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ASIAN OIL & GAS

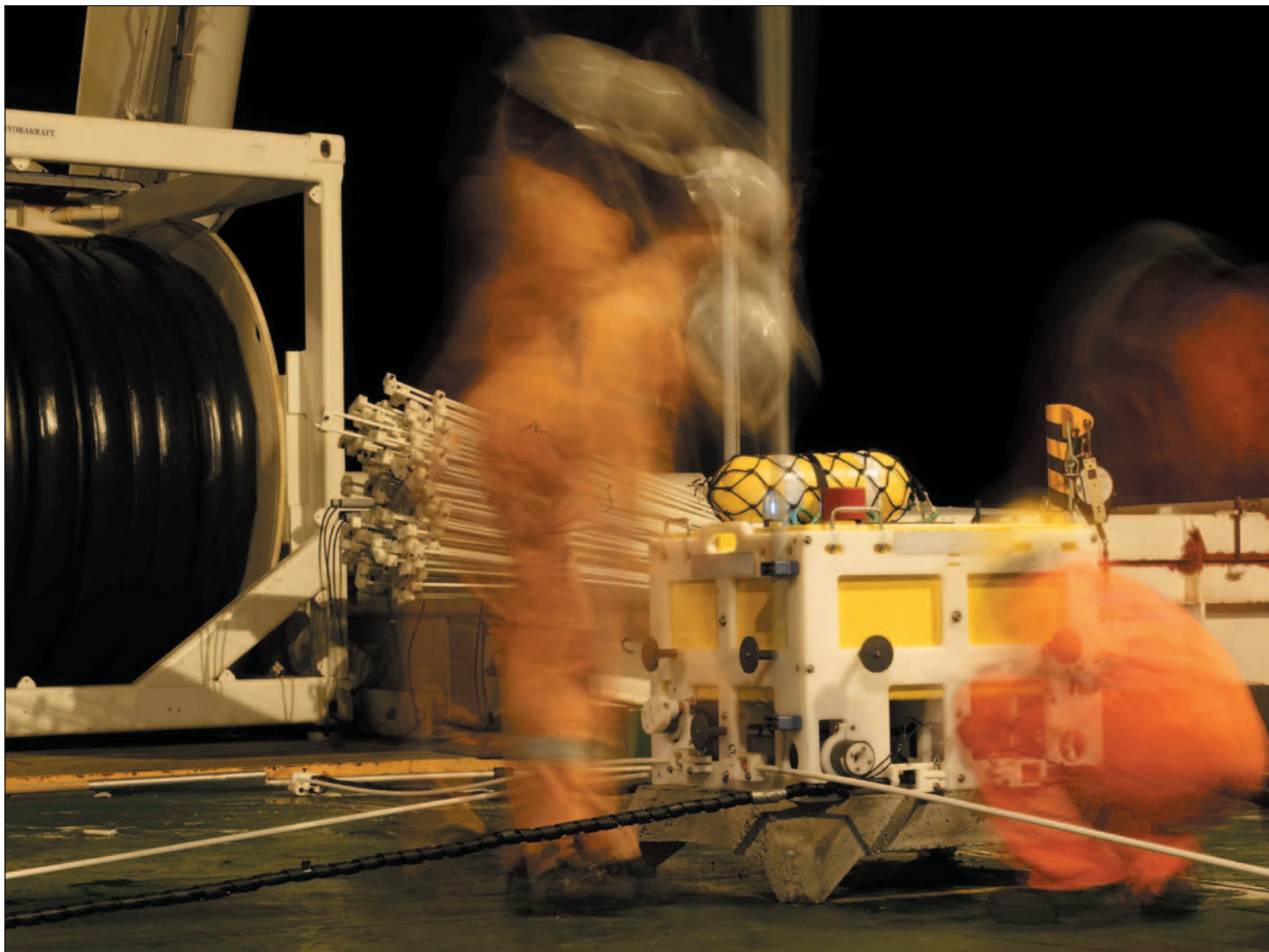
Indonesia illuminates
frontier basins

Gorgon lands local
green verdict

Shipyards think small
for FPSO connection



Seabed surveyors
break new ground



Riding the upward cycle

The seismic business knows all about the recovery process, making the venue choice for the Society of Exploration Geologists' recent annual meeting all the more appropriate. **Andrew McBarnet** reports from New Orleans.

