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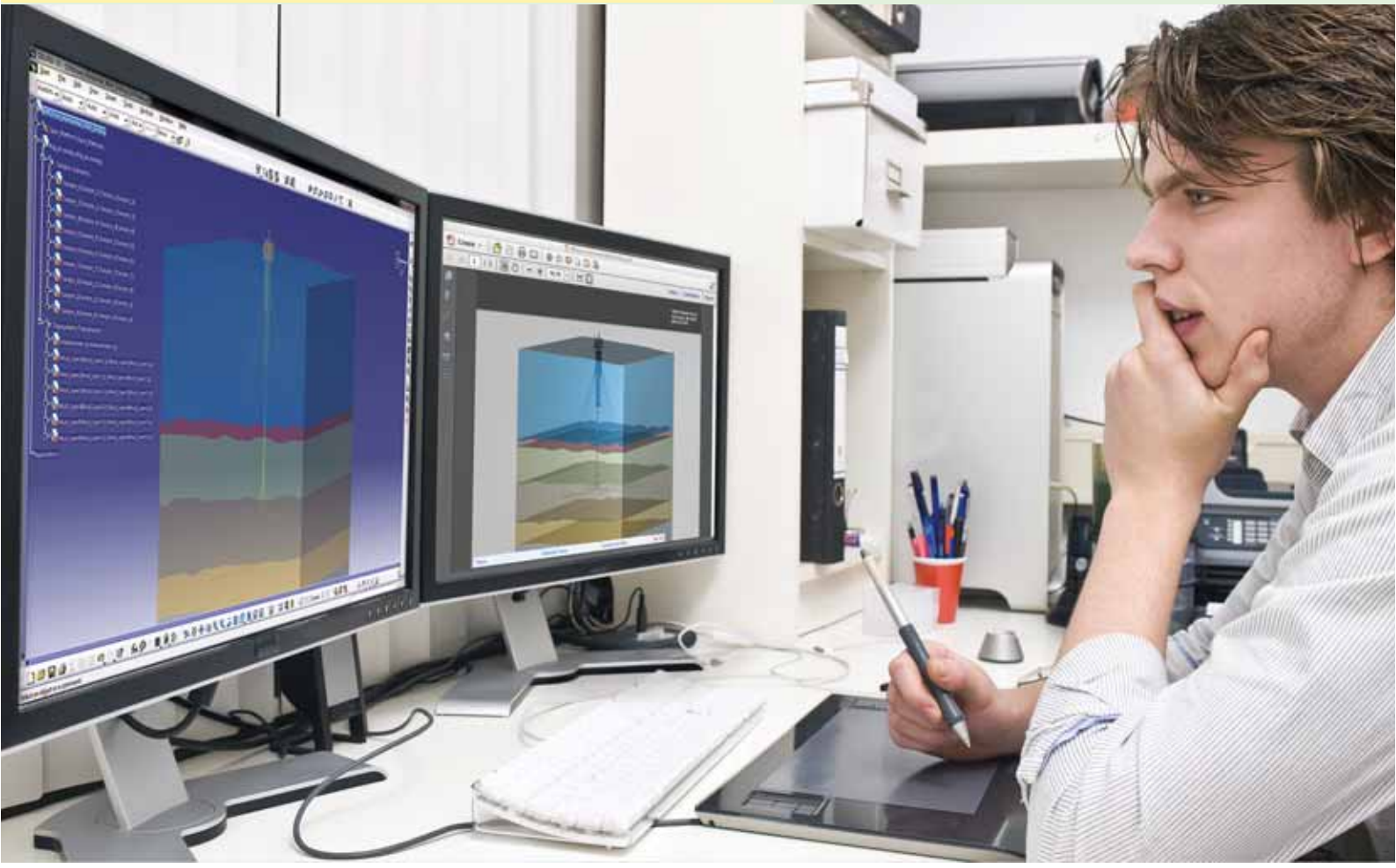

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David Bamford
Consultant Editor,
Digital Energy Journal

Rock changes during production

To understand how a reservoir is being drained, you need to look at the rocks – and can towed streamer seismic, recording only P waves, help?

New reservoir engineering observations lead to the conclusion that time-lapse geophysics – indeed any observations of any reservoirs over time - must be based on the understanding of the physics of fluid-filled, parallel, compliant, fractures/micro-cracks, dilating or compacting as the reservoir is produced.

Why do I say this?

When a reservoir, any reservoir, is put under production, fluid compositions change, for example oil may be partially replaced by water or gas, gas may be expelled from oil, and so on.

However, what is also well-documented and of significance is the fact that fluid pressures drop, changing the internal stresses on the reservoir rock.

Tempting as it may be, however, it is not possible to understand the (time-varying) geophysics of reservoir rocks by theorising an isotropic pore space (uniform in all directions) responding to fluid changes and changing 'internal stress'. Several studies have shown that the hydraulic conductivities of faults and fractures in reservoirs can be influenced by geomechanical perturbations due to production operations.

It is reasonable to anticipate that such dynamic permeabilities will be manifest as changes in flow-rates at production and injection wells.

Heffer & co-workers (Edinburgh University) have shown that statistical correlations in flow-rate fluctuations between wells from fields in the North Sea appear to bear out this expectation.

They are characterised by high correlations over very large separation distances between wells, and appear to be stress-related and fault related.

Heffer has proposed that the most likely geomechanical mechanism to explain such orientational characteristics of correlations relative to stress state is dilatation or compaction of aligned compliant fractures in "en echelon" patterns and at critical densities, also previously proposed by others as active in the nucleation of shear failure.

This mechanism is also consistent with an independent empirical feature of production data: the observed frequencies of directionalities in flooding schemes.

These reservoir engineering observations lead to the conclusion that time-lapse geophysics (observations of any reservoirs over time) must be based on the understanding of the physics of fluid-filled, parallel, compliant, fractures/micro-cracks, dilating or compacting as the reservoir is produced.

This physics has been documented over many years by Crampin, based on understanding and observing the effects of closely-spaced stress-aligned fluid-saturated microcracks on seismic shear-wave splitting (SWS) in the crust and upper mantle.

Critically, seismic observations of P-wave propagation and P-waves are relatively insensitive to fluid-saturated microcracks, whereas SWS is wholly determined by parallel microcracks and can be measured with first-order accuracy.

Thus SWS is a second-order quantity (small changes in shear-wave velocities) that can be read with first-order accuracy- thus there is tremendous resolution.

Consequently, there are significant implications for geophysical, especially seismic, monitoring of reservoir dynamics.

First of all, we can say that conventional 4D seismics, towed streamer surveys for example, only discern changes in P-wave reflectivity and thus offer at best an incomplete view of reservoir dynamics, one that is unquantifiable, allowing only empirical comparisons.

Secondly, a complete, quantifiable, view of reservoir dynamics requires 3C seismic acquisition (and strengthens the case for permanent installations).

Time for a New Geophysics?

David Bamford is non-executive director of Tullow Oil, and a past head of exploration, West Africa and geophysics with BP

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Oracle – raising the game for oil and gas data

The oil and gas industry's IT systems could be better at working with real time data, managing new data types and providing analytics, says Jay Hollingsworth, director of oil and gas with Oracle

Some ideas about how to do IT better -Jay Hollingsworth, director of oil and gas with Oracle

The oil and gas industry's IT systems are not able to handle many new data types, don't connect real time and static data well, and don't allow very good real time analytics of drilling data, said Jay Hollingsworth, director of oil and gas with Oracle, speaking at the Digital Energy Journal March 13th conference in Aberdeen on developments with subsurface data.

"When you talk about industry challenges with IT people, they are all surprised that we have some of these problems," he said.

Mr Hollingsworth joined Oracle in autumn 2011, having previously worked at ExxonMobil, Landmark and Schlumberger.

Data types

IT systems cannot yet manage many of the data types the industry is now using, he said.

"People are taking all this microseismic data with shale plays. What's the industry standard for holding microseismic data? There isn't one."

"What's the industry standard for Controlled Source electromagnetic (CSEM) data, distributed temperature surveys? There isn't one."

"There's a lot of new data types people are really excited about using, but the industry has got ahead of our ability to handle that information."

"The [subsurface] databases people are most familiar with are a year or two behind [being able to hold it]."

There are similar challenges in the production arena, with lots of new data types, such as continuous temperature readings, but no standards for how the data should be managed, he said.

Static and real time

A major challenge with subsurface data is incorporating static models together with real time data.

This challenge goes in two directions – with drillers wanting to use the subsurface data models together with their streams of drilling data, and subsurface modellers wanting to incorporate real time field data into their models.

When it comes to bringing real time data into earth models, the current subsurface interpretation tools can take an input of real time data, but "That's opening a WITSML channel into your earth model, not really managing that real time data together with your earth model data," he said.

"The geoscientists want to bring the full suite of real time information back into the earth model. That's something the industry isn't doing very well."

Locked in

Another problem with subsurface data is that much of the software is provided by companies which also provide oilfield services.

"Whether it's true or not, there's a perception that if I rely on one [subsurface software provider], I'm going to have to use their directional drilling services or wireline logging services," he said.

"There is a desire to have a kind of neutral party."

Drilling

Perhaps the biggest area where IT systems are letting the industry down is in how real time drilling data is managed and analysed.

Some drilling companies send real time data from the drilling rig to a shore office, where someone watches it.

But these real time data centres, as they are currently set up, often provide such little value that oil and gas companies are starting to question whether the cost of them is worthwhile, he said.

It would be more useful to have the data displays in real time operations centres actually available on the rig. Then the driller can see what is happening for himself, rather than trust what someone is telling him on the phone.

"How many drilling rigs have you been on where, in the dog house in the drilling rig, they see the same data display that someone is able to see at the operations centre back in the office? Not many," he said.

"The drillers crave having the same information that the college kid in the office has. For whatever reason, we as an industry aren't doing this."

"That driller is not interested in what [someone working onshore] has to say about what is happening on his rig."

Another problem is that oil service companies charge extra if the operator wants to keep the real time drilling data.

"You pay a service company to drill your well, you pay a service company to steer your well to where it needs to be, you pay a service company to tell you where the well is in space.

"You can pay the service company to do logging while drilling and tell you if you're still in the reservoir zone you think you are. You can pay them to send the data, you can pay them again to put a person in front of a wall full of monitors."

"When that data leaves the screen it dribbles off the floor. Operators don't usually get a copy of their real time data that they've paid someone to drill and monitor."

"If you want a copy of your data, you get to buy that back from the service company."

Mr Hollingsworth said he only realised how many people at operators felt about service companies, when he left Schlumberger to join Oracle in Autumn 2011. "It was surprising to me, I didn't realise how people felt about it," he said.

Real time drilling data would also benefit from more analytics.

"It takes a bit of experience to watch that on the screen and infer that something is happening," he said.

Why don't companies develop technology to interpret drilling data and make it easier to work with? "The fact that we haven't applied technology to that is a problem," he said.

Banks and supermarkets have worked out how to do analytics on continuous streams of data, and oil and gas companies can do the same thing, he said.

"It seems pretty simple but for whatever reason we haven't really done this as an industry."

On the rigs, there have been some advances in drilling data systems. Some companies are installing process control systems which make constant adjustments to keep the weight on bit constant, to optimise rate of penetration. "You no longer have a driller with his hand on the brake," he said. "Why do we need that anyway?"

