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November / December 2008 Issue 15

Shell - pushing the frontiers of technology

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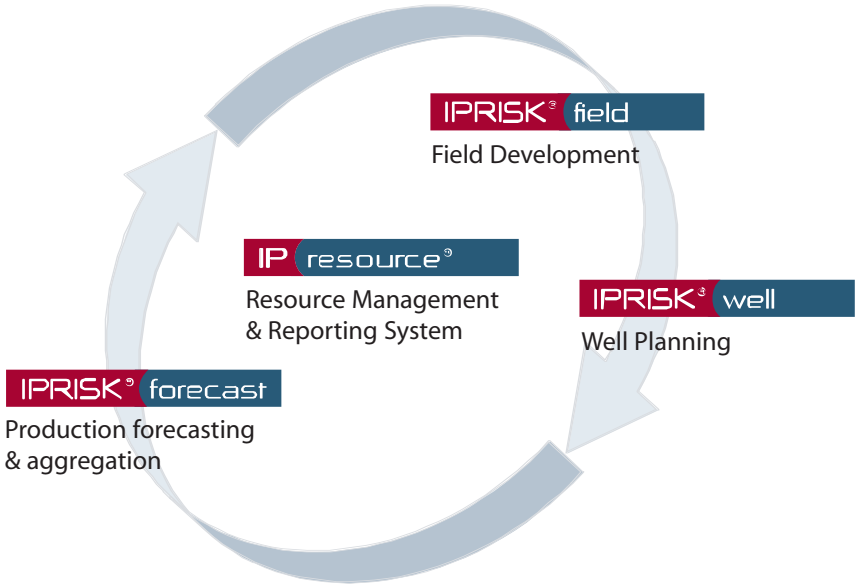

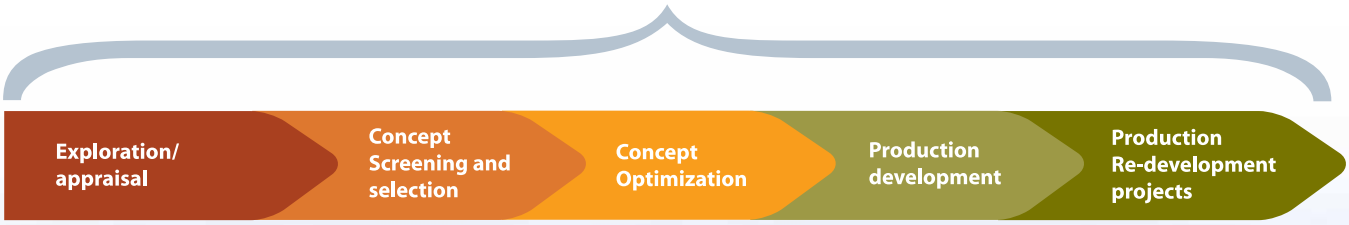

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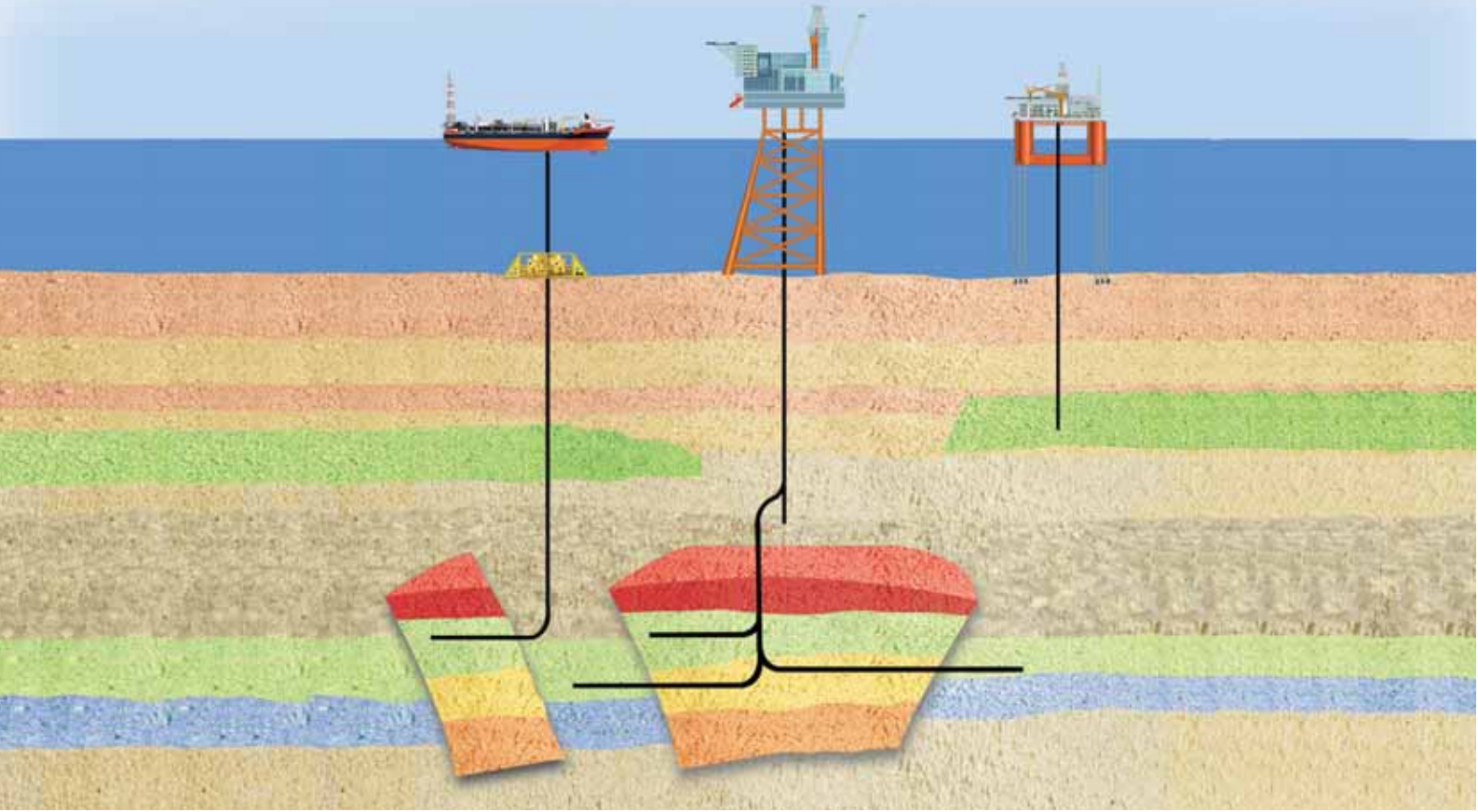

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Front cover: Shell's 250 ton outdoor drill rig, used to test well construction techniques, new drilling techniques and smart well technologies in field conditions, as well as for training staff on new technologies. (see page 6).

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Contents

Shell - at the forefront of technology

Washing oil out of rock with soap (surfactants), drilling wells the same diameter from surface to total depth, and getting light fractions of heavy oil to the surface and leaving the rest behind – these are just some of the technologies under development at Shell's research and development labs in Rijswijk, Netherlands. We spoke to *Jan van der Eijk*, group chief technology officer of Shell, and *Matthias Bichsel*, EVP, Development and Technology, to find out more.

Shell's research lab in Rijswijk, Netherlands, was where the polycrystalline diamond compact (PDC) drillbit was developed, along with swellable elastomer seals and the first expandable tubulars – both technologies are now used in oilfields all over the world.

Shell has long taken a lead in technology development – part of the company was originally founded after it built the first dedicated oil tanker in 1892, and was the first to do 2D and 3D seismic, and the first to transport LNG.

So it's not surprising that there are plenty of new exciting technologies underway. And in today's energy era, technology is becoming more and more important.

Shell proudly quotes figures from the UK's Financial Times, saying that the company spends more on research and development than other oil majors - $1.2bn last year, compared to $0.9bn at Petrobras, the number two; $0.8bn at ExxonMobil and Total; $0.75bn at Schlumberger; and $0.47bn at BP.

Chevron, StatoilHydro, ENI and ConocoPhillips spent less, according to the data. The $1.2bn spent on research and development doesn't include all the investment in demonstration projects or funding in some commercial energy projects such as wind

As well as gradually building its in-house research capability, Shell is working more and more with other organisations, such as start-up companies, engineering companies and universities, to develop new technologies.

Important areas of oil and gas research include finding ways to treat contaminated gas, managing heavy oil, improving drilling, enhanced oil recovery and improving smart fields.

In recent years Shell has dramatically increased its efforts in experimental R&D. This research is expensive, but a cheap way to de-risk new technologies before testing them in field trial, says Axel Makurat, research and development manager for rock and fluid physics at Shell.

This includes executing many experiments at temperatures and pressures similar to the conditions we find in the reservoirs. This is a serious challenge but makes the results much more useful.

A good example are the experiments were we expose rock and fluid samples to high pressure and high temperature steam to simulate the conditions when exploiting a heavy oil reservoir through steam injection. This allows us for example to study the effect the steam has on rock porosity and fluid mobility.

Jan van der Eijk, chief technology officer of Shell, distils the most influential developments happening in science today to 'bio, info, and nano' – and by 'info', he means improved connectivity and high performance computing.

In exploration and production, one of the biggest areas is improving oil recovery, he says - from the current average of 30-40 per cent to 60 per cent and above.

On the gas side, Shell wants to do more to provide gas services directly to consumers – so it offers the full chain, from field to the house.

"We want to create a value stream, instead of just developing a reservoir," says Matthias Bichsel, EVP, production development and technology. "Not many companies can offer that."

Shell sees its expertise and ownership of technology as an important differentiator, and it wants to leverage what it calls the 'technology plays' – oil and gas fields which can only be accessed with advanced technology. "All our development has a strong technology component," says Dr Bichsel.

"Shell's strategy is to grow by differentiation, which we seek mainly in technology," says Dr van der Eijk. "We want to have something to offer that no-one else can offer. Technology is more than research and development – it's about applying technology in the field. We do many demonstration projects – close to full scale operation."

Shell sees technology as the way forward, to maintain its production levels. "Today we have 66 bn boe resources – but we will need technology to access it," says Dr Bichsel.

Why oil companies?

In today's era of many of the world's oil reserves being owned by state national oil companies rather than international oil com-

Biographies

Dr Matthias Bichsel

Matthias Bichsel, executive vice president, development and technology

is executive vice president, development and technology with Shell. He is responsible for delivering reserves and production from new upstream projects, and providing technology applications and research through Shell's upstream technology organisation. He has a Phd in earth sciences from the University of Basel, Switzerland, and worked for Shell on exploration in Bangladesh, Oman, Canada, Indonesia and the Netherlands, also taking a role as managing director for Shell Deepwater Services in Houston in 1999, and executive vice president exploration from 2002 to 2006.

Dr Jan van der Eijk

Jan van der Eijk, Shell Group chief technology officer

was appointed Shell Group chief technology officer in May 2006. He was previously vice president customer services and intermediates for Shell Chemicals since 2005, and executive vice president technology in Shell Chemicals since November 2003. He has a doctorate in physical organic chemistry from the University of Utrecht and leads Shell's team of Chief Scientists.

panies, there have been questions asked about what role international oil companies will play.

If all they do is provide technology rather than owning assets, they start to look similar in role to the oil service companies (such as Schlumberger and Halliburton).

But there is a big fundamental difference in how an oil major such as Shell operates and how an oil service company operates, asserts Dr Bichsel.

Oil service companies generally sell their services by the hour, or for fixed fees, leaving all the risk with the asset owner; whilst an oil company will take on part or the whole of the risk of producing a field, in return for a share of the profits with the asset owner.

In an era where there is a lot of talk about the advantages of small independent oil companies over the majors, Shell is keen to emphasise the benefits it gets from its enormous scale.

For example, it claims to have saved $500m from the long term deals it made to charter deepwater rigs, services and helicopters – between 2005 and 2008, daily rates for rigs (including services and helicopters) have risen from $300,000 – $350,000 a day to $1.2m to $1.5m. "You can't do that as a small company," Dr Bichsel says.

Working with start-ups

In order to develop technology as fast as it wants to, Shell is working more with start-up companies and universities.

"We are talking a little bit about culture change – we are growing in our capability to work more effectively with external parties," says Mr van der Eijk.

The Society of Petroleum Engineers has identified 150 areas of research and development in the oil and gas industry, Dr Bichsel notes. "Clearly a single company can't do all that."

"We take a lot of technology provided by others and integrate it into our products and create capabilities around that," he says.

There is also the challenge of how Shell should protect its technology, particularly if it has been developed by a start-up company, even one founded by Shell.

When working with other organisations, "you have to be clear about what you want to get out of it," says Mr van der Eijk. "We are very clear about our strategic intent."

"When we work with these entities, we have to work out, do we want to protect the knowledge, or leave it with the other company and get a license, or have it in the public domain?"

Shell has a 250 ton outdoor drill rig, used to test well construction techniques, new drilling techniques and smart well technologies in field conditions, as well as for training staff on new technologies.

Research volume

With 25,000 patents, Shell is the second largest patent holder in the oil and gas industry after ExxonMobil, says Dr van der Eijk.

The company has 30,000 technical staff altogether, of which 10 per cent are working in research and development.

It has 350 research and development staff in Rijswijk, Netherlands. It also has a research centre in India with 600 people, which it wants to increase to 1,000. "We recruited 500 PhDs across the Shell Group in the last two years," says Dr van der Eijk.

Dr van der Eijk said that the oil companies are sometimes criticised for not spending as big a percentage of overall sales on research as other companies do, such as pharmaceuticals – but it is not a like-for-like comparison.

Shell spends a great deal of money developing and building its oil and gas facilities, which should also count as product development, equivalent to 'research' at pharmaceutical companies. "Our total involvement in technology development is enormous," he says.

Seismic processing

Shell believes there is a lot of potential to do more with seismic data. The benefits from seismic data are limited by the amount of computer power available to process it, Dr Bichsel believes. "But that's increasing every year."

Salt bodies and basalt layers have proved a big obstacle to seismic data processing until now, because they distort the waves so much it is hard to get anything useful out of them, but this can be overcome with more computing power and better algorithms, Dr Bichsel says.

The company believes that its seismic data processing competence is one of its competitive advantages, and something it is better at than many independent seismic data processing companies.

"Shell has been processing seismic data since the 1950s," says Dr Bichsel. "That's an area we have nurtured. We get people who are good at doing the work."

"It's not so easy to replicate by a small bunch of mathematicians in a small company," adds Jan van der Eijk, chief technology officer of Shell.

Shell is also a leading company in other types of data processing, such as electromagnetic (which analyses how much the ground impedes an electromagnetic field, possibly indicating the presence of oil and gas).

"Shell performed the industry's first dense 3D CSEM (Controlled Source ElectroMagnetic) survey in 2006 in Malaysia," says Dr Bichsel.

Shell can do a computer model of what the electromagnetic response would be if hydrocarbons were present in certain locations, then compare that to the actual response. If they are similar, "it gives you a high degree of confidence," he says.

It is also a leader in finding ways to combine electromagnetic and seismic surveys.

Drilling

A lot of research and development is going into reducing the cost and improving the effectiveness of drilling.

At its laboratories, Shell has a 50 tonne indoor drill rig, which was used to develop the Polycrystalline Diamond Compact (PDC) drillbits, now standard in the industry. It is used to test and develop new drilling tools and techniques.

It also has a 250 ton outdoor drill rig, installed in April 2008, with a 350m deep hole beneath it. The rig has the same capabilities as a normal drilling rig, but with added flexibility, precision and data acquisition to turn it into a very capable facility for experimental research. It can be used to test well construction techniques, new drilling techniques and smart well technologies in field conditions, as well as for training staff on new technologies.

By testing new technologies on a full scale before sending them out to the field, it gets around the problem of no field asset manager wanting to be the first to try something out.

Shell is currently building two drill ships, together with Frontier Drilling, which are 188m long, instead of a 250m long Enterprise class drill ship that offers similar features, which reduce the day rates by up to 20 per cent. They are called "Bully Rigs." The vessels can drill in 3,500m depths of water, and through up to 20m thick ice. They can be used anywhere Shell operates, from deepwater to the Antarctic.

