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How technology investors make decisions

A better understanding of shale

Oct-Nov 2011 Issue 33

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Cover image: 3D Seismic work at Shell's EpiCentre, Rijswijk, The Netherlands. Photograph courtesy Shell

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Deepwater Horizon: how big were the holes?

David Bamford
Consultant Editor,
Digital Energy Journal

As you will see, I hope, this is a significant technology question.
Much discussed after the Deepwater Horizon tragedy last year was the so-called "Swiss Cheese" model of risk management in which a system is considered analogous to a stack of slices of Swiss cheese. The holes are opportunities for a failure or accident to occur, and each of the slices are layers of the system. A 'problem' may pass through a hole in one layer, but in the next layer the holes are in different places, and the problem may be stopped. Each layer is a defense against potential problems. For a catastrophic failure or accident to occur, all the holes need to align, for each step in the process, allowing all defences to be defeated and resulting in a failure.

An example of such a "Swiss Cheese" model is found in BP's Deepwater Horizon: Accident Investigation Report, from September 8, 2010.

To repeat, in this model, an organization's defences against failure are envisaged as a series of barriers, with individual weaknesses in individual parts of the system, and are continually varying in size and position. The system as a whole produces failures when all individual barrier weaknesses align, permitting "a trajectory of accident opportunity", so that a hazard passes through all of the holes in all of the defenses, leading to a failure.

What is interesting is that when a drawing of the model is shown, typically the holes are small compared with the total surface area of the barrier. An RAF 'acquaintance' of mine (my friends will know who I mean!) said, of their experience - "how do you know how big the holes are?"

An interesting question!

Let's pick – not quite at random – five technology aspects of a deep water rig's defences, five technology 'barriers':

Cement jobs: it has been reported that cement jobs, especially at high temperatures and/or pressures fail from time to time. How often? 1 time in 5; 1 time in 10; 1 time in 100?

Cement bond logs: it has been reported that they fail from time to time? How often? 20% of the time or 1%?

Negative pressure tests: it has been reported that they are sometimes difficult to interpret? How often? Half the time; once in a hundred times?

Acoustic triggers for Blow Out Preventers (BOPs): the US MMS did not make them mandatory apparently because sometimes they were believed not to work in muddy or polluted water. How often does this occur? Once in a thousand, once in a hundred, or once in ten, times?

How often do the shear rams on BOPs fail to cut drill pipe? Once in a thousand times, once in a hundred?

I point out without hesitation that I have no idea of the right answers to any of these questions; I have simply quoted a wide range in each case because this range speaks to 'the size of the hole(s)' in a particular barrier?

If the failure rates of each of these technologies – and all the others involved - are such that a hole appears like a pin prick in an extensive background, one might conclude that the chances of every hole aligning are very small and the chance of catastrophic failure correspondingly so. Equally, relatively large holes – significantly high technology failure rates – would lead to the opposite conclusion. Technology providers tell us of the virtues of their offerings – but do we know how often they don't work? I only ask because I would like to know!

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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Contents

Paradigm: a better understanding of shale

With just well logs and seismic data, together with powerful software, you can get a much richer understanding of a shale gas formation you are thinking about fracking, said Sandra Allwork, business development manager Paradigm, speaking at the Sept 20th "Unconventionals" Finding Petroleum London forum

With nothing more than standard well logs and conventional seismic data, but with powerful software, you can get a much richer understanding of a shale gas formation you are thinking about fracking, said Sandra Allwork, business development manager with subsurface software company Paradigm, speaking at the Finding Petroleum London Forum on Sept 20th "Business Opportunities with Unconventionals".

Her talk was entitled "Investigating the Barnett Shale: A case study on how integrated technology can help improve your understanding of an unconventional reservoir."

As a result of the detailed analysis, you can get a better idea of which areas of the subsurface you want to drill into, which areas to avoid, which direction your drilling (and fracturing) should be oriented in, and what types of frac fluids and proppants you will need.

In more detail: you can use the seismic data to get an understanding of the rock properties around the well, and try to identify a "sweet spot" to drill, away from complex rock structures (faults and dissolved rock) that may compromise the efficiency of the frac process.

By using seismic decomposition by azimuth and angles you can identify the best orientation for the bore hole, and the best zone to fracture.

From analysis of existing wireline log data, you can work out the brittleness and ductility of the rock (to know what frac fluids and proppants will work) and calculate the kerogen content (which indicates a high likelihood of gas-).

You can analyse microseismic data to get an idea of how far the fracking has actually extended.

Paradigm has a suite of products to perform all of these tasks, including "Geolog" for petrophysical analysis; "SeisEarth" for seismic interpretation, "StratiMagic" for seismic facies classification; "VoxelGeo" for visualising 3D seismic data using voxels (3D pixels); and EarthStudy360 to analyse rock properties in all azimuths (North South East West direction).

Well planning and structural modelling can be carried out in Paradigm's "SKUA" tool.

EarthStudy360 is the newest of Paradigm's technologies. "We are still introducing it to the market. The uptake so far has been in the US and we are about to start investigations in Poland," she said.

Brittleness and ductility

To work out the right frac fluids to use, you need to know the brittleness of the rock (how easily it breaks). To work out what proppants to use, you need to know the closure stress (how hard it will be to keep the fractures open). "We need an understanding of the mineralogy and the mechanical rock properties we're drilling into," she said.

Another useful property is ductility (how much a material deforms under stress), which is useful to know when evaluating the seal.

This data can be measured if you have cores (rock samples from the well) in the zone of interest, but these are only available for certain sections of wells already drilled.

However if you have log data, which extends much further along the well, and you have data from nearby wells, you can work out relationships between core data and log data for the section of the well where the core was taken, allowing you to get more information out of the logs for the rest of the well.

"What we're looking for is a way of getting the information we get from cores and propagating that out, and extracting information from other wells," she said.

You can get a sense of ductility and brittleness by cross plotting Poisson's Ratio (ratio of transverse strain to axial strain when the rock is stretched) with Young's Modulus (a measure of stiffness of the material), using data from the wireline logs, she said.

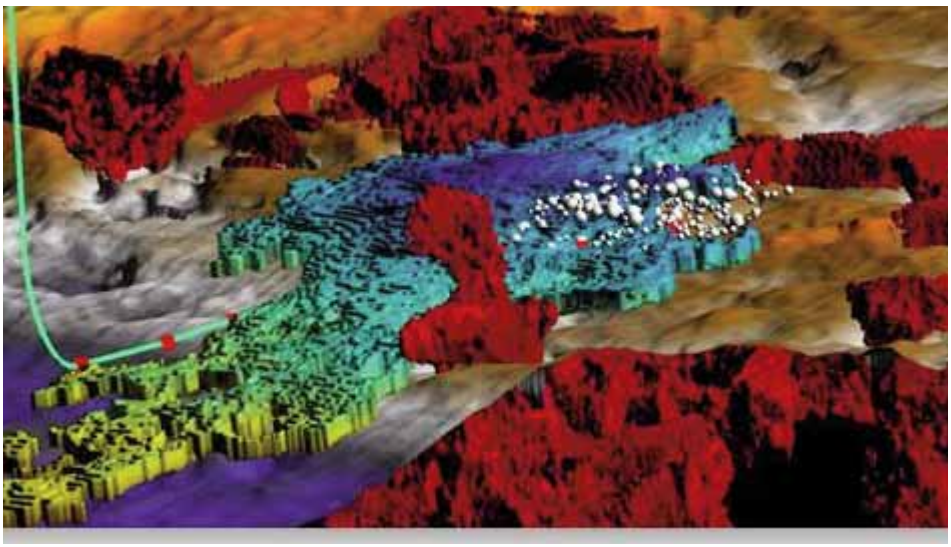
Kerogen

It is useful to know the amount of kerogen (organic matter) in the rock, which can give you a sense of whether there is likely to be gas in economic quantities.

Kerogen content can be mapped directly from gamma ray logs. High gamma ray activity is thought to be a function of kerogen in the shale. But gamma ray logs have lots of sudden spikes, whilst kerogen content is usually fairly consistent, so the logs don't provide the whole answer.

Ms Allwork suggests using the Paradigm "MultiMin" rock modelling tool, which can be used to build a model of different minerals in the well. You make a guess of the mineral composition, and see what curves that mineral would produce, and how that compares to the actual curves you get, then adjust your guess until the modelled curves match the actual ones.

You can also use the "Passey Method" which can be used to calculate kerogen content, by overlaying resistivity and sonic curves on a log scale and comparing the



Integrating geoscience techniques for a clearer understanding of your gas shale

curves.

A further step is to model another material in the rock. In the example, Paradigm added a mineral close to pyrite, an iron sulphide often found in coal beds.

So you get 3 different kerogen calculations, one just using gamma ray, one using the Passey method, and one adding pyrite into the model.

The end result is a smoother curve, which looks a like a more 'robust' prediction of the amount of kerogen, she said. "This has given us a pretty good analysis of the kerogen content, the variation of kerogen within the well, within the zones that have been logged," she said.

Seismic

Typically in shale resource plays, the drilling pace is so rapid, the role of seismic data is greatly diminished.

This is pity because there's a lot more information you can get from seismic, she said.

The first seismic analysis step is fairly standard, looking for horizons.

The Barnett Shale is "not particularly interpretable. It doesn't come out as a huge booming event on the seismic," she said.

But there are known rock formations above the Barnett Shale, the "Marble Falls" and below, the "Ellenberger", which you should be able to pick out from the seismic, which help you in turn in locating the Barnett formation.

The Barnett Shale does not fill the entire subsurface between these formations above and below so you still need to look more closely.

For the initial interpretation, Paradigm uses waveform propagation,; an automatic technique whichpropagates interpretation according to the trace shape rather than amplitude, making it more accurate and provides interpretation maps showing structural detail.

Another image is generated by Coherence Cube technology, which can help spot the major faulting zones. You want to have an idea about how the shales are fracturing naturally (to see which direction they split easiest in), and where the major fault zones are (so you can avoid them). You also want to avoid karst structures (where rock was dissolved by rainwater when it was close to the surface). "The surrounding structures around the shale are as important as the location of the hydrocarbon," she said.

So using information from seismic attributes and rock structure, you can spot areas which might be of interest.

More detail

Now you can look at the shale in those areas in more detail.

Paradigm suggests using isoproportional slicing of the area between the Marble Falls and Ellenberger, which means putting together slices of the subsurface an even distance between the upper and lower zones. You chop the rock up into slices and look at them all in more detail.

Then you look at how the wavelet shape changes as it passes through each slice, using a neural network classification process. Every change in wavelet means a change in facies (a change in the specific rock properties) because each type of rock (facies) will have its own distinctive wave trace shape.

Your zone of interest should show up as a collection of wavelets which look similar.

If you find a voxel (a 3D pixel in the data) with a targeted value, the software can find all the voxels nearby with similar properties, so you can get a 3D view of the area you are interested in. So you have a 3D body of a potential shale zone of interest. Correlations between multiple seismic attributes can also be carried out with principal component analysis (PCA), a mathematical technique to work out which of your seismic attributes are most useful.

"We're building a 3D complexity into the interpretation which will give us the structural setting for the shale that we're exploring," she said. We're using different ways of extracting information from the seismic and using automated interpretation techniques to extract these so we can put them into our geological model."