A random sample of SEG visitor observations suggests that most felt staging the Society's flagship event in New Orleans was a very positive statement, the only negatives were reserved for the federal government's level of support in assisting the city's recovery.

The analogy may be a bit of a stretch, but the seismic business knows all about the recovery process after its near collapse five or six years ago and its troubles in the late 1980s, for those with

long memories. It's all about momentum and critical mass. In the case of New Orleans this is still observably a work in progress, but the expectation must be that it will suddenly come alive again, even if changed somewhat in character.

Now riding the upward cycle, seismic business is definitely back, but with some significant changes. For example, who would have thought that wide azimuth seismic surveys and controlled source electromagnetic (CSEM) would be the standing room only sessions at the SEG?

The wide azimuth craze raises some interesting questions about the future direction of marine seismic operations. The major contractors have all rushed to embrace the technique, because it provides an opportunity for some 'added value' just when the 3D seismic survey is increasingly falling into the commodity category. Results shared at the SEG and elsewhere have shown fairly convincingly that wide azimuth shooting is able to improve the imaging of complex subsalt geological structures. Although the

Night vision: emgs engineers preparing new generation electromagnetic receiver for deployment on the Atlantic Guardian, offshore Borneo.



immediate target has been the Gulf of Mexico subsalt, the assumption is that certain areas of the North Sea, West of Shetland, for example, West Africa, Southeast Asia, and the like, will be candidates for the wide azimuth survey treatment.

Hidden treasures

A little discussed benefit of wide azimuth which helps to explain its attraction for oil companies is that the technology opens up a channel for them to put their

current abundance of cash thanks to a prolonged period of stratospheric oil prices. It's often remarked these days that the old business model has changed and that international oil companies no longer have a lock on any acreage which becomes available. Something like two-thirds of the world's future oil and gas reserves are said to be controlled by national oil companies (NOCs), and the competition in licensing rounds around the world is fierce with the aforementioned NOCs muscling in on the scene just to make it that bit tougher.

In this context, the wide azimuth survey is something of a blessing for current oil company stakeholders who can review some of their existing properties in the new light offered by the technology and, who knows, may be rewarded with the discovery of some hidden treasures. There are of course no guarantees, and it was clear at the SEG meeting that optimum acquisition and processing for azimuth surveys is still being evolved. Even so, it looks as though plenty of companies are considering giving it a shot.

Emphasis on wide azimuth had some people at SEG wondering about the implications for multi-component surveys which rely on ocean bottom receivers in order to record both p (pressure) and s (shear) waves. Proponents of multi-component surveys argue that the ocean bottom survey instrumentation, whether in the form of cables or nodes, enables the acquisition of the s waves which are regarded as invaluable in the imaging of complex geologies such as subsalt environments. The objection to seabed techniques has always revolved around 'bang for your buck' and the challenging data processing issues that have not been satisfactorily resolved. Now it seems that wide azimuth may offer a cost effective, towed streamer option for imaging some of these previously problematic prospects.

The current frenzy in the marine seismic survey market has helped to sideline the OBC business. No one has got time for it, so it just isn't on the agenda of most contractors as they rush to meet the less demanding requirements of the conventional towed streamer business. Even before wide azimuth burst onto the scene, oil companies were being persuaded that the improved subsurface imaging possible from the more sophisticated high resolution technology, such as WesternGeco's Q-Marine, PGS's 3DHD, and CGG's Eye-D presented an

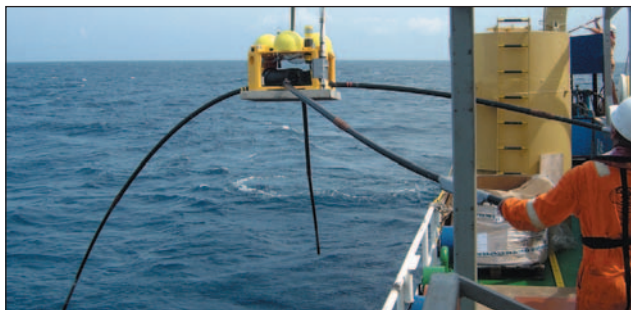
acceptable, cost effective alternative to OBC surveys.