Doing drilling with carefully managed pressure in the mud (known as 'managed pressure drilling' or 'underbalanced drilling') is proving very successful.

It reduces the problem of drilling fluids going out of the wellbore into the rock formation, which can damage it and make it harder for oil and gas to get into the well bore.

In its gas wells drilled using underbalanced drilling to date, the ultimate production was between 2.5 and 4 times greater than it expected. Shell has also drilled more underbalanced drills than any other oil company, it believes.

An interesting development is "monotowers', scaled down, unmanned, offshore platforms, powered by wind and solar energy.

The idea was inspired in part by offshore windmills, Dr Bichsel said. "They are like a windmill with basic gas processing equipment on it."

The monotowers should make it viable to develop smaller pockets of oil and gas in the North Sea.

Shell already has 6 installed and one more under construction.

Shell is working out ways to drill more efficiently. In Salym, Russia, Shell has drilled a 2,600m well in just 6.3 days, which would have taken 34 days using previous methods, by reducing superfluous steps. It has also completed a well in just 5.1 days.

Dr Bichsel compares speeding up drilling to how racing car teams find ways to speed up the time to change a car wheel, by minimising all the movements which need to be made and co-ordinating everybody. It takes them 10 seconds. "It takes me half an hour with a lot of shouting and swearing," he says.

"That's not a technology but a capability. It's about developing the most efficient way of working," he says.

Shell's core library

Expandables

An exciting area of research is in expandable tubulars. Expandable tubulars can be put into the well and then expanded (stretched) to a greater diameter once in the well, by pushing a cone shaped device through it. It requires steel which is soft enough to be stretched, but strong enough or the demands of the well.

A conventional well looks like a telescope, with a number of stages of decreasing diameter casing. This is because it is only possible to drill a hole to a certain depth without casing (metal around the wall made up of steel tubes) before the hole will cave in or control of the fluids present in the rocks is jeopardised – so the conventional practise is to drill as far as you think you can safely go, remove the drill bit, install casing, then drill again a smaller diameter hole through the bottom of the first one, and so on.

But if you have an expandable tubular, you don't need a telescope of decreasing diameter casing – because you can fit each stage of casing through the casing above and then expand it to the same diameter as the casing above.

This is very exciting because it potentially means that a well with a final diameter of say 8 inches can be drilled from the surface with an 8 inch diameter hole, leading to enormous savings on drilling costs and environmental impact, and also making dry holes less expensive. You can also drill very low diameter and low cost experimental wells to see what you can find, before drilling a full size well.

This technology is being used for some applications already, says Jochen Marwede, research and development manager for well engineering, but more development is needed before a whole well can be made with expandable tubing.

Much of it comes down to experiment-

Swellable elastomer seals were invented in Shell's research lab in Rijswijk

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ing with tubing with slightly different make-ups of the steel and variations of the cones used in the expansion process.

Smart fields

Shell is very keen on smart / instrumented wells, because every time it has used the technology so far, it has managed to increase oil recovery by 5-15 per cent, and reduce the production of water, which is expensive to handle. Shell believes it has more instrumented wells than any other oil company. "Every new field we are installing is a smart field," says Dr Bichsel.

"We are putting sensors in the wellbore to continuously measure temperature and pressure – and send the data to remote operating centres where people analyse the data, and send instructions back, " he says.

"Every so often you take measurements and model your reservoir to optimise over time. We want to do it continuously instead of e.g. every 6 months."

"We combine that with snake wells – you can compartmentalise the reservoirs – and that is what we call a smart field.

The company researching for ways to reduce the cost of the instrumentation and controls, doing more with the data from fibre optic cables in wells.

It is also improving information management, so that operators just get alerts when things are going wrong, rather than being faced with a continuous stream of data. "We're running data driven models that crunch real-time data all the time, flagging unusual measurements to the operators" says Jochen Marwede, R&D manager well engineering.

Improving recovery

Improving recovery is very important to Shell. "The average recovery in an oil field is 35 per cent – 65 per cent stays in the ground," says Dr Bichsel.

"[Getting more of the 65 per cent] should be an easy resource – but it's technically challenging."

Various ways have been developed to improve recovery, including adding heat (to make oil flow better), using water, carbon dioxide or other gas to push the oil out, or use surfactants to loosen the oil from the rock. "These are very complex processes, he says. "But these developments make sense with the high oil price."

Shell currently has 11 enhanced oil recovery projects in operation or under construction, and a further 20 projects or studies on the way.

On the South Belridge Field, California, Shell (as part of a joint venture company) has been injecting steam to improve oil recovery since 1997, leading to recovery of up to 80 per cent in some parts of the field. However this can't be done in all fields, Dr Bichsel notes.

An 80 to 90 per cent recovery for heavy oil "seems feasilble on a lab scale," says Axel Makurat, research and development manager for rock and fluid physics at Shell (right).

Enhanced Oil Recovery is often considered 'tertiary' oil recovery – with 'primary' being what comes out of the field by itself due to reservoir pressure (up to 20 per cent recovery) secondary being what comes out from water or steam flooding (30-40 per cent recovery).

Shell is aiming to improve its understanding in many areas, including its understanding of how fluids flow through rock, developing better ways of using steam and water to push oil out of rock, developing ways to loosen oil from the rock, and developing ways of recovering chemicals afterwards.

Shell aims at finding ways to achieve an 80-90 per cent recovery rate for heavy oil. "It seems feasible on a lab scale," says Dr Makurat. "and now needs to be transferred to the field scale. You have to play with well spacing, injection cycles and things like this."

To analyse how fluids flow through the rock under high temperature and pressure, Shell utilizes several CT scanning machines, similar to those used by hospitals. Shell's scientists use also special high resolution scanners to scan rock samples and develop computer images of the pore space. Then fluid flow through this pore space can be modelled with the computer

"These technologies allow us to look inside the rock and see how fluids flow inside the rock," says Dr Makurat.

This way, Shell can limit the need for very expansive core samples from the reservoir to do its analysis; it can do just as much with a drill cutting, which is much easier and less expensive to obtain.

"Then we can simulate the simultaneous flow of water and oil through the reservoir rock. It's called pore network modelling," says Dr Makurat.

The chemicals research is going in two directions – developing polymers which can help push fluid through the rock more evenly, and developing surfactants which can wash the oil out of the rock (like washing oil out of your jeans).

A problem with water flooding is that the water tends to push through the rock in narrow fingers, rather than as an even barrier, and that reduces its effectiveness at pushing the oil out.

Shell is experimenting with a polymer substance which is very good at absorbing (holding) water – it is the same substance which is used in baby nappies. The polymer makes the water thicker (more viscous) so it does not finger so much.

Shell adds in the range of 1g of polymer to 1 litre of water used in waterflood, and the result is that the water pushes oil out much more powerfully – with a solid wall – rather than fingering into the oil, which is not so much use.

On the surfactants side, Shell is working with chemicals which can wash the oil out of rock.

In exactly the same way as household soap, they reduce the surface tension between water and the oil, so the oil starts mixing with the water and it can wash it out.

Shell is working out ways how it can

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recover the chemicals from the produced oil and use them again.

"We're looking at ways to separate and recycle the surfactant at the well head," says Dr Makurat.

The cost of the surfactants works out at about $20 per barrel of oil produced, which is feasible in today's high oil price world – and it helps of course that Shell Chemicals is the biggest supplier of surfactants in the world.

In situ upgrading process

Shell is developing technology to use electric heaters in heavy oil fields, so that at high temperature heavy oil is converted in the reservoir to useful lighter oil fractions which can easily produced to the surface. Coke and impurities stay in the ground. This technology is "proprietary to Shell", Dr van der Eijk says.

The field is drilled with a number of closely spaced horizontal wells, with some used to insert heaters, others used for production and monitoring. As much as 50 per cent of the oil can be recovered with this method.

It is a similar (but much simpler) system to what happens in an oil refinery, when oil is boiled to separate the light oil fractions from the heavy ones.

This is a more environmentally friendly way of extracting heavy oil than the conventional way, digging it up and extracting oil out of it, Shell believes, in particular because it does not use any water.

Shell calls the process 'In Situ Upgrading Process'. It has been running a pilot at Peace River, Alberta, since 2004, with more than 170,000 barrels of light oil produced to date.

This technology only works if there is a substantial layer of earth between the oil sands and the ground, which can keep the heat in; if the oil sands are close to ground level, the heat will just leak out of the surface.

Because of oil reserves such as this, which can be accessed with new technology, Dr Bichsel does not believe that we will see a peak in oil production any time soon. "There is more heavy oil in Canada than conventional oil in Saudi Arabia. That is why I believe we're some way away from the worries of the peakists," he says.

Right now, reckons Jan van der Eijk, chief technology officer of Shell, the heavy sands operations in Alberta have probably reached the limit that the region can stand. But maybe over time the local infrastructure will be developed, so it can support bigger oil and gas operations, but it is hard to predict how long that will take.

CO2 and H2S separation

Shell is doing a lot of research in technology to separate carbon dioxide and hydrogen sulphide from gas streams.

The oil industry is currently looking at gas fields which contain large amounts of carbon dioxide and hydrogen sulphide. These fields could be produced in a safe and environmentally friendly way if there was a viable way of separating out the carbon dioxide and hydrogen sulphide and putting it safely back underground.

According to some estimates, up to a third of proven gas reserves have not been brought into production, because high levels of carbon dioxide or hydrogen sulphide makes it unviable. This includes fields in the Middle East, Far East China and Russia.

The technology being developed is different to the carbon capture systems being developed for power stations, because the gas stream from a field is under pressure.

Jan van der Eijk believes that Shell can be a world leader in technologies to separate impurities (including carbon dioxide) from gases. "We want that to be something we can do that no-one else can do," he says.

It is also researching ways to use the sulphur which is removed from oil as a waste product. "We're looking for ways to do more with the sulphur – turn it into useful products like concrete," he says.

Shell is developing a technology to liquefy (condense) the carbon dioxide, by cooling it to -62 degrees C at pressures of 10-30 bar. The gas is already under pressure when it comes out of the reservoir, so the cooling can be achieved simply by allowing it to expand.

When the gas is cooled, microscopic liquid droplets form, which can be coagulated by swirling them around into droplets of about 1 micron in diameter.

Shell uses a centrifugal separator to separate out the liquid. The gas containing liquid droplets is rotated, sending the liquid drops to the perimeter of the pipe so they can be separated out.

The entire system, including expansion / cooling, coagulation, and separation, can be supplied in a simple modular unit.

This method has worked well for separating out 30 per cent of the carbon dioxide from a contaminated gas stream in one stage. By having several stages in series more of the carbon dioxide could be removed.

A second carbon dioxide separation method is using membranes. The carbon dioxide molecule, at 0.32nanometres, is smaller than the hydrogen molecule (0.36nm) and the methane molecule (0.38mm), so by having a membrane with holes 0.36nm it should be possible to filter out the carbon dioxide.

The problem is that the membrane tends to stretch under pressure, Dr Bichsel says, which changes the size of the holes. This is a challenge Shell is working on. "We have to come up with new materials," he says.

New energy sources

Shell is very active in developing non oil and gas sources of energy, although it is finding many more competitors than it does in oil and gas.

"The space is getting very crowded," says Dr van der Eijk. "High energy prices make lots of people very interested. The days that everything could be done by one company is essentially over."

Dr van der Eijk says that Shell has invested, including R&D, around $1.7 bln over the past five years in renewable energy and CO2 reduction. This includes a quadrupling of the R&D investment in biofuels and increasing levels in carbon dioxide capture and storage, some of the company's most rapidly growing areas in the renewable and CO2 field.

Hydrogen is an interesting area of research; Shell is running 2 hydrogen stations in Washington D.C. and Japan. "We hope to make the transition to a hydrogen fuel cell car," he says.

However he does not expect Shell to get involved in purely electrical cars. "We are very interested in the development, but we are not in the battery industry and we are not in power generation."

Internal combustion engines will be important for many years, he believes. "And we will develop differentiated fuels that get more performance."

Shell does not believe that the world will choose any single technology to power cars. "There will be space for biofuels and hydrogen – and hydrogen has to be developed from something. No-one knows what the outcome is – but we believe it will be a multi-horse race for many years. We believe that going forward, mobility will see quite a range of options," he says.

Shell has interesting developments in biofuels. "We're looking at growing algae and turning it into diesel," he said.

On the subject of environmental impact of biofuels, Dr van der Eijk acknowledges that it is a hot debate. "We believe that some claims were overdone, for example the biofuels relation to the fuel price, but it is a relevant topic," he says.

"This is all a transition period," he says. "The main thrust is developing biofuels from other sources – eg cellulose."

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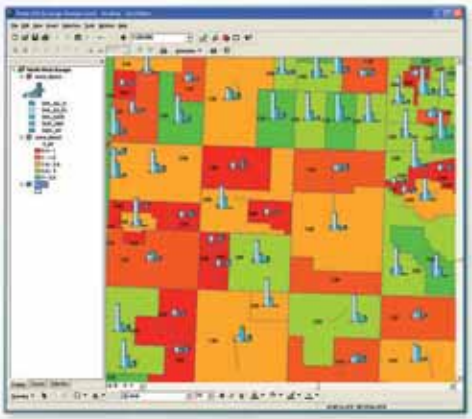

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Digital Earth, a company founded by two ex-IHS Energy executives and a number of early internet pioneers, has a bold business plan – creating an online portal for oil and gas information which is easy to search, a basic version of which will be openly available to the general public.

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This is the business plan of a start-up company called Digital Earth, founded by two ex-IHS Energy executives, John Redfern, a former president of IHS Energy, and Robert Winsloe, a former international managing director and senior VP worldwide sales and marketing with IHS Energy.

You can find a lot of the public information using Google, but Google has its limitations; its algorithms might recognise when you type in a flight number, but they don't generally recognise a well number, so they could never (for example) give you all the documents about the wells in a certain region.

Whereas on Digital Earth, "You'll be able to type in a keyword, for example, 'shale play,' and it will say 'hey – are you looking for documents about shale plays from these basins?"" said Digital Earth's VP of engineering, Hitesh Sachan.

There might be reports about a particular oilfield written a few years before, but they will be impossible to find on Google if the field name is a commonly used word. There is plenty of unstructured data that can be impossible to find if you don't even know it exists.

"Given the relative costs of data versus drilling in the oil industry, you normally want ALL the available information on a particular area of interest, but you don't want to spend months looking for it," says Mr Redfern.

"Our goal is to enable you to quickly find additional useful information, but also to help give you some assurance that you know of all the relevant data sources and can stop looking."

Mr Redfern emphasised that a large amount of information which is sold by organisations such as IHS, Woodmac and Deloitte which is already from publicly available sources, but that these data vendors process and package the information to make it a lot more valuable. All of this processing and packaging is made manually by highly qualified staff; but could computer systems also add a lot of value to public information, by making it easier to find?

"I thought, there's an unmet demand between what Google does and what the oil service sector currently offers with subscription database products," Mr Redfern said.

There are already a number of companies offering similar services in real estate, health, finance, and other industries, that by adding domain experience to the search process are helping people find what they are looking for.

"Google is well placed to offer such a service, but they are just not interested", Mr Redfern said. "This was made clear during my discussions with Google on integrating my then company's structured database of 45 million electronic components into their search algorithms.

They admitted it would vastly improve their searches in the $250 billion dollar electronic components market, but that just wasn't big enough for them! They have to keep focused on their consumer markets and that leaves the door open for us."

With a team of software developers in Shenzhen, China, Digital Earth is currently scouring the Internet through an oil and gas lense, going through public sources of oil and gas information and indexing documents according to oil and gas related terminology (e.g. for specific oil relevant job titles, oil field names, well numbers, geographic locations, types of drilling).

This will enable the system to immediately serve up the documents which users are looking for.

Robert Winsloe sees the system's content as being "built through the creation of both a thin film and a deep dive. The 'thin film' is data we are collecting from service company partners and industry associations such as the AAPG. These are structured, global datasets that we can index and tag alongside existing data from the web."