Angle and azimuth decomposition

An interesting new development from Paradigm is a software tool called EarthStudy 360 which can analyse the subsurface by looking at the seismic data rays from any azimuth and any angle.

With conventional seismic techniques rays from the same image point but with different azimuths collect data which are subsequently averaged. As a result of this process, azimuthally dependent properties (velocities, rock properties) are lost.

Instead of doing that, Paradigm suggests that you gather together all of the different rays which you think have passed through your subsurface zone of interest, going through at different azimuths (North South East West angles), to get a clearer picture of what is happening at that point.

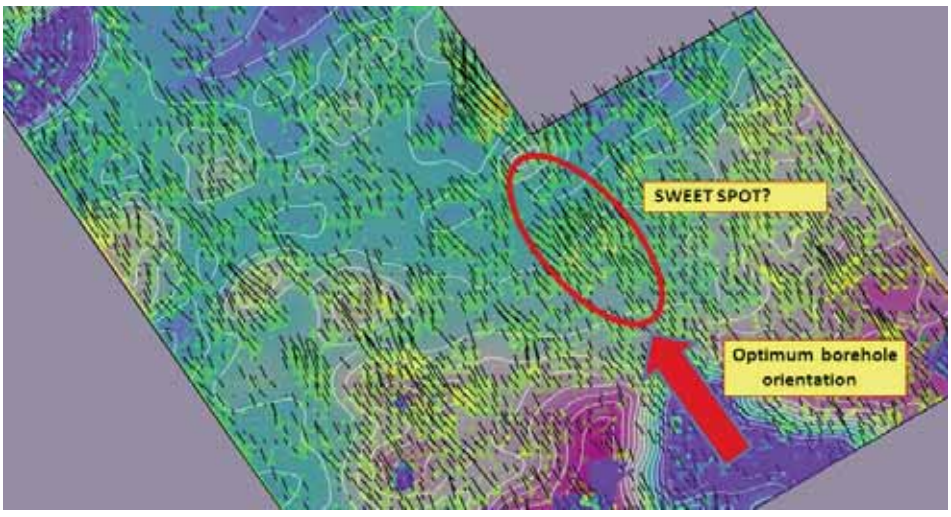
The traditional industry method of working with azimuths is to split the data up into sectors (usually 6 to 8), for example North to North West, North West to West, could each be a sector.

Then you analyse each of them separately, so you can see how the end result is different for each of them.

But if you want to get your fracture in exactly the right direction, then just knowing which of 6-8 directions is the best, isn't a very high resolution answer. "The number of sectors that you divide the data into is generally driven by convenience. The resolution of those sectors is of course compromised," she says.

Also this standard 6-8 sector approach uses the assumption that the azimuth of the ray travelling from the subsurface to the surface is the same as the azimuth it entered the subsurface with, which is not necessarily true.

Paradigm suggests a different method, modelling the rays in all azimuths all at the same time. You can model the path of rays shot from each point in the subsurface for a



Co-visualisation of seismic-derived attributes leads to sweet spot identifcation

wide range of angles and azimuths, then map your surface source/receiver data to the ray arrival points.

Paradigm calls it "full azimuth imaging and decomposition" – looked at the seismic wavefield in 360 degrees.

"This is a completely new way of organizing data, making it more of an interpretive tool," she said. "We generate full azimuth angle gathers in depth."

Then you can work out exactly which directions are best to fracture in, not just the best direction out of 6 to 8 different sectors analysed.

You can also continue your understanding of the subsurface in different directions. "Rather than visualising the data as a cylinder of seismic data, we can look at radiating cylinders out with increasing angle," she said. "Or we can take the slices round and look at them as more traditional gathers."

"We're trying to give you the full information you can extract from the seismic and allow you to make the decisions in terms of what you get from that."

Anisotropy and fracture density

Paradigm has a number of other interesting processes which can us tell more about the rock properties.

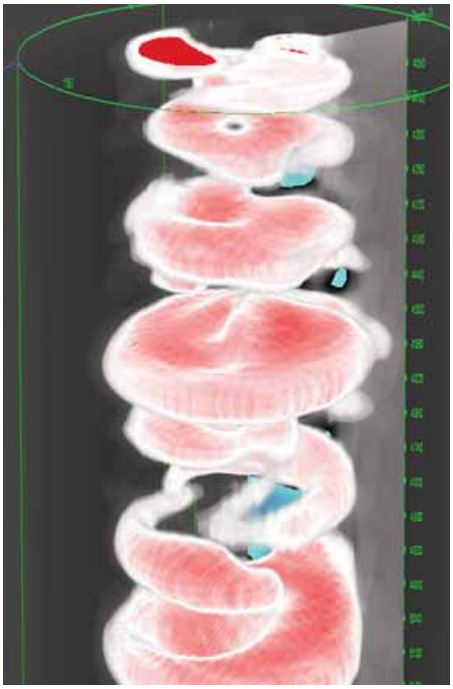
You can do a full azimuth AVAZ Inversion (analysis of amplitude variation with angle of incidence and azimuth), which will tell you about the anisotropic gradient which relates directly to the density of the fracturing.

Another independent measurement of the fracture density is Anisotropic strength, derived by looking at residual moveout of the 360 degree gathers. A high fracture density is also something to avoid, because your frac fluid can get lost in the existing fractures rather than creating new ones.

By plotting together anisotropic gradient and the fracture density, you can spot areas you want to avoid fracking.

Another interesting process is to invert the seismic and build an impedance volume of P and S (showing how different areas of the rock are interrupting, or impeding, P and S seismic waves). These can be correlated with the P and S impedance logs from the wells.

Using existing well data, Paradigm discovered a relationship between the thickness of the shale layer and the impedance, so mapped that relationship to the impedance volumes - "So now we can start to map the thickness directly from these impedance values," she said. "That's another piece of information that we've put into the integrated picture."



EarthStudy 360TM : Visualisation of a Full Azimuth Reflection Angle Gather gives you detailed Anisotropy data.

So you end up knowing about which areas of the Barnett Shale have the thickest layer of shale gas, are furthest away from structural activity, and the best way to orientate the borehole.

Watch the complete video of Sandra's talk at the Sept 20 2011 Finding Petroleum forum, and download a video in pdf, at http://www.findingpetroleum.com/video/299.aspx

Our conference speakers

Here are some of the speakers who have given presentations at Digital Energy Journal / Finding Petroleum conferences over the past year:

Atle Rettedal, Vice President Field Evaluation, **Statoil**
David Latin - Technical Director, **BP**
Andrew Grosse - Exploration and Technical Director, **Sterling Energy**
Gordon Headley, HR manager, **Tullow Oil**
Sergey Drachev, **ExxonMobil**
Steve Horton - CEO **NewDevCo** and ex worldwide Director of Drilling, **BP**
Jim Green - CIO and GM, Technical Computing, **Chevron Energy Technology Company**
Angus McCoss - Exploration Director, **Tullow Oil**
Andrew Lodge - Exploration Director, **Premier Oil**
Wim Walk - manager geophysics measurement technologies, **Shell**
Tony Atherton - General Manager, **Talisman Energy**
Magnus Svensson - IT consultant, **Dong Energy**
Meyer Bengio - VP petroleum engineering, **Schlumberger Information Solutions (SIS)**
Rob Pinchbeck, group director of strategy, **Petrofac**
Jim Farnsworth, COO and president, **Cobalt International** (ex Vice President of World-Wide Exploration and Technology with **BP**)
Bryan Lovell - Senior Researcher, Earth Sciences, **Cambridge University** (ex Chief Sedimentologist and Exploration Manager with **BP**)

Shale gas: better financial management

In "unconventional" operations, when margins are tighter, you have to manage your finances in much higher resolution. By Jason Ambrose managing director and founder, and Fiona Macmillan, sales and marketing manager, of Palantir Solutions

The current trend in the oil and gas industry is towards development of "unconventional" resources. The "unconventional" label might be replaced by the more appropriate "marginally economic" tag.

One key way to ensure that "marginally economic" developments stay profitable is to invest in timely performance monitoring systems, to ensure that they deliver on their promises to shareholders, employees and partners.

For these types of projects, tracking of expenditures becomes as important as monitoring production numbers.

For both expenditure and production, companies should be able to compare their planned forecasts with actual data and then make adjustments to their business plan accordingly.

Yet in many organisations this process is a significant challenge. Detail is often sacrificed in the quest to simply get the job done and a significant manual effort is required to create even a high level forecast.

Traditionally, performance tracking has been an arduous and highly manual process with data residing in many disconnected systems and databases.

Compiling, consolidating, validating and maintaining data represented a major challenge.

Spreadsheet based systems were utilised and significant time was spent building and fixing formulas, identifying and correcting broken-links and consolidating disparate data and workbooks. Consequently, budgeting was often a once a year activity.

Where more regular performance monitoring was attempted, analysts typically spent more time creating the forecast than analysing the updated forecast and investigating the impact of historic and future variables and devising strategic adjustments to the plan.

As a result the insights gained from the process were often lacking in real value or delivered too late to be applied effectively.

Faster plan updates

But when monitoring the performance of "marginally economic" resources, most companies recognise budgets and financial plans rarely last the entire fiscal year.

Days or weeks after they are finalised, they may be discarded due to changes in the commercial environment.

Companies know they need to be tracking their performance on a monthly basis to assess how their business is performing relative to plan.

Case study

At the beginning of 2008, one large, shale gas focused independent E&P based in North America set out to do monthly performance tracking, continuous tracking of operating and capital costs, production levels and deviations from the forecast.

Our company, Palantir was asked to implement an integrated, dynamic planning system that would enable a monthly re-forecasting process.

Integrated Planning refers to the centralisation of planning data bringing budget, economic and financial planning processes together. Conflicting data sources are eliminated and information becomes accessible throughout the organisation. The result is shortened submission cycles allowing business plans to be altered dynamically.

Dynamic Planning enables interrogation of the plan without having to repeat, resubmit or redo submissions. Sensitivity runs to assess the impact of changes in price, foreign exchange rate or inflation can be undertaken without having to involve the entire organisation. Advanced portfolio planning tools can be utilised to enable the impact of changes in the business environment to be investigated. Strategies can be devised and tested in real time.

The large, shale gas focused independent E&P based in North America wanted a fully integrated system that would enable them to continuously track business performance.

By using Palantir's forecasting software, PalantirCASH and PalantirFINANCIALS, the company is now able to combine data from its financial accounting software (i.e. Hyperion, SAP) with its economic and financial forecast.

From simple reports on actual performance versus budget, to more sophisticated "what-if" scenario creation and predictive modelling, the system enables the company to generate a raft of financial budgeting reports and charts for planning purposes.

Business intelligence is now driving the company and they are able to create fact-based business plans and continuously track their performance.

Actual and forecast data are now centrally managed and can be instantly consolidated at any level of detail. This provides transparency at all levels of the business.

Problems can be highlighted and opportunities can be exploited. Variance reports can be generated to reconcile differences between actuals and forecasts. Deviations from the forecast can be investigated and analysed.

Accurate, dynamic financial reports such as Income Statements and Balance sheets can be produced and compared for multiple periods.

