contribution or contributions that have, in the unanimous opinion of the Honors and Awards Committee and the Executive Committee, substantially advanced the science of exploration geophysics.

The SEG is honoring CGG for its contributions to the science of exploration geophysics over the past 75 years. Founded in 1931 by Conrad Schlumberger, CGG has remained independent

CGG's Chairman and CEO, Robert Brunck, was presented with the Award at a ceremony held by the SEG Honors & Awards Committee on the opening afternoon of the 2006 SEG Convention in New Orleans.



and has throughout its history contributed to the advancement of the field of geophysics.

CGG employs 4,000 people, from over 30 nationalities, working at 50 sites around the world and is a force among international industry associations. CGG currently operates through two divisions: Sercel is a sup-

plier of land and marine seismic acquisition systems, while CGG Services cover onshore and offshore seismic acquisition, seismic data processing and reservoir imaging. Late 2005, CGG acquired Exploration Resources with seven new vessels and Multiwave, the leader in ocean bottom seismic.

Finding Oil without a Drilling Rig

An innovative technology is now being developed that will facilitate the drilling of wells and verify the presence of hydrocarbons in both frontier and mature areas without a conventional drilling rig.



"The Badger may contribute to a doubling of the exploration activity, while at the same time being environmentally friendly as there are no emissions to air or sea," says Managing Director Kjell Erik Drevdal.

Sigmund Stokka, Research Manager with International Research Institute of Stavanger (IRIS), Norway, and an expert in drilling technology research, was the first person to consider drilling and logging holes without using a conventional drilling rig by developing an idea that came to him in 1999. Stokka envisaged a drill bit – a slim electronically powered drilling system that carries sensors and continuously records subsurface data – digging a hole like a frantic badger.

Cheaper boreholes may be the result of this development, and if successful, it may open up a revolution in drilling technology that is also environmentally friendly. In 2005 the technology was awarded a 2nd place in the Norwegian DnB NOR National Innovation competition.

"The Badger Explorer, as it is named, drills into the ground and buries itself without the risk, cost and complexity of a rudimentary drilling rig," explains Kjell Erik Drevdal, Managing Director of Stavanger-based

Badger Explorer ASA.

The tool consists of a drill bit driven by an electromotor, a cutting, transport and injection device, and a drum of spooled cable, through which power is supplied from the surface and data signals are transferred up to the surface.

Developing the Badger Explorer is now entering a final phase. "The idea was established seven years ago, and the first two years were spent preparing a patent application and then actually getting it," says Drevdal. It took another three years to establish the project, which included financing through the Norwegian petroleum research fund PETROMAKS, as well as additional oil company funding.

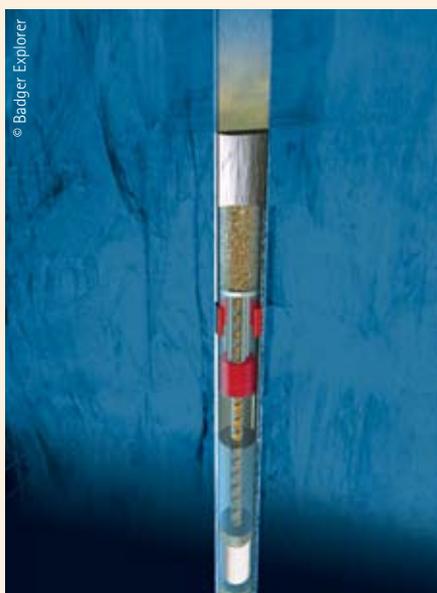
"Now, during what we call the pre-project phase, the activity level has increased exponentially, and early this year the company was included on the Norwegian OTC list, meaning that you and I can buy shares in the company," says Drevdal. During this "financing phase" the design and testing of full-scale modules have been completed, and several successful further tests have been done, including transporting, depositing and compressing drill cuttings.

"We are soon entering the commercialisation phase, meaning that we will conduct full scale prototype testing both onshore and offshore and, hopefully, we will be operating the first commercial Badger Explorer in about two years time," says Drevdal.