"This is then being augmented by what we're calling our deep dives," stated Mr Winsloe. "By a 'deep dive,' we mean user-sponsored county-by-country research conducted in conjunction with the government and local partners to ensure we uncover every data item of possible value, whether it be in the national archives or some regional university, regulatory body or institute."

The system will also include a bit of guesswork as sites like Zoominfo do; they try to guess information about people, using sources about them on the internet; they don't always get it right, but when they get it incomplete, it prompts people into correcting their own information.

That way the site can build up a large amount of information without having to cover the costs of doing all the research, or negotiating

Digital-earth.com - you will be able to make free internet searches of oil and gas information

with companies about what information they are prepared to make public.

"We want to avoid putting up a big subscription, or entitlements, barrier around the core search functionality because then you can never get the same dynamic going as you can on a public website," Mr Winsloe said.

Not all the information on the site will be free; the company hopes to follow in the footsteps of sites such as One Petro (www.onepetro.org) and Touch Oil and Gas, acting as an online broker to organisations which sell information.

The Business

Digital Earth has twelve staff at the moment, the four founders, two business development people and six staff in the Shenzhen office.

A prototype version of the software has already been developed, to be followed by a commercial product launch early in 2009.

For the public part of the site, it plans to keep costs low enough to cover its costs and make a profit from advertising, with a system similar to Google Adwords. That said there will be a number of subscription products for those (like the oil majors) who have already indicated they want an enhanced service or to integrate Digital Earth's functionality within their in-house GIS..

Many oil service firms are also supportive. Along these lines, Digital Earth has made agreements with a number of firms, such as Fugro, to use the metadata layer from their various datasets to create an index of key reference data that will be used to identify, tag and geo-reference all the other data of relevance.

By sharing its field and basin header data, Fugro, for example, will have the advantage of being able to promote and sell further information such as field studies. "We are just helping

them make their data more visible and easier to market," said Mr Redfern. "In the process we are also creating the index against which to sort and classify all the other relevant data as most oil and gas data will hang off a field, a basin, a license area or a well bore."

The company has already earned fees from the buyer side – doing 'scouting projects' (searching through available data for possible opportunities). "The great thing about these projects is it provides real value to the customer but at the same time provides funds for doing the research we'd need to do anyway to build the product" said Mr Winsloe.

The company has also got involved in larger scale information brokering: it recently brokered the sale of a Trondheim (Norway) geochemistry company called Geolabnor to Fugro. And Digital Earth has a number of other companies in the pipeline.

On the financing side, the company conducted a seed round last year, which along with some early revenue has provided the funds required to this point. This is to be followed by a Series A round, but given the financial market conditions, the company has decided to push this into next year.

Government systems

The company has already been approaching operators of national data repositories around the world, to build partnerships with them, and to help them make their data more accessible.

Many people have used tools like Google Maps to find geographically indexed information, they know how easy it is to use, and they wonder why governments don't provide something equally easy for oil and gas data, said Hitesh Sachan.

The answer is that it all takes money to do and many governments have trouble getting the budgets to do it internally; but maybe Digital Earth can do it for lower cost. More importantly, governments can only effectively justify investing in national data catalogues, whereas this cries out for a global solution.

John Redfern has extensive experience with government oil and gas data, including as founder and initial Chairman of Common Data Access Ltd, which manages public data on the UK Continental Shelf, and is perhaps one of the world's best known and longest established national data repositories.

"We had the idea that governments weren't doing as much to distribute their data as they could," Mr Redfern said. "People are doing a good job of setting up national data repositories but much of the data often just sits there. Meanwhile oil companies are using expensive intermediary companies to try to find out what is available."

In terms of indexing national data repositories, Digital Earth's initial focus is on countries like Peru and Colombia where there has been significant interest in scouting projects from customers. As a result, Digital Earth already has an agreement with the Colombian government. The goal is to index the large amount of public data that is currently residing in these archives and make more easily accessible and searchable.

For information which is not public, Mr Redfern believes Digital Earth will still be able to create indexes of all the documents which exist, even if it can't provide direct access to them without the user going through the data owner's sale channel. "The fact that you have well logs shouldn't be as secret as the well logs themselves," he said.

Is all this possible? Digital Earth has even had preliminary discussions with OPEC, according to Mr. Winsloe. "Contrary to what you might expect, we explained exactly what we're going to do, and they were really very supportive."

Technology

The company has built up a team with a lot of technical competence on web projects.

The company's CTO, Dr. Robert Podolski, has worked with John Redfern in five different companies, including helping organise data management at Hess Corporation and putting together Common Data Access, the data system for the UK government, and also working on IHS Energy's software portfolio.

Digital Earth's VP of engineering and product development is Hitesh Sachan, who spent 8 years at Amazon.com as a solution architect and project manager, opening software development centres around the world. Mr Sachan previously worked for the world's first comparison shopping company, Junglee, which was bought by Amazon.

Mr Sachan joined Digital Earth because he began to hunger for a project in the 'real world,' not the consumer world, he said. Meanwhile the Digital Earth team were looking for someone who had extensive experience with these kinds of web data projects, so it was a good match.

The company has a development centre in Shenzhen, China, where it has six staff. It opened the development centre in 2007 and plans to double its size shortly.

Mr Redfern has been living in Shenzhen for the past five years. "It's a pretty good place in terms of infrastructure, access (next to Hong Kong airport), and lack of bureaucracy," he said. "We know how to operate in this environment and that has helped us keep costs low."

"The only downside is that we've taken a little while finding the right people in China. But that's because we want everybody to be superstars. Once we find them, they all seem to stay."

The company focuses on using open source software as much as possible so it can stretch its budget as far as possible, and maintain flexibility. "Everything here is open source, whether it's a mapping application, a database, or fast caches," said Mr Sachan.

"I thought, there's an unmet demand between what Google offers and what IHS offers with a subscription database"- John Redfern, founder, Digital Earth

It is also easier to find people with the appropriate skill sets with open source, and bugs get fixed more quickly. If the company encounters a problem, there are probably plenty of other people who had the same problem too.

"But regardless of the tools used, what always frustrated me when I looked at oil and gas applications is that they looked like oil and gas applications," Mr Redfern said. "We wanted something with oil and gas functionality, but with the speed and ease of use of a consumer application."

A culture of secrecy?

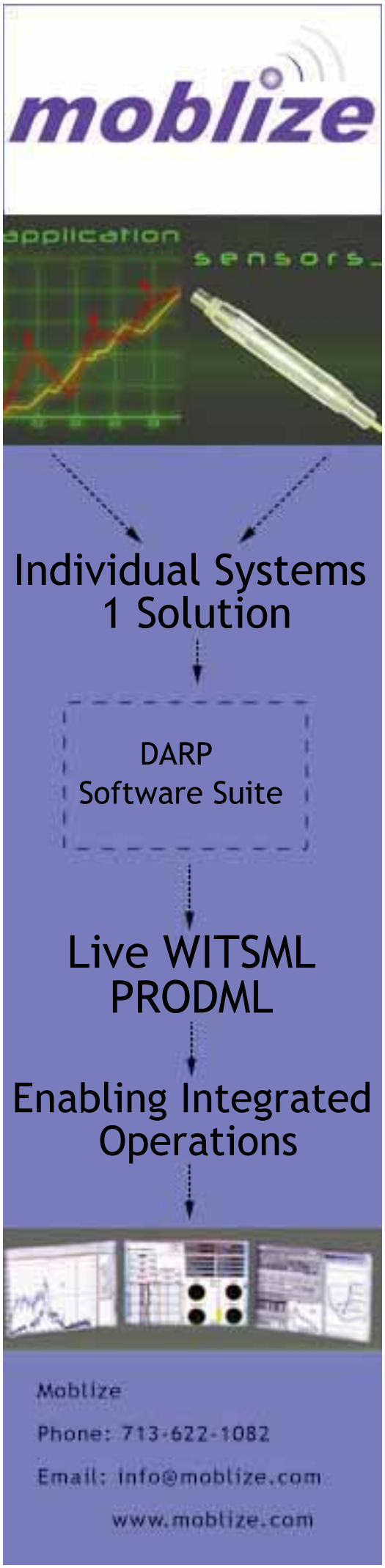
The oil and gas industry is famously concerned about secrecy – and by trying to make information more available, Digital Earth could be seen as swimming against that tendency.

But Digital Earth believes that much of this concern stems back from the industry's history, when competitive advantage genuinely came from having secrets. If there was only one seismic survey and three wells in a basin and you controled them, you were in a very powerful position that you'd want to protect.

On the other hand, if you're in a mature data-rich basin, the ability to generate competitive advantage through unique proprietary data is much more circumscribed. "Look at a place like Alberta for example. The amount of public data is massive," said Mr Redfern. "If you're looking for small pockets of bypassed pay, the value comes not from having any proprietary data but from having public data and looking at it in new ways."

Some resource companies outside the oil sector have actually gotten benefits from making their data completely public, as Goldcorp did when it put all its data on the web, and retired geologists, students and independent consultants from around the world searched through it to look for gold — with considerable success for the company.

As oil and gas basins around the world mature, value will come not so much from new proprietary data as from having tools that let you connect the dots using existing information. Digital Earth hopes to play a central role in this task.



Wavefield Inseis awarded 3 year contract by ONGC

www.wavefield-inseis.com

India oil company ONGC has given a contract to seismic company Wavefield Inseis, to conduct 3D seismic surveys offshore India.

It will do a number of surveys between 2008 and 2011, with the first starting in the fourth quarter of 2008. The total contract value is over $170 million.

Geotrace's new E&P data management tool

www.geotrace.com

Small and medium size oil companies can manage the data as well as the majors can with Geotrace's TIGRESS Live

Oil and gas software company Geotrace has introduced TIGRESS Live!, a new E&P software solution designed to make it easier for small and medium-sized oil companies to find data. The tool can be used for all data in the exploration lifecycle.

The system is similar to the one many oil majors use, Geotrace says.

It can access data from a range of different sources, such as existing physical and digital archives, interpretation systems and geostreaming services.

The system can generate production reports, well performance and analysis data.

The system has a map interface, to help users select data based on a geographical location, or view output data on a map.

Earthworks releases latest MPSI version

www.sorviodvnvm.co.uk

UK software company Earthworks Environment & Resources Ltd, together with its partner company ARK CLS Ltd, has launched the latest version of its Seismic Inversion software, Stochastic Inversion MPSI v1.2.

Using this software, users can explore the level of uncertainty in their estimated rock lithology, porosity and reservoir volumes, worked out from seismic data recorded at the surface, and well data.

"MPSI technology is ground breaking, resulting in the maximum performance on standard desktop workstations and avoiding the need for special hardware" says Ashley Francis, managing director of Earthworks.

Users can quickly run the inversion calculation 100 times or more to get a range of different answers, and with this data work out the likelihood of any of them being right (or get a range of results where a certain value is most likely). The software can work on a normal PC.

The word stochastic means random or probability: in this context it refers to working with data which has uncertainties attached to it.

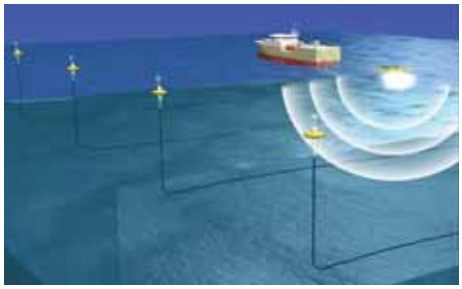
Seismic inversion means trying to construct an earth model from a seismic wave received on the earth's surface, by modelling the wave's path reflected back up through the earth.

The MPSI package also comes with deterministic inversion software, which tries to give you a specific answer with the smallest possible error.

The inversion is created using both well data and seismic data and the user can control the relative importance of each of these data sets in creating the final model. The user can also make a correction to the derived impedance values to take into consideration the asymmetric error term in inverting the seismic amplitudes to estimate the final impedance model.

RXT do to ocean bottom seismic in Nigeria

www.rxt.com



RXT will do a survey offshore Nigeria with seismic receivers placed on the ocean floor

Reservoir Exploration Technology (RXT) has won a contract to do a four component ocean bottom cable (OBC) seismic data acquisition in the Nkarika field, offshore Nigeria, for Total E&P Nigeria Ltd.

The seismic source is on a vessel, but the seismic receivers are placed on the ocean floor, where they are less susceptible to noise.

The survey will be performed by RXT's Nigerian crew.

Paradigm and Vietnam Petroleum Institute collaboration

www.pdgm.com

Oil and gas software company collaborating with oil and gas consultancy Vietnam Petroleum Institute, an organisation which provides consultancy for Vietnamese oil company Petrovietnam. As part of the collaboration, Paradigm will supply its software and conduct training on how to use it.

Exploration and drilling news

Ingrain appoints chief geoscientist

www.ingrainrocks.com

Elizabeth Diaz, chief geoscientist, Ingrain

Houston rock physics company Ingrain has appointed Elizabeth Diaz as chief geoscientist. Ms Diaz was previously a senior geoscientist at Shell. She will help Ingrain's physicists and geologists develop new ways to calculate reservoir rock properties.

BP uses AGM's geological interpretation software

www.austingeo.com

Geological interpretation software company AGM Inc (Austin GeoModelling Inc) of Austin, Texas, has announced a worldwide contract with BP.

Under the contract, BP will use its Recon 3D geological interpretation and visualisation technology worldwide. AGM will also train BP staff to use the software, through its training facilities in Houston and London.

AGM claims that Recon is the most advanced 3D geological interpretation software on the market, helping improve users' productivity and decision making.

Bangladesh Gas Fields uses Geotrace

www.geotrace.com

The Geowave Endeavour

Bangladesh Gas Fields Company Ltd has selected Geotrace's Tigress Software for its 3D reservoir interpretation. The software will be used to determine accurate reserves figures and guide drilling programs, using data from a 3D seismic acquisition program which will start in late 2008.

It will be used to build a front-end E&P database for each of the company's five producing gas fields, using data from a variety of sources, including legacy data from the past four decades.

It will be the first time 3D technology will have been implemented in the Bangladesh gas fields to quantify assets.

BGFCL says it selected Tigress over other 3D seismic interpretation systems because of its cost-effectiveness and capabilities, Tigress says.

World's largest multiclient electromagnetic survey

www.emgs.com

Electromagnetic survey specialist EMGS has completed the largest ever multiclient electromagnetic survey, in the Norwegian portion of the Barents Sea, covering 9000km2 or 30 blocks.

The survey covers the area being auctioned in Norway's 20th exploration licensing round.

Companies can use the electromagnetic data, together with their own seismic data, to get a better idea of where oil and gas might be; seismic gives an idea of the structures and electromagnetic can provide an idea of whether or not they contain oil.

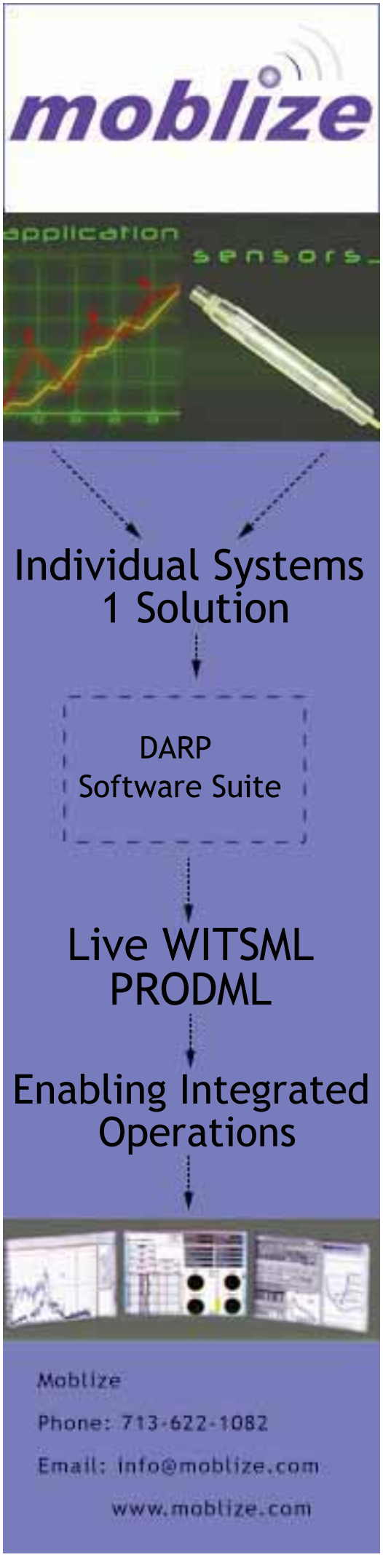
"The electromagnetic data will give potential bidders a competitive advantage during the licensing round, and will help them to target their exploration resources more effectively," claims EMGS.