Financial benefits

The financial case for investing in better IT systems for drilling is quite easy to make.

"Anything that you can do with data to

make it possible to do a drilling operation with fewer workers on the rig is a good thing," he said.

"Anything we can do to help reduce the risk of loss of reputation, on behalf of the companies which are conducting the drilling operation, in those very public environments, that's a big driver in the industry right now."

This is a particular issue with shale gas operations in the US, where drillers are finding themselves drilling very close to homes, and have people watching continuously with cameras waiting for someone to make a mistake.

With unconventionals, there is a massive focus on reducing non productive time, with some wells being drilled in under 8 days. "We talk about well construction not drilling," he said. "They talk about well manufacturing."

Specialist analytics

There have been people selling data analytics tools saying "just point our analytics at the seismic data, and you can fire your geophysicists, our analytical tools are so great that we will find all the oil and gas for you," he said.

You should be wary of such solutions, because the data analytics tool doesn't know what to look for unless there is an oil and gas person to explain, he said.

As an example, if you are pulling drill pipe out of a hole, the hook load should reduce by a certain amount with every pipe length which is taken out.

"Most people's analytical software is capable of making an alarm, tell me if I'm about to collapse the derrick - I've exceeded 60 per cent of the collapse load of the derrick - everybody's system can handle that," he said.

"But most people's systems can't handle is - if the curve kicks up slightly, which shows i'm pulling up through a part of the hole that's collapsing."

"It requires someone with E&P knowledge to say, that's a problem worth looking for. A business analytics solution isn't going to find it by itself."

"You can tell it what pattern to look for - now you're applying the E&P knowledge to the tool."

Big data

Big data is a fairly new technology term, which means a specific type of data, where the value is found from the analytics, not individual components of data.

In this way, a list of bank transactions, where every piece is valuable, would not be considered 'big data', but a database of online purchases used to work out what someone might like to purchase next, would be.

An example of big data would be a stream of temperature data from a well. Each individual reading is not worth so much, but by analysing how the temperature changes over a long period, you could get useful information, such as which factors cause the temperatures to change.

Oil and gas companies often reduce the temperature data to a reading every hour to make the data volumes easier to manage, but in doing so lose a lot of the value.

"A surveillance engineer could make use of high rate data but he typically doesn't have that available," he said.

Big data typically has lots of varieties, including structured data (databases), unstructured data (documents), and something in between, for example when a report has fields in it which contain free text, like "Toolpusher shot a cow and had to buy the rancher a set of tyres to make up for it."

You can watch the video of Jay Hollingsworth's talk at http://www.findingpetroleum.com/video/383.aspx

Can we run the E&P workflow through a browser?

Oil and gas IT could be much easier if all data and application functionality was on a centralised database and computing platform accessed via a web browser, instead of using multiple PC software tools. Dr Duncan Irving of Teradata asks if it can be done.

The foil and gas industry could have all of its subsurface data in a single database, sayd Duncan Irving, EMEA oil and gas industry consultant

If the oil and gas industry was starting its IT from scratch, it would probably choose to do it like many other industries do it, with all data and software being accessed using web browsers, and all data running in a central database, says Duncan Irving, EMEA oil and gas industry consultant for data warehousing company Teradata, speaking at the Digital Energy Journal March 13th Aberdeen conference, 'Developments with subsurface data'.

No complex PC applications, no subsurface 'projects', just one large database which all the company's subsurface, surface and sensor information was kept in, which people work directly with.

So geoscientists and engineers would never have to move data between systems and reformat it. There wouldn't be problems of multiple data in different places about the same field.

The database would be run according to standard computer science tenets of how to run a database, with long term stewardship, good data governance, and records of which people did what, at which time and with which version of the data.

"That would be a good place to be," he said.

But the oil and gas industry, and technology itself, have a long way to go before something like this can work.

Data transfer rates have not increased as fast as other aspects of IT, such has CPU speed and hard drive space – so you can't move the data around fast enough.

A seismic survey was acquired last year which was 1.7 petabytes; and one oil major has noted that a CT scan of 1000 m of core would generate an Exabyte of data, which is too large for any current platform to process usefully.

You would need to get all of the oil and gas industry's existing data in a database, which can cope with the data volumes involved, with data in a suitable structure to perform current analytical calculations on it.

But there are technologies and services available to help do this, including better web technologies, faster processers, and data storage devices which can serve up the data quickly, and analytical tools.

"But the challenge is putting all of that together," he said.

Another obstacle to doing this is the organisational tension – including between enterprise architects who understand a lot about IT at the corporate scale, but "are not really sure what the guy in the heavy metal T-shirt is talking about," he said.

Some people understand the technology, but just don't manage to make it work in their company.

"No-one as far as I know in oil and gas has put all these pieces together to allow you to do all the computations and get the questions answered in the timeframe you need to do it in," he said.

"Our vision is that from your web browser you perform all of these different analytical activities. It doesn't matter where the CPU cycle is, as long as you interact with it in a seamless rapid fashion, that's all you really care about," he said.

"As long as you're getting the job done, it's a lot more collaborative if you're using the same data."

Integrating

The industry benefits of everybody working on a common database would be much larger than the benefits people have got from visualisation systems.

"Collaborative visualisation doesn't share the data or insight. It just shares the images, in a very expensive cave."

Integrating the data would also yield much bigger benefits than are available from sharing workstation capacity, he said.

Putting workstations in server farms rather than on people's desks is "not really integrating data at all, that's just helping out your local hardware vendor with their annual revenues," he said. "It doesn't get away from the issue of having all these proprietary file formats and data types."

If data is all stored in lots of separate files or projects, there is a loss of knowledge every time data is transferred from one system to another, he said.

Working with your data

Oil majors vary in how much they want to work with the data they have stored. Some supermajors have a lot of their decision making architecture and modelling directly built on their data. Others just store lots of data but don't do much with it afterwards.

To get to know what value lies in data, Dr Irving suggests using Hadoop programming framework to re-purpose incoming data (streaming seismic and well sensor feeds). Hadoop is the open source Apache foundation project originally launched as MapReduce by Google in 2004.

Hadoop is great for finding patterns in the data, extracting features and resorting for another purpose.

Google uses MapReduce in its search engine, running many different algorithms on data which is stored in different data stores, to deliver you a list of all the web pages with a certain term in them, structured in an order so that the page it thinks you are most likely to want is at the top.

"Parallel systems are very good at this, they have very good indexing systems, they know how a database is structure, and they will present you with an answer very quickly," he said.

"It allows you to get all of this and put it in some sort of order, or get all of this and put it somewhere else."

Dr Irving said that he previously used MapReduce on seismic data, when he was working as a geoscientist before joining Teradata.

"It's something that the community is building, it's not enterprise grade yet. But if you've got some very clever system administrators, computer architects, they could build you something like this," he said.

"You could do a lot of mucking about

with your prestack gathers and derive some sort of insight from them that you couldn't get from the commercial offerings with the same sort of flexibility."

In its Aster platform Teradata puts a SQL layer underneath MapReduce, so it can draw data directly out of the databases.

So the computer can look for all kinds of patterns in the data, such as spotting that a certain behaviour is seen in the surface compressors, when there is a certain reading from the wells, and a certain subsurface rock structure.

"It allows you to have a good level of insight from your data, by trying out lots of things and excluding some hypotheses."

"When I'm doing reservoir modelling, I can put a neural network on it,

It performs all the pattern matching on the different reservoir models, things might be interesting."

You can search all of your seismic data to look for a trace which has a certain shape.

The analytics can bring in statistical measures. For example, if you want to look for something which looks a bit like something else, (for example, find me all the flow sands), the analytics can judge the likelihood that a certain formation is a flow sand, and show you all the areas it thinks are most likely to be flow sands.

The same database can also act as the company's master data store.

You can build workflows on it, showing what you want people to do every day, and have alerts if something wasn't done.

"It is not that difficult, it is just data modelling," he said.

You can have a single data system with covers everything from permanent seismic monitoring, to fraccing, up to hydrocarbon accounting. "We've done this," he said.

For one oil company, Teradata is designing a completely new data model to hold the data – although the oil and gas industry has the PPDM data model available to members of PPDM, and the Schlumberger SeaBed data model.

Why is it hard?

So why does the industry struggle so much to put all of its data in one place?

"I think the industry has always been a bit too conservative and has always been reliant on vendors that have not been looking out at what computer science can offer, especially in data management," Dr Irving said.

"We have brilliant visualisation, brilliant application development, but we're not good at working with large volumes of data."

"The super crunching data community gets it, but for everyone else this has been quite a new thing for the last 10 years or so."

"There are better ways of storing seismic data, instead of storing it in SEG-Y, a tape format. Is that the way we should be storing seismic data? It's an archive and transfer format – not something for complex analytics".

Comparison with retail

Dr Irving said that the oil and gas industry has much more complex data and expertise demands than other industries Teradata works in.

"We do a lot of business intelligence work in different vertical industry sectors, such as retail," he said. "Retail is quite simple compared to this."

But the oil and gas tools are not really business intelligence tools, because they require domain expertise. "They're built by experts and driven by experts," he said.

"The clever bit in the software is the algorithms. The graphical interface, buttons and widgets, that's not so special."

[Other industries] "don't have the rich applications that we have up here - but they have similar levels of sophistication in the workflow," he said. "They are probably 2 years ahead."

You can watch the video of Duncan Irving's talk and downlaod slides at http://www.findingpetroleum.com/video/385.aspx

Developments with subsurface imaging

The most interesting developments with subsurface imaging are time lapse (reservoir monitoring) and advances in seismic imaging with full wavefield inversion and electromagnetics, said participants in an SPE subsurface imaging webinar

The most interesting developments in subsurface imaging are time lapse (reservoir monitoring), advances in seismic imaging with full wavefield inversion and electromagnetics, said participants in an SPE subsurface imaging webinar, ranking a choice of 6 factors from most to least interesting,

Participants said that they were "least intrigued" by (lowest first) advances in computing technology, the overall challenge and multicomponent seismic.

The webinar was "Higher-Resolution Sub Surface Imaging," on March 6 2012, provided by the Society of Petroleum Engineers, with speakers Jack E. Neal and Christine E. Krohn of ExxonMobil Upstream Research.

Seismic for unconventionals

A interesting point of discussion were the challenges persuading unconventional gas asset managers to spend more money on seismic.

Jack E. Neal, Strategic Technology Advisor at ExxonMobil Upstream Research Company, said that for unconventional reservoirs, there is not widespread acceptance by engineers and asset managers that more seismic surveys can improve profits.

Companies compare the costs of doing more geophysics surveys with the costs of drilling.

"In unconventional gas, the value of expensive seismic may not justify its costs," Mr Neal said. "Dense 3D and multicomponent 3D may be more expensive than the value you get from just drilling."

Seismic is maybe more beneficial for unconventional plays outside North America.

"When you go to international plays, you need to quickly identify the quality of a play," he said. "Seismic is a key tool to making a quick acceptance, we have more acceptance there."

"If we can get the seismic at a cost which demonstrates the value in avoiding bad wells it pays for itself," he said. Seismic for unconventionals is an "active area of research for sure."

"We don't understand very well how unconventionals are producing in the subsurface - especially shale gas plays," Mr Neal said. "We're very much in a learning mode before we go into a more efficient production mode."