"Successful implementation of this technology will result in a dramatic cost reduction compared to today's drilling methods," claims Drevdal. His motto is 'The deeper the water, the better', as "the cost of using Badger Explorer is estimated to be a



Badger Explorer, about 30m long with a diameter of 15cm, is transported to the drilling location by boat and then lowered on wire to the sea floor and put in a start position assisted by ROV and a guide frame.



Drill cuttings will be transported from the drill bit and up through the tool while a hydraulic piston compresses the cuttings and forces them up and out to the borehole wall. The drilled hole above the tool is permanently plugged and sealed with cuttings during the drilling operations. Information about the formations and the fluids are logged continuously and the information is transmitted through the cable to the sea floor and then further to a buoy at the surface. Finally, the signal goes by satellite to onshore operation offices.

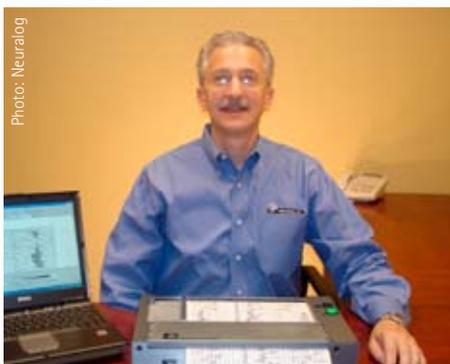


Test holes made by Badger Explorer. There is no need for drilling mud or casing.

third today's traditional methods in moderate water depths (150-1000m), while in deeper water (above 1000m) drilling costs that are a tenth of today's method may be achieved".

Whilst the management will be pleased about saving money, the geologists will be a little disappointed, as they will have neither cuttings nor cores to work with.

New Portable Log Scanner



Javan Meinwald, Vice President of Sales at Neuralog Inc., with NeuraScanner II.

NeuraScanner II will aid in preserving the oil and gas industry's huge paper-based knowledge stores, being able to rapidly and accurately scan paper logs, maps, core photos and reports.

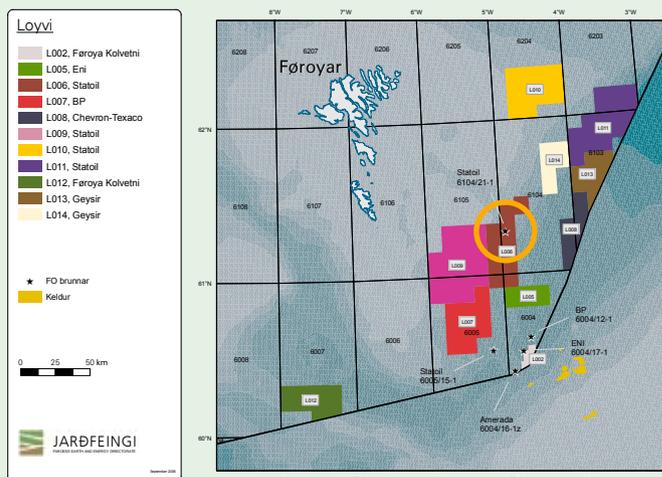
"With the need to preserve data for the future, Neuralog, has upgraded the NeuraScanner that was first introduced in 1999. The new NeuraScanner II has improved image quality, speed, reliability, and portability," explains Javan Meinwald Vice President of Sales at Neuralog.

"The exploration and production industry has huge paper-based knowledge stores in danger of being lost as fragile logs and other documents degrade. The NeuraScanner is the industry's only purpose built log scanner and enables the user to preserve logs, maps, core photos, reports and other data commonly found in the

E&P environment wherever it exists. Millions of logs have been scanned with the original NeuraScanner. Millions more remain, and for this reason Neuralog Inc. invested in technical innovations for NeuraScanner II," says Meinwald.

The new scanner has been a big hit. Don Kotowych, Director Data Acquisition Services at A2D Technologies, a TGS-NOPEC Company, which has the world's largest log image library says: "Neuralog makes a really unique scanner, and when we have projects here in the USA and half way around the world it is the main scanner we consider. We deploy our teams with laptops and NeuraScanners to get the job done in Nigeria, throughout Canada, Russia and elsewhere. We are impressed with the new NeuraScanner IIs which are substantially faster and make better quality images day in and day out."