Geomage appoints David Bird as EVP

www.geomage.com

David Bird, EVP, Geomage

Seismic data processing company Geomage has appointed David Bird as executive vice president North America, based in Denver. He was previously exploration advisor - Rockies and Canada, senior geophysicist, manager of geophysics and exploration manager with Samson Resources.



Sperry Drilling – MWD at 230 degrees C

Sperry Drilling Services, a brand of Halliburton's Drilling and Evaluation Division, has started a two year project in collaboration with TOTAL to develop measurement while drilling (MWD) tools which can record and transmit data at temperatures of up to 230 degrees C, running for 14 days continuously.

The tools are being developed for use on the Victoria oilfield in the North Sea, which is being drilled by Total, with ENI and Statoil-Hydro as partners. The field as a very high thermal gradient (it gets hot very quickly as you go down).

Halliburton hopes that as a result of the research work, it will be able to develop a new suite of logging while drilling sensors which can operate at extra high temperatures.

On the drilling side, traditionally, challenging HPHT wells are drilled with the simplest of tools, like turbines and mud motors, that have minimum electronics.

Most formation evaluation tools have lots of electronic components, and so initially couldn't be used in HTHP wells. However, these wells are often located offshore, where high rig rates force operators to look for all possible means to increase drilling efficiency and optimize wellbore placement for maximum production.

The main challenge with the project is preventing the electronics from getting damaged, says Ron Dirksen, global manager of measurement and logging while drilling, with Sperry Drilling Services.

To keep the electronics cool, Sperry will experiment with a variety of different technologies, including cold plates, flasking and refrigeration.

The cold plate is a metal plate near which the electronics can be mounted , which can quickly carry the heat away from the processors. A similar technology is used in personal computers.

"Flasking" means putting the electronics inside a special chamber, which can be filled with a low density gas or a vacuum, reducing heat transfer from the environment to the electronics.

"It delays the amount of time it takes for the environmental temperature to reach the electronics," says Mr Dirksen. "You can extend the period that components can survive in."

"Flasking is not something that's new – it's been used in the wireline industry for a long time – so that they can run electrical components that are rated to a relatively low temperature in a high temperature well," he says.

For refrigeration, Sperry will experiment with using a downhole turbine, which will generate electricity from the flow of the drilling fluid. The electricity will be used to power a refrigeration unit.

It will likely use phase change technology (similar to a domestic refrigerator). A special liquid is allowed to expand, causing it to evaporate and get colder, cooling the environment around it.

Having batteries which operate at high temperatures is not a problem. "There are batteries in the market that work well over 230 degrees C. The only problem is they don't work very well at lower temperatures," he says. "But the batteries are something that we may be able to solve even today."

There will need to be some improvement on the seals which keep drilling and formation fluids from entering the tool. "They are typically made from some kind of rubber / elastomer - but they are not all capable of withstanding high temperatures," he says.

The drill bit itself will either be rotated directly from the surface, or run using a downhole motor driven by the drilling fluid.

Halliburton is also asking its electronics manufacturers to try to develop components that can work at higher temperatures.

"This is not the first time we've drilled at this temperature, but it's the first time we've tried to put electronic components down there," he says. "Previously we would have to go in blind – we couldn't take any measurements while drilling."

Halliburton will begin with extra high-temperature tools which can measure vibration, gamma rays and pressure.

The data will be communicated to the surface in real time, using pressure pulse technology.

Halliburton will also need to develop new pressure pulse components. "We currently don't have any pressure pulse components that work at 230 degrees C," he says.

The target is to start drilling in mid-2010. Halliburton will be doing tests of different components over the next 6 months, and then will start putting subassemblies together and testing them. "We'll put the sensors in there and see how well they work," he says.

If Halliburton successfully manages to make drilling work at these temperatures, it could open up access to many more oilfields. "There are lots of environments globally where temperature currently is a limitation, which could be overcome with this," Mr Dirksen says.

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Electromagnetic surveys - going mainstream?

Electromagnetic survey techniques can do a great deal to support seismic in helping find oil and gas. We asked Chris Gulberg of electromagnetic survey specialist EMGS how business is developing.

Norwegian electromagnetic surveying specialist EMGS has just launched a multi-client electromagnetic survey of 10,000km2 of the Norwegian Barents Sea, which will be coming up shortly for bids in the 20th round.

This is the largest multi-client electromagnetic survey released to date, carried out during April to August 2008.

Interest in electromagnetic surveying techniques is growing, but it could be growing a lot faster, says Chris Guldberg of EMGS.

In its first few years after being founded in 2002, business grew on average around 20 per cent a year, but for the past two years, annual growth has been less, he says.

EMGS believes that electromagnetic surveying techniques do not get the attention they deserve at oil companies. Oil companies are generally aware that they can do electromagnetic surveys, but they don't all use it. "We feel there's a discrepancy between the value of EM and how much it is used," he says.

"Our dream in the future is that this will be a part of the exploration tool kit – alongside seismic," he says. "But there's a long way to go yet."

"One of the main things we need to focus on is ensuring that EM becomes a part of the oil company's workflow and it is integrated to their workflow."

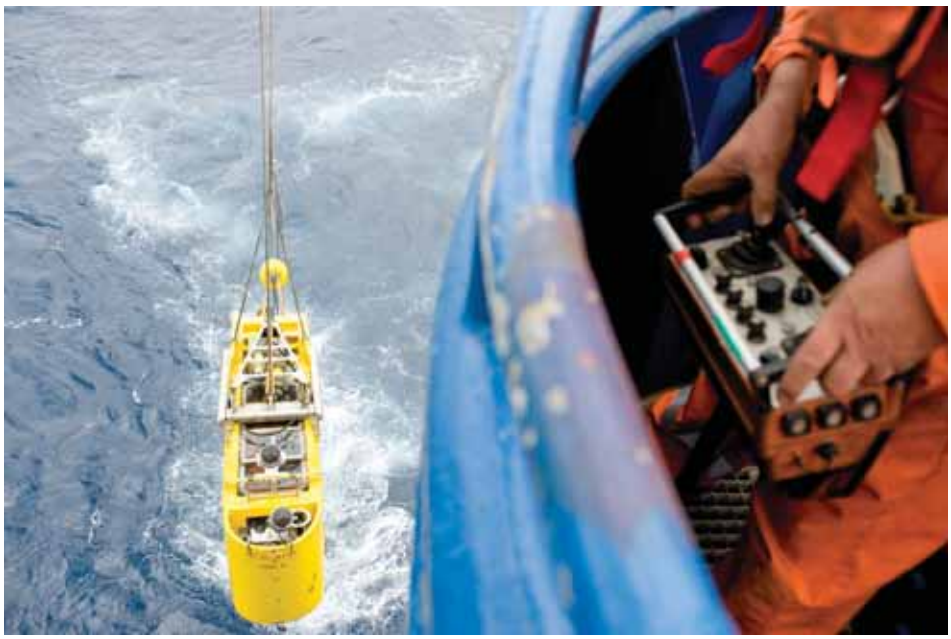
"There is still a lot of people need to learn about EM," he says. "It's still a very new field. Training customers is really important - it takes time to introduce new technology, and it takes time to change the way you're working."

The technology measures the electromagnetic resistance of different areas in the subsurface.

More electrically resistive material (such as an oil field) will attenuate (reduce) the electromagnetic field.

The received electromagnetic field is recorded by receivers on the seabed, and the data is processed to create resistivity maps and 3D volumes of the subsurface.

The electrical resistivity data acquired by EM can provide direct evidence of hydrocarbons. Though not all resistive bodies are hydrocarbons, all commercial hydrocarbon deposits are resistors. So, locating the resistors within an exploration area provides very useful information for the oil companies, Mr Guldberg says.



An electromagnetic source is towed from the boat

If the seismic has already indicated a structure that might hold oil, having electromagnetic information showing that there is a higher resistivity can give you additional confidence before you drill. "It is important to know the geology of the area and also to have the seismic data," he says.

EMGS has developed a plug-in for Schlumberger's Petrel called Bridge, which enables users to integrate electromagnetic data in their earth modelling. This way they can integrate electromagnetic data with their seismic data and well logs. It plans to develop similar plugs for other geophysical modelling tools, he says.

Electromagnetic receivers are placed on the seabed

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Oil & Gas Survey & GeoEngineering
Alternative Energy Technology Training

52 surveys completed since 2002, where well evaluation data also exists, have provided validation of EMGS' technology, the company says. Survey predictions and well evaluation results show an 85 % agreement.

Equipment

The survey involves a vessel and receivers on the sea floor.

A high power electromagnetic (EM) source is towed by a survey vessel. Sensitive seafloor receivers detect EM energy that has been guided by electrically resistive bodies in the subsurface, including hydrocarbon reservoirs.

The receivers are placed about 3km apart on the seabed, although 1km spacing can be used when a higher resolution output data is required.

EMGS is currently building the world's first vessel built specifically for electromagnetic surveys, which will be ready for operation around Christmas 2008. It already operates 3 vessels.

The receivers have anchors made out of a special biodegradable concrete, developed by Norwegian research institute SINTEF, which take them to the seabed. When a data signal is sent to them through the water, they detach from the anchor and float back to the surface, so the data can be retrieved and the receiver can be used another day. The anchor stays on the seabed and degrades over the next 3-6 months.

Surveys to date

So far, EMGS has completed around 350 surveys, for 40 different oil companies (see photo below).

Most of the work so far has been for individual clients (contract work) but multi-client work is an increasing part of the company's revenue, he says.

The company did a lot of work in 2005-2006 in India. "Discovery rates of offshore India have dramatically increased due to increasing understanding of basin technology and systematic application of EMGS technology.

Electromagnetic receivers are placed on the seabed

EMGS is currently building the world's first vessel built specifically for electromagnetic surveys

Map of all the surveys done by EMGS around the world

Which acreage should you pursue?

Oil companies might be better thinking in terms of which play to enter, or which acreage to pursue, rather than specifically which prospect to drill. UK company Exprodat has developed software to help them do that.

By Gareth Smith, managing director of Exprodat

In 1996, Peter Rose stated that "the most difficult and critical decision in petroleum exploration is not which prospect to drill, but instead, which new play to enter".

We would argue that this is even more so the case in today's climate of decreasing reserves replacement rates, renewed focus on exploration and increased competition for quality assets.

We would also propose that the next most critical decision is what acreage to pursue after the play has been identified.

Exprodat's Team-GIS™ Acreage Analyst application has been developed specifically to support this process.

Current practise

Acreage analysis forms a key part of the exploration cycle, but is generally the most poorly defined from a process point of view.

Decisions are often driven by subsets of the large volumes of data available to an exploration team, and by personal or historical bias, based on past experiences or exploration strategies.

Quantitative acreage analysis and the ranking of opportunities using all available information require data integration on a massive scale. It is usually seen as too time consuming to carry out on a regular basis, if it's ever carried out at all in a structured, repeatable way.

Many companies apply different processes to acreage analysis, varying between countries, assets or even individuals.

This makes it very difficult to objectively review opportunities on a company-wide scale, and leads to greater uncertainty in opportunity ranking and portfolio management. It is also rarely seen as an iterative process, where new data is fed back in on a regular basis to refine the model.

Technology vendors have traditionally focused on the prospect analysis part of the exploration process, then down in to the earth model and the 'Digital Field'. There are also several innovative technologies associated with basin analysis, often driven by academic research. However, there is very little technology support for the play and acreage analysis components.

Geographic Information Systems (GIS) technology has been used increasingly in this area in recent years, with some success. The problem is that 'out of the box' GIS, being a horizontal technology, is not 'tuned' to this analysis work.

Most of the few commercial tools that have been developed for this purpose are tied to specific vendor data sets. In reality, most companies try to integrate many vendor data sets plus in-house data for their analysis.

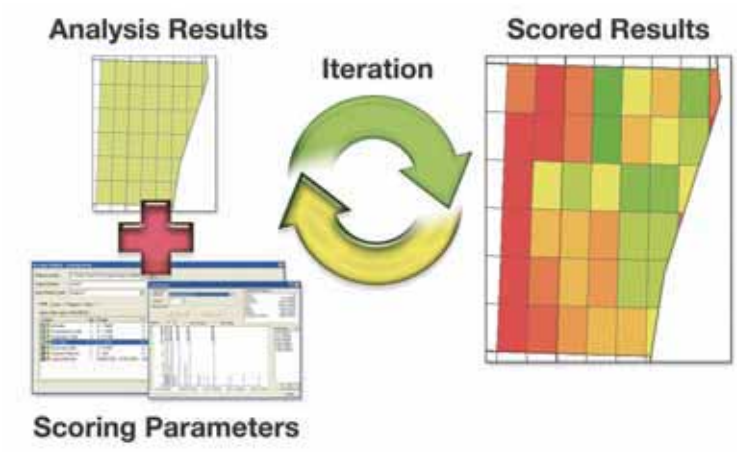
In our experience we see companies developing many different methods using GIS to address essentially the same processes.

Many companies also only use GIS as a data integration and visualisation tool, and don't exploit its full spatial analysis capabilities.

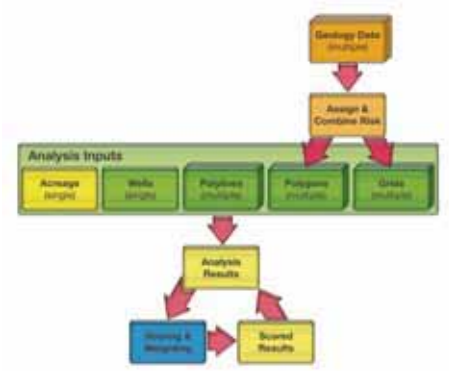
Once data has been collected in the GIS, it is often exported for analysis in Excel, where the rich spatial trends and relationships inherent in the data are lost.

Ranking opportunities

Exprodat Consulting has worked with GIS technology for over 10 years, first as a data management and integration tool, but then exploiting its spatial analysis potential. We started to develop our first tools to support acreage analysis and block ranking in 2000.



The scoring process



How Exprodat works out which acreage should have the most to offer

One of our clients had established a small multi-disciplinary team to evaluate the remaining potential of the North Sea basin system, and to evaluate the many opportunities to farm in to or acquire acreage in this area.

It quickly became clear that they would not be able to review everything available to them, and wanted to systematically rank the opportunities they had using the large regional database they had compiled. A prototype analysis system was developed in GIS.