In unconventional production on land, it is hardest for 3D seismic to be financially viable, where "it's very cheap to put wells down," said Christine E Krohn, of Exxon Production Research Company, Houston and chair of the SEG research committee.

"But we're making improvements all the time."

Ms Krohn noted that the conversation about whether to use seismic in unconventionals is similar to the discussions which took place a few decades ago about what kind of seismic to use for deepwater. "Now we've moving to a new world with the same questions," she said.

There has not been much with cross well seismic for unconventional resources either, Mr Neal said, although it could be very valuable.

"With traditional cross well seismic, you need 2 co-planar wells," Ms Krohn said. "If you have vertical wells it makes it attractive. As you're moving to unconventionals, if you can get between different wells at different depths which are somewhat coplanar that can be useful. But if they have different trajectories there may not be a plane where you can do your imaging."

Modelling fractures

A new area of development is using seismic for modelling rock fractures, something which could be very helpful in unconventionals.

Shear waves have an interesting property when they pass through a rock bed with a lot of natural fractures, which can be detected.

"What happens is the shear wave hits a bed with a lot of natural fractures and the energy perpendicular to the fractures is slowed down," Ms Krohn said.

This information can be used when guiding drilling for unconventionals, to get better at picking areas for drilling. "We've done an experiment like this," she said.

Ms Krohn was involved in one survey project to try to identify natural factures in an unconventional gas region, covering 82 square miles in very difficult (mountainous) terrain.

The project used 7 helicopters transporting drills which were used to make holes for dynamite seismic sources, which logged 9,000 flights.

330 people and 1500 vehicles were involved. There were 900,000 man hours without a safety incident, with 12,000 hours of safety training. The seismic data was recorded in 80,000 channels over wide angles.

"It was amazing data quality, even though it was difficult terrain," she said.

The recorded shear wave energy can show where the natural fractures are, so drilling can be made in those areas.

"The drilling engineer can decide to drill an area - connect a horizontal well into these natural fracture sets," she said.

Microseismic recording can help here. You can get a better understanding of how the rock is fracturing, with different parts of the rock moving up and moving down.

"You can get a much more detailed picture of the fracture network - giving much more information to the engineer."

SEAM project

The webinar covered the SEAM (SEG Advanced Modelling) projects, set up by the Society of Exploration Geophysicists, aiming to create a massive database describing a large section of subsurface, which can be used for testing seismic modelling and processing techniques.

You can send simulated seismic rays through the seismic model, and model what kind of seismic reflections you would get. Then you process this seismic reflection data and see how the results compare to the actual subsurface model you began with.

A number of companies got together to make SEAM so they could create a data model which was larger than any individual company could create.

The model covers 1400 km2, 16 Gulf of Mexico blocks. The computer could model 65,000 shots into 400,000 receivers going through it. The data model is 200 terabytes.

"When you're doing research in imaging, it's very useful to have a test data set where you know the answer," Ms Krohn said. It is "just huge. You could subdivide this research into 11 different classical data sets. It has spurred a lot of research."

Modelling one shot through the synthetic data took a week of computer time when SEG started a few years ago, but is now much faster.

The research group is modelling waves going around a salt body, to watch how they are reflected and refracted (bent).

Shale gas drilling in the Marcellus field – but do you need seismic to get the most out of it?

"They are now working on a new model SEAM 2, working on some land examples, and an unconventional model. Those are going to be very interesting."

Full wavefield inversion

Another interesting area of development is full wavefield inversion, where you process the seismic waves to get a depth model, then do the same thing backwards to get seismic waves.

If your velocity model (which you use to convert seismic waves to a depth model) is right, you will end up the same as you started with.

If your velocity model is not so good, you can keep improving it until it is good.

Doing this takes enormous amounts of computer processing.

After about 300 iterations "we see a pretty good match," Ms Krohn said.

If you have some well data for the region, you can also use this to see how good your velocity model is. You can compare where the depth model thinks the well is, with where the well actually is. Then you can keep improving the velocity model to try to get a narrower gap.

Not so long ago, the company worked out that to compute a 3D model of the subsurface this way would take the age of the universe. "But now we can get it down to a month or less," she said.

Permanent reservoir monitoring

There are also advances in using seismic to help model and manage reservoirs during production.

This can be done with ocean bottom recording devices left permanently on the seabed in precise locations (which can be close to the production platforms).

"You're able to get a high degree of repeatability of your seismic surveys," Mr Neal said.

There have been examples of when a company got a completely different understanding of how fluids were flowing in the reservoir as a result of doing repeat seismic surveys, he said.

You can also track where injected water is flowing in this way.

The upfront costs can be high but benefits can be high over future years, he said.

If you're using ocean bottom cables, it is important to get the density right. A sparser system will be less expensive and so justify its costs faster than a denser system.

There have also been trials looking at how gravity above a reservoir changes over time, including to track the flow of injected water.

Mr Neal said that there are many examples of where liquid saturation changes, predicted using 4D seismic, are confirmed from well logs (ie confriming that the 4D seismic is providing useful data). This was done in a microgravity survey in Prudhoe Bay, monitoring water injection.

Electromagnetics

Controlled source electromagnetics (CSEM) are an interesting area of development, measuring the resistivity of rock to electromagnetic (radio) waves, similar to how it is done in well logs, using receivers on the seafloor.

Hydrocarbons in the subsurface, which have a different resistivity to rock, will show up in the survey.

It is possible to identify roughly the depth of the anomaly and the thickness using modelling, Mr Neal said.

"It is possible to get a number of false positives," where something other than oil gives a change to resistivity.

"But you don't typically get false negatives" – where an EM survey fails to identify an actual reservoir.

"This technology does not miss reservoirs if properly processed."

"Taken as a risking tool for multiple objectives especially after calibration it can be very useful - but it must be used with caution," Mr Neal said. "It is always an option we bring up - especially if there are multiple objectives. This technology can help us derisk a play basis."

So the challenge is to work out which of the anomalies are actually hydrocarbons, by using what else you know about the reservoir.

"Combining it with 3d imaging you can reduce your exploration risk with this technology."

"There are challenges - it's not a silver bullet by any means," he said. "But we are moving forward and becoming more familiar with the technology."

Electromagnetics are proving very exciting when used in cross-well, where you have a source in one well and receiver in the other, to identify what is between the two wells.

The source well needs to be treated with an electronic conductive casing.

The cross well electromagnetics have been used in steam flood, where the injector well is also an electromagnetic source, and the observer well is nearby (maybe the production well).

"As the steam / condensate boundary moves through the reservoir, you can see the steam / condensate boundary - as it passes the resistivity goes down dramatically - so you can record where your steam front is,"

he said. “This is an exciting area of research-which will hopefully be cost effective and give us more benefit for more efficient production of hydrocarbons,” he said.

Cross-well seismic works in a similar way, where a source in one well sends data to a receiver in another one to identify what is between them.

It can be used to highlight bypassed pay, because they have a higher degree of acoustic impedance (hydrocarbons stop seismic waves getting through).

New technologies

When asked about subsurface imaging for CO2, Ms Krohn said “it's an ongoing area, we’re very active. SEG has a subcommittee that's very active in the CO2 area. When we look at the effects of CO2 there will be a lot more work to do.”

When asked about research with permanent acoustic sensing in a well bore (distributed acoustic sensing, or DAS), Mr Neal said “We don't have any experience with DAS - it’s something I'm interested in pursuing more. I'm looking at how industry validates this technology. It’s a promising option down the road.”

“Seismic while drilling data is something we played around with - it never went somewhere,” Ms Krohn said.

But there is a growing interest, because it could be a way to spot drilling hazards before drilling into them. “There is a new effort with a number of people looking into seismic while drilling,” she said. “Carrying tools on the bit which let us make signals which we can detect to the surface.”

High growth companies employ more female technical professionals - Schlumberger

High production growth companies typically have 27 per cent of their geoscience petrotechnical professionals who are women, compared to 18 per cent for low growth companies, according to respondents to Schlumberger's 2011 HR survey.

High production growth companies typically have 27 per cent of their geoscience petrotechnical professionals who are women, compared to 18 per cent for low growth companies, according to respondents to Schlumberger's 2011 HR survey.

Among petroleum engineers, the female ratio was 19% for high-growth companies versus 11% for lower growth.

The study showed that the companies with the highest production growth and biggest technical resources tend to have more "pragmatic" HR policies than low growth companies, in terms of the diversity and flexibility they show in developing their talent pools.

High growth companies typically employ retired staff on a consultancy basis to serve as mentors, coaches or experts; they typically have fewer barriers to promotion; and training is more often on the job than in classrooms.

The survey, by Schlumberger Business Consulting, covers issues related to technical staffing in the upstream oil and gas industry.

It concludes that the industry is in the midst of a 'major transition' and human resources are the 'main driver of production growth'.

Issues studied include changes in demographics, increasing technical complexity of the work, and the challenges of developing talent pools with the required experience and competency.

37 upstream companies, accounting for 37 per cent global oil and gas production, participated in the study.

High production growth companies "tend" to have a higher ratio of petrotechnical professionals employed (male + female) per unit of operated production, compared to lower growth companies, the survey found.

The developing of unconventional resources and deepwater exploration have raised the complexity of technical challenges, both in geosciences and in petroleum engineering.

The "big crew change" is now well underway, with an expected outflow of 22,000 key petrotechnical professionals from the beginning of 2012 to 2015 due to retirement.

The net loss (outgoing minus incoming) will be 5,500 petrotechnical professionals.

New graduates will make up the numbers of petrotechnical professionals, but not the gap in experience.

Up to 70% of national oil companies (NOCs), 60% of major international oil companies (IOCs), and 45% of independent companies who completed the survey acknowledged project delays due to staffing difficulties.

Participating companies reported mid-career recruitment targets significantly higher in 2011 than in 2010 with an increase of more than 60% by the majors, which are being severely hit by the retirement of senior PTPs.

Annual staff turnover (% of staff changing company) is also increasing. In the geosciences it is 4-5 per cent compared to 2.6 to 4 per cent in 2010; for petroleum engineers, it is 4.5 to 7 per cent in 2011, compared to 3.5 to 6 per cent in 2010.

The survey also found that developing countries are getting more ambitious in their demands for how much of the workforce of foreign companies working in their country must be local.

Female technical professionals – does your company do better the more of them you have?

It is not unusual for regulatory bodies to set recruitment targets for nationals at 80% to 90% of middle management positions, the survey found.

This acceleration of requirements is stretching companies' capabilities, since it requires both education and changes in culture and people management.

The top executives of major international oil companies are still "almost exclusively" from their home country, the survey found.

Schlumberger Business Consulting developed a concept of "time to autonomy", the time taken to get staff to a point where they are able to make their own (autonomous) decisions. This is an indicator that companies seek to reduce.

www.sbc.slb.com.

SafeKick – understanding your drilling

People involved in drilling a well should be able to see sophisticated information telling them exactly what is happening downhole and how close they are to the margins, not a stream of well logs, believes Helio Santos from SafeKick

The state of the art in drilling technology today is still for drillers to look at a range of complex logs of different raw data, such as pump pressure, torque, bit depth, weight on bit, rotation per minute and strokes per minute (see image bottom left).

Drillers, often working 12 hour shifts, are expected to continually process these logs to understand what is happening downhole, not an easy task.