Traces of Gas



Map of licenses granted on the Faroese Continental Shelf. Licenses 001 to 007 were awarded in the 1st licensing round in August 2000, while licenses 008 to 014 were awarded in the 2nd licensing round in January 2005. In the autumn of 2005 an agreement was reached between the license holders of licenses 001, 003 and 004 and the petroleum authorities on a transfer of wells to licenses 006 and 007. Licenses 003 and 004 were at the same time relinquished. Source: www.jf.no

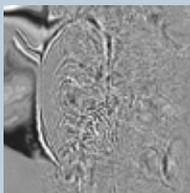
The last well drilled offshore the Faroe Islands, and the first sub-basalt well, did not find commercial quantities of hydrocarbons. The well 6104/21-1 in Licence 006 operated by Statoil did, however, encounter traces of gas. Dong Energy, Anadarko, Shell, Amerada Hess, BG group, Faroe Petroleum and Atlantic Petroleum are partners in the license.

The Faroe Islands Exploration

Conference 2006 was held in September with more than 160 attendees. It was opened by Minister of Trade and Industry, Bjarni Djurholm, who said there is an increased exploration interest in the Faroese area. He also said preparations for the third Faroese licensing round are now under way, and that it will probably be announced in the autumn of 2007 as scheduled.



Thorshavn, the capital of the Faroe Islands.

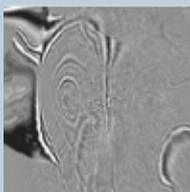


ERRATA

The Sub-Salt Imaging Challenge

The figure caption on page 28 in GEO ExPro No 4/5, 2006 should read as follows:

"Comparison of Narrow and Wide Azimuth seismic depth slice from BP Gulf of Mexico model data (Taken from: Farnsworth, OTC, May 2005)." We apologize for this mistake.



Meeting challenges head on



Mountain flying in British Columbia for multi-client partner JEBCO Seismic.

As oil companies are facing increasing pressure to replace reserves while reducing exploration risk, the demand for geophysical solutions is running at an all time high. Service companies around the world have bursting order books and a backlog of work orders; one company experiencing this surge in demand is privately owned ARKeX Limited.

ARKeX, which is based in Cambridge, UK, uses its advanced airborne gravity gradient imaging technology to provide detailed exploration information enabling new levels of depth and understanding in geologic interpretation. The company flies a Lockheed Martin-developed full tensor gravity gradiometer system (FTGeX) and uses specialist software tools developed in-house to assist in the interpretation of

gravity gradient data.

Gravity gradient imaging is a non-invasive airborne imaging solution that is ideally suited for obtaining detailed geological information cost-effectively with minimal environmental impact. It enables companies to efficiently screen large areas, not only accelerating the decision-making regarding where to concentrate seismic surveys, but also supplementing other geophysical data. In particular gravity gradient imaging is ideally suited to work in combination with seismic surveys to form an integrated subsurface picture.

Applications for gravity gradient imaging include prospect evaluation determining detailed structures (faults, edges, depths), identifying structure beneath 'fuzzy seismic', field development and delineating

salt morphology. In addition, it can be used for direct gas and commodities (diamonds, copper, zinc, gold, nickel, iron) detection, and oil/water contacts (4D effects).

Traditional land seismic surveys have significant cost, timing and environmental considerations, whereas airborne surveys provide a rapid imaging solution of limited environmental impact, expense, and logistical considerations. Even where land seismic surveys have been performed, integration of ARKeX data with existing 2D or 3D seismic data provides improved geological understanding, especially in areas where the geology inhibits clear seismic imaging.

The ARKeX technological solution incorporates gravity gradiometry, magnetic gradiometry and digital terrain mapping (LIDAR). Integrating data from these components results in a valuable exploration dataset that provides regional overview through to prospect evaluation.

Earlier this year, ARKeX commissioned a study of senior exploration and production professionals which revealed some interesting points: industry awareness of the value of gravity gradiometry is increasing and the technology is now considered a significant alternative to other imaging techniques especially in regions where access is difficult. In some situations, the study revealed that exploration companies believe airborne gravity gradiometry (AGG) to be suitable for screening a greater area of terrain more effectively than seismic data, and for a lower cost; in other environments the industry considers AGG to be a technology that complements seismic data. This all adds up to a shorter exploration to production time cycle and an increase in the probability of success.