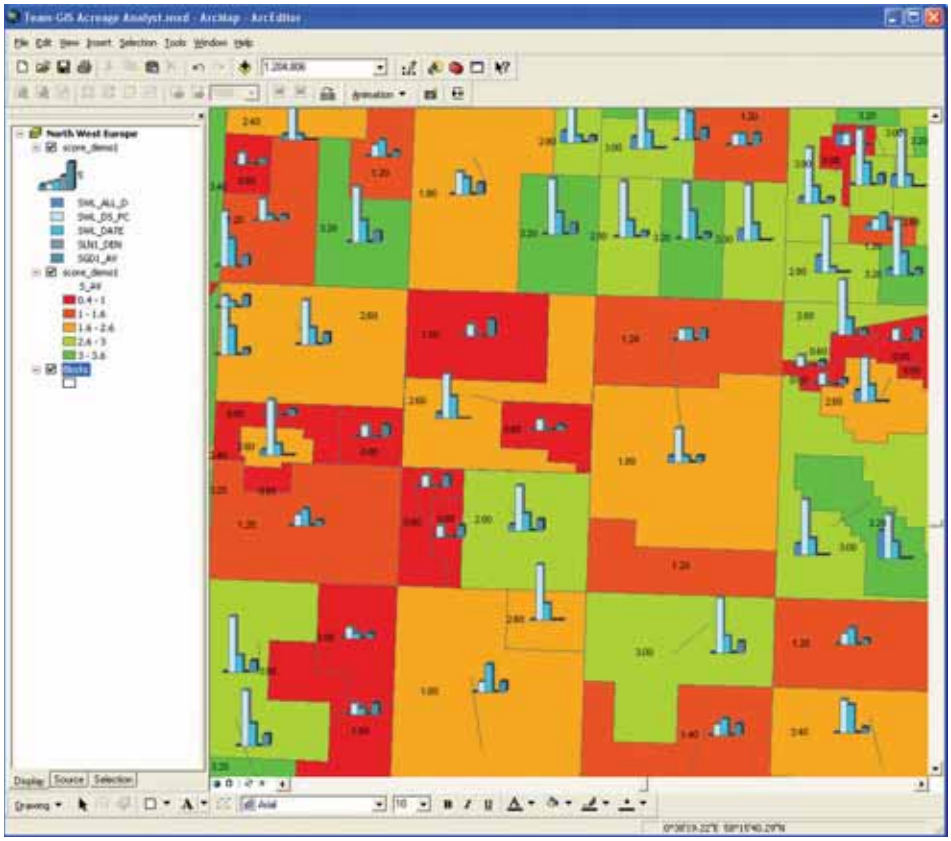
They immediately were able to focus on the most valuable opportunities and present these to management in context of an integrated regional model. Experiences in this area with many clients over the past 8 years have been synthesised in to Team-GIS™ Acreage Analyst.

Team-GIS Acreage Analyst is a play fairway and acreage ranking extension for ArcGIS. It enables you to rank acreage based on large volumes of GIS-based data. Acreage ranking workflows can be standardized, automated and rapidly iterated in order to reduce decision cycle-times, improve decision quality and reduce risk.

Time-consuming and complex manual opportunity ranking workflows are transformed into rapid, repeatable and consistent processes that can be iterated, shared across whole organisations and compared through time. The application is data independent, and can use any vendor or in-house data available in GIS format.

Acreage Analyst consists of three modules:

The **Common Risk Segment** module



Ranking different acreage using Team-GIS Acreage Analyst. Green =high ranking (good), red = low ranking (poor)

allows the user to create Common Risk Segment maps of basins and play fairways. Multiple input layers from disparate sources (e.g. depositional environment, paleogeography, etc.) can be easily combined to create component risk maps for key petroleum system elements such as reservoir, source and seal.

The **Analysis** module is the engine of the acreage ranking process. It allows the user to input multiple GIS datasets (including Common Risk Segment components) which are then analysed with respect to their spatial relationship with the base acreage layer, e.g. by calculating how much of a license/basin/play is covered by a reservoir unit, the average depth to the reservoir or the average play risk in each component of the acreage layer.

Almost all data developed in the Basin and Play modelling processes can be used in the Analysis module.

The **Scoring** module enables the user to score acreage based on the results of the analysis. This allows the input areas of any type of acreage to be ranked according to a user specified scoring schema e.g. the presence of reservoir may be more important than distance to kitchen in ranking a of licences in a particular area. In others, distance to facilities may be a crucial factor.

Speed

Team-GIS Acreage Analyst allows rapid grading and evaluation of potential opportunities at basin, play and licence level and improved portfolio analysis, including competitors acreage positions, farm-in opportunities and licence rounds.

The time taken to carry out this work is reduced from weeks or months, to hours or minutes, and it also becomes an iterative process.

Different models can be quickly generated and calibrated to basin statistics, known discoveries and the prospect portfolio, ensuring consistency and reduced uncertainty across the entire Exploration life-cycle.

For the first time, the Exploration team can use all of the data available to them to develop quantitative models for a key part of the Exploration cycle.

Definitions

Basin: A region of prolonged subsidence and sediment accumulation in the Earth's crust.

Play: A group of geologically related prospects and fields with a similar petroleum system (reservoir, source, seal, structural style.)

Acreage: An area within a basin or play, usually defined by one or more licences to explore or produce hydrocarbons.

Prospect: A potential oil or gas field.

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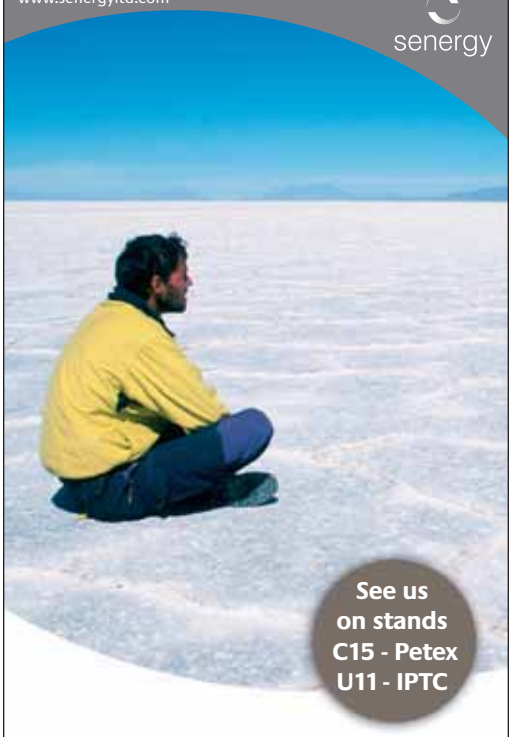

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New 3D reservoir modelling and well path planning software – on sale for first time

3D interpretation and well path planning software, developed by TerraSpark Geosciences® through its consortia funded by Anadarko, BHP Billiton, BP, Chevron, ConocoPhillips, ENI, ExxonMobil, Shell and Paradigm Geophysical, is now available for sale for the first time under the name Insight Eart™

TerraSpark Geosciences, of Boulder, Colorado, is making its Insight Earth software available on the general market for the first time.

The software was developed by TerraSpark Geosciences, which operates the consortia, which have been funded over the last five years by Anadarko, BHP Billiton, BP, Chevron, ConocoPhillips, ENI, ExxonMobil, Shell and Paradigm Geophysical.

The work was started in 1998 at ARCO's research lab in Plano, Texas, continued at the BP Center for Visualization (a research lab at the University of Colorado) following BP's acquisition of ARCO in 2000, and has been continued at TerraSpark Geosciences following a January 2006 spin-out from the university.

Early pre-release versions of the software have been used by the companies participating in the consortia, and by eight additional companies during beta testing of the software.

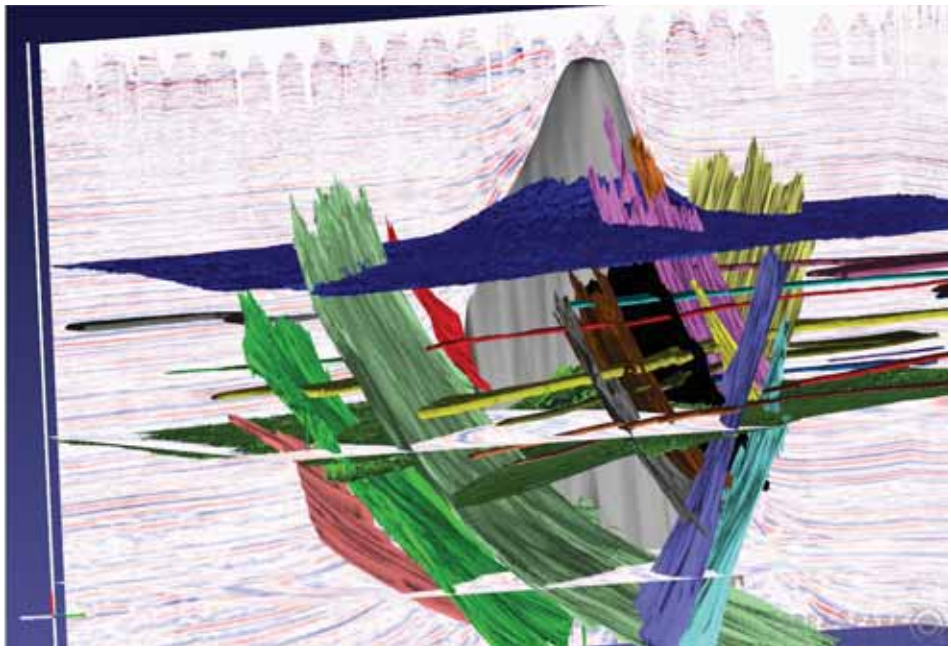
The software provides substantial value added interpretation capabilities that can substantially improve the speed and accuracy of interpretation and well path planning.

The software can be used to interpret structural surfaces (salt, canyons, faults and highly faulted horizons) and to image and interpret depositional systems (channels, prograding fans, etc.) where the entire 3D surface is interpreted at once.

The software is intended to be used as an add-on to industry standard seismic interpretation packages, such as those developed by Paradigm Geophysical, Halliburton/ Landmark, Schlumberger and SMT.

For example, a user of a package such as that provided by Paradigm or Landmark could use Insight Earth technology to pick out the boundary of the salt body or the 3D fault surface pattern.

According to Dr. Geoffrey Dorn, President of TerraSpark, "We don't claim to provide a complete interpretation system. What we provide are tools that help you accomplish interpretation tasks and provide 3D surfaces that can be used inside other systems."



Seismic sections (crossline, inline and time-slice), horizons, faults, and channels from Insight Earth™

3D from the start

What is unique about TerraSpark's Insight Earth, Dr. Dorn says, is that it can be used to interpret complete 3D surfaces right from the start.

In many other software packages, the 3D surface is built up by constructing a series of interpretations on 2D slices through the seismic volume. For example, faults are frequently interpreted on a grid of such slices, and connected together in an initial surface which only approximately matches the seismic data.

By imaging and interpreting complete 3D surfaces from the start, the end results are much better and achieved much more quickly, he says.

"In everything that we do – you're always working with a complete 3D surface. You're not joining fault cuts together, your interpreting a complete network of fault surfaces all at once."

In a single stage, you can interpret the seismic structure, including highly faulted horizons, fault surfaces, canyons, and salt bodies. You are also able image and interpret more depositional systems and depositional detail than ever before.

"You can much more accurately interpret the geology than you can with current standard interpretation systems," he claims.

Surface Draping and Wrapping

Key to TerraSpark's 3D interpretation capabilities is its Surface Wrapping and Draping tools, which can be used to interpret entire 3D geological surfaces directly from the seismic data in a couple of simple steps.

"Surface Draping can be pictured as a sheet you toss out into the data volume," he says. "You position it in 3D close to the event you want to pick, then you just drape it – like letting it settle out by gravity across the event."

"The sheet will settle down on the reflection event regardless of how faulted the structure is, which gives you your interpreted horizon."

Most interpretation systems build 3D horizons using a technology called autotracking, which has been around since the early 1980's, Dr. Dorn says, It involves marking a 'seed point' on a seismic reflection, and then setting the computer to look

for similar features on neighboring traces in the volume – an approach which he says breaks down for highly faulted events.

"With Surface Wrapping, you rapidly paint an initial 3D surface completely around an imaged boundary in the data. This could be a complex 3D salt body, canyon or channel system. You then simply shrink the surface to the imaged boundary, producing a complete 3D interpretation of the geobody all at once," according to Dr. Dorn.

History

The company grew out of ARCO's research lab, performing research to develop subsurface interpretation and modeling techniques since the 1980's in its laboratories in Plano, Texas.

While an ARCO employee, Dr. Dorn patented Surface Draping in 1999, and others in the research group he managed patented Automatic Fault Extraction that same year.

When BP acquired ARCO in 2000, Dr. Dorn persuaded BP management to keep the research team together, and to create a visualization technology centre located at the University of Colorado at Boulder.

"I convinced BP management to keep the visualization technology centre together, by donating the hardware, software, and our existing patents to a US university to establish a new research lab," Dr. Dorn says. This donation created the BP Center for Visualization.

All the work at the Center during this time was focused on interpretation of 3D data and directional well path planning. "That's the legacy of research of interpretation and well planning technology that we're pursuing at TerraSpark," he says.

The BP Center for Visualization formed and operated two consortia, funded by major multinational energy companies and major software vendors from the US and Europe. Each company contributes to the research costs and receives some rights to use the research software.

The BP Center for Visualization operated from October 2000 through December 2005, when it was spun off into an independent company, headed up by Dr. Dorn. All of the consortium members decided to continue as part of the research effort in the new company.

Well path planning

TerraSpark also makes directional well path planning tools. The company's research in this area started in 1997, also at ARCO.

Planning a wellpath was relatively simplistic in the days of vertical wells – you picked your target and drilled down to it.

But in today's era of multidirectional wells, there are different options of which route you are going to take to reach the target, what the structure of the well will be, how to minimise costs and simultaneously minimise risk, while taking all of the uncertainties inherent in the data into account.

For example, it may be better to be drilling in a straight line (rather than a curved path) as you approach the pay zone, because this gives you more flexibility to adjust the drilling as you approach the target.

You also need to make absolutely sure you don't drill through existing wells en route, which is a particular concern when drilling in a producing field.

"You have to take into account the characteristics of the type of rock you're drilling through – depending on how hard and soft it is – and so what kind of curvature you're going to build in the well," he says. "It's a very complex design engineering problem."

The research grew out of an initial project to enable engineers to plan their well paths using 3D views on large screens with all of the available geological, geophysical, cultural data and existing well paths, so they could get a much better feel for the different problems.

Easier to use

As well as providing better subsurface interpretations, Dr. Dorn also believes that his software is easier to use.

"The motivation has been to identify the parts of interpretation that are the most tedious and the most time consuming on the part of the human being," he says. "We want ways to significantly reduce the interpreter's time burden."

"Using our 3D approach, interpreters can get much higher quality results in a shorter period of time," he says.

"And with the workflow guides that we've built into the software, an inexperienced interpreter can accomplish more," he says.

Quantifying benefits of visualisation

TerraSpark has recently completed some very interesting research on quantifying the value of large-scale visualisations, where geophysicists work on large screens with 3D glasses, rather than on a computer desktop to do complex tasks. such as work out the optimum route for a wellpath.

"When a manager asked, what value is this providing me, the best answer we had was anecdotal evidence," he says. "We could say, it would take a couple of months in normal way of doing it, now we can do it in a week or so."

"Using our 3D approach, interpreters can get much higher quality results in a shorter period of time" - Dr. Geoffrey Dorn, President of TerraSpark

"Anecdotal evidence is fine, but when a manager is trying to decide whether to spend a million dollars on a visualisation room, it's really good to have some numbers."

The studies, which ran from Dec 2003 to December 2007, each involved 15-25 students who had no familiarity with the problem, and the tests utilized a modified version of the wellpath planning software.

The test subjects performed combinations of four well planning exercises of increasing difficulty. The initial study compared the environment of a desktop computer with a keyboard with a 3D virtual reality room with large screen displays.

The results were that the well planning test cases could be done 30-40 per cent faster on the large screens than on desktop computers, he says. Also, nearly all of the participants (94 per cent) had more accurate results. "That's pretty pervasive improvements," he says.

A second study was made looking specifically at the advantages of 3D input devices over 2D input devices, keeping everything else constant, including the size of the screens.

"We found that being about to interact with the data in 3D rather than 2D leads to quite a bit of improvement in the speed," he says.

This second study was repeated at ExxonMobil, using their geoscience experts as test subjects. "We wanted to see if those same gains in performance were realised by people who knew what they were doing," he says.

The result of this third study was that experts in the field see a significant improvement in speed and accuracy if they use 3D visualisation, instead of working on the desktop," he says.

A preliminary study has been conducted that shows a 25% advantage in a 3D display over a 2D (standard desktop) display. Final results from these studies will provide information on the individual contributions of each component of a virtual reality system.

IPRES – a suite of risk management tools

Norwegian software company IPRES has bundled its risk and resource management software tools into a single suite.

Norwegian software company IPRES has bundled its risk and resource management software tools into a single suite. The suite now has a common user interface, and covers key decision processes and reporting needs for upstream oil and gas companies.