The current system relies on the right individual looking at the right data at the right time to be able to understand its significance.

UK company SafeKick believes it can improve this, by providing drillers with far more useful information instead of just raw data, allowing them to clearly identify situations that could lead to future problems, such as well control and stuck pipe.

There is no reason why the displays which drillers and mudloggers use can't be more sophisticated, but at the same time much simpler to understand, believes company founder Helio Santos.

The information can be provided by combining the mud log data with a powerful simulation of what is happening downhole, and intelligent processing. SafeKick is building both.

The simulators SafeKick is building can also be used for planning the well, training and to review what happened during a drilling operation. It is the first integrated software platform for drilling covering the full cycle of a well: design, train, execution and learning.

This avoids the current scenario where people use different software and models in design, training and drilling, making it difficult for companies to compare what they thought would happen with what would actually happen. So it is hard to learn.

With SafeKick you can use the same software to plan the well, practise drilling it, train the crew in the procedures to be used, monitor the well in real-time following your plan, and adjust as necessary based on what is found different from the plan. And, last but not least, learn and improve for subsequent wells.

Questions to answer

In order to understand what is happening downhole, a few questions must be answered:

- Where is the bit? Inside the casing, open hole or riser?
- What is the well configuration? Casings, liners, shoe depths, diameters, top of cement?
- Is the BOP open or closed? Is the choke/kill line open or closed?
-Are they aligned to take returns from the well or to inject into the well?
- Where are and what are the fluids inside the drill string and annulus?
- What is the operation being conducted?
- What is the pore/frac pressure and pressure along the wellbore?
- Are we likely to be under or overbalanced? By how much?
- Is the well likely to be cleaned (without cuttings)?
- What are the expected conditions (pressures) in the next 3 hours?

SafeKick visualisation

SafeKick's visualisations (see screenshots below right) aim to display the right information needed to understand the situation of the wellbore and nothing more, so people are not overloaded with unnecessary data.

Everything is displayed on one screen, on a clear and intuitive way. And the same system can be used before, during and after the operation; and the same information can be available both on and off the rig.

Following the rational of providing valuable information and not the usual display of raw data, instead of just displaying the mud weight, pump strokes per minute, and revolutions per minute, the system displays the equivalent circulating density along the entire wellbore annulus.

Instead of providing just the rate of penetration and strokes per minute, the user sees the cuttings distribution in the annulus.

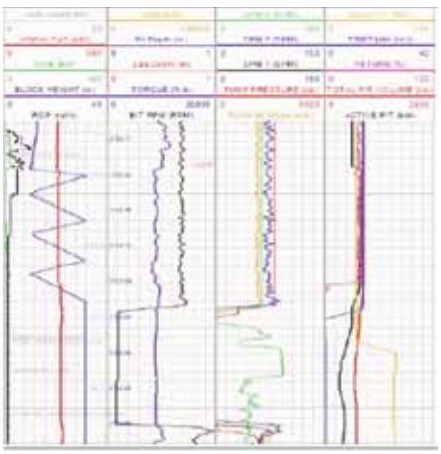
Instead of providing mud weight, the system shows the trip (pressure) margin.

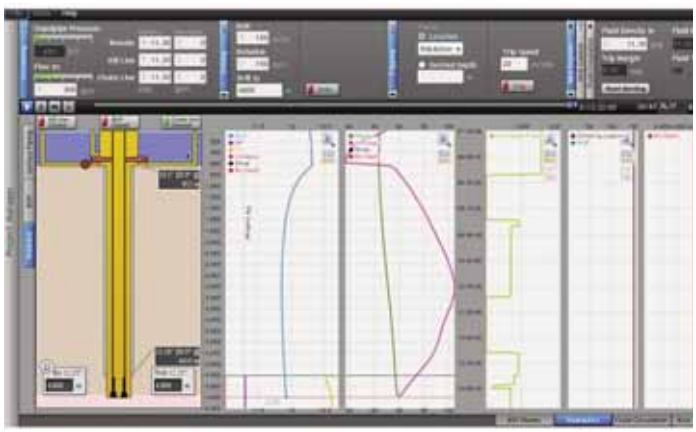
Instead of providing the block position (height) the system displays the surge/swap pressures.

In order to calculate all this information SafeKick uses powerful hydraulic, thermal and mechanical models, taking into account the temperature and pressure effects on mud properties, the effect of pipe rotation, the effect of pipe movement (surge/swab), and the effect of cuttings load.

Modules under development include supporting drilling operations and well control. Future modules will include kick and loss detection, leak off test, BOP and casing tests, tripping and cementing.

Ultimately SafeKick aims to provide an accurate representation of all drilling steps – drilling, making connections, circulating, tripping and reaming in and out, washing down, pumping out, displacing pills, running and cementing liners and casings, and operations with the BOP closed (well control procedures, leak-off, casing and pressure tests).





Rather than use well logs to understand your drilling (left) Safekick provides computer images visualising current drilling status and how close you are to boundary conditions (right)

Version 1

The first version of the SafeVision software was launched in January 2012. This Standalone version does not need real time data, and can be used for well design, training and simulation of the next operation. The version using real-time data is under field tests and will be launched in the next few months. **www.safekick.com.**

Getting comfortable with disasters faster

After a disaster, senior executives can usually figure out what to do and what to say eventually – but it helps if they get there faster, says UK consultancy Link Associates

Most managers can, eventually, get to a point where they are reasonable competent in a disaster situation, says UK emergency response consultancy Link Associates.

Most managers understand their business, understand the dangers, and, with time, can figure out what needs to be done after an accident happens, and what story to tell.

The problem is that time is not usually available in a crisis situation. People's first instinct is often to tell journalists 'no comment', which is one of the worst things to do, because it creates an opening for someone else to give a comment instead, so you 'lose control' of the story, the company says.

So Link Associates runs disaster simulator centres, where a company's management team can practise dealing with a range of different disasters, with professional role players phoning in as journalists, and get practise getting to 'own' the story themselves as quickly as possible.

The company opened a new centre in St Katherine's Dock, London, in March 2012, in addition to its centre in Derby, UK.

You can send your executive team so they sit together in a room, and receive a phone call saying that something has gone very wrong, based on a real life event, for example the loss of IT, fraud or an emergency, fires in a chemical plant, an offshore helicopter incident.

Never say 'no comment' to a journalist - Mike Hogan, senior consultant at Link Associates, and ex head of global PR with Shell

Then they have to figure out what to do, and meanwhile the phone is ringing with calls from (pretend) journalists asking what is going on.

The simulation suite has a range of audio and visual equipment so people can replicate the communications and information flow that would actually take place after a disaster. Professional role players are brought in.

Link Associates will monitor and record people's responses so they can be discussed afterwards.

Link Associates also provides training on the effects a crisis can have on people, assets and reputation, and how to maintain business continuity.

"We try to give people sweaty palms," says Mike Hogan, senior consultant at Link Associates International. "And try to get people to where they make a reasoned decision."

Owning the story

Having a crisis is as inevitable as death and taxes, Mr Hogan says. But you can learn to minimise the impact of them if you can get back in control of a situation as quickly as possible.

After an incident, you probably need to have something to say to a journalist within 30 minutes, or they'll go and find someone else to talk to, such as one of your disgruntled employees, or an environmental campaigner with an objective to make the accident look as bad as possible.

"The worst thing you can say to a journalist is 'no comment'," he says. "People's instinct is to put their head in the sand. But in the 24 hour news environment, it won't happen. We teach people to face the fact that there's no hiding place."

The company needs to quickly decide on a message it can put out, so you can "buy yourself time," he said.

"You want to get quickly to the point where you know your key messages."

"The ideal is if you have 3 key messages, and something new every few hours," he said.

This way, you 'own' the story, rather than someone else 'owning' it.

As you shape the message, "you want people who are aware of what the issues are and what the problems might be. A lot of it is about presentation, you have to think, what we are trying to put over."

It is also critical not to lie to journalists, he said. "We teach people two rules in PR - Rule One don't lie; Rule Two. Remember Rule One."

If your internal discussions don't fit with the message you are giving the public, you might end up in trouble. "What you say inside the company and outside has to be matched," he says.

Your entire workforce has to be engaged with the company's agenda – because if they aren't, they might be engaged with a different agenda.

How to behave

Mr Hogan has extensive experience on both sides of the media fence with crisis public relations. After an initial career as a journalist with the London Financial Times and economics reporter with the BBC (including editing the famous 'Panorama' program), he joined PriceWaterhouseCoopers as head of European media relations, then joined Shell as head of global public relations.

During his time at Shell, 1996 to 2003, Shell ended up involved in two very challenging public debates, how to dispose of Brent Spa, and pollution in the Niger delta, with events leading to the execution of Ken Saro-Wiwa by the Nigerian government.

Since working at Shell, Mr Hogan has also led a master's degree in international public relations and crisis management at Cardiff Business School, Wales.

When he was head of global media relations at Shell, one approach Mr Hogan took was to try to help people make their own judgements.

At one stage, the company chartered a helicopter for five journalists, some accompanied by film crews, to spend time in the Nigerian delta, so they could decide for themselves whether Shell or local people were responsible for the oil spills there.

As a result, there was a front page story on the UK Times newspaper saying that Shell was not at fault, Mr Hogan said. "It turned things around."

"You tell people what has taken place and leave other people to make the judgement," he said.

"We are never going to be loved because we were big oil," he said. "But we wanted to be admired for what we did."

Shell has hired market research organisation MORI to do surveys to find out how Shell is viewed around the world. Its chairman has also held meetings with members of Greenpeace. "We were trying to get across

that we weren't a secret society," he said.

Mr Hogan says that the way the public person should behave is illustrated by the behaviour of the chairman of UK aviation company British Midland, after one of his aircraft crashed into a busy motorway in the UK in January 1989.

The chairman conducted a radio interview whilst driving to the crash site, saying that he regretted the incident, it would be investigated, and the results would be published – a code of behaviour with the memorable acronyms RIP (regret, investigate, publish).

The success of the initial approach to the media was reflected in the fact that British Midland shares climbed on the week of the disaster, Mr Hogan said.

Similar behaviour was shown by Richard Branson, chairman of Virgin Group, after the derailment of one of his trains in the UK in February 2007. "He was on holiday and flew to the site by helicopter, and did the same thing. He said 'people don't know you care until they see you care'", Mr Hogan said.

BusinessPort – helping you streamline your processes

BusinessPort of Aberdeen grew 33 per cent last year and doubled staff head count, helping companies integrate Process, Risk and Compliance through the use of its agility intelligent Business Management System.

BusinessPort, a software and consultancy based in Aberdeen, is reporting 33 per cent business growth over the past year, helping companies streamline and integrate their processes and procedures. The company has also doubled staff over the past year.

Many companies have got into a situation where they have more procedures than staff can manage, they keep bolting on more procedures without removing any, and people's professional judgment is distorted by the stress of trying to work out which procedure they are meant to be following.

The procedures are often stored on different systems, and are not up to date, conflicting with other procedures. Meanwhile there are certain tasks which don't have an approved company-wide means of accomplishing.

BusinessPort aims to streamline all of that.

It starts off by carrying out a Discovery Exercise whereby members of their Professional Services Division visit a company, understand how its procedures work, help filter out which procedures it needs.

Then it puts together an online system which can by run stand alone or via Microsoft SharePoint Portal, which all company employees can access, so they can understand as clearly as possible what they need to do at what stage.