Frequent and accurate forecasts can be produced. Budgets and financial plans can be quickly and easily updated to precisely reflect the current business environment.

By regularly reconciling actual production and cost data with forecasted figures, companies can gain new insights and business plans can be built on the most accurate, up-to-date information available.

For a company focused on unconventional or "marginally economic" resources this system enables them to closely track their performance and be reactive to any deviations from plan.

For this North American E&P company, the vision of monthly re-forecasting has become a reality. Their decision makers are now confident that their organisation's performance is aligned with their business strategy and objectives.

Functional groups are able to actively share, analyse and interrogate consistent, auditable data leading to more informed, faster decision making based on trusted data.

Lengthy, annual planning is replaced by fast, continuous, iterative planning enabling companies to be responsive to changeable market conditions.

The importance of talking to customers

Many oil technology companies try to understand their customers by their own analysis, or assume their purchasing depends on oil price. Why don't you just ask them, says Paul Gibb of consultants CouttsGibb

In a presentation to his sales team, a sales manager confidently stated, "Our customers buy software when they have money!"

"Of course cash flow and a certain amount of financial freedom must be important..." suggested a business development manager.

Unfazed, the sales manager continued to assert his theory. "It was a moment of epiphany, I have looked back at the revenue the company has earned over the last 5 years. When the oil price increased our customers bought software, when the oil price dropped they didn't. Therefore, the company's revenue is linked to the oil price!"

"In order to develop a detailed analysis," suggested the business development manager, "we might use a third party to undertake a study which over a period of approximately two months could collate and review technology trends, commercial influences and customer expectations.

"Or, alternatively the third party could host a collective dialogue with customers, which would encourage our existing and potential clients to clarify their current technology requirements, investigate their future expectations and include their preferences regarding commercial models or other selected criteria."

Different factors

It is seldom the case that one factor alone will influence an oil companies behaviour; there will be a number of contributing factors that will have influenced technology sales and a technology vendors revenue trends.

Internal vendor metrics that might have contributed to additional sales and increased revenue might include a new product release; the acquisition and promotion of a complimentary technology; the availability of technology on a new platform; revised pricing and other commercial incentives.

External vendor metrics which might influence increased acquisition of technology, includes: client mergers and acquisitions; clients' new or expanded regional focus; new geotechnical challenges; an increase in clients personnel and the consequential demand for access to technology; new management and review of existing technology portfolios.

Internal influences which might drive additional sales and increased revenue, might include: effective and strategic marketing campaigns; effective sales strategies; effective management coupled with an experienced sales team.

External influences which might drive additional sales and increased revenue, might include: government incentives for the vendors clients to pursue new projects or develop what once might have been considered to be uneconomic assets; or, the emergence of new sources of hydrocarbons such as shale gas.

External influences which might increase the price of a barrel of oil include: actual and potential geopolitical instability; refining capacity and distribution restrictions; stock market activity; calculated global reductions in production by OPEC; increasing regional demand by countries such as China or India.

External influences which might negatively affect potential sales opportunities, include new government legislation and increased taxation leading to the suspension or the cancellation of planned projects; reduced demand, recession and fiscal tightening.

There is a broad range of factors that influence a client's business objectives and technical requirements and it is important to engage regularly to ensure that your sales strategy can help them achieve their objectives, [not yours].

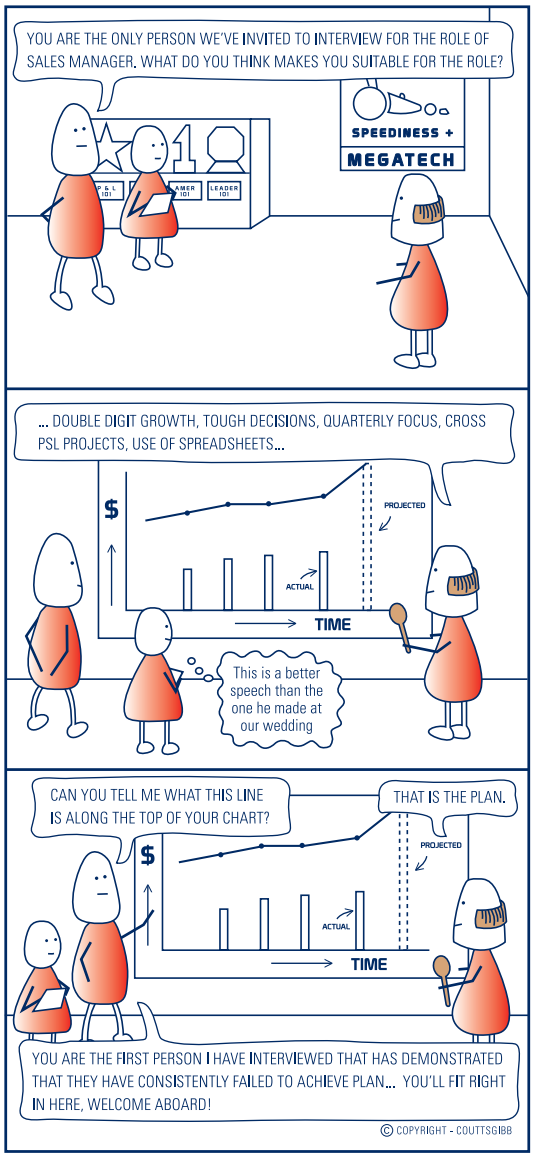
At many oil companies, budgets are calculated and set prior to the start of the new fiscal year. The budgets are designed to support the oil company achieve their business objectives with provision included for new or additional technology where required.

A rise in oil price - within a financial year - is unlikely to lead to additional revenue for a technology vendor unless the clients objectives and the budget are also changed, however, a significant drop in oil prices might lead to a pause or review of budgets and spending.

Through regular engagement, a business development manager or account manager will be able to ascertain the client's objectives.

Starting with some assumptions they have drawn from annual reports, past objectives and technology requirements, recent client press releases, and existing relationships with their clients, a business development manager can begin to qualify their assumptions through regular dialogue with the client.

Effective sales managers will make many broad assumptions and qualify those assumptions by engaging with their clients. The outcome of understanding your clients' needs will result in considerably more success and revenue when compared to a sales strategy based exclusively on the analysis of internal vendor metrics [and occasional misguided nonsense].



Why production data is hard to work with

The more you want to do with production data, such as integrate it into enterprise resource planning systems (ERPs), the harder it is to fit it all together, explained Magnus Svensson, IT Senior system consultant with Dong Energy at the Digital Energy Journal London conference

Managing production data is easy enough when you're just sending a figure to the regulators or partners once a month or on a daily basis about how much you produced.

Where it gets harder is when people want to incorporate the production data into all kinds of software systems – when you discover that people in different departments define terms such as 'net oil volumes' in very different ways.

"From the production domain net oil volume is a crude oil excluding sediment and water. From economics perspective it would be associated with the net revenue associated," said Magnus Svensson, Senior system consultant with Dong Energy.

He was speaking at the June 2nd Digital Energy Journal / Finding Petroleum London conference, "Developments with digital oilfield infrastructure".

There can be problems when one engineer moves to a different field, which uses a different definition for a term such as "volume management."

The oil industry has never had a standard dictionary. On the Norwegian shelf EPIM (www.epimg.no) and OLF (www.olf.no) have (as part of a joint operator effort on the NCS) put together a "reference database" with around 3,000 terms in it (ISO15926), which describes how things should be described within theproduction and drilling domain, including subsea.

DONG stands for Dansk Olie og Naturgas A/S. It is 75 per cent owned by the Danish government.

The country is the largest power producer in Denmark (generating 49 per cent of electricity) and has exploration and production in the Southern Norwegian North Sea and Danish part of the North Sea, also West of Shetland, Faroes and mid Norway. It also has drilling activities in the Barents Sea and offshore Greenland.

Dong has participated in efforts in Norway to standardise production reporting to authorities since 2000, in work which was ultimately incorporated as part of the ISO 15926 standard.

This standard has been used in production since 2006 on a daily basis and forms the basis for the PRODML standard (PRODML started off after the initial effort on the NCS to standardize daily production reporting and as such the xml schemas and definitions have the same basic foundation), and most of the fields in the Norwegian continental shelf use it to report on a daily basis, he said.

Enhanced production reporting

On the NCS a joint operator effort under the OLF/EPIM umbrella recently added enhancements to the data to be sent to governments, including stating who owns what information (ownership stream tracking), how volumes in pipelines are allocated, stock accounting and covering vessels and their cargo (typically liftings), health and safety reports, shutdowns and deferments (when production was less than anticipated). A lot of these requirements come from the Norwegian government but also as part of the NCS standardization of monthly partner reporting.

Dong wants the data to be generated automatically out of the existing IT systems, not pulled together manually from a range of sources.

Many of its rigs have different processes for collecting the data, and it is handled in different ways. "One of the challenges here is to find the correct data and to trust the source of the data," he said.

"The really old fields can be a nightmare to tackle when it comes to standardisation of business processes," he said. "That is because of decisions that were taken 10 years ago. They made a certain decision of how to hook e.g. a well up to the platform."

"We have had several locations where we needed to call up a pensioned production engineer to ask him, what did you actually mean when you tried to introduce this business process? It wasn't documented. The people have been doing it for 20 years."

There are many software tools being developed which can help find the right data in corporate systems, but it is still very difficult, he said.

Manually entered data is gathered together in forms (ie a list of different pieces of data required for a well), rather than individual pieces of data.

One of the challenges implementing the standardized production reporting has been that all the benefit is perceived to go to head office, not the people who have to do the work of entering the data into a system, rather than their spreadsheets.

"It's been a hard nut to crack convincing people that this is actually beneficial to them," he said. "As always, the problem relates to Excel. We can't get rid of it, we just need to tackle it."

It is possible that standardizing data means that individuals actually end up with less data available to them than before, and that means it is hard to persuade them. Similarly, if you want people to start entering new data, there can be resistance to that.

Working with the data

Then the next challenge is bringing the data into an infrastructure, so it can be interpreted the data, particularly to calculate key performance indicators and do budgeting.

"When you start moving up in the value chain - corporate reporting, budgeting, you have a lot of challenges just relating to gathering and aggregating the data and ensuring that it is correct."

At the end of the chain, when the data enters financial systems, "this type of data is the cashflow within the company," he said.

"A lot of these processes are still done through e-mailing and spreadsheets. It's an old way of doing things. But it's up and running and it's working," he said.

There are people in the oil industry who still wants to receive and work with the data manually, he said.

Sustaining it

Once the methods have been implemented, you have to make sure that people carry on doing them in the same way.

The company does not allow people to add their own data into the system, because it might not all be set up right. "Then we have the same nightmare over and over again," he said.

If the data is in PRODML or WITSML format, it is easier to make automatic quality control checks on the data.

If the underlying data is better, it should be easier to develop new reporting and analysis systems or look for new trends.

"We have a common asset model for the whole Norwegian continental shelf as part of the joint effort from all of the operators,describing things like fixed equipment and field setup" , he said.