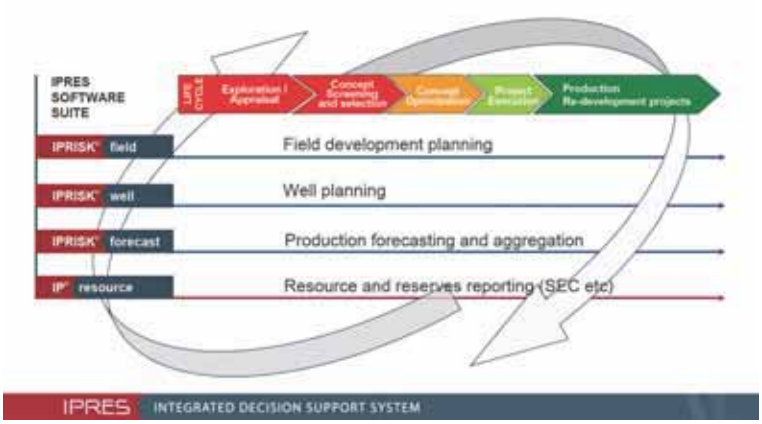
The software suite can be used to help maximise the value of drilling new wells, well campaigns, field development and redevelopment projects. These are both the most risky and capital intensive areas for an oil company.

The software suite is also used to generate reliable production prognoses and stores and reports this data together with booked reserves, historic production and current and future investments. These are all data that are vital for company planning and investor confidence.

It is very common to underestimate time and cost when planning a well or a field development, says Sverre Tresselt, product manager for IPRISKwell at IPRES.

"Most companies see they have been too optimistic - they don't plan for unscheduled events - but you know they happen", he says. "How do you plan for something that only happens 10 per cent of the time, but costs 50 days if it happens?"

The software can take companies out of a deterministic world of planning everything according to pre-selected numbers (which are rarely hit), to a world where everything is provided in terms of probabilities and uncertainties, and where expected values are arrived at.



IPRES' Integrated Decision Support System helps companies manage uncertainty

"When we made our first stochastic decision support models more than 10 years ago, we experienced that many companies were not ready for such an approach. With the many marginal discoveries over the past years combined with fluctuating oil prices, we have seen that this has changed", he says.

The software can take a range of input data supplied as distributions, and then come up with probabilistic answers – for example, which well is likely to yield the best returns, or which field set-up is most likely to work the best.

We are all comfortable working with probabilities because it is such a big part of everyday tasks involving risk, such as driv-

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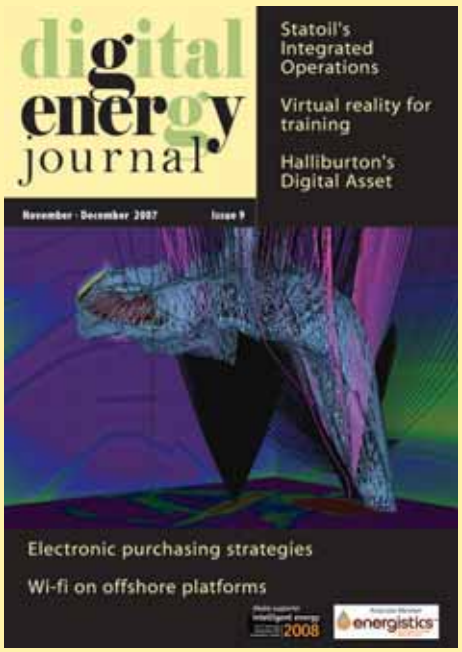

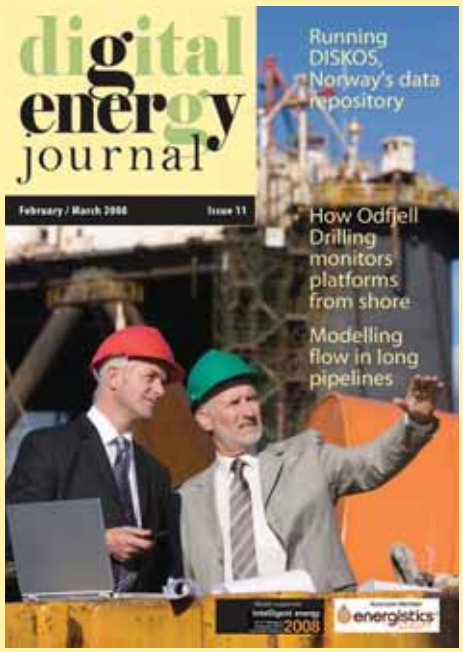

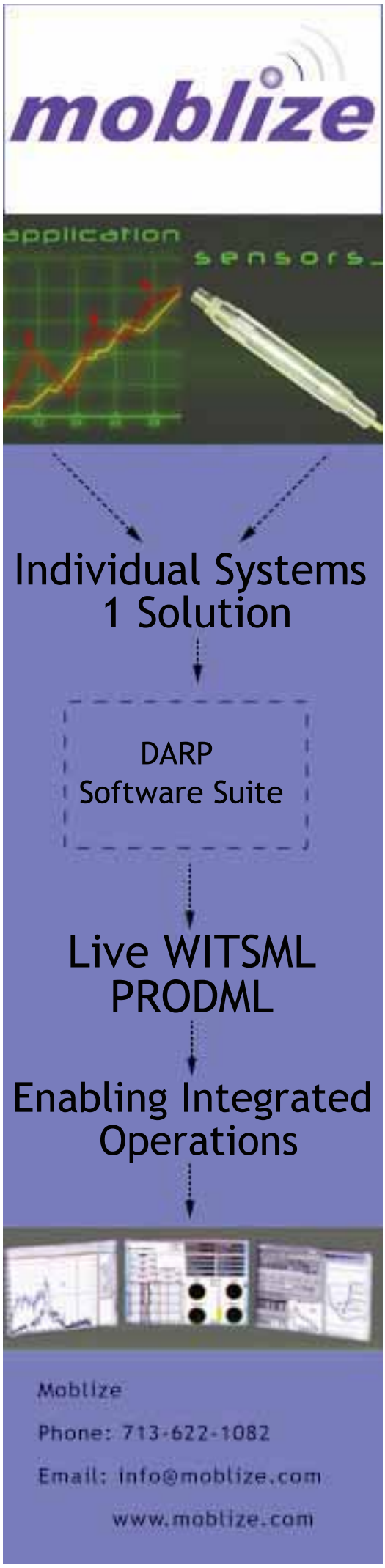

ing to work or getting to an airport on time. We know there are certain factors which happen infrequently but could have a big impact (such as train delays) and we choose a departure time which takes this into consideration.

When on our way home, we might phone our partners and tell them when we expect to arrive, but don't give them a definite time.

But when crunching all the different variables gets too complex to do in your head, and large amounts of money are at stake, it is time to bring in the computers – and this is what IPRES does.

Planning new wells, field developments and production forecasting is an uncertain world. It is important to communicate each project's inherent uncertainty and risk to management.

The best project team is not the one that is trying to find an exact answer, because this is an impossible task. The best project team is the one that fully understands the project's inherent uncertainties and is able to convey this message to management. The project team should also recommend appropriate measures to minimise downside risk and capture the upside potential.

"Project managers should never act as if they invest money from their own pocket; this often leads to a risk averse attitude and upside potential being lost," says Mr Tresselt.

"In order to maximise the value of a company's portfolio, decisions must rely on expected values. Projects we have been involved in show that there is often more than a 25% difference in a deterministic 'base case' and a 'true stochastic expected case'. This could lead to wrong decisions being made, opportunities lost and deteriorating confidence in being able do deliver what is planned. "

The software

The software suite has separate modules for well planning, field development planning and production forecasting. Each module can help you work with all relevant uncertainties – not just subsurface, but also uncertainties in cost and schedule.

The software serves as an integration platform for all involved disciplines in a given project, and the number crunching is all Monte Carlo.

The well and field planning modules can help you choose between a range of complex options. These analyses are also often directly linked to use of the forecasting module in providing realistic production prognoses.

For drilling, you might want to evaluate and compare different well path options – for example, two wells going vertically to two targets, or one snake well hitting them both – with potentially lower drilling costs but higher risk. Part of such an evaluation should also include the possibility of getting stuck, loose circulation or other problems, with resulting increase in total drilling cost. The software tools require the user to come up with a probability value for a certain event to take place, and then to provide a range for the possible outcomes, given that the event will happen. This covers both cost and time.

The updated and more realistic drilling schedule can then be used as input to the production forecast module.

Field planning decisions may include type of facility, maximum capacity you want to design for, or options that allow future flexibility e.g. tying in satellite structures. These decisions are potentially very complex, and need to be structured in a decision tree up front.

"In projects we have been involved in we have seen that the software helps the project team to stay focused on what matters. The earlier you identify the driving risk and uncertainty factors the earlier the project team can start working on these areas. Too often detailed work is being done in areas that are not important for the decision to be made, with subsequent delays in the project as a result", Sverre Tresselt says.

The oil companies that are going to be winners tomorrow must have complete control over decisions related to their most cost intensive activities, and they must be confident that they are able to deliver on time and within budget. In this process the project managers need tools not only to help them understand what is the best course of action, they must also be able to convey the message to management.

About IPRES

IPRES' main office is in Oslo, Norway, with subsidiaries in Trondheim (Norway) and London (UK).

IPRES, established in 1995, is a leading provider of risk and resource management tools and associated services to the upstream oil and gas industry.

IPRES focuses on improving and facilitating for cross-discipline decision-making processes in oil and gas companies. Main areas of expertise are within well planning, field development planning, production forecasting and resource and reserves management.

IPRES has doubled its staff during the past year, and are involved in a number of projects for international oil companies.

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Opportunities with synthetic seismic for reducing seismic imaging risk

Faster algorithms mean that it gets much easier to generate synthetic seismic data, which is a model of what you think seismic will look like.This can lead to enormous improvements in what can be done with seismic data. We interviewed Tierra Geophysical's chief scientist Dr. Christof Stork to find out more.

Predicting what seismic data and the resulting seismic image will look like before you actually shoot the real seismic data could help seismic effectiveness.

The point – to try to put it simply – is that using seismic data is a very imperfect process-- you don't know how much error it contains , or which bits of it are wrong..

But if you make a model of your expected geology before actually shooting the seismic, based on what you think the subsurface looks like, and then try to create the earth model back from the synthetic seismic, you can get a good idea about how useful the actual seismic would be.

If the earth model created from the synthetic seismic looks similar to your original model, it means that the seismic survey will probably yield good, clear results.

Creating the synthetic seismic involves a complex calculation about how the seismic wave goes through the earth, known as the Wave Equation. The process also automatically models the things which create noise, such as multiples (the wave bouncing several times between two reflectors) and ground roll (a wave going along the ground surface).

In order to create synthetic seismic, you start with an approximate earth model, of how you think the subsurface looks like, including density of the rock at different locations (so you can calculate how sound waves will pass through it).

"If the seismic imaging were perfect, the result of your seismic image should be almost exactly the same as your input model," says Dr. Stork. "But because of the imperfections, there will be a lot of errors."

"In some cases artifacts will be introduced; in other cases you will have lost part of the features. You will get additional stuff that's wrong – you will also lose stuff."

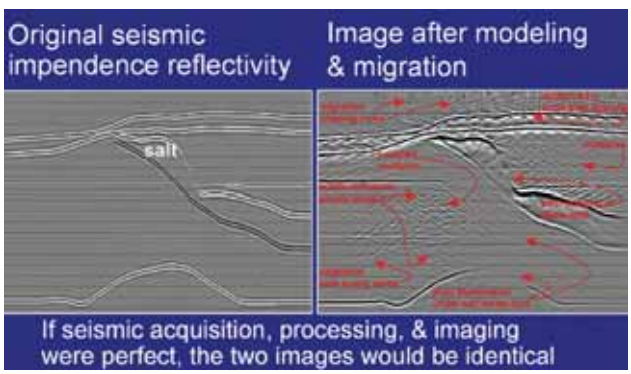
Referring to the image shown bottom left, "If seismic imaging was perfect you would get the image on the left," he says. "On the right is the image we often get. This is realistic on subsalt data."

"There's an anticline at the bottom – the top part of it is lost – because it's below the steep dipping part of the salt. There is a shadow zone going through it, so we have a seismic 'dead zone'."

"That's an example where seismic image isn't able to image something that's in your geology."

"You can see pretty bad multiples. Multiple removal techniques can take out some of that but not too much." This is an example of seismic imaging adding artifacts to your image.

"On the migration on the right – if you look at the edges you can see that subtle reflector – you can see one of the arrows pointing to it – you can see it in a few locations then it gets washed out."



Benefits

But this is only the start of the benefits of modelling what you think seismic will look like (known as 'synthetic seismic'). Another is working out how much you can rely on the seismic data. If a decision needs to be made about whether to drill based on the available seismic data, you can try to identify how much the seismic data can be trusted.

"A key job of a geophysicist is to reduce the risk associated with the imperfections in seismic data – and this gives them another tool to do it," he says. "They ask, how much can believe the seismic data. By doing modelling they can actually get a clear answer."

"In 3-5 years that may be the biggest revolution with seismic data – it might be as big as 3D seismic," he says.

If you are considering an expensive seismic survey, you could make a model of roughly what the results will look like – that will give you an idea of whether or not it is worth shooting.

This is what BP did in 2003, when it was considering doing the first ever wide azimuth survey, which is very expensive because it takes a lot of extra vessel time. The fields could not be imaged well using standard seismic techniques.

"It was so expensive that management said, we don't want to spend so much money on a glorified science experiment," says Dr. Stork.

"So instead of spending several million dollars on an acquisition science experiment they decided to spend a few million dollars on a modelling compute engine," he says.

After spending around $5m on modelling what the seismic would look like, they could go to management and say, maybe we don't need a $50m acquisition survey, but a $30m will significantly improve our imaging," he says.

As a result of that model, the whole technique of wide azimuth acquisition was born, and around a billion dollars worth of additional seismic acquisition work was done, as well as additional oil discovered, Dr. Stork says. "That was an inspiration for Tierra Geo."

A further benefit of synthetic seismic is that it can help you work out the best way to process the actual seismic data, because you can see where large amounts of noise are likely to be.

"A lot of times you're trying to interpret various subtle features," he says. "There's a question of how aggressively you should interpret the seismic data – if you do it too aggressively – you end up interpreting noise."

Interpreters often struggle to accept that there is a lot of useless noise in their data, and something they don't understand might be nothing more than that, he says.

"A lot of people will say – every little thing on the seismic section represents something," he says. "I've seen a lot of seismic data – half of is the subtle features can be pure artefact."

"A lot of subtle things on seismic data do not reflect geology – they are more a re-

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flection of acquisition problems," he says.

"Seismic data is a very imperfect method of imaging the earth. You do not get a perfect representation of the earth on your seismic data. Because of the complexity what you're looking for will be distorted."

Building on what you have

In most areas where a new seismic survey is being considered, there is already enough information available, eg from previous surveys, to build an earth model, which can be used to make synthetic seismic.

Often, people have a good idea of the shape and the structure of the surface, and that's good enough to make useful synthetic seismic. What they don't know is the actual location of faults, which make a great deal of difference to the right place to drill, and for that, you need better data, Dr. Stork says.

"Most people before they do a survey have a pretty good idea of what the geology is," he says. "There are almost no cases of surveys being done blind."

For example, in the Gulf of Mexico, people already have a good idea of the structures, and what kind of structures contain oil. "You know what you're looking for, you just don't know where it is," he says.

"In large subsalt fields, you know there are large faults which control production," he says. "The $100m question is where exactly those faults are."

"Sometimes there are older surveys, or there are regional surveys nearby," he says. "People have an idea of the structural style."

Sometimes people want to get a seismic image of a specific area in high resolution, when they already have a low resolution idea of the structure.

New frontiers

There are plenty of parts of the world where oil may well exist, but have not yet been explored due to the difficulty of making a good subsurface image from the seismic.

"For example, Saudi Aramco is trying to open up exploration of the red sea – they have a lot of salt problems," says Dr. Stork.

"They have a lot of heterogeneity problems" (problems where the land is not consistent and so is very hard to model), he says.

SEAM project

An interesting research project just underway with synthetic seismic is being led by the Society of Exploration Geophysicists (SEG), called "SEAM" (SEG advanced modelling).