BusinessPort has around 50 major clients, and most of them have between 1,000 and 10,000 employees accessing the system regularly, so it has around 250,000 users.

Clients include Nexen (oil and gas company based in Calgary); oil major Total (using the system in its bases in Aberdeen and Nigeria); Canrig (a drilling company based in Houston and Calgary); Clough (an Australian engineering and construction company); the Saudi Arabian National Guard (a Saudi Arabian military force); Petrofac (a UK engineering company); Centrica (a UK oil and gas company); Babcock Marine (a UK engineering support company); Bibby Offshore (a UK offshore shipping company); Lloyd's Register, a UK risk consultancy; and Ahlstrom, a Finnish wood processing company.

The system can also be used offshore – Bibby Offshore uses it in this way, with procedures being updated in head office, and the latest procedures being sent out to the vessels.

The company is targeting all kinds of businesses which are highly regulated and have operational risks which need managed processes.

In March 2012, BusinessPort launched the second version of its Agility software. The new version, which is already being used by construction giant Petrofac, has improved tools to work with the process documentation, both for administrators and users.

On Agility 2.0, users see information which is more tailored to them. There is a more advanced user interface both for users and for administrators. There is a module to manage risks.

Company background

BusinessPort was founded by Peter Shields in 1996, who had just completed putting together a maintenance management system for oil company Conoco (now ConocoPhillips) in Aberdeen, working for a company called Brown and Root (now part of Kellogg, Brown and Root, or KBR). He could see the benefit of process maps replacing text based procedural documents, and thought it should be possible to build a business around that.

Despite being based in Aberdeen, the company's first client was an umbilicals manufacturer in Florida and the second client was based in Denmark.

Lloyd's Register, when assessing engineering giant Siemens' use of the system in a quality audit, wrote:

"The structure, content and usability of this system was excellent. The structure is process based and allows the user to quickly identify their role within the system. Change, control and archiving of records is good and the company should be congratulated on their effort with the development o this system. This electronic system is one of the best examples of its type."

Users

Users can access the system as often as required, according to marketing executive Nicola Smith.

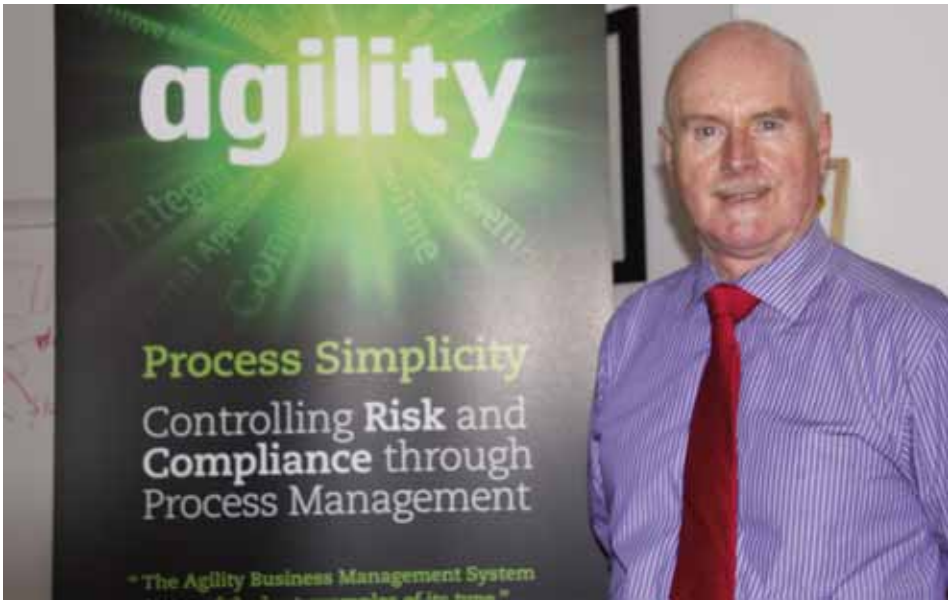
If they aren't sure exactly what processes they need to follow to complete a task, they can look it up on the system. They can search for a procedure, see who is involved and what they have to do.

Most of the information is provided in diagrams – there is an emphasis away from providing lengthy text based documents, which are expensive to produce and hard to get people to read. "It is presented visually in a way that's easy to understand," Ms Smith says.

The individuals who have to do the work can log in and see clearly what procedures they have to follow in a certain task, because of what job title they have.

When there are updates to procedures, the relevant individuals can see when they log on next that something has been changed, so they can read it.

In future, the information might be accessed more using tablet PCs rather than desktop PCs, particularly when an expected generation of indestructible tablet PCs comes onto the market, she says. This way people can see what procedures they should be following when they are doing the work.



Helping Nexen, Total and Centrica streamline business processes - Peter Shields, founder of BusinessPort in Aberdeen

Administrators

From the administrators' side:

Administrators can design a process, with specific instructions for people in specific roles, which they should follow.

There is a tool for sending processes out to people in specific roles so they can approve the text, and check that this has been done.

The software is geared around processes – short chunks of instructions, not lengthy text documents.

There is a special agility mapping tool for putting this process together, showing who does what, where and when. Using Visio, Microsoft's organizational diagrammatic programming system, overview diagrams can be designed to help further simplify an overall process, which link in seamlessly with agility

You can map the way tasks are completed in the company, and which person in which specific role performs which task at which point, and how the task should be done.

The new process mapping tool is up to 3 times faster than the old one, Ms Smith says.

Training administrators to use the system usually takes 2 days, in a training course which BusinessPort provides.

Consulting

The consultancy provided by BusinessPort is perhaps the most important part. BusinessPort specialists visit a company and look through its existing procedures in depth, and try to work out areas they can be simplified or streamlined.

Duplicate procedures can be merged, redundant procedures removed, duplicate job titles (such as co-ordinator and supervisor) can be merged.

If the company has a merger, Business Port will identify common processes across different business areas and harmonize them.

Standardization is the enabler for our ability to integrate knowledge across the organization. Open standards from Energistics are the key to Integrated Operations being 'the way to operate' in Statoil.

Peter Eilsø Nielsen
Chief Geologist Production
Statoil

energistics™
The Energy Standards Resource Centre

<WITSML/>™
energistics standards

<PRODML/>™
energistics standards

<RESQML/>™
energistics standards

Does your IT department work well with operations?

Is IT staying with the demands and requirements of an operations department in developing new ways to do business better? Perhaps not, says Dutch Holland

Is your business and IT aligned?

How closely does most companies' IT function work with operations personnel? Or vice versa?

Is IT staying with the demands and requirements of an operations department in developing new ways to do business better?

In short, is the business aligned with IT and "Does your IT department work effectively in the Digital Oilfield?"

How important are those questions?

Googling "Business/IT alignment" produces millions of hits, easily exceeding any other alignment search terms, such as for Finance, Engineering, or Marketing, for example.

So, what about re-inventing the connection between IT and the business?

Let's examine the wide-ranging "seven dimensions of re-invention for business-IT," comprised of:

- Language: speak the language when in Rome
- Organization Structure: structures must match the business
- Competence: getting "professional"
- Program Management: herding cats to the vision
- Process Management: drink the water of
- "Process"Corporate Responsibility: will ing to take "full responsibility?"
- Operations Integration: taking it all the way to the bank

Language

Listening to a conversation between business and IT management can be both interesting and entertaining.

Imagine an IT professional using the following terms in a discussion with a business team that needs support: applications, servers, data bases, vendors, operating systems, DBMS, infrastructure and data architecture, network components, and on and on. Imagine where this conversation is going.

IT management and support personnel must do two things: learn to speak oil patch with some degree of authority and limit their IT vocabulary to (1) business goals and objectives (2) work processes and (3) names of applications.

An IT audience member asked: "Are you saying I have to learn their business language but they don't have to learn mine?" "Yes" was the reply. She defiantly said, "That's not fair." True, but it is what it is.

Organization Structure

If change is the rule for the business today (and it is), IT must be formally organized to play in an environment of continuous change.

Business organizations are more and more being organized along the lines of "Run the Business" and "Change the Business."

In a typical modern upstream organization one will find departments ginning out a workstream today just like they did yesterday.

Look around, however, and one is likely to find a medley of "projects" or task forces focused on "Changing the Business." Projects might be focused on streamlining some aspect of supply chain or developing rules and protocols for intra company collaboration.

While at one time such ad hoc groups or teams were likely to be comprised of "people who aren't busy right now," the tide has turned. Taskforces and projects are now staffed with the "best and the brightest."

So, what is the problem? Almost all change-the-business projects today involve information technology, so there should be an interface between business and IT. Frequently, the interfaces are not funny — or maybe they are funny.

An IT organization's structure must match the business structure and in some ways it usually does, such as IT operations interfacing with the run-the-business side of operations. However, many IT organizations have no strong and robust analysis function (or section) that can square off with best and brightest team members from the business side.

Try making progress in a team populated with business-side pros and a couple of recent graduates of a ranking business school attempting to fill the shoes of an experienced IT analyst. Maybe it's time to return to mainframes' heyday when just about every IT shop had a first rate business analysis section made up of pros who could stand with one foot in the business and the other foot in IT.

Competence

Given today's taxing environment with needed interplay between IT and the business, something more than programming and modeling skills are called for in the interface.

In fact, in an effective IT interface, players look more like "professional service guys," accountants, lawyers, and even consultants from the big companies. Such professionals spend the better part of their lives working with parts of their client's business that need professional advice and services.

Thus, the suggestion for re-invention is not to stage a raid on a big name consulting house, but to begin cultivating professional service competence in IT. For example, looking into a typical IT organization today may reveal those who could perform very well in the business/IT interface.

Conversely, others who might not have what it takes to play that critical interface role are typically easily spotted.

A more complicated way of saying it may be: IT can no longer send its best and brightest into the bowels of IT where contact with operation people is limited to a collision in a hallway.

Today's world calls for the best and brightest IT talents to take their place on the IT organization's boundaries where they regularly interact and innovate with the best and the brightest from the operations side. What goes around, comes around.

Program Management

Program management is coming to the fore as a needed discipline for handling the proliferation of changes, upgrades and modifications IT faces every day. The phrase "herding cats" is common parlance around many of today's IT departments.

Program management is not new to

Today's new executive standard is "to run the business well all the time, and to change the business well every time." Both sides of the standard will be impossible to meet without business-IT alignment.

Is your IT function aligned with the rest of the business?

many IT organizations, but there is good news and bad news. The good news is that program management as a discipline is gaining a foothold, on the IT side at least. The bad news is that program management has become a creature of IT, not the enterprise.

Program Management to guide multiple technical projects in IT to a safe conclusion except for a collision or two with other projects clearly works.

But the real need is for program management to be used at the enterprise level, not just inside IT. The reason is simple. Those on the operations side just do not do program management or Project Management. Their skills are in running the business to hit targets, something they do well. But, in today's changing world, running the business well just isn't enough.

Today's new executive standard is "to run the business well all the time and change the business well every time." IT's competence in program management can even be used outside of IT. Business management with multiple task forces and initiatives going all at once could use strong program management skills and discipline. Today's IT organization must have the skills and the willingness to re-invent their role to include helping the enterprise "change the business well every time."