Making DOF infrastructure work

To make your digital oilfield infrastructure work, you need good planning and as much standardisation as possible, says Julian Pickering, director of Digital Oilfield Solutions Ltd

To get the most out of the design of your digital oilfield infrastructure you need to plan it well and use industry data standards as much as possible, says Dr Julian Pickering, consultant with Digital Oilfield Solutions Ltd and former digital domain lead for drilling and completions at BP and member of BP's Field of the Future Programme Office. He is currently the Intelligent Oilfield Consultant to Qatar Petroleum.

He was speaking at the June 2nd Digital Energy Journal / Finding Petroleum London conference, "Developments with Digital Oilfield IT Infrastructure".

The digital oilfield infrastructure should be a "properly designed evolving piece of technology in its own right," he said.

"Many people only think about the technology which runs on the infrastructure and pay little attention to the design of the infrastructure itself. The infrastructure evolves piecemeal as the Digital Oilfield project implementation progresses, which can lead to operational problems. The net result is that engineering costs are high, systems are difficult and costly to maintain, solutions are not easily scalable and operators are concerned about security."

In the past, and to a large extent still today, oil and gas operators took a fairly low interest in rig data infrastructure because it was used mainly by the service company who were running day-to-day operations. The infrastructure might include mud logging and directional drilling data services, sending data back to an onshore office by satellite where it could be visualized.

"Operators weren't in touch with day-to-day operations," he said. "Most operational decisions were taken by the service company. The operator might have had a software application for viewing some rig data but it was not a real time system at all," he said.

"Now everything is changing. There are constant demands for rig data from operator and other personnel that are remote from the rig and this places much greater demands on data security."

"Oil companies are keen to keep all of their data together, with contiguous information from reservoir characterisation through to production, rather than having separate data systems for everything," he said.

"Having contiguous data is an important step in the digital oilfield roll-out. The lack of data continuity and appropriate business processes has been a hindrance for many DOF implementations," he said.

What to plan for

"When planning an IT infrastructure you need to make sure it can be expanded or ttransmit much more data in the future," he said, "because it will almost certainly need to.

The design needs to integrate with the corporate network and work with corporate knowledge. Much of the data will eventually be accessed in collaboration centres, desktop computers and remotely by people working from their homes. "That needs to be planned upfront."

It makes sense for your infrastructure to use data communications standards as widely as possible, for example, WITSML for exchanging drilling data. "By building an architecture based on industry data standards you are likely to make it much more future proof," he said.

The digital oilfield infrastructure must be designed to include collaboration centres. "If suddenly a project comes along to build a collaboration centre and the infrastructure can't cope, it creates a whole lot of problems," he said. "Infrastructure should be built using anticipation."

The infrastructure should be designed to support existing work processes as far as possible. "I've been to companies with fantastic collaboration centres with state of the art IT but sadly they are used really as glorified meeting rooms because the work processes are not supporting the collaboration environments," he said.

"You either change the work processes or change the DOF implementation to match the existing work processes. Unless that's done there will be resistance."

Your infrastructure also needs to be designed for the local conditions. "Something that's going to be cost effective and useful on a million dollar a day rig is not going to be appropriate for a hundred wells strung across the desert," he said. If it is an offshore operation it is critical to understand whether you are dealing with a single exploration well or a large multi-rig set of production wells."

The more complex the drilling project (for example, drilling through subsurface salt domes rather than simple geology), the more data interactions you must expect to have and your infrastructure must be designed accordingly.

There might be extra demands for confidentiality of data (controlling who can access data and where). "Demands are often highest for joint venture or HP/HT wells."

You must also consider where the corporate staff will be sitting when they work with the data and how you will make sure the data gets to them fast enough. Also who else will need to see the data.

Drilling data infrastructure

For offshore drilling, Dr Pickering suggests that all of the data sources on the rig are merged into a single contiguous data store. Sources might include WITSML (drilling) data, PRODML (production) data, older drilling data systems (WITS), weather data, positioning data and drilling automation data (OPC).

You gather data from the drilling operation about speed of rotation, weight on bit and other day-to-day information. Real time systems on the rig can interrogate the rig data store directly. It is easily accessible and can be viewed by different discipline groups."

All of the rig data in the rig data store is replicated to an onshore server. This server then becomes the "onshore store" for the

data and it becomes the source of data for all onshore applications and data consumers.

Onshore, the infrastructure should be geared around the needs of people in specific business functions, such as "well delivery". The well delivery team needs to see real time information about drilling, so they can see what is happening and spot and fix any problems.

Standardised model

Once you've decided how to put your infrastructure together, do it in the same way across the company. "It simplifies DOF projects," he said. "The main building blocks of the infrastructure are common across the organization."

"Deployments are quicker, the company can benefit from bulk supply discounts and suppliers understand the company's requirements in advance. Training on a standard infrastructure is also more efficient as there is consistency."

High performance computing

Expect to see much higher performance computers in the future, doing wonderful things with data, and also making big demands on your infrastructure.

"In 2010 I gave a presentation at the Moscow State University IT department where there is a lot of work going on in high performance computing," he said. "They are working directly with some Russian oil and gas companies to see where high performance computing can be dovetailed into their operations. High performance computing will help enormously with geophysical interpretation. You may update reservoir models continuously as you produce. We are likely to see many new applications of numerical modelling in drilling and production enabling us to make advanced predictions rather than operating retrospectively.

"High performance computing hasn't really made a great impact on our industry so far but it's coming up. Modelling within our industry could be totally transformed through additional computing performance."

One way to reduce data transmission volumes is to store data where it is needed. "Taking the models or other applications to the data will be more efficient than running them remotely over a network," he said.

Third party "Apps"

"One benefit of standard IT interfaces is that it is easier for software developer companies to build specialist tools, or 'apps', to work with them. As an example, the increased uptake of the Energistics WITSML standard (for drilling data) is encouraging the wider development of specialist drilling applications. The potential market for these applications becomes much greater and there is more incentive for software companies to develop them," he said.

"We've now got 50+ member companies in the WITSML Special Interest Group. Some of the recent joiners have been smaller software companies with specialist drilling related expertise and it is very good to see them playing an active role as WITSML product developers. WITSML gives them a broad market to aim their products at.

This trend could increase as oil companies start using other data standards more regularly such as PRODML for production data and RESQML for reservoir models.

Dr Pickering can see a potential synergy with the way that Apple Computers have developed their App Store. Apple has provided a standard infrastructure for their products which has enabled software developers to build compliant apps. This has created many benefits. End users are able to buy a wide range of apps which encourages them to buy the Apple products. Developers meanwhile have a large potential market for their software. "It is the ultimate win-win situation that has arisen from a common infrastructure," he said. " One day we may be able to buy oil and gas apps in this way."

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How technology investors make decisions

How do technology investors choose where to put their money? At "dragon's den" themed session at the Aberdeen Offshore Europe conference four top industry investors made their choices in public

At Offshore Europe in Aberdeen in September 8, a session for entrepreneur investment themed on the UK "Dragons' Den" television show was held, where four entrepreneurs presented their technology, and four oil and gas technology investment experts gave their verdicts.

The investment expert "dragons" were **Leo Roodhart**, a past head of strategic innovation at Shell and president of Society of Petroleum Engineers; **Max Rowe**, chairman of Industry Technology Facilitators (ITF); **Trevor Burgess**, Managing Director, Lime Rock Ventures; and **David Reid**, VP E&P Business and Technology with drilling technology company National Oilwell Varco.

The four candidates were **Verdande Technology**, a company providing software tools to provide advice to drillers; **Siem WIS**, a company developing a device which can sit in the riser and manage the pressure below mechanically; **ReelWell Drilling**, a company developing drill pipe with multiple annuluses, so you can have different pressure (and different fluids) at the drill bit than outside the drill pipe; and **Badger Explorer,** a company making a device which can drill by itself, for exploring the subsurface.

Leo Roodhart, said he was looking for technologies and companies which could use "angel" (early stage) funding.

At Shell, Mr Roodhart was responsible for selecting Shell's angel investments, considering technology ideas people brought to Shell, such as to drill with a laser beam.

Shell would consider how much value the technology might create, how much control Shell could have over the technology, how much it changes the industry game, whether the company has a plan for achieving it, and whether the technology could have a market for many years.

It also considers the passion of the people behind it. "We've been putting money on the most silly ideas, purely because someone showed the passion. We thought, it's so crazy it will never work but he/she will go for it," he said.

Max Rowe, chairman, of Industry Technology Facilitators (ITF) and member of the advisory board of Energy Ventures said he was looking for investments which ITF might like to support.

ITF is an organisation owned by oil companies, which helps oil companies organise to fund, develop and own technology jointly, and decisions are made by the members about what to fund. The intellectual property rights are retained by the original developer of the technology.

ITF considers whether the technology will work, how the developer will ensure that it works, if anyone will want it, and if the developer has capacity to manage the development process.

Trevor Burgess, managing director, Lime Rock Venture Capitalists, and a past VP Global Business with Expro Group and president of Hughes Christensen, was looking for technology which could make a good investment for private equity.

Lime Rock has invested $2bn in 40 companies, including exploration and production, service companies and technical companies. The investments are mainly in Europe and the US, with some in the Middle East.

"We come after the business concept has been proven. We come after the 'angels' have been there and try to clean up the mess," he said. "We take a 5-8 year view on investment."

The most important factor when choosing whether to invest is the management team. "It is people who make this happen. [We need] credible managers with vision and capacity for hard work."

The technology must be better than what is currently out there. "If you can't explain why your idea is better than others in the marketplace you'll fail. Will you cut costs 30 per cent or increase production 10 per cent?"

The technology also needs to be integrate-able into existing business processes.

The business approach must be realistic. "I can't tell you have many investors think they can change the world with one gadget," he said. "If they say, 'I'm CEO' but they've never been a CEO [before], we say, perhaps you have to find a CEO."

David Reid, VP E&P business and technology with drilling technology company National Oilwell Varco, said he was looking for technologies which NOV could acquire.

Mr Reid said that the drilling technology business could be dysfunctional, because there are vested interests which can get in the way of new developments.

When making decisions about which technology to invest in, "It begins with people, that's the thing everybody misses the most," he said.

You have to understand the barriers to the technology. The people who make it "can explain their barriers and how they're getting around them," he said.

NOV looks for technologies which can achieve 30 per cent improvement. It sets high demands at the outset because many technologies ultimately under-deliver on their promises, he said.

NOV has a few regrets about technology it has acquired. "I see technology and think, I wish I'd never bought into that, because there's no way to make it work," he said.

"If you've got something we couldn't do ourselves, we're interested," he said. "But we're not looking for things we wouldn't do [ourselves]."

Would they get investment?
Verdande Technology – 1 investor
Siem WIS – 1 investor
ReelWell Drilling – 3 investors
Badger Explorer – 1 investor

Verdande Technology

Lars Olrik, CEO of Verdande Technology, explained how is company's software tools provide advice to drillers about problems which might be about to occur, such as stuck pipe, lost circulation, wash out, twist off and stick slip.

The software receives a stream information about current drilling operations (in WITSML data format), and can compare the current data with similar projects in the past.

The software is programmed with data about large numbers of previous drilling projects, and how the data was trending before problems occurred.

The system spots problems which might be building up over a period of days, not minutes. Drilling service company Baker Hughes recently acquired a minority stake in the company.