20 oil companies and 4 service companies are in the project, and they have each contributed $100,000 towards the costs.

The project team are trying a really challenging project, creating synthetic seismic in 3D of a tertiary basin beneath salt.

"The exciting thing about SEAM is that they have the money and they have the volunteers behind it – to do truly revolutionary realistic modelling case study," says Dr. Stork.

"They have built a revolutionary model – a truly very large and very detailed model," he says.

"We are going to be bidding to do the computer simulation of that model to simulate the seismic data," says Dr. Stork.

The project team estimated that the cost of processing how the waves would go through its model would be $1m to $1.5m; but with Tierrageo's algorithms it can be done for a few hundred thousand dollars, Dr. Stork believes.

"Hopefully, we will help them be significantly under budget," he says.

"The interesting thing there is they thought – because the compute would be so expensive – they would need a consortium with 24 companies. But the costs have come down so much you don't need a consortium – it's cost effective for each company to do the work individually.

However, there is still great benefit in the consortium. They have built an amazingly interesting velocity model. They have very high quality standards so they will generate very accurate data. And, as a large public effort, they are creating a standard dataset that many companies will use to test and compare their technology. This model will help push forward seismic imaging technology in complex structure."

Efforts were made by SEG to synthesise seismic around 15 years ago, but they were hampered by the lack of computing power available at the time.

"It was somewhat successful – but the compute power and the algorithms weren't good enough," says Dr. Stork.

2 way modelling

Where things get really interesting is when you can start modelling the data forwards and backwards.

That is to say – if your earth model is entirely accurate, then the synthetic seismic will look the same as the actual seismic.

Conversely, you can keep fine tuning the earth model until the synthetic seismic does look the same as the actual seismic, then your earth model is probably close to reality.

The way this is done is by modelling the actual received seismic wave backwards through the rock to find out what path the wave took through the rock and what kind of rock it met.

Then you build a model of the rock according to the reflections you think are there, and then create 'synthetic seismic' – what the seismic would look like according to the model you have.

Then you compare the synthetic seismic with the actual seismic and look at how they differ – and use that information to gradually improve the earth model.

"You do iterative modelling and migration to improve your model," he says.

Computing

The algorithms developed by TierraGeo runs a calculation of the wave equation about every 10m through the rock and for every half a millisecond of time, Dr. Stork says.

The computer calculates the path of each wave until it emerges at the surface, goes deep underground or runs out of energy – including any multiples (bounces up and down between two reflectors) it makes.

"You model the physics of what's happening in the ground," he says.

Companies are always pushing the limits of computing power, but you do reach a point where more investment will not give you faster calculations – but as microchips get faster, more becomes possible.

"Seismic wave propagation is such a computationally expensive process," he says. "Even when it costs a little, it's still not insignificant."

About TierraGeo

TierraGeo is a start-up company with three staff, who has been working exclusively on this since September 2006.

Dr. Stork believes that his company will always be at the forefront of technical development and always getting faster data processing techniques, although other companies will always be close to catching up. "There will always be a little bit of a cat and mouse game," he says.

The company sent two years working on ways to speed up the algorithm to calculate how a seismic wave would go through rock, and worked out ways to make it run 20 times faster on the same computers.

Computers have got a lot faster as well, so the total speed up is around 50 times. "That's a game changing number," he says.

"We figure it makes sense to be a small company that is focussed on making this expensive algorithm truly optimal," he says.

Selling this new service to the oil companies has been challenging, Dr. Stork says, because this is something they aren't used to. It doesn't fit into their normal workflow. But, we are confident that this technology will be adopted because it's advantages are too strong.

Lloyd's Register to acquire Scandpower

www.lr.org

UK classification society Lloyd's Register has signed 'heads of agreement' to acquire Scandpower, a company which produces a range of oil and gas software, including MEPO, to help optimise reservoirs through history matching, and OLGA, to simulate multiphase flow (eg from subsea well to shore). Scandpower also has services in the nuclear industry, railway and aviation industries.

TAQA uses Rovsing Dynamics condition monitoring

www.rovsing-dynamics.com

Abu Dhabi National Energy Company (TAQA) - using Rovsing Dynamics' OPENpredictor software for condition monitoring

Abu Dhabi National Energy Company (TAQA) has installed Rovsing Dynamics' OPENpredictor software to monitor reliability, condition and performance of critical gas turbine compressor lines and auxiliary machinery, on its North Sea field.

The company has saved over $5m from using the system, estimates says Neil MacRae, TAQA's Rotating Equipment Engineer, by achieving a 2 per cent increase in availability of the equipment.

The increase in equipment availability was achieved by having better information about the equipment's performance and condition, which enabled maintenance to be clustered at best fit moment from a production point of view.

Alerts from the system are monitored by three staff members on the offshore platform; the staff also write in the reasons for any downtime to achieve better downtime statistics.

Data from the system is then sent back to shore, where it can be monitored by TAQA asset managers and engineers.

"We use the key performance indicators and statistics on downtime causes to identify the common faults on the machines," says Mr MacRae.

"We also compare with the information in our computerized maintenance management system to ensure that we capture all faults."

"The target for the platform and the asset management team is 97% availability. Compressor performance is crucial to the operation, so if they are not reliable our annual targets are not met.

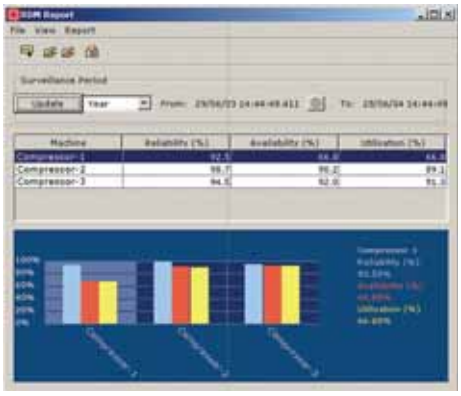
"Thanks to reliability monitoring, we now have more concrete data to work with."

"Our asset manager uses the monthly reports with analysis and recommendations from Rovsing Dynamics to check how the machines are performing.

"In case of downwards trends in availability we can now easily identify the cause and quickly solve the problems."

Yokogawa Europe and Rovsing Dynamics team up

www.yokogawa.com



Rovsing Dynamics' software - maintaining data about equipment reliability, availability and utilisation

Machinery condition monitoring company Rovsing Dynamics is partnering with industrial automation company Yokogawa Europe to offer combined automation and monitoring services.

Rovsing Dynamics' OPENpredictor system for condition monitoring will be Available as a module of Yokogawa's VigilantPlant(R) system for industrial automation.

The service will be offered for offshore oil & gas production, FPSOs, downstream LNG production facilities, terminals and onshore gas compression stations.

It supports the Yokogawa Asset Excellence services to achieve higher process uptime by minimizing downtime of the critical rotating machinery.

Norway – joint industry integrated communications project

www.dnv.com

A joint industry project has been launched in Norway, led by classification society DNV, to try to develop a common digital platform for integrated communications in oil and gas, particularly for managing communications with remote oil and gas assets, including controlling them remotely. This needs a robust digital infrastructure.

The project will run for 4 years, which should go from conceptualisation to industrial implementation.

A number of pilot projects are planned, including a control system for unmanned drilling rigs; doing control of sub-ice operations; and finding ways to ensure high uptime levels and security for projects in the Arctic.

The Norwegian military is also involved in the project. The total budget is 90m NOK (USD 14.2m).

The project will look at developing information exchange between sensors, activators and nodes.

Sensornet pushes the temperature limits

www.sensornet.co.uk

The Sensornet Oryx DTS has been designed for remote monitoring in harsh environments

UK company Sensornet has launched Oryx, a new surface fibre optic temperature sensing unit for wells.

It can operate in surface temperatures of -40ºC to +65ºC. It can be powered by solar or wind power.

The fibre in the wells can monitor temperatures at a range of up to 5000m and a sampling resolution of up to 1m. The housing enclosure is IP66 rated or above to ensure weather and dust proof deployment.

Data can be sent to the company office by satellite, radio or fibre optics, or stored in an onboard unit.

Sensornet has also launched SureSight, a fibre optic system which can operate in wells at up 300 degrees C. These temperatures are often experienced in steam assisted gravity drainage wells.

Paradigm to open new training centre in Aberdeen

www.pdgm.com

Oil and gas software company Paradigm opened a new training and technical briefing

facility in Aberdeen, Scotland on October 2008. It has high performance workstations running Linux and Windows operating systems, each with twin, 24" flat screen monitors. The facility can be scheduled by customers and clients to conduct other meetings, events and training.

Nessco launches crane radio for offshore

www.nesscogroup.com

Nessco's new radio for offshore crane operators

Oil and gas communications company Nessco Group has launched a new crane radio system that can be used in Zone 1 Gas Group II hazardous areas.

It is specifically designed to be used by crane operators, particularly in offshore environments.

Nessco says it has designed it to be as safe, simple and reliable as possible.

It has a separate radio box, a small control unit (to control the radio), a gooseneck microphone, headset and footswitch.

The system is supplied ready for installation, with all interconnection cabling, connectors, speakers and antennas (optional) provided as standard.

The control unit is as small as possible, to minimise the amount of space required near to the crane operator.

The radio box can be installed outside the crane cab, or in any other available space away from the operator.

Norway contracts for Tracerco

www.tracerco.com

UK process measurement company Tracerco has won a contract with StatoilHydro and Aker Solutions to provide a pilot subsea measurement system for phase II of the Ormen Lange field. It is a pilot project for a full scale subsea compression system.

The system will monitor the level of a gas – liquid interface. If high or low levels are detected, emergency shutdown signals are sent to the compressor unit, preventing possible damage and downtime, eg caused by slugs. The system can be remotely monitored from shore, 120km away.

It has also won a contract to track pigs in a subsea pipeline on StatoilHydro's Alve and Yttergryta fields. The pig is tagged with a radioisotope, which enables its position to be pinpointed to within 5cm, so it can be found quickly if it ever gets stuck in the pipe.

Baker Hughes appoints CIO

www.bakerhughes.com

Baker Hughes has appointed Clifton (Clif) Triplett as chief information officer. Mr Triplett was previously VP global services with Motorola, and before that VP and CIO for their network and enterprise group. He has also held a variety of IT leadership roles with General Motors, and Allied Signal and Entergy Services.

Halliburton acquires Pinnacle Technologies

www.halliburton.com

Halliburton has agreed to acquire Pinnacle Technologies, a company which provides stimulation monitoring and analysis services.

Pinnacle can monitor how well an oil well fracturing or acidizing operation is going, using microseismic mapping and tiltmeters.

This can make sure the stimulation is as effective as possible.

Pinnacle will operate as a business unit within Halliburton Wireline and Perforating Services.

Petris launches information sharing system

www.petris.com

Houston oil and gas software company Petris has launched Petris WINDS iShare, a system for people to share data, something which is often a problem for people from different companies working together on the same project.

The system is based on Microsoft's SharePoint platform. It is available as a web hosted solution or it can be installed as software on a customer's server.

There are options to automatically alert members about information changes if requested; you can track activity on different files; you can search by text of folders and documents; you can control permissions; you can upload large files by file transfer protocol.

Exprodat launches Team-GIS Explorer

www.exprodat.com

Exprodat, a company which offers oil and gas graphical information management tools, has launched Team-GIS Explorer, a tool for finding data quickly on ArcMap, a Windows tool for managing graphical information using software from ESRI.

It is designed to ensure that users can quickly locate data of interest to them and add it easily to their ArcMap session.

Team-GIS Explorer has a treeview structure that means ArcMap users no longer need to know where their GIS data is located physically on disk or within a geodatabase in order to use it. It has data preview, data access and metadata visualisation tools.

Exprodat got the idea for Team-GIS Explorer from the tools it was asked to develop as consultancy work.

Black Hills oil company uses DO2 for accounts payable

www.do2.com

Colorado oil company Black Hills Production and Exploration (BHEP) has decided to use an electronic invoicing system by US company DO2 Technologies, to automate its accounts payable reconciliation and approval process, so it can increase invoice processing accuracy and apply early payment discounts.

It is using DO2's OpenInvoice Professional and OpenInvoice PriceBook to provide a complete workflow for both suppliers and BHEP personnel to route, code, approve and adjudicate invoices.

Roxar – subsea meter and sensor

www.roxar.com

Roxar's new subsea meter

Reservoir software and automation company Roxar has launched a new singlephase subsea meter and a singlephase subsea sensor.

The single phase meter can measure oil and gas flow by measuring absolute and differential pressures across a venturi, eliminating problems associated with traditional

The new Roxar subsea Singlephase meter (subsea SPM) uses Roxar's DualQ downhole pressure measurement technology, measuring both absolute and differential pressures across a venturi, which it says eliminates the problems associated with traditional differential pressure cell measurement.

The subsea sensor measures the deflection of an intrusive probe by the material flowing through the pipe.

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This expert speaker panel from Jacob Fleming's strategic business meeting will present current case studies from leading operators, initiate lively discussion to combat challenges and ensure an interactive environment for all participants.

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- **Discover** new technologies and tools enabling advancements in the industry
- **Consider** and discuss integration techniques and strategies

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Event info: For further information please contact:
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Oil and gas production news

StatoilHydro's Gjøa platform uses shore electricity

www.statoilhydro.com

StatoilHydro has announced that its Gjøa platform in the North Sea will be the first floating platform to get its electricity from the mainland.

Gjøa is expected to come on stream in 2010. A cable running from the new power plant at Mongstad, north of Bergen, will supply the platform with electricity. One of the world's first full scale carbon capture and storage plants is being planned at Mongstad.

This will mean a reduction in carbon dioxide environmental emissions of 250,000 tonnes per year.

AGR opens Singapore office

www.agr.com

AGR Group opens in Singapore. From left to right, Lionel John, Johan Warmedal, HE Janne Julsrud, Gunnar Hilsen

Norwegian automation company AGR Group has opened an office in Singapore, in the International Business Park at the Nordic European Centre.

It was formally opened by the Ambassador of Norway, Janne Julsrud and Johan Warmedal, CEO AGR Asia Pacific.

The company provides technology and engineering solutions for equipment and plant integrity, inspection, maintenance management, operation and subsea services.

Roxar supplies sensors to Petrobras

www.roxar.com

Roxar has won a contract to supply reservoir sensors and multiphase measurement systems to Petrobras America for use in the Gulf of Mexico's Cascade and Chinook field. The contract is worth NOK 19.5m (USD 3.2m).

It will provide its subsea multiphase meter, which provides continuous monitoring of the flow rates of oil, water and gas in subsea well streams. It will also provide its SenCorr sand erosion sensor, which can measure sand erosion in real time.

Schlumberger – fluid sampling and analysis service

www.slb.com

Schlumberger has launched a service for well site multiphase fluid sampling and analysis called PhaseSampler.

PhaseSampler can provide fluid samples at the same temperature and pressure as where they came from in the well.

The system has an optical phase detector to distinguish between oil, gas and water. It can work with all types of oil, from heavy oil to gas condensate.

"Representative fluid and flow information, available at every stage of a well's life,

Schlumberger's fluid sampling service

helps operators reduce uncertainty during exploration, monitor treatment effects in development, and clarify production allocation," says Schlumberger.

The system has already been used by an oil and gas company in Russia, to do comprehensive well testing on a Western Siberia gas condensate field.

The operator was able to accurately measure reservoir fluid properties and find ways to optimise production. The operator also got a better understanding of the changing reservoir fluid composition, and the allocation of multiphase flow.

digital energy journal

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network.digitalenergyjournal.com

Digital Energy Journal has started a social networking site to connect the oil & gas technology community. Meet people involved in digital oilfield projects - learn and share experiences - connect with experts around the world.

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Technical Programme

The Energy Minister will be giving the opening address followed by keynote addresses prior to the start of the full technical programme. Oral and poster presentations will be presented, with three parallel sessions over two days. The themes encompass:

Exploration ● Seismic technology ● Integrated technologies ● Field studies/case histories
Reservoir monitoring and management ● Carbon capture and storage

NEW for Day Three: Invited speakers look at the Big Picture – Focus on the Future
Lord Oxburgh gives the final address after which the floor is opened for a panel discussion.