Conclusion

One might make a case that changing business practices require Information Technology to "reinvent" itself for Business IT Alignment. Yet, reinvention is not a simple linear operation; reinvention must happen on multiple fronts or dimensions. It may not be fair, it may not be easy, but alignment is there to get done. "Lead, follow, or get out of the way."

Starting with seven dimensions was a good idea, but perhaps too bold an attempt to cover everything in a brief overview. Fortunately, there is a next time and, in the next edition, expect to hear "the rest of the story."

About the Author: Dutch Holland is a multi-decade veteran of the business wars, in the trenches long enough to know that the real excitement comes from taking the high ground to see today's big picture and to envision tomorrow's "Upstream Business of the Future." Dutch can be reached at http://www.hollandmanagementcoaching.com/digitaloilfield/.

Service company IT and corporate IT

Who is responsible for fitting together IT from service companies and the corporate IT department? The business unit managers. Are they the best people to do it? By Mark Reynolds, staff drilling analyst, Southwestern Energy (Houston)

Why do companies buy computers? Such is the question presented to my freshman computer science classes.

After much prodding and discussion, the students get it – to make money.

Paraphrased, why do oil and gas E&P managers invest in technology? Again, to make money.

Sometimes making money may result from reduction of injuries, reduction of spills, or reduction of NPT.

Other times, monetary value is realized through boreholes which are straighter, drill faster, and stay in-zone. In other cases, technology improves communication and asset management.

One thing is clear: managers invest in technology which is operations-centric and bottom-line focused.

Operations-centric systems and technologies (specifically software and data systems) are not financial systems and are not accounting systems; they provide explicit functional benefit to the operations side of the enterprise.

Drilling systems and drilling technologies are distinctly focused on keeping the bit turning – reduced HSE incidents, reduced NPT, increased wellbore quality and increased ROP.

Business unit challenges

Development, implementation, and management of operations-centric [software and data] technologies is not well understood either within or without of the business unit.

And the business units must locate solutions: service companies, corporate IT, or business unit (in-house, in-group) solutions.

Service companies provide many solutions, often a systems-wide solution.

Corporate IT departments develop the requisite application to custom specifications, often integrating in-house data and applications.

Business units solve problems – quickly, internally, and with differing degrees of success – system solutions and integrated data solutions.

Industry standards have helped smooth the dissimilar edges of diverse subsystems. WITS, WITSML, and PPDM (most especially WITSML) contribute to a level of interoperability.

Furthermore, these standards form the glue between the subsystems far superior to emailed spreadsheets and 24-hour reports.

But, in many cases, the advantage has been lost due to the non-standard nature of the standards as well as the increased complexity of the drilling problem.

Service companies offer many timely and out-of-the-box solutions. And these solutions are typically designed with a level of forethought, planning, and agility but they must meet expectations from a range of potential clients. Thus they are seldom a single solution with a great fit.

Systems which provide a high degree of customization will achieve a degree of agility, but with the cost of a level of complexity.

Nevertheless, solutions provided by service companies are critical to the drilling challenge. Drilling engineers have grown adept at shoehorning diverse, yet synergistic, service companies into a functioning unit.

Rig / PVT sensors and subsystems, downhole equipment and subsystems, mud logging subsystems, and geologic subsystems can be brought together to produce a system of values – a system of visualizations – which can be assimilated by the engineer.

And this has been successfully achieved by all successful E&P managers.

Traditional IT departments

Traditional IT departments want to take over, manage, audit, and control systems.

They approach the problem from the viewpoint of a technologist – a technologist bound by a decade of regulations and audits: Sarbanes Oxley, ISO-9000, and various SEC regulations.

IT departments understand analysis, development, scalability, and roll-out but product development cycles are seldom nimble and responsive. Agile and Scrum development techniques have improved the situation, but not sufficiently improved to keep the bit turning in today's systems.

Ad hoc fitting these solutions together – solutions from the service company and from the IT department – has become the challenge of the business unit expert.

Immersion within the drilling environment promotes an agile and responsive mindset, but discourages robust designs.

Spreadsheets

Thus the business unit operations and processes tend to spring from spreadsheet solutions designed to address 1) immediate challenges and 2) interconnecting dissimilar systems. Thus, business unit solutions are frequently non-integrated technologies.

But spreadsheets have accomplished unbelievable feats; but they are inherently ad hoc solutions and normally require hands-on nurturing to keep running.

Move to closed loop

As the industry moves away from hand-on-the-brake drilling mentalities into closed-loop automated drilling, look ahead predictive analysis, and nearby well comparisons, the ability to consume and process ever increasing datasets becomes the driving factor.

Support-center based performance visualization is becoming more common place thus raising the bar in regards to monitoring. Specifically, traditional threshold based alarms are giving way to knowledge systems, case-based reasoning, and closed loop systems.

Business unit based teams of data analysts, data engineers, and systems architects become central to the new drilling paradigm.

This Business Unit IT may exist as a business unit organization with connections to IT or may exist as an IT extension tightly coupled to the business unit. Either way, rapid-reaction operations-centric solutions are required.

Regardless, Business Unit Development teams create intrinsic value in the drilling datasets by moving away from 24-hour morning reports and into the real-time data streaming environment.

And drilling challenges may force the real-time streaming systems to move from 10-second update rates down to 5-second, 2-second, 1-second, or even sub-second updates.

System and subsystem interplay cannot be understood when the sampling granularity is too large. The ability to watch and analyze trip speed, vibration, and most transient events is non-existent with updates slower than 10-second rates; 2-second or even 1-second updates are preferable in many scenarios.

Service companies and solution providers are rapidly developing new integrated solutions. Case-based reasoning, complex event processing, and closed-loop control provide new levels of centralized direction, steering, and control. But bringing these new services (internally or externally developed) requires a new level of industrial and software management expertise.

Management oversight is asking for more complex analysis of more data. Big data systems, business intelligence, and traditional data mining become the ingrained minimum expectation.

When coupled with increased asset scheduling and mobilization expectations, with the increased governmental permitting and reporting expectations, and with increased management oversight, the integration of current drilling parameters with asset management becomes its own challenge – and this challenge can only be understood and solved by the ingrained / integrated business unit team of data analysts, data engineers, and systems architects.

Increasing ROI

But technology must increase the ROI; it must increase the generated revenue or decrease the capital expenditure. And the business unit team must, themselves, produce a net increase in company value.

Quantification of the ROI benefit is difficult at best and unwieldy in most scenarios.

For example, asset management and scheduling ROI can be inferred by idle rig-days and reduced governmental penalties. Operations-centric borehole control ROI can be assumed and quantified based on 1) reduced sidetrack counts in known areas, 2) borehole straightness, in zone-ness, and achieved lateral length, and 3) higher production volumes.

Quantifiable justification of the business unit embedded team of data analysts, data engineers, and system architects when compared to internal IT organizations as well as service companies is no less challenging.

Comparison of raw estimates to perform a project (time and head count) is meaningless unless a demonstrable accurate task estimation system is in place – but this frequently precludes agile and nimble development teams.

The business unit development team, when properly formulated, must address the drilling challenge in an embedded and integrate fashion and must consist of data analysts, data engineers, system architects, and a management layer adept at creating the operations-centric, agile and nimble, service group.

The business unit development team can, when properly constituted, equipped, and encouraged, become the E&P manager's go-to asset.

So the case for business unit development teams becomes a management approximation of the team strengths, the business expectations, and the cross-discipline need for results.

The expectation for success of the business unit team must be compared to internal IT teams and to service company turn-key supplied solutions.

When expectation for business unit teams to respond to ever tight tolerances to time, production, and HSE, the case for the business unit, operations-focused, development team becomes more readily apparent.

Business unit software and data systems development teams can, and will, make money for the organization through improved and faster drilling, improved production, and reduced HSE, NPT, and asset downtime.

Mark Reynolds is currently at Southwestern Energy (Houston), where he works in the Fayetteville Shale Drilling group as a Staff Drilling Data Analyst. In this position, he pulls his experiences in data processing, data analysis, and data presentation to improve Southwestern Energy's work in the natural gas production and mid-stream market.

Mark began developing military avionics systems for General Dynamics and Sikorsky Aircraft. Since 1990, he has been developing Systems and Applications for the Energy Industry including integrated information systems, systems analytics, real-time processing, and operations management.

Any opinions expressed in this article are personal opinions of Mark Reynolds, and are not related to any business activities of Southwestern Energy

Doing more with data

Kuala Lumpur,
October 24-26, 2012

Finding Petroleum / Digital Energy Journal is running 3 one day conferences in Kuala Lumpur, Malaysia, on October 24, 25 and 26 on doing more with petroleum data, covering drilling, subsurface and production data.

These 3 events will present the most exciting new technology to help manage and work with all aspects of data in the upstream all and gas industry.

The conferences are for people who work with drilling, subsurface and production data, who want to learn about new ideas and new technologies to make their data work harder, to improve efficiency and safety of drilling, ability to find new reservoirs and extend existing ones, and maximise production.

The event is scheduled to coincide with the Energistics National Data Repositories conference in KL on October 21-24.

Attendance is free - register now to secure your place

October 24 - Doing more with drilling data
October 25 - Doing more with subsurface data
October 26 - Implementing data tools faster

The aim is

(i) to make it easier for people working in KL oil and gas companies and service companies to find out more about the latest new technology to help manage data, and

(ii) to provide technology companies attending the National Data Repositories event with a chance to meet a local audience during the same trip.

The events are supported by the South East Asia Petroleum Exploration Society and Energistics, and timed to co-incide with the Energistics National Data Repositories conference in KL.

The events will be free to attend.

For days 1 and 2, we will look for financial contributions from speakers - in the range 14600 MYR / USD 4760 / GBP 3000 for a morning slot and MYR 9750 / USD 3200 / GBP 2000 for an afternoon slot. Sponsorship opportunities are also available.

The third day "getting data implemented faster" will be panel discussions, chaired by Jerry Hubbard, CEO of Energistics, and participants in the first 2 days' sessions will be invited to join.

For enquiries about sponsorship and speaking please contact our sales manager John Finder on +44 208 150 5292, e-mail jfinder@onlymedia.co.uk

Reserve your place now at **FindingPetroleum.com**

Want to manage logistics like Caterpillar?

Heavy machinery manufacturer Caterpillar believes that its internal logistics processes, which manage supplies of 620,000 spare parts, are so good that it is offering them as a service to oil and gas companies

Caterpillar manages many spare parts for its own heavy equipment - could it do the same for yours?

Caterpillar Inc, the famous machinery and engine manufacturer, has to manage 620,000 different spare parts.

The company believes that its expertise in managing the delivery and inventory of spare parts is something the oil and gas industry could find useful.

CAT's expertise, making sure critical spares for heavy, expensive equipment are quickly available, is something very relevant to the oil and gas industry. "If the $4m truck is down, the guy loses his sense of humour very quickly," he said. "It's kind of within our DNA, we know how to manage that."

Cat Logistics's service offering for oil and gas companies is to try to understand their strategy for supplies of items, understanding the current supply chain in depth, looking at the accuracy of records, and putting together a proposal which will include an opportunity to improve the current set-up.

"This assessment we do is pretty accurate," said Moe Iverson, Commercial VP for Cat Logistics, speaking at the Digital Energy Journal Feb 28th conference in Stavanger on Optimising supply chains.

"It allows the client to understand the benefits and what the benefits might be."