ITF's Mr Rowe said he was in. "It makes sense to take the industry knowledge. The user interface is great. You need engagement with operators and service companies and that's what we do. I think the chances of success are in the balance. The history of expert system advisors is chequered."

Mr Roodhart said he was out. The com-

pany doesn't need angel funding, he said. He was worried about the "willingness of operators to share anonymised drilling data," and worried about the close relationship with Baker Hughes, which might dissuade other service companies from participating. "I do like it but it's not for me," he said.

Lime Rock's Mr Burgess said he was out. "I think you've captured a good business, recognised the need for knowledge, teamed up with Shell and Baker Hughes. But I don't believe oil companies will share their knowledge around the industry. What I think you've done is right, but I don't think it's right for private equity".

NOV's David Reid said he was out. "I agree it's the right product, can you multiply that to call it a business in 10 years. There are so many players [in the sector]."

Mr Reid was concerned about the difficulty of persuading the companies involved in the drilling rig to provide an output stream of their data, particularly service companies which compete with Baker Hughes (which has a stake in Verdande).

Siem WIS: Riser managed pressure

Siem WIS AS, a company which provides a device which can sit in a riser and allow a higher pressure to be beneath it than above it,was presented by director of business development Jan Atla Andresen.

The device is designed to be used for managed pressure drilling, when you want to keep the pressure around the drill bit in a narrow window, heavy enough to break the rock but not so heavy that the drilling fluid gets lost into the formation.

Currently the pressure at the drillbit is managed by controlling the density of the drilling mud in the well, taking into consideration the vertical height (head).

But this is very hard to do on subsea wells being drilled from floating platforms, with a drilling platform going up and down on the waves, it can end up adding pressure and sucking out pressure like a bicycle pump.

The seal can provide an additional barrier between the blow out protector and the rig, which can be sealed off if necessary.

Lime Rock's Mr Burgess said he was out. "I think you've got very nice technology. I'm worried about competition. And you have 2 year route to market which is too long for private equity," he said.

Leo Roodhart said he was out too. "I like the product, but it doesn't have the novelty I'm looking for. The end customer is absolutely key, who will you target. I would think its service companies?"

NOV's David Reid was in. "It's interesting, there is a market. I think I would invest," he said.

ITF's Max Rowe said he was out. "I can see the potential, I'm worried about the route to market and the competition. I'll say out but I'd like to help you be in."

ReelWell Drilling

ReelWell Drilling, a company developing drillpipe with multiple internal annuli, was presented by CEO Jostein Aleksandersen.

The idea is that you can have two separate mud flows while drilling, so you can have a different pressure at the drillbit than you do around the drill pipe.

This can enable the maximum length of a drillstring to be extended. In normal drilling operations, you can only drill until the weight of the drilling mud and associated pressure starts leaking into the formation, (but still maintain a high pressure around the drillbit, so you get the desired drilling rate).

But if the mud flows are separated, this doesn't matter any more. It is easy to imagine drill strings 20km long.

The technology has been supported by Shell and Statoil, and has been used in a pilot well in Stavanger. It has also been tested in a shale gas well.

"The long drill string could be useful if your reservoir is under an environmentally sensitive area, if you can drill it from a surface base 20km away.

Shell's Mr Roodhart said he was in, on the basis that Shell has already been an investor in the technology. As an angel, "it's too far advanced to support now," he said.

Lime Rock's Mr Burgess said he was in (his company is already investing in the company). From a private equity perspective, "the potential is high but there's a lot of risk. The challenge for a project like this is not to get stuck in the valley of death.

"This was an investor with a brilliant idea, who knows he wasn't the right person to lead a company, and they put a team together," he said.

ITF's Mr Rowe also said he was in, and ITF can help the technology get the traction it needs so it doesn't get stuck in the valley of death. "We could have been in a lot earlier," he said.

NOV's Mr Reid said he was out. "It's great technology, I like everything you're doing, [we'll be interested] soon but not now".

Badger Explorer

Badger Explorer, a robotic drilling tool which drills by itself, was presented by CEO Kjell Erik Drevdal.

The Badger Explorer is approx 20m long and 6 inches in diameter, and has a drillbit on the end so it can burrow down into the subsurface. The drill cuttings are compacted inside the tool, and taken out at the top, where they form a permanent seal above the tool. The tool is connected to the surface by a cable, and is designed to never be retrieved, although it can continue sitting in the reservoir as a monitoring device.

It drills at 2m per hour. This drilling rate was chosen to be equivalent to a drilling rig, if it drills 3000m in 60 days.

It has an anchor which grips to the side of the rock, holding the drillbit in place as it pushes down. Then the anchor moves in, the tool drops down, then the anchor grips the rock again.

The company already built a full scale prototype which was tested in Norway, but only drilling down for 2 metres. "Oil companies accepted it as concept proof," he said.

To explore a typical lease block, the company suggests the costs of 5 exploration wells could be $50m, and take 3-5 years to drill. But 5 badgers could cost $10m, and get results within a year. In future, you would only use drilling rigs for production wells, not exploration.

The tool could be used for all year round drilling in the Arctic, not waiting for ice to break.

The most important technology is the compaction device, to compact the drill cuttings and output them at the top of the deMr Roodhart said was out, but he would be in if the concept could be proven. "I like it a lot. We had a similar project in Shell' s gamechanger 15 years ago which failed. Now is the time for bigger money."

Mr Rowe said he was in. "I think it's a fantastic concept, love it, I'm worried about the technical risks, and you can't afford too many failures in a full trial."

Mr Reid said he was out. "That's a compelling business case especially for operators. But from my perspective there's a mountain of technical questions -can you actually seal behind you?" Mr Reid said he was out for now, but it was "very compelling - keep going."

Mr Burgess said he was out. "It's truly different for exploration," he said. "The engineer in me tells me to be in, my head tells me to be out, I don't how how long it will take to bring to market.

"It will be capital intensive for a number of years. I feel you should stick with Shell and Exxon and then team up with a service company."

Security and the digital oilfield

The best way to keep your digital oilfield secure is to have strong security frameworka co-ordinated system and a good understanding of data flows, so everybody knows what data needs to be kept moving and where the security risks are, says Justin Lowe, Managing Consultant with PA Consulting Group

Helping you keep your digital oilfield secure - Justin Lowe, managing consultant, PA Consulting Group

Understanding what data exists, where it need to flow, and where your security risks are, is the key to keeping your digital oilfield implementation secure, said Justin Lowe, Managing Consultant of PA Consulting Group in London.

He was speaking at the June 2nd Digital Energy Journal / Finding Petroleum London conference, "developments with digital oilfield IT infrastructure".

Once designed, everybody needs to understand and work with your security systems, including company staff, contractors and vendors from telecom companies, service companies, and security companies, so you have an effective end to end security framework.

Once you understand your risks, you can look at where you can reduce the risk easily, for example by turning off certain functionality, switching off less important connections, or separating networks. You can also need to identify longer term security measures and be better prepared for any incidents which do occur.

You can help staff to be better aware of the risks. "Security has never been a part of engineering training, it is only coming into some engineering courses now," he said.

For new projects it is essential to get security right at the early stages, he said. "Trying to bolt on security afterwards is expensive and not very effective. Most projects are commissioned as completely separate projects and bolted together afterwards and that's where the integration becomes a nightmare."

And all of this needs governance, with policy and standards. "Someone needs to ensure that all of these bits have the ongoing management that's needed in terms of patching and hardening," he said.

Some companies do digital oilfield security successfully, developing secure ways to transfer real time data on the rig about drilling and production into a secure, central business environment, and providing the data externally, where required, he said.

Some E&P companies collect real time data from the various service company systems at the rigsite, aggregate it and provide it to collaboration environments. Other companies get the service companies to send the data back to their own base and from there share with the operating company.

But many things are proving very hard. Remote condition monitoring is proving a particular headache. Companies offer services to monitor their own equipment continually, but "each of the condition monitoring services want to do this in a different way," he said. "Trying to connect a vendor to lots of different plant securely is quite a challenge when you get down to it."

Modern drilling rigs might have 10 or so industrial computer systems calling for remote connectivity for troubleshooting or data transfer. "This can be a bit of a nightmare to secure," he said.

Control systems + business networks

A lot of recent problems stem from the increasing desire to integrate plant control systems with corporate networks, which a lot of company data security people initially said should not even be attempted.

Many plant systems were never designed to connect to anything else.

In the past, the only data systems for drilling were an isolated control system on the drilling rig, and various separate systems operated by service companies (e.g. mud logging, MWD/LWD). There were phone calls and faxes, and an occasional floppy disk, going to shore.

Now there is much more computer controlled equipment, including dynamic positioning systems, rig control and condition monitoring systems, and they are often connected together. "It is standard TCP- IP, Ethernet connections, and wireless you might find in any sort of office," he said.

Meanwhile most company IT security policies were designed for office environments, not industrial ones. Some corporate IT departments have tried to make the same security demands for offshore users as they do for users in the office, and they don't know much about plant.

Standard IT security policies commonly require companies to make sure their computers have the latest patches installed, a reasonable request for 'normal' business systems but something very difficult in the industrial environment. "It's an operational nightmare and often doesn't get done because it is too costly, too complex and sometimes can't be done because vendors don't allow systems to be patched."

Drilling environments seem to have a worse record than production environments with IT security, he said, particularly with viruses being transmitted on a USB stick.

Service companies increasingly want to get real time data back from the rig to their customers, accessible via an online portal. The open standards for drilling and production data, WITSML and PRODML, encourage connectivity is a "brilliant thing on one side but there are some issues on the downside," he said, "if it makes the systems easier to hack into or open them up to malware."

Accidents and mistakes

Many security problems are due to staff mistakes and accidents.

Some examples of accidents and screwups Mr Lowe has seen include:

A virus getting into drilling rig dynamic position system (so a semi-submersible rig was not able to control its position);

A worm disabling a safety critical drilling control management system (it wasn't drilling at the time so not a real issue, but it could have been very different, Mr Lowe said):

A service company providing the **wrong client's data** through a web stream (which caused a lot of embarrassment if no real problems);

A **worm** getting into a fiscal metering system (there was no impact on the control system and standard operations, but there was a loss of metering information).

A **disgruntled employee** disabling a pipeline monitoring system.

Worms (from computer viruses) can also fill up your satellite communications link

with data so operational data doesn't get through, he said.

Problems can occur through **poor configuration management** as well as viruses. In one example, someone uploaded a software patch to the wrong programmable logic controller at the end of a crude pipeline, resulting in an oil spill. The person thought the patch was being uploaded to the PLC they we standing next to, and only realised they weren't when they saw the light wasn't flashing.

Virus attacks

More recently, there have been two well publicised virus attacks on plant, named NightDragon and StuxNet.

NightDragon was an attack specifically targeted at a number of oil and gas companies to steal information in different ways, including hacking into information available through web servers and "spear fishing". This is the sending of targeted e-mails to specific individuals, with content to encourage them to open attachments and install software on their laptops, which would then enable the hacker to steal information on their machine, and attack other systems which the user has access to.

"This was quite sophisticated, with multiple attack mechanisms over a matter of years," he said.

When people are trying to hack into online information or get you to install software on your computer, "antivirus and patching are very little use," he said.