3D Visualization Theatre

Parallel sessions in the new Visualization Theatre on all three days of the exhibition.

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Scanning plant by laser

Wouldn't it be great if you could be sure that the new piece of equipment being delivered will fit your existing plant exactly, so you know you won't have to do rework on site, or send it back, which can all involve increases in cost and disruptions to schedule? US company Quantapoint can help.

Quantapoint, a company based in Pittsburgh and Houston, has developed a new technology which scans plant by laser, so it can put together a detailed high resolution 3D image of the plant, which can be manipulated by computer.

The information is a lot more useful than a digital photo image, because the laser beam is reflected back from the object to the scanner, giving the computer system information about how far away the item is.

The laser quickly scans everything it can see, rotating 360 degrees horizontally and vertically, and taking thousands of measurements about how far away everything is, and feeding all the information back to the computer, so the computer has a record of everything in the plant.

The scanner can provide an accuracy of an eighth of an inch (3.2mm) at a distance of 60 feet (18m) from the camera; a higher accuracy is possible for objects closer to the camera.

It can show an image of the plant which looks like a digital photograph, except it can be viewed from any direction, and from any position.

This means that, within the limitation that the laser can only go in straight lines, the computer can put together a 3D model of what the plant looks like.

The laser can also scan parts of the plant which are too dangerous to send people to.

Quantapoint was originally developed at Carnegie Mellon University, and has been developed since 1991.

All of the software and hardware is developed in house, and is constantly being improved; in April this year it launched version 8.0 of its own computer aided design (CAD) software, to work with the 3D models together with CAD drawings.

Knowing what you have

One of the biggest applications for the system is for companies who are planning to install new equipment or upgrades in their plant, but do not have detailed plans of the current plant layout, so it is hard to work out if the new equipment is going to fit, or if anything needs to be removed.

The technology has been used by both Chevron Nigeria and ExxonMobil, when installing new equipment on its platforms offshore Africa, to capture and process natural gas rather than flare it.

Both companies did a laser scan of the actual platform, and was able to manipulate the scanned data together with a CAD drawing of the equipment to be installed, to make sure that it would fit properly the first time, without any construction rework or hotwork.

In ExxonMobil's case, the scan showed 9 possible clashes and 2 fabrication issues on the new equipment being designed, which could be easily resolved before installing the equipment on the plant.

The technology has been used in refineries by Fluor Corporation, when it was modifying 17 tightly spaced process heaters and 3 carbon monoxide boilers in Texas to comply with new environmental legislation.

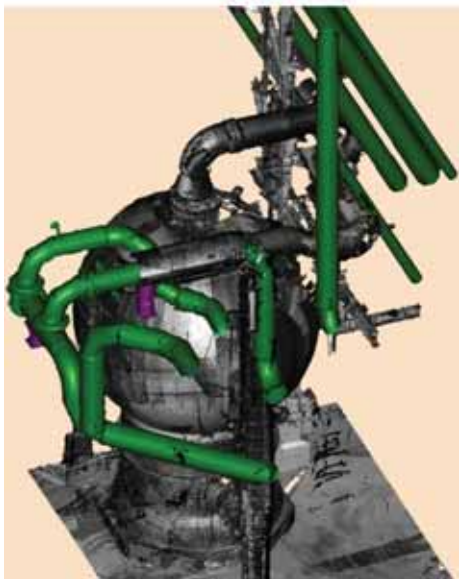
The work involved replacing older burners and adding new fuel gas piping. The space under each furnace and around each boiler was tight and congested with support columns, platforms, inlet air ducting, fuel gas piping, instruments and utilities, and there was a lack of documentation on it. It was determined that traditional surveying technologies would not suffice.

Quantapoint was employed to do laser scanning, putting together a detailed 3D picture of the area under the furnaces and around each boiler, to make it easier to plan the new equipment. This also meant it was not necessary to send people under the operating furnaces to do the scanning.

The same technology has also been used on buildings, and power stations.

Quantapoint claims that clients have been able to reduce field trips by 90 per cent (by doing virtual site visits in the design software); they have been able to reduce remodelling time by 85 per cent (by being able to model using digitised actual plant, not the CAD drawing); they have been able to decrease design time by 60 per cent (by having more complete information available in the design software); and they have been able to cut rework from design clashes by 85 per cent, because clashes can be corrected in the digital version, before the plant is actually made.

"We do a lot of scanning jobs and documenting jobs for companies that want to know what's out there and where it is," says John Fleming, customer success manager at Quantapoint.



See how well your new plant (in green, with the image from the CAD software) will work on your existing plant (in grey, with image from a laser 3D 'photo')

Working with the models

There are many different ways that these 3D models, or images, can be used.

You can make much more accurate measurements of the distance from one point to another on the 3D model than you can with a tape measure on the plant, because it is impossible to avoid the tape sagging if you are holding it above space.

Even if you can easily physically get in the plant, it can get very hard to make accurate measurements over longer distances across space, Mr Fleming says. "A tape measure over 15 feet (5m) will give you some sag. With ours that laser is not affected by the wind in the slightest bit."

You can use the 3D laser models together with computer aided design software – importing the 3D model into your CAD, or importing a CAD model onto the 3D model, enabling you to check that new equipment you are designing will fit properly, or what you will need to remove to make it fit.

The CAD software can work out how fluids will flow and react in the plant, even if the original drawings and designs have been lost; for example, it can calculate the

SMi present their 11th annual conference

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The 2009 E&P Information and Data Management will encourage attendees to take a fresh look at the processes and practices they use. The programme will examine not just Information and Data Management activities, but the impact these actions have on the business as a whole.

As well as providing an update on recent developments in the industry the conference will try to answer some of these questions:

- **How** can investment in information and data management be justified?
- **How** can we demonstrate ROI?
- **Can** we change the way we work? • Should we change the way we work?
- **What** can the E&P industry learn from other industries?

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inner pipe diameter from the outer diameter (so long as standard pipe sizes have been used), and use that to calculate flow.

You can also join together several 3D laser scanned models – for example if you scan a plant room from different points, so you can see everything, you can join the models together so a computer has an understanding of the whole room.

Or you can join together a 3D laser scan of a piece of equipment, with a 3D laser scan of the plant room, to see how the new equipment will look like when it is implemented, and what might get in the way.

You can see, for example, what items might get in the way of the new equipment, such as railings and other pipework. You can make sure that the bolts will line up properly, so equipment can be screwed together. You can work out how to minimise the amount of welding you will need to do, because welding can require expensive plant shutdowns.

If part of the plant is going to be demolished, a laser image can be taken of the plant, and then imported into CAD software, and then people can identify exactly which pieces of plant they want to demolish.

You can walk through the digitised facility and get familiar with it, before you visit the actual plant room.

You can do initial quality assurance checks on new equipment before it leaves the manufacturing facility to be delivered to the plant.

It could also be used to do studies for corrosion, perhaps getting a much clearer image using a laser than was possible using digital cameras.

In the future, people might use head-mounted displays while doing maintenance jobs (rather than get their instructions from a laptop or desktop computer nearby), and the display will show instructions superimposed on the actual equipment. However in order to do this, the computer will need to have a highly accurate picture of the plant layout, which is possible using systems like this

Checking for obstacles

One important benefit is being able to check that designs you did in the computer will actually work when you get onto the plant.

You know the kind of problem – when you have a new piece of equipment which looks as though it will fit on paper, but when you install it, you suddenly discover a piece of railing in the way, which needs to be removed, making the job more complex and lengthening the time of any shutdown to accommodate the work.

With the Quantapoint tool, you can import a model of the actual plant, taken using the laser technology, into your computer aided design software and see exactly what will get in the way – a piece of piping in the wrong place, or a railing which needs to be removed.

Overlay a laser drawn 3D image of the actual plant (in grey) with the new equipment you are modelling (in red and blue) – you can see easily about possibly clashes which are hard to imagine when you are drawing in 2D.

"You see if you will run into another piece of equipment or not," says Mr Fleming.

Loading CAD into the image

It is possible to take a computer aided design (CAD) model and load it into the 3D laser scanned model, so you can (for example) see how well a piece of equipment will fit onto the existing platform, before you have built it.

This means you can do verification of your designs, from your office.

Many people have experience of getting equipment onto the platforms and finding that it doesn't bolt into place properly.

"You can make sure it will bolt into place properly," says Millie Brinkly, head of investor relations with Quantapoint.

"Sometimes, people don't put the proper bolt rotation on the spool – so if it was sent to the field it would not have lined up."

If the new part or additions have already been built, the oil company can check they will fit properly, by scanning both the platform and the new part.

"You can go to a manufactures – scan a spool – bring that office – and drop into the actual platform to check they've built it to the proper specifications," says Mr Fleming. "That's been very successful for us."

A new development is the ability to project a piece of equipment developed in CAD onto the photo of the plant.

This can be used to identify where you are going to do the welding, and where you can bolt equipment together rather than weld it (welds need the plant to be shut down).

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Global Energy Talent – a new model for recruitment

Global Energy Talent, based in India and the UK, is a new talent management consultancy for the energy industry, which aims to go a lot further than traditional consultancies in developing long term relationships with people, employers and colleges, and use the latest IT tools to help industry professionals connect.

The company was founded in March 2008 and has around 50 staff, including 40 in India and about 10 in the UK. The mission, says Yagya Ahuja, CEO, is "helping talent in the energy sector find the right jobs and be more effective."

Mr Ahuja got the idea after being headhunted himself and realising what a painful experience it is. "I felt used without feeling any aim," he says. "I wasn't given any information. It was strung out over a period of 6 months, it was low-touch don't call us, we'll call you. I was sure there was a better way," he says.

"Global Energy Talent wants to remove the friction in finding or moving jobs," he says.

Mr Ahuja started his career as a field engineer with Schlumberger on rigs in Egypt, Iran and China, then spent five years with BP as commercial manager for a gas business in London.

The problem with many recruitment consultancies, Mr Ahuja says, is that their focus is all on transactions – since this is how they make their fees – but other than that, they don't care about people too much.

"We said – don't look at it as a transaction – look at it as a relationship," says Vikram Singha, VP marketing with Global Energy Talent.

"We take a wider view of the talent ecosystem in the energy industry. We say to people, 'we'll be your lifetime career centre', and to companies 'we'll ensure you get the right person for the right job at the right place'", he says.

"We take a wider view of the talent ecosystem in the energy industry." - Vikram Singha, VP marketing with Global Energy alent.

For students, it believes it has an important role to play as an advisory service. "Students say, there's so much information on the net, but how can I find the nuggets that can help me in advancing my career," says Mr Ahuja.

"There's a lot of excitement about the industry but also lack of credible information about it. A question we keep hearing is how long will the current oil boom last and how marketable are my skills?

"We are launching a Campus-to-Corporate training service to help students better their skills for the energy industry."

As well as recruitment, Global Energy Talent also provide HR consulting- helping energy companies better tie their business strategies to people policies and programs; and training – supporting organizations improve the skills of their employees.

Where oil is strong and talent is weak

The company intends to find technical staff at a level of graduate and upwards, to work on oil and gas projects in the Caspian region, Middle East and North Africa among other areas, where, as Mr Ahuja puts it, the "oil is strong but the talent is weak."

The company has started by visiting technical colleges in India – so far it has collected and qualified 2500 engineering students who are interested in the energy industry in the past 2 months, from the first 9 colleges it has built relationships with.

It will be expanding its campus program to technical colleges in China and Central Asia.

The company has 20 senior technical oil and gas experts in different technical disciplines, who will evaluate and provide career advice in those fields. "They want to give back to the industry so that young professionals can learn from their experiences," he says.

The experts will try to give people useful advice that will help them advance their careers, in areas such as entry into the industry, company profiling, networking and upgrading skills.

The company has developed a structured evaluation process, including an in-depth technical evaluation with the subject expert. These evaluations are made over the phone or face to face.

"Global Energy Talent wants to remove the friction in finding or moving jobs" - Yagya Ahuja, CEO.

"These experts are able to understand and evaluate not only your technical capabilities but also how you think in conflict situations," he says.

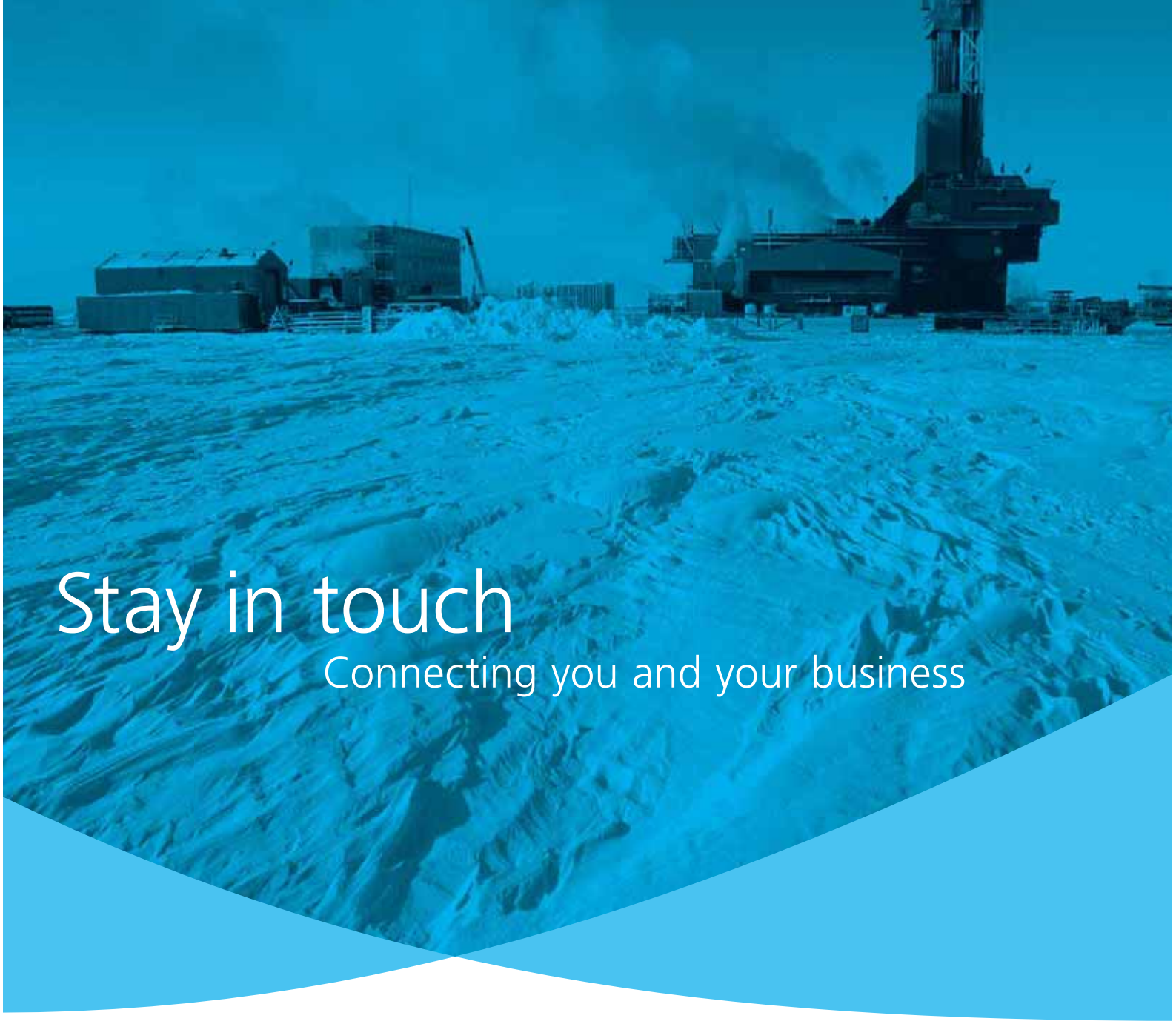
Technology

The company has a plan to "leverage technology aggressively" to try to connect people, Mr Singha says.

It wants to build up a social network style system, where people can find out people who have tried similar jobs to the one they are considering, so they can ask them directly about it.

The system will have some rules (eg not to be too negative) otherwise companies might try to prohibit staff from using it.

"We don't want to push people, but we can help you figure out what the net job will be," says Mr Singha.



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