It would be wrong to say that the major contractors, to whom oil companies look for 'the next best thing', have given up altogether on the multi-component option. It's true that Petroleum Geo-Services (PGS), one of the few OBC survey operators, last year opted to re-assign the relevant resources of its two OBC crews into towed streamer operations because these were perceived to be more lucrative. However, it did advise that it might revisit OBC in the future, so it wasn't that much of a surprise to find that the company had on display at SEG an example of its fibre optic cable R&D. In a nutshell, the company believes that an optical 4C (multi-component) seafloor cable could be the preferred solution for permanently installed reservoir monitoring systems of the future. It says that 'the dense wavelength division multiplexing technology offers significant flexibility in terms of large dynamic range, the use of a very small number of optical fibres to record from several thousand channels, no in-sea electronics, light weight, reduced cost per channel, improved safety, and great reliability and durability.'

UK company QinetiQ, with an oil industry consortium, has also been researching the fibre optic route to eliminate the use of electronics at the 'wet end' of seismic recording, so ocean bed seismic solutions are still being ruminated.

Paradoxically RXT (Reservoir Exploration Technology) had what might have seemed to some as a perversely large booth at SEG. It was certainly effective in flagging the fact that the company is very much in the OBC multi-component survey business, and plans to be listed on the Oslo stock exchange before the end of the year. At the show the company announced a \$30-35 million multi-component seismic acquisition contract for a new crew, its third, on the Kashagan field, offshore Kazakhstan, operated by Agip on behalf of a group of seven companies. The complex operation will involve three shallow draft vessels to operate in water depths of 3-4m. RXT has indicated that the crew will become a permanent fixture in the Caspian Sea implying some pent-up demand for the imaging made possible by OBC surveying.

The evolution of RXT from a start-up company just a few years ago appears to confirm that OBC technology belongs for



Recording equipment being loaded during a controlled source electromagnetic survey by OHM, which is maintaining a business as usual approach to patent infringement claims.

the time-being with a niche player prepared to focus on the specific acquisition and processing challenges in order to render a cost effective service. RXT has worked closely with Input/Output on the development of its VectorSeis Ocean acquisition equipment and has also been able to reduce OBC from a multi-vessel to a single vessel operation. Last July the company ordered a custom-built 'single vessel' unit for delivery in April 2008.

Alliance agreement

At SEG the observant may have spotted Mike Scott, founder and CEO of RXT, in discussion with another ex-PGS luminary Diz Mackewn, who has started his own technology oriented company EnOvation Resources to facilitate the development of resources in mature provinces such as the North Sea and the Gulf of Mexico. Lo and behold, days after the SEG, the two companies announced an alliance agreement. RXT will provide EnOvation multi-component acquisition services worth a minimum of \$11 million over 27 months. The first combined project got under way recently and involved a \$2 million survey in the High Island area of the Gulf of Mexico where one of RXT's three crews is located.

The decline in interest in OBC, RXT being the exception that proves the rule, has also muted some of the previous excitement which hailed 4D seismic as the next revolution in the industry. The widely predicted evolution of OBC and 4D seismic into life of field seismic developments has spawned less than a handful of projects worldwide. It is true that a number of the larger oil companies often make sure that the parameters of early 3D seismic surveys over new prospects can be used for comparison with subsequent time-lapse acquisition as a means of monitoring reservoir performance. But this is by no means common practice and to date has only found real favour on the northwest European continental shelf and a few

other locations around the world.