The StuxNet worm, was thought to have been specifically designed to attack the Iranian nuclear industry, but caused wider problems. "I've seen a number of oil and gas companies that got infected," he said.

StuxNet was thought to have originally entered the system by being somehow installed on USB sticks used by plant engineers. The software on the USB stick could then exploited multiple different previously unknown vulnerabilities of Windows, which had actually been discovered by whoever wrote the malware – no patches had been available. The code on the malware was programmed to look around the network for Siemens distributed control systems (DCS), and if it finds one, to install itself on those systems and in the programmable logic controllers (PLCs). It would then hide itself so no-one could see that the worm was there.

"It was really sophisticated," he said. "This isn't a 14 year old hacker on diet coke in his bedroom."

StuxNet didn't have a big impact on most people, because it was specifically targeted at a certain control system which most people don't have. But if the same energy and been put into targeting a different system it could have caused much more problems.

Mr Lowe suggests that anyone who has industrial control systems should make sure they know the signs of infection or compromise.

You can monitor the control systems for suspicious activity. There are commercially available services for doing this if the skills are not in house. "It shouldn't be a big effort but is worthwhile for the peace of mind," he said.

"It is no longer a matter of [just] protecting against viruses, CDs, USB keys or accidental screw-ups," he said. "There are people out there targeting oil and gas companies, targeting industrial control systems, and they are getting much more sophisticated."

Sekal – drilling with real time physics

Sekal, a start-up company in Stavanger, is commercialising real-time systems that advise drillers how best to progress their drilling program within the operational limits of the well bore and down hole equipment

Sekal, a start-up company based in Stavanger, provides tools to help drillers drill as efficiently and safely as the well bore and down hole equipment will allow, with real time physics calculations.

Using real-time data gathered at the rig site, the solutions maintain coupled calibration and modelling of the hydraulic, mechanic and thermodynamic parameters, giving a consistent and complete overview of the drilling operation in the well bore.

This includes modelling of the ECD (equivalent circulation density) based upon the physical conditions within the well, including the mud rheology, temperature and density, physical dimensions of the drill string and bottom hole components, the well bore, accelerations and movement of the drill string, accelerations of the mud pumps, current pump rate, and much more, providing the drilling crew with "real time measurement" of the ECD for all drilling operations and downhole flow rates.

Sekal's solutions will help drillers to drill according to the current physical conditions of the well bore, rather than the capacity of the drilling equipment and/or the estimated drilling prognosis.

The systems have been used in the ConocoPhillips Eldfisk A and Eldfisk B fields, Statoil's Grane, Statfjord C, Tyrihans fields and BP's Clair field. After two years of field-based trials it is now ready for commercial rollout, the company says.

Real-time analysis of downhole

DrillScene, running offshore, systematically analyses the real-time data in order to monitor downhole conditions, as the mechanical, hydraulic and temperature models are combined to calculate the predicted hook load, surface torque, stand pipe pressure and ECD for the complete well bore in any drilling condition. The coupled numerical models are automatically calibrated. The modelled drilling parameters and their minimum and maximum boundaries are then applied as a backdrop in the graphical user interfaces for the real-time measurements to detect the development of poor downhole conditions. Automatically generated messages can be sent to key personnel who can evaluate the potential problems and take necessary actions.

In a number of offshore field trials, the DrillScene software managed to notify drilling teams of potential problems in the well bore long before they became critical, giving the drilling crew time to take steps to avoid the problems, the company claims.

Management of drilling operations

The DrillTronics solution from Sekal provides a broader overview of operations.

It is designed to operate in both passive (advisory) and active mode. The passive or advisory mode is similar to the red band on the revs per minute gauge on your car, telling you that you are pushing the equipment to the edge of its limits.

The active mode is when the machine makes the decision for you - the equivalent of a F1 car's rev limiter or alternatively, your car's anti-lock brake system (ABS).

DrillTronics can actively control (or passively provide advice upon how to control) the draw-works (the hoisting machinery on the drilling rig), top drive (which rotates the drilling equipment within the well bore) and mud pump performance, taking into account the dynamic behaviour of the modelled ECD in the complete well bore during drilling, tripping and other well operations.

DrillTronics can manage the drillstring movement, pump startup, friction testing, reciprocation (moving the drillbit up and down) and safety triggers for over-pull (when the amount of force being used to raise the drillbit is higher than the weight of the drill string, indicating that something is going wrong within the wellbore).

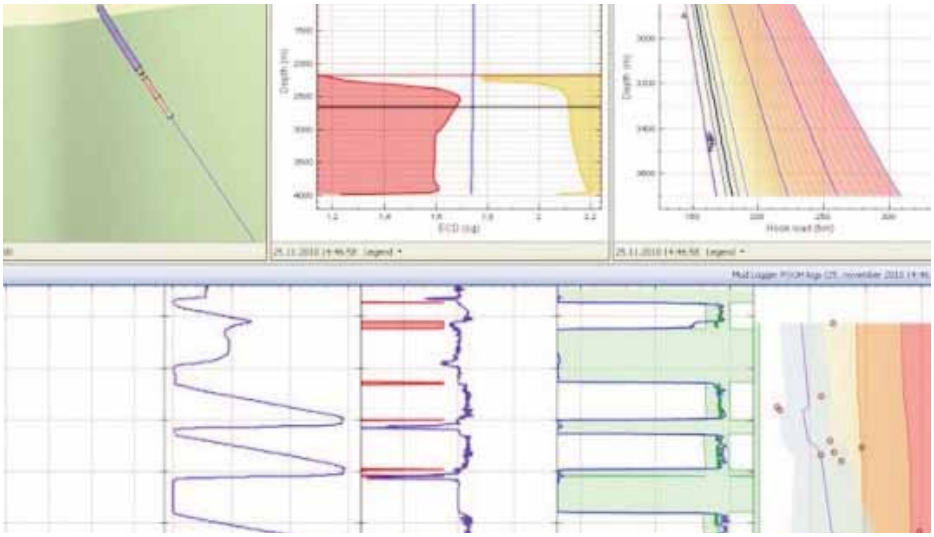
DrillTronics provides safety triggers for maximum torque, maximum set down weight, pack-off (where the wellbore gets plugged around the drill string and fluid can't escape), mud pump operations associated with pack-off, and compensation for rig heave due to wave and weather conditions.

As an example of how Sekal's solutions can help: rig personnel routinely perform regular friction tests in the wellbore using the downhole drilling equipment, to try to spot well problems in advance, such as poor hole cleaning or a borehole that isn't completely straight (known as borehole tortuosity). Drillers then use charts which predict the hook load and torque for a given bit depth and mechanical friction factor. An abnormal torque and hook load observed at the surface can indicate a problem downhole.

The Sekal software includes a computer model of all drilling parameters including hook load and torque that are calibrated in real time, providing the drilling expert an improved view of the drilling process and enabling him to detect abnormal down hole conditions earlier and more consistently.

The technology has been under development at the International Research Institute of Stavanger (IRIS) over the last 20 years. Statoil, BP, ENI, the Research Council of Norway and Demo 2000, a Norwegian research organisation, funded the technology development.

The principal owners of Sekal AS are Statoil Technology Invest, PV Invest 3, SåkorninVest and IRIS. The company is based in Stavanger, and Sekal is setting up commercial offices in Aberdeen and Houston. The Aberdeen office is headed by Nick Gibson, a past sales manager for Kongsberg Oil and Gas Technologies.



Sekal - providing real time information you can work with

X Prize – improving spill cleanup technology

Shell is supporting the Wendy Schmidt Oil Cleanup X Challenge, sponsored by organized by X Prize Foundation to help develop oil spill cleanup technology,

www.iprizecleanoceans.org/

The Wendy Schmidt Oil Cleanup X Challenge, to encourage development of new technologies which can do more to clean up an oil spill, aims to announce a winner in October this year, and give them $1m.

The $1 million prize purse, along with 2nd prize of $300,000 and 3rd prize of $100,000, has been personally donated by Wendy Schmidt (wife of Google CEO Eric).

Shell is assisting with direct support for the technical, operational and scientific components of the competition.

The idea is to find a technology which could be used on all kinds of oil spills, including from offshore oil and gas operations and tankers.

The expected minimum requirements were an oil recovery rate of 2,500 gallons per minute (35,700 barrels per day over 10 hours) with oil spill of 1 inch thickness, and oil recovery efficiency (oil water ratio) of 70 per cent. If none of the entrants achieve this, the judges will decide whether to adjust the criteria – or maybe not make an award at all.

To determine the winner, 10 finalists are testing their equipment in a water tank 203m long, 20m wide and 3.4m deep, covered with an inch of oil, and with a wave machine to make things more difficult (and more realistic).

Shell is covering the costs of the testing of oil spill equipment and providing staff to help design, run and judge the competition, including Peter K Velez, Shell's global emergency response manager.

Mr Velez has also served for 4 years as chairperson of the US Coastguard national offshore safety advisory committee, and chairman of the International Petroleum Industry Environmental Conservation Association (IPIECA) Arctic Oil Spill Task Force.

Shell will also help bring the winning technology to market.

X Prize is an organisation which specializes in trying to solve big problems by putting up prize money, and is probably most famous for offering $10m for the first privately financed team that could build and fly a three-passenger vehicle 100 kilometres into space twice within two weeks, a contest won in October 2004 by Mojave Aerospace Ventures.

The equipment is being tested at the OHMSETT facility in New Jersey. OHMSETT stands for "Oil and Hazardous Materials Simulated Environmental Test Tank." The facility is also known as the National Oil Spill Response Research & Renewable Energy Test Facility. It is owned by the US government.

10 finalists have been testing their equipment in the tank over the period July 22 to Sept 30 2011, with a week each.

Judges are from government agencies, oil spill response organisations, nongovernmental organisations and others.

"What we're hoping is that these teams will get a lot of recognition from the equipment they've developed," says Shell's Mr Velez. "The ones that do very well will make the next generation equipment that is purchased by oil spill response organisations."

The competition is focused on mechanical equipment – it will not cover any other response equipment or controlled burning technology.

Oil companies do not compete in oil cleanup, and so there is no need not to co-operate or keep secrets in the technology and methods being developed, Mr Velez says. "At the end of the day we're going to share."

The "oil shaver" - one of the technologies being put to the test at OHMSETT.

Technology

One of the interesting new ideas that recently evolved within the industry has a sensor which can detect the thickness of the oil, so that the skimmer head can adjust accordingly, so it can collect as much oil and as little water as possible, Mr Velez says.

There have also been new mechanical systems which can sweep oil off the water surface in new ways. There have been new separating technologies which can separate oil and water on the device itself (one with a centrifuge).

Some of the finalists in the competition have technology which can assess the viscosity of oil and adjust the equipment accordingly.

Some systems are using existing technology but with a faster moving vessel. "Typically oil recovery systems move about a speed of a knot," he says. "We tested this one at 4 knots and it's capable of going a bit faster – so it can cover a large area much faster."

A successful oil cleanup technology needs to somehow remove oil from the water's surface, and oil spreads itself very thinly on top of water and over a large area.

It will ideally gather more oil and less water – or have a means of separating the water out straight away.

"We are looking for new technologies and advancements which will make a step change," Mr Velez says.

"There's a lot of new technology coming into play. They'll be a lot of outcome."