To make sure people in the field can get fast access to the spare parts they need, you need to look at your system as an entire network. "It's one thing to run the warehouse, it's another thing to run the network efficiently. That's kind of what we do."

Caterpillar has to manage 620,000 spare parts for all of its products

"We play very well in the industrial, mining, oil and gas capital asset area."

Since 2002, Caterpillar has offered logistics services to outside companies, following a deal to manage global parts distribution with Land Rover.

Now Cat Logistics serves 65 companies, in the automotive, heavy industrial, mining and oil and gas sectors, employing around 12,000 people. Other external customers include Ford Motor Company, Harley-Davidson, Mazda, Cadillac Europe, Mosaic Fertilizer, Newmont Mining Corporation.

In 2005 Caterpillar acquired the logistics business RelayStar NV, which was previously an affiliate of ChevronTexaco Technology Ventures LLC.

The company does not operate any transportation vehicles itself but purchases a large amount of transportation services around the world.

Inventory

Inventory "drives pretty much everything," Mr Iversen said."It drives the store size, real estate, buildings. It has an influence on operations, how many people you have, what are the processes you've employed, all of the equipment you have in place to manage it."

"You have to make sure you have the right part, right place, right time to maximise your business. It helps create a competitive advantage for your operations."

A good inventory management system will also help you manage business changes, such as new regulation, natural disasters, business cycles, new competition, increasingly complex sourcing networks, he said.

Simulators

Caterpillar has to make as many of its spare parts as possible available at short notice anywhere in the world.

It approaches this task using sophisticated computer simulation, to make an optimum statregy for stocking for each item, and decide how to play off the need to reduce capital tied up in inventory, against the need to have parts quickly available, stored close to where they might be needed.

The computer simulation tool can also adjust spare part inventory very quickly if there are changes, for example when the recession forced customers to postpone acquisition of new machinery, so they kept older machinery in action for longer (needing more spare parts).

The simulators forecast what CAT terms "independent demand", ie the demand which cannot be easily predicted.

This is the same as the type of predictions your local supermarket makes. It does not know exactly what your neighbor will purchase tomorrow, but can make a fairly good guess of its overall sales based on past overall purchasing history.

"A simulator is a tool that allows you to understand and model the changes in your inventory profile before you pull the trigger, so you're able to simulate the actual results prior to implementation and execution," he said.

CAT's simulator model works with 3 years of demand history for certain items, and studies the transactions that were made.

You can model different routing strategies for spare parts, whether to store all items in one central location or in distributed warehouses.

"We create a profile of the inventory investment and a profile of your service," he said.

CAT Logistics is so confident in the results of its simulation process, that it can sign contracts with customers where it guarantees that specific items will be available where needed, otherwise the client doesn't pay.

When doing simulations, getting clean data can be much harder than running the actual simulation, he said.

"It's a bit of an arduous task - you spend a lot of time in making sure that the data is not in any way a problem. It is a lot of hard work - but that is kind of what we do."

Capital and service availability

A useful task with the simulator is to test what is possible by either reducing capital tied up in inventory, or improving service availability times.

For example, say you currently have $18m of items in inventory, and a service availability of 85 per cent (the part you want is available 85 per cent of the time).

After running the data through the simulator, you might get an improved inventory set-up, which will mean you still have 85 per cent service availability, but only $11m tied up in spares.

Of you could keep $18m in spares, but get a 95 per cent service availability.

Or go for something mid-way, with say $13m in spares and 90 per cent service availability.

You can watch the video of Moe Iversen's talk and download slides at http://www.findingpetroleum.com/video/379.aspx

3D PDF Technology for the supply chain

3D CAD models of spare parts, embedded into PDFs, can be used to improve purchasing and maintenance, says U.S.company EOS Solutions

Helping you work with 3D pdfs - Steve Prast, managing director, EOS Solutions

EOS Solutions (www.3eos.com) of Rochester, Michigan, is helping oil and gas companies create significant improvements in the supply chain of replacement parts through the use of 3D PDF technology. The dynamic new 3D visualization and collaboration tool allows users to embed 3D CAD models, from virtually any format, directly into a PDF document that is universally accessible throughout the supply chain. As such, oil and gas operations are using it to help maintenance teams more accurately identify the correct parts that need to be ordered.

In tests, companies using it "saw significant results in improved accuracy in ordering from their offshore units," said Steve Prast, managing director of EOS Solutions, speaking at the Feb 28 Digital Energy Journal Stavanger conference 'optimising supply chains'.

It is possible to embed animated 3D models in PDFs and view them in free Adobe Reader software, so anyone in the company can view an item in 3D without having to buy expensive design software.

The system can work on its own or be embedded within a maintenance or enterprise resource planning (ERP) system.

EOS developed the technology to use 3D PDFs for supply chains in a research project with funding from the US Army, which wanted to find ways to re-use its 3D data to improve the supply chain.

Being able to view 3D models "doesn't have a direct impact on the supply chain but it had an ancillary impact by improving communication across disciplines," commented Mr Prast.

According to Mr Prast, generating 3D PDFs of items can be done affordably enough for companies to choose to install it on every piece of critical equipment.

The 3D data can be generated directly from 3D CAD data, laser scans of the actual equipment, such as offshore oil rigs, or even from 2D drawings.

Drawing accuracy is not so critical. "We don't actually have to have engineering precision in the models, it has to be visually correct, it has to fit up correctly, but you don't need the same accuracy you would have if you were going to manufacture this thing," said Mr Prast.

EOS Solutions is based in Rochester, near Detroit, Michigan, and works together with a Norwegian partner called Norisol to offer 3D PDF as part of its Model Based Enterprise solutions in Europe. Additionally, EOS Solutions specializes in 4D Simulation, which can provide a variety of benefits for clients operating complex systems with large capital investments. Most notably, 4D Simulation gives clients the ability to improve risk mitigation strategies, planning optimization and create an accurate total cost analysis.

EOS Solutions works in the aerospace and defence industry, and has been working in the oil and gas industry since 2007. Its clients include: Aera Energy, a joint venture between Shell and Exxon Mobil, Boeing, Lockheed Martin, GE Energy, General Dynamics Land Systems, BAE Systems and the U.S. Army and Navy.

Plan maintenance tasks

3D PDF technology can be used to plan and record results of maintenance tasks.

You can animate complex 3D CAD models within a PDF, which can include an audio voiceover, to explain how the repair should be done. Because the 3D PDF technology exponentially reduces the size of the original design file, the 3D PDF document can be easily distributed throughout the supply chain via e-mail or download.

Once a 3D PDF is opened using FREE Adobe Reader, which is installed on 98% of the world's computers, you can collaborate by making comments, design mark-ups and even draw measurements. For example, maintenance teams could make the following comments, "in this particular attempt we found this part does not fit this configuration." The lesson will be stored in the PDF for and eliminate further inefficiencies in the maintenance process.

If you view parts you are about to purchase in 3D, using free Adobe Reader, you are more likely to purchase the correct part

Construction Modeling

You can use EOS' 4D Simulation to assess the viability of operational plans prior to making major capital investments. EOS 4D simulations can help you understand any number of issues that may affect the profitability of a construction project during its life cycle, including: new technology, staffing levels, weather, equipment failure and delivery schedules.

In one example, a project involved digging and filling trenches. The operator wanted to work out if it would be better to have two vehicles working simultaneously, one filling a trench while the other was digging the next trench. The 4D Simulation showed that the additional truck traffic would actually slow everything down.

The technology can be extended internationally, to model and visualise your supply chain around the world. Using a secure web-based user interface that allows key decision makers to access the data gleaned from the simulation and change certain variable that test "what-if" scenarios.

EOS 4D Simulation begins by building a mathematical model of all the components that comprise a complex system and the variables that can affect them. Once this is completed, the 4D Simulation is run using advanced discrete event simulation software, which allows decision makers to see how different components will interact – for example, what happens after there is bad weather, or truck congestion, or equipment breakdown.

According to Mr Prast, the technology has been used to make a model of an entire reservoir and topsides, he said.

"We can go all the way though and look at the condition of specific wells, we can pull in live data and see exactly what the state is at any given time, said Mr Prast.

You can watch the video of Steve Prast's talk and download slides at http://www.findingpetroleum.com/video/376.aspx

Analytics on your inventory

By doing an automated analysis of your inventory levels, you can work out ways to increase your chances of having the part you need readily available, whilst reducing the amount of money tied up in inventory, says ASCI

A better managed inventory is a "gift that keeps giving" - Scott Hawkins, president, COO and co-founder of Anchorage based ASCI

By applying statistical analytics tools (such as the ones developed by Oniqua) to your inventory, you can achieve a rare combination reduced stock outages and lower cost of inventory ownership at the same time, said Scott Hawkins, President, Chief Operating Officer and co-founder of Advanced Supply Chain International, speaking at the Digital Energy Journal Stavanger conference on Feb 28th, "optimising supply chains".

Many people think optimizing inventory only means reducing the amount of inventory, but often the more useful improvements are in making sure you have important parts readily available when you need them she aid.

If you have the right parts available, and so stock outages and maintenance delays waiting for deliveries, "at the end of the day you save money," he said.

Another benefit of doing automated analytics on inventory is that you have a method to resolve disputes about whether a certain part should be stocked, or taken out of stock.

"New items keep coming. People will say, 'it would be nice if you carried this'. It is hard to say no."

"The maintenance community carries a lot of clout and sway, and in the absence of good rigorous analytics and quantifiable answers, it becomes an emotional conversation - 'I need this' - 'no you don't' 'yes I do, you don't know anything about maintenance'.

"That conversation happens 100 times a month."

But if you have a computer analytics program to tell you the best answer, "it makes it easier to say no if you don't need to stock the item and easier to say yes if it does," he said.

If everybody agrees on the rules, such as the stocking philosophy and criticality classifications, and if there is an understanding of the power of statistical tools, then it "builds a tremendous bridge" between materials and maintenance organisations, he said.

It is important to explain to maintenance staff how the classification system works, so they understand that important items are more likely to be in stock.

A common error is to neglect including the maintenance organisation in the inventory criticality classification process. If the materials organisation just does the classification in a vacuum and fails to educate maintenance staff on the power of the tools, "the buy-in that's so essential doesn't occur."

Once those bridges are built, maintenance managers begin noticing a real difference in inventory performance. For example, if the statistical tools drive warehouse service level (availability of needed parts) from 95 per cent to 99 per cent, that is an 80% reduction in stock outages. The maintenance staff will definitely notice.

This means that out of 1000 orders, the numbers out of stock has reduced from 50 to 10.

"And of the remaining ten stock-outs, the items which were out of stock are far more likely to be the less consequential items, because of the way the available usage forecasting tools treat critical items."

Returns

Once items have been purchased for a capital project or even a major turnaround, if they are not there is often a strong push to get the warehouse to bring them into stock.

Here again, the analytics tools can settle the question. Tools such as Oniqua Inventory Optimiser can work out if you are better off paying the costs of returning items, including restocking fees, or if you should go ahead and bring the items into stock based on usage history for like items.

Analytics tools can also help foster better working relationships between maintenance staff and materials staff, when maintenance staff find that the parts they need are more likely to be immediately available.

"We're in the early years of a revolution in business analytics," he said.

"I think over the next 10 years you'll see this type of thing become much more widespread.