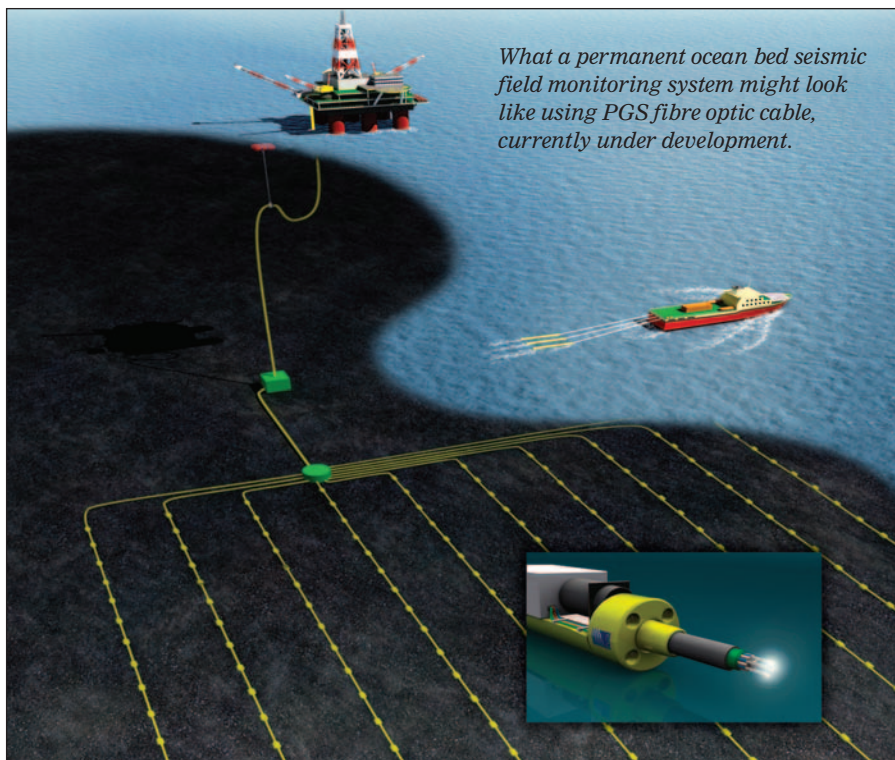
Outside the research departments of the main contractors, there are just a few companies like 4th Wave Imaging in the US and the newly formed Reservoir Imaging (RIL) in the UK who can advise companies on how to optimize a 4D survey. At SEG 4th Wave Imaging said it would in future be working with Fugro's seismic imaging group to provide advanced data processing services, thereby filling a gap in the company's expertise and enabling it to support clients through more of the 4D seismic project workflow.

4D seismic to some extent may be a victim of the lack of in-house expertise in many oil companies today. Basically there's no one who can sell 4D to the management and carry the project through. This doesn't seem to be the case with marine controlled source electromagnetic (CSEM) survey

technology for the direct detection of hydrocarbons – if the crowded sessions on the topic at SEG are any indicator. Excitement about CSEM has been matched by the speed of adoption, by improvements in the technique since it was introduced two or three years ago, and by the festering animosity over patent rights between Norway's Electromagnetic Geoservices (emgs) and the UK's Offshore Hydrocarbons Mapping.

If it's all in the timing, then emgs chose its moment by announcing halfway through the SEG event that it was suing OHM in London's High Court for alleged patent infringement. In its only public comment, OHM expressed confidence that no infringement had occurred and that the claim would have no impact on its business. Aficionados of this saga will recall that the University of Southampton, founder of OHM, withdrew its appeal against the July 2005 judgement by the UK Patent Office in favour of Statoil, with regard to the CSEM technique called Seabed Logging now being used by emgs, itself a spin-off from Statoil. Best guess is that it could be another year before any further judgement is made.

At SEG emgs was talking about one of a number of applications the company is mulling to broaden the scope of CSEM as an exploration tool. Based on its



What a permanent ocean bed seismic field monitoring system might look like using PGS fibre optic cable, currently under development.

Stop exploring. Start finding.

The last 20 years have seen huge advances in exploration technology.
But success rates continue to decline.

A hit-and-miss affair

Traditional exploration workflows rely on indirect evidence to find locations where hydrocarbons can exist. Formation resistivity is the industry's preferred direct hydrocarbon indicator. Seabed logging improves the exploration workflow by measuring subsurface resistivity from the ocean floor.

The new standard

emgs' seabed logging can show you where hydrocarbons do exist. Seabed logging is reinventing how the industry finds hydrocarbons, and is enabling new exploration strategies such as scanning frontier and mature regions for new leads.

These strategies are delivering prospects earlier than traditional methods. And operators continue to use seabed logging to rank prospects before they commit further resources.

It's hardly surprising then, that over 35 leading operators worldwide are using seabed logging to evaluate existing prospects – and to find new ones.



Seabed logging

Winner of *Hart's E&P* 2006
Special Meritorious Award
for Engineering Innovation

Finding hydrocarbons™

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the seabed logging company