"I'm encouraged by some of the things that I've seen – they are different," he says.

Competition

Discussions about setting up a competition style challenge to develop new oil spill clean-up equipment began in July 2010 after the Deepwater Horizon disaster in the Gulf of Mexico. The competition was officially launched in September 2010.

There were initially over 300 ideas, of which 37 teams submitted formal complete entries.

What type of digital oilfield pro are you?

When it comes to the digital oilfield, are you a pony with no tricks left, a "vendor/contractor" mentality type, a passive investor, or a "sweet spot" type of operations professional? By Dutch Holland

Dutch Holland

With digital oilfield, it's almost like a line from the movies, "Everybody into the pool." And everybody means all upstream energy professionals will need to get into the DOF pool.

So what stroke do they use to make the most progress in swimming? They could use a variety of strokes: the aggressive overhand, the dramatic backhand or maybe just treading water? It is clearly an important decision to make for the swimmer, and it is an important decision for upstream professionals to make as well.

Participation and ownership

A simple framework for positioning can be constructed with only two variables: degree of participation in the details of implementing DOF for business value and degree of ownership felt for DOF-enabled improvements in the organization.

Participation simply means getting in and getting one's hands dirty with the hard work of making improvements for business value.

Participation means taking part in identification of business improvements that could increase business value; contributing to design of such business improvements; interfacing with technical professionals who can bring an appropriate technology to enable all, or parts of, the improvement, and leading the operations organization to fully implement the DOF-enabled improvement to increase business value.

When it comes to digital oilfield.. Are you a "sweet spot professional", willing to give new things a try and willing to spend time in learning, experimenting, failing and succeeding in using new technology?

Ownership, the second dimension for the posturing framework, is less an action and more of a feeling. Ownership simply means the feeling that the improvements the pro is working on are really yours, holding a personal place in your heart and mind.

Ownership must be tied to the business value that can be gained through a DOF-enabled improvement, not tied to either the seductiveness of the technology or the elegance of the newly-designed work process.

Combining the two variables of participation and ownership produces this simple framework:

Operations professionals who **feel ownership and are directly involved** are in the sweet spot.

Operations professionals who **feel ownership but are only indirectly involved**, are acting as a passive investor in the project.

Operations professionals **who are directly involved but don't feel ownership**, probably have a vendor/contractor mentality.

Operations professionals who **don't feel ownership and are not involved**, are like a pony with no tricks left.

Fortunately other industries have struggled through the process of recognizing the value of a new technology and the hard work of bringing the power of new technology to bear on business improvements designed to increase shareholder value.

Applying the patterns from other industries to possible DOF positions helps paint a picture of the ways you might, as an upstream professional, select as yours.

The "sweet spot professional"

Sweet Spot Pros are eager beavers willing to give new things a try and willing to spend time in learning, experimenting, failing and succeeding in using new technology.

Expect the Sweet Spot Pro to be the volunteer or otherwise obvious leader of business improvement projects enabled by the new technology.

Upper management sees a professional working in the new technology sweet spot as pro-active, helpful, loyal, aligned, and supportive of organizational directions and strategies. Upper management is almost always appreciative of the time and effort this professional is spending on trying to incorporate new ideas into business improvements.

Tomorrow's leaders are almost always selected from the population of sweet spot professionals who can apply the most important technologies to increase business value.

The kind of work done in the sweet spot is different for each organizational level or role. "Short versions" of the sweet spots have been described before in a previous article.

The **Executive Sweet Spot**: Execs are responsible for putting the elements of DOF Business Value Architecture into place … as well as for visible and explicit DOF leadership.

The **Operations Management Sweet Spot**: Operations Managers must take the lead in DOF innovation and performance improvement … understanding their own work processes and pointing out leverage points for DOF application.

The **Technology Manager Sweet Spot**: Technical Management must know Operational processes like "the backs of their hands" and be able to bring technologies to bear on operational leverage points.

The **DOF Vendor's Sweet Spot:** DOF vendors must support their clients all the way to the bank … providing technical and advisory services until their clients realize business value from DOF technology.

The **Technical Professional's Sweet Spot:** If DOF technical professionals cannot "make money for their company" through their technical disciplines, then they are not masters of their disciplines.

Passive investor professional

Operations professionals who feel ownership but are only indirectly involved, are acting as a passive investor in the project.The DOF passive investor can talk the DOF talk but chooses not to walk the DOF walk.

This professional is likely to be supportive of DOF initiatives but not to the level of getting his hands dirty in the details or designs of business improvements.

Upper management can see both positives and negatives of this positioning, look-

ing at the pro as supportive but not someone to be counted on to resolve technical details of a DOF -enabled business improvement.

Will they be looked at as one of the "good guys"? Yes. Will they be looked at as one of the "go-getters"? No.

Pros who take this position with regard to a new technology are not likely to lose their job over their unwillingness to roll up their sleeves. But they also are not likely to be promoted to important positions as fast as pros operating from their sweet spots.

Vendor/contractor mentality

Operations professionals who are directly involved but don't feel ownership, probably have a vendor/contractor mentality.

This professional is very interested in the technology for technology's sake but is not tuned into the business consequences of using the DOF technology to improve business results.

Their day-to-day actions are likely energised by the technology's glamour or by the vendor's siren song rather than by the opportunity to connect technology to the company's bottom line.

Upper level managers spot this pro easily because of his /her focus on the situation's technology aspects rather than on any of the business implications.

While the boss almost always asks if this pro is on the problem-solving team to apply his technical skills and interest, the boss almost never invites this pro into the heart of business decision-making for operations.

The contractor mentality pro who really likes the technology may be shunted off into the technical organization or become the leader of a shadow technology organization inside operations. In either case, the positioning will not take the professional up the organizational ladder.

Regardless of the level of interest and skills in the new technology, the lack of linkage to business results will be a continual promotion obstacle.

Pony with no tricks left

Operations professionals who don't feel ownership and are not involved, are like a pony with no tricks left.

While this professional may be very interested and deeply involved in upstream business, he/she will be missing in action when the conversation turns to utilizing DOF technology to enable business improvements.

Whether a feeling that "this too will pass" or a lack of comfort with the idea of digital technologies (i.e., computers), the result is the same, an aversion to the notion of DOF.

Upper management can spot aversion in a heartbeat and they cannot afford to tolerate it for long.

If use of a new technology like DOF has become a company strategy, these bosses will only look at adverse professionals as one trick ponies, ultimately burdens on the organization.

Professionals who take an adverse position to the implementation of any important technology are living on borrowed time. Survival in the short run may not be a problem, but long term survival as a vital member of the organization is not likely.

The time to choose is now.

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Developments with the digital oilfield

One Day Event, Hallam Conference Centre,
London, December 01, 2011

Can we overcome obstacles with the digital oilfield?

From operators side we have

- a frustration about lack of progress
- a frustratation that many products being sold do not meet user requirements
- increasing demands for more security
- increasingly complex systems
- increased demand for remote monitoring of activities
  a slow but sure move towards cloud technologies

from IT suppliers' side we have

- a move to providing IT "services", where a company runs it for you
- interesting tie-up between SAIC and Wipro to provide IT services with strong domain expertise tied-up
- more products using WITSML, the standard system for drilling data
- efforts from Oracle and Microsoft to promote standard architectures
- development of new mathematical methods to simplify the information which is presented to people

Our one day digital oilfield conference will provide an opportunity for everyone who works in the digital oilfield, as an operator, driller or vendor, with a chance to keep up to speed with what is going on and share some of the latest developments

Tickets just GBP 300

Featuring

Hossam Farid
Global Oil & Gas Industry Lead
Oracle Corporation

Tony Edwards
Director
StepChange Global

Keith Armstrong
Solution Sales Manager, Landmark Software and Services
Halliburton

Hannu Rajaniemi
Co-founder
Thinktank Maths

Peter Marks
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Jon Curtis
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Reserve your place at FindingPetroleum.com

Diesel from CTL with CCS @ $53 / barrel

UK company Altona Energy believes it can supply vehicle ready diesel made from coal at $53 a barrel (33¢ a litre), with a coal to liquids plant, incorporating carbon capture and storage, with financial support from China, with a mine and plant located 800km north of Adelaide, Australia

Altona Energy of the UK has plans to develop a coal mine, coal to liquids plant, carbon storage and electricity generating plant on a site 800km North of Adelaide, Australia.

With financial support from China National Offshore Oil Corporation (CNOOC), it believes it can provide road ready diesel at $0.33 a litre.

The coal to liquids process is often considered a dirty way to create vehicle fuels, because carbon dioxide is emitted into the atmosphere both in the coal processing plant and from the vehicle.

But if the carbon dioxide from the coal processing plant is sequestered (buried underground), then the overall carbon emissions are just the same as for traditional motor fuels, but with the added benefit of much lower emissions of other pollutants (SOX, NOX, particulates), because they are removed in the processing plant, rather than coming out of the vehicle's exhaust.

So far, Altona has conducted an initial, or "pre-feasibility" study, by engineering giant Jacobs Engineering. Now, at CNOOC's expense, it has embarked on a far more comprehensive study, known as a "bankable feasibility study", or in other words a study so thorough a bank can lend money on the results. This study will cost Aus$440m (US$415m) and will be primarily completed in 2012 or early 2013.

Coal to liquids

In the coal gasification process, coal is reacted with oxygen and steam. The carbon in the coal is oxidised, ending up with a mixture of carbon dioxide, carbon monoxide, water vapour and hydrogen.

The carbon dioxide is separated out, dehydrated, compressed and is ready to be sent to the carbon storage system. The hydrogen and carbon monoxide are sent to the Fischer Tropsch plant, where they are processed to form a liquid hydrocarbon which is then refined to produce diesel naptha.

If carbon storage is incorporated, running vehicles from synthetic fuels is arguably more environmentally friendly than conventional transport fuels. The carbon emissions from the vehicle itself are the same, but all of the impurities (for example sulphur) can be removed in the processing plant, not through the vehicle's exhaust. There are lower particulates in the emissions (small particles of unburnt carbon / soot), and less NOX emissions and also zero aromatics such as benzene.

Studying coal samples at the mine

Synthetic fuels are also 10 per cent lighter (in mass per kilojoule) than conventional fuels for the same energy content. This makes a big difference when putting them in aeroplanes – because it means that the plane can go 10 per cent further distance for the same mass of fuel.

The process to converting coal to liquid fuels on an industrial scale was first done in Germany, to provide liquid fuels for German equipment in World War 2. It was then further developed by SASOL in South Africa to provide liquid fuels during the apartheid era, when sanctions prevented delivery of oil tankers.

Currently coal-to-liquids is enjoying a resurgence due to high oil prices, the need to create a diversity of supply, and reduce risk of supply concerns. There are coal gasification projects underway in the US, UK, China, South Africa and South Korea.

Jet fuels produced by the coal-to-liquids process have been provided to airlines refuelling at Johannesburg and Cape Town since 1998, in a 50:50 mix (synthetic and kerosene).

In 2008, 100 per cent synthetic fuel was approved for aviation, and has been used since 2009 by Qatar Airways on its London to Doha route, sourced from Shell's Pearl gas to liquids project in Qatar, for the production of synfuels using Sasol technology.