"Mould"

Unless attention is paid to it, inventory tends to grow over time, much like mould, Mr Hawkins says.

"Once you have it, it tends to grow at a certain pace if you don't have a program to keep it in check"

Stocking levels are often planned around a certain level of usage for the item, and if the item starts to be used less, there is no process to correspondingly reduce stocking levels.

"Eliminating items is a lot more difficult to do in most organisations than bringing new ones in," he said.

It is also common that oil and gas companies don't have a plan for dealing with excess inventory. Oil and gas people are commonly very good at making plans and putting them into action, but not so good at circling back around to check on status and then optimise, Mr Hawkins says.

"Around supply chain, what we've observed, is that [planning and executing] get most of the time and energy and there isn't much left over for optimising, checking and re-optimising."

Yet the oil and gas industry has made a lot of effort to optimise other areas of its business, including reservoir engineering and exploration techniques.

Master data

A lot of the barriers to doing optimising work are with master data quality, because you can only optimise a supply chain if the master data is good, he said.

Master data, including catalogues and equipment lists, varies a great deal in quality.

Equipment bills of materials, the list of maintenance parts a certain piece of equipment requires, also need to be accurate, otherwise the wrong parts get ordered.

"Without at least a modicum of master data quality it is very difficult to optimise," he said. "It is very difficult to know what you've bought repetitively, to tease out the opportunities, when you have a catalogue rife with duplicates and poor descriptions."

There are many agencies around the world which specialise in helping sort out master data, he said. "There are firms which have sprung up which can help you put proper taxonomy and nomenclature in place, do an initial data scrub, and even help maintain the data over time."

The data quality does not need to be perfect to generate enormous value, he said. The most important pieces of information are the purchasing history of items and past order lead times.

Technology tools

Another barrier to adopting analytics is the technology tools. Many companies spent

large amounts of money in the 1990s and early 2000s installing ERP systems and putting all of their data into them, with a view to making this system the only system they used.

But many ERP systems don't have very good data analysis tools, or other specialised analytics tools, and companies are reluctant to use software outside their main ERP system. That is a barrier, says Hawkins, because no single system can do everything. Specialized functions such as advanced analytics rely on ERP system data and functionality, but can greatly enhance the value and efficiency of ERP systems.

Supply chains will not optimise by themselves. And ERP systems won't do it, either. It "takes some new energy, some external third party stimulation, and some leading edge tools." he said.

ASCI

ASCI, or Advanced Supply Chain International, is mainly a business process outsourcing company.

It has a sister company focusing on asset management services, including catalogues, equipment bills of materials, and technical aspects of enabling and operating supply chains, with a focus on optimisation.

The company employs around 250 people, with a further 75 involved in joint venture projects in the Caribbean and Australia.

It helps companies which do high volume transactions, companies making thousands or hundreds of thousands of purchase and receipt transactions per quarter.

Criticality level

If all of your stock has a defined criticality level, that is useful for making decisions about stocking, he said.

The criticality can be defined as the cost of not having the item when you need it, he said.

"A" criticality could be for an item which, if not available when required, would lead to the platform being taken out of action.

"E" criticality is for items which would be inconvenient to be without.

"Hands in the field wouldn't like it, but there would be little cost in not having it," he said.

You need expertise from maintenance personnel to classify items in terms of criticality.

How well do you know your inventory?

Algorithms

The calculation of whether a part should be kept locally in stock is a function of the criticality level, the amount you use the part (stock issues per year), and the costs of looking after the stock for each item, including storage, handling, capital tied up in inventory, and other costs.

You can plug this data into algorithms which can tell you the optimum stocking levels for your warehouse, and even flag vendor-held stock opportunities.

There are statistical algorithms which have been around for decades to analyse different types of inventory, he said, with different profiles for items.

By processing the data you can get an answer which "everybody can agree on," he said.

Some companies still try to use spreadsheet models to do tasks like this, but these can get terribly time consuming when you have tens of thousands of items. The bottom line is that old fashioned spread sheet models lack the robustness and productivity benefits of leading edge analytics tools.

Behind other industries

Other industrial sectors, such as manufacturing and retail, have been doing optimisation of inventory for many years, and are a long way ahead of the MRO ("maintenance, repair and overhaul") sectors, he said.

"Oil and gas is one of the last industries to embrace this.

"I have my own theories about why," he said. "Industries with tighter operating margins have more incentive [to optimise]".

Ongoing process

Managing inventory is not a one-off process – you have to continually re-examine inventory and keep up with staff training.

Once the system is in place, it is important to run annual training in how to use the system, or otherwise, as people move into new roles, "this process, like any other process, can wane," he said.

Mr Hawkins recommends that you re-run the inventory analytics algorithms monthly so you can identify, every month, items which are in stock but don't need to be; which items need better vendor management; and recommendations for items which would be better stored in a different location (onshore vs offshore), based on their criticality and usage patterns.

You can identify items which have seasonal use patterns and set stock levels to adjust accordingly.

You can also look at where the largest changes are taking place in your spare parts consumption and then examine them in more detail.

The system will also match the supply to current demand, not the demand 2-3 years ago. "Demand patterns change a lot," he said.

Case study

One company ASCI is involved with, described as a "tier 1 multinational oil company," worked with ASCI to help optimise inventory.

The company had varying levels of master data quality in different parts of the world.

The oil company employs a highly regarded specialist in inventory analytics, who was "able to get out front and pilot this process and bring his peers along," he said.

The company started with pilot implementations of the analytics in the Arctic and Indonesia.

"That allowed the organisation to learn some lessons to define some templates around setting up the cost model, and to validate the return on investment (of the effort," he said. "Is the view from the top worth the climb?"

The effort for Alaska took six months, and the "results were eye popping," he said. The results for Indonesia were "equally impressive".

So the company decided to make the effort globally, running on a global analytics platform.

The company's internal studies for the first year showed a 20:1 ratio of benefits to costs for the project, including the costs of the software, set up, software maintenance and implementation.

It will continue to get the same results every year. "Having your inventory properly optimised on a monthly and quarterly basis is a gift that keeps on giving," he said.

"The value was not limited to stock reduction; it was also about increasing stock, particularly high criticality and medium criticality items," he said.

"Having the correct items you need when you need them, and having process to eliminate items you don't need - generates quantifiable value," he said.

There were also intangible benefits from the improved trust levels between materials and maintenance departments.

You can watch the video of Scott Hawkins' talk and download slides at http://www.findingpetroleum.com/video/374.aspx

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Founded in 2000, **OFS Portal** is an organization which consists of diverse supplier members who are committed to promoting eCommerce and reducing cost. We have a non-profit objective to ensure we promote the best approaches for the industry. In addition to advocating strong protection for the security and confidentiality of electronic data, **OFS Portal** has gained the trust and confidence of the entire upstream oil and gas industry. We do this through our proactive advocacy approach toward best practices to reduce costs and complexity while increasing the speed of adoption.

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A shortage of cargo aircraft?

The oil and gas industry uses a lot of cargo aircraft, many of which were built by the Russians during the Cold War and are not being built any more, said Lesley Cripps of aircraft charterers Chapman Freeborn. This could mean problems in the future

The oil and gas industry makes big use of large cargo aircraft, such as the Antonov 124 (max 150 ton payload, with its own crane).

But these aircraft are not being built any more, said Lesley Cripps, Group Sales Manager Energy with UK aircraft chartering specialist Chapman Freeborn, speaking at the Digital Energy Journal supply chains conference in Stavanger on Feb 28th.

The air heavy cargo industry has been dominated by Soviet aircraft since the end of the cold war, including Antonovs and Ilyshin-76s (IL76), she said.

Production of the IL76 has been much reduced since the 1990s. There are just 30 Il76 aircraft certified to fly in Europe, and the remainder in the Arabian Gulf and Africa.

Production of the Antonov 124 (which can carry 150 tons and has its own crane) was suspended in 2004, and there's a fleet of around 20 aircraft.

The US manufactured Lockheed Hercules aircraft has a 23 ton payload, although it is no longer in production. Only 118 were ever built, 48 were written off, 8 withdrawn, so only 62 are in service, of which 40 are with government.

"In the near future, unless someone comes up with a source or start building new aircraft, they will soon die up," she said. "Those are the only aircraft that can carry some oil and gas equipment."

Oil companies often charter aircraft to carry pipe lengths between Stavanger and Aberdeen. Not many aircraft are long enough to take the pipe. "The Aleutians and Antonovs are such a key player in the energy industry."

Oil Spill Response Ltd, an organisation which runs a network of oil spill response organisations around the world, keeps a Hercules on standby to drop dispersants on an oil spill.

Chapman Freeborn

Chapman Freeborn is 30 years old and has over 30 offices around the world, and charters both helicopters and fixed wing aircraft. Its head office is near Gatwick Airport, London.

It has offices in many oil and gas locations and can arrange aircraft in under 2 hours.

It was very involved in providing aircraft to evacuate oil and gas personnel from Libya and Egypt during the recent unrest.

Capable of carrying 150 tons – the Antonov 124 – but no-one makes it any more

It provides assistance with permits, knowledge about airports, and talking to local governments.

Chapman Freeborn vets the aircraft operators, and also has 3rd party liability insurance to cover its costs if there was an accident.

Aircraft advice

For geological surveys, you have to choose between a helicopter and fixed wing aircraft. Helicopters can maintain a constant ground position and land in trickier areas, but are more expensive to operate and can only cover about a third as much distance. They also need more maintenance work per flying hour than fixed wing aircraft, she said.

People usually choose helicopters because they provide a higher resolution survey because they move more slowly.

"In most cases an aircraft has to be modified if special survey equipment is used," she said.

Chapman Freeborn also advises on the best way oil and gas operations can be set up.

Petrobras, for example, needed helicopters able to cover 300km to its offshore pre-salt fields, which is beyond the range of many helicopters. Chapman Freeborn suggested setting up a hub part of the way offshore, so smaller helicopters could shuttle between the platforms and the hub.

Runway advice

Chapman Freeborn can also give advice about the nearest runway to your operations where you can land your cargo.

As an example, in Norway, the closest airports to the oil and gas activities in Snøvhit and Shtokman is Hammerfest airport, which has a 6025 feet runway, which limits the size of aircraft which can land on it to a De Havilland Dash 7 and Dash 8.

The runway can be closed for days due to strong winds. The next nearest airport, Alta, is 2 hours away by road, but can take an Antonov 12 aircraft, which can carry 20 tons of cargo. But there are limits to the weight of cargo which can be handled at Alta.

Bardufoss airport (South of Tromsø) has an 8,000 feet runway, which means an Antonov 124 can land, but there are limits in the weight it can carry.

The nearest airport which can take very large equipment is in Bodø, which is 17 hours trucking time away.

It is possible that the runway at Hammerfest could be increased, if the local government wanted to.

There have been examples of airports being extended just for oil and gas projects, in Papua New Guinea, when an airport was is being extended to be able to take larger aircraft for a LNG project.

You can watch the video of Lesley Cripps' talk and download slides at http://www.findingpetroleum.com/Lesley_Cripps/390.aspx

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PetroDAQ, Inc. is a technology provider for the oil and gas industry, with emphasis in data acquisition and aggregation solutions.

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Our customers include national oil companies, rig owners, mudlogging, BOP testing, and data management companies. Each solution is tailored to the specific needs of the customer.

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