In 2010, total worldwide synthetic fuels plants in operation exceeded 330,000 barrels per day, with an extra 270,000 barrels of oil per day plants expected to be operational in 2011, with US Air Force expected to complete 100 per cent certification of its whole fleet to use synthetic fuels blend, Altona says.

By 2030, the US Department of Energy has predicted that synthetic fuels consumption will be over 3m bopd, if sour crude oil price is over $57 a barrel.

It is therefore possible that coal to liquids could create a more viable financial pathway for carbon capture, or 'clean coal', than just using coal to make electricity.

But if the coal is used to make a liquid fuel, then the public gets the option of liquid fuels for their vehicles which are cleaner and cheaper than conventional fuels. If the carbon dioxide from the coal processing is sequestered, then there are no objections about use of synfuels produced from coal.

Altona's project

Altona's project in the state of South Australia is known as the "Arckaringa" project, because Arckaringa is the name of the coal basin.

The amount of mine-able coal in the basin has been estimated at 7.8bn tonnes, and this has already been verified as part of a detailed AU$440m study of the project, currently being conducted by CNOOC (see below). Altona Energy has acquired rights to build an open cast mine on the site.

A railway line has been built in the past few years which passes through the basin, connecting Adelaide with Darwin, which could be used to transport coal or liquid fuels from the region.

Altona plans to mine 15m tonnes of coal a year. If the total resource is 7.8bn tonnes, this means the mine can operate for 520 years.

It will build a coal to liquids plant which will convert this coal to 10m barrels of diesel a year (equivalent to a 27,000 barrels of oil per day well).

It will also build a power station to provide the power necessary to operate the facilities as well as being able to export 560 MW into the grid.

The power supply will come in handy – South Australia currently has 2 power stations with total output of 750mW, and the region actually uses 3.5 gigawatts. There is an estimated electricity deficit of 1 GW for the region being forecast, says Altona's finance director Anthony Samaha. Being able to supply baseload power has helped get the Australian government's support for the project, he says.

Once the plant is built, the syngas production (hydrogen and carbon monoxide mixture) can be varied to the electricity generating plant, or the coal to liquids plant, according to the demands (and pricing) of the day.

Leading an ambitious project - Peter Fagiano, executive director of Altona

To illustrate the importance of the project, the Arckaringa UEJV (Unincorporated Evaluation Joint Venture Agreement) - signed in June 21 2010 in Canberra, in the presence of the VP of China Xi Jinping, prime minister of Australia Kevin Rudd, President of CNOOC Fu Chengyu and Minister for Trade and industry South Australia Tom Koutsantonis.

Altona also plans to build a plant which will react carbon dioxide with hydrogen to form fuel grade methanol, which can be added to the local gasoline pool.

The gasification technology can be used to gasify biomass (for example, wood) as well as coal. This means that you could build a system which can actually take carbon dioxide out of the atmosphere and make electricity or liquid fuels at the same time. You grow trees to absorb the carbon dioxide, gasifying the biomass, and separating the resulting hydrogen and carbon dioxide, sequestering the carbon dioxide and using the hydrogen to make electricity or liquid fuels.

It can also gasify black liquor, a by-product from the paper and pulp industry – as well as sewage and municipal waste.

The gasification processing technology can make a range of plastics as well as liquid fuels, by the conversion of syngas into methanol, which can then be converted into olefins and finally polypropylene.

The plan is to store the carbon in an underground aquifer near the site, about 150km away, so the carbon dioxide can be transported by pipeline to the site.

The region is very low population (desert), so the company does not anticipate public concerns about underground carbon storage, as there have been in other countries which are densely populated.

Study

So far a 2008 "pre-feasibility" study of the project has been made by US engineering giant Jacobs Engineering, which developed the design of the coal to liquids plant, which is estimated to have a refinery gate cost of $0.33¢ per litre (or $53/barrel) for diesel.

The $53 per barrel includes the cost of capital expenditure. Operating costs only are $38 per barrel.

According to the initial "pre-feasibility" study, the plant (including coal gasification, coal to liquids plant, IGCC power plant and carbon storage) will cost $3bn to build, and the coal mine $500m.

Now, CNOOC is financing a full scale feasibility study into the project, with a cost of AU$440m (US$ 415m), and has been given a 51 per cent stake in Arckaringa coal asset in return.

Currently a CNOOC team based in Adelaide is looking at the mine and CNOOC in Beijing is looking at coal to liquids plant development.

The study is known as a "bankable feasibility study" – in other words, the level of detail should be sufficient enough for a commercial bank to lend money based on the results.

Altona's full scale financial evaluation is based on costs of the 4th quarter of 2010. The re-evaluation of the coal resource by CNOOC and Chinese institutions was completed in Q1 2011, including the quantity and quality of coal. Now CNOOC's consultants are evaluating the plant project design.

Altona Energy

Altona Energy has been listed on the UK's Alternative Investment Market (AIM) since 2006.

Altona Energy is 20.1 per cent owned by Tonjiang International Energy Co Ltd, a company whose CEO is Zheng Qiang, previously management at China Economic Commission, China Rare Earth office of the State Council Rare Earth Leading Group of the State Planning Commission. Mr Zheng introduced Altona to CNOOC and is also a non executive director of Altona.

UK investment company Investco Perpetual has a 17 per cent stake in Altona.

If the coal to liquids plant goes ahead, CNOOC can increase its interest in the overall project up to 70 per cent, with Altona owning 30 per cent. (CNOOC owns half of Arckaringa project licenses, so CNOOC would effectively own 85 per cent of the project). CNOOC would also provide debt finance for the whole project, including its own equity, leaving Altona needing to raise 15 per cent of the project costs.

Peter Fagiano, executive director of Altona, was previously director of operations for the process and technology division at Jacobs Engineering UK Limited. Parent company Jacobs Engineering is one of the world's largest project engineering firms. Mr Fagiano was also previously managing director of ABB Global Engineering UK & International Oil and Engineering Division.

Altona is the only coal to liquid company on the UK's Alternative Investment Market (AIM).

By buying a stake in Altona Energy, you also get a share of other projects the company might get involved with, with lots of possibilities for projects within China itself, says Altona's finance director Anthony Samaha.

Supply chains: use your data to improve them

Many oil and gas companies are not aware about how much efficiencies they can gain from their existing supply chains – using their existing data By Rick Magnuson, Director Analytics, ASCI

Push your supply chain data much harder - Rick Magnuson, Director Analytics, ASCI

Supply chain processes are never static and constantly in need of adjustment. Whether in procurement, logistics or warehousing/materials management, supply chain processes must be consistently performed, adapted to various situations, tuned to improve performance, and measured to provide tuning feedback.

All well and good you might say…"But how do you adjust processes when we have no documented processes anyway? We process material requests quickly, negotiate well with suppliers, we manage our logistics contracts and track our shipments and we control our inventory well. But we still seem to have lots of issues in our supply chain."

It may not seem like you have documented processes, but you do. Your business management system executes most of them for you when you process daily transactions. You may get some process feedback from the computer system, but mainly it executes the day-to-day business processes to feed the accounting processes.

Improve your data

No matter what system you use or how well you currently use it, you will need to have good data to make effective decisions.

There are two areas to make sure you have best data possible – your master date (spares catalogue, suppliers, bills of material, etc.) and then your transactions.

For your master data, don't accept that it cannot be improved. Both technology tools and services companies can help improve the data. Don't attack the problem in a random manner; work the most important items first.

For your transaction data, make sure you capture all available information, for example make sure all issue transactions are to work orders or projects. Avoid standing work orders which effectively 'hides' usage but makes the paperwork easy.

We can't get there from here!

Your computer management system may have been installed longer than some of your retired assets or it may just be out of date and need a refresh via an upgrade. Whatever the case, take the time to improve your existing system or replace it with a more modern one.

If you don't collect accurate transaction data, you will not be able to take decisions to improve operations. This is not a trivial matter to be sure, but if your organization is proceeding forward with new E&P projects, the investment in a new system is generally rather small compared to the overall cost of major projects. Adjustments to existing configurations can also improve process execution and data capture.

Leverage Your Data

While business systems provide execution and control of important business and financial processes, the data that is generated by your system are indeed the 'keys to improvement'.

Yes, occasionally there are new technologies that can significantly improve supply chain execution (EDI transactions, Barcode or RFI for item tracking during logistics and warehousing) and while these can improve execution and provide great benefits they do not affect the other processes used to run the operation.

What must be done is to continually evaluate business execution and also have accurate information to take corrective actions as well as adjust and improve your strategies for an asset, location or specific region.

You can begin the improve process by utilizing data warehouses to examine the data, perhaps using spreadsheets to process, asses, and visualize the data. But data warehouses are generally available with your existing system and provide reporting but not analysis capabilities.

In order however to make significant improvements (both financial and operational), you will need to develop concrete management strategies which work to integrate and direct processes to produce improved results (again both financial and operational).

Analytical applications (sometimes called Operational Business Intelligence software) which possess specific domain knowledge are part of the solution. The ability to process, interpret and recommend specific actions based on transactional data is the key. Tools which all ready contain domain knowledge and are configurable to your situation are also essential.

Your data is there. It holds the key to improvement process. Find ways to make it better and to leverage it because "you can't improve what you don't measure". In today's dynamic environment, you'll need timely and directed information to make better decisions. The opportunities are out there…you just need to attack them.

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Advanced Supply Chain International (ASCI) is a supply chain management and consulting organization, specializing in operation of remote supply chains and assisting energy companies to optimize their own supply chain processes. ASCI works with a number of oil companies globally, supporting operations in the North Sea, the North Slope of Alaska and elsewhere.

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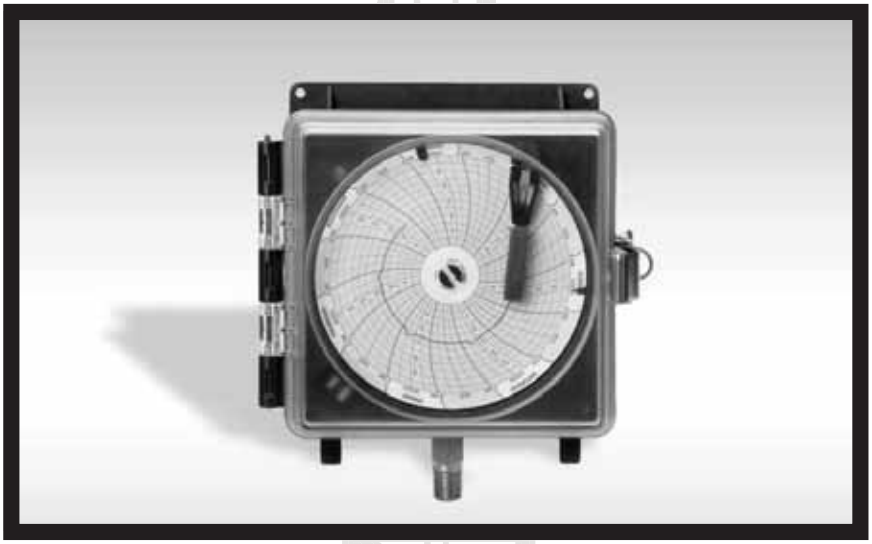

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