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Event Report, Improving production rates through new approaches to digital technology Mar, 2017, Aberdeen

Special report

Improving production rates through new approaches to digital technology

March 14 2017, Aberdeen

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Improving production rates through new approaches to digital technology

Digital Energy Journal held a forum in Aberdeen on March 14 looking at what new approaches to digital technology can help improve production – which came up with some exciting ideas

This is a report from the Digital Energy Journal conference "Improving production rates through new approaches to digital technology" held in Aberdeen, in March 2017

Event website

www.findingpetroleum.com/event/7959e.aspx

Some presentations and videos from the conference can be downloaded from the event website.

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What does improving production mean? Most people in the oil and gas industry think they understand. But the answer is pretty complex because it is such a wide range of things, involving an understanding of the wells, the pipelines and the topsides, being able to spot and resolve problems quickly, and also looking for opportunities where it can be done better.

And all the time, it isn't very clear what the results of the decisions are. You can see the current production with varying degrees of clarity (not all wells have flowmeters, and some of them are inaccurate and it takes a while to get the data). You can see when there are obvious problems, like slugging (big bubbles of something in the oil flow, which stops the flow from moving).

If something goes wrong, production engineers are under pressure to make fast decisions, because if they don't, someone else (probably offshore) will make the decision for them, and they may not make it so well.

According to data seen by one of our speakers, up to 1 in 4 wells in the North Sea can have negative production, where opening the choke actually means the overall production is reduced – perhaps because this well connects to a lower pressure reservoir, it draws oil production from other wells down into it. That's something good to know.

It also involves understanding the topsides. The separators, removing water and gas, have a limited capacity. There is no point in maximising production from individual wells if the production flow is then constrained by the separators downstream. And you also want to understand the causes of downtime with the topsides equipment, the most common of which is probably compressors 'tripping' (switching themselves off due to high or low constraints being violated or being manually switched off). This starts to get into the facilities management and maintenance domain, but it is all connected.

One interesting theme which emerged in the conference is that the big challenges can be split into platforms and tools. By 'tools' we mean the software tools which production engineers directly work with, to understand a flow, analyse something, look at different options and try to see what the results of a decision would be. By 'platforms' we mean everything these tools are built on – including the sensors and flowmeters, the data management and integration systems, the databases and the data exchange standards.

Steve Roberts

Both the tools and platforms should be handled in different ways. For the tools, you ideally want a competitive ecosystem of continually developing and refining different sorts of tools to help in different ways – understand a situation, analyse it, see the impact of decisions. These tools might be developed by engineers or domain experts themselves, rather than software people.

For the platforms, you want it to be as solid as possible, changing slowly. The platforms take real IT expertise, and a fair bit of domain expertise as well, to design and build. But once built, they shouldn't take much maintenance. The costs of poorly managed production data are not obvious, but they could become more obvious in time. An audience member noted that one North Sea oil company has an unofficial business model of acquiring assets and going through the data very carefully, to try to discover where the reservoirs are larger than the selling company thought, and it seems that was a successful tactic for them.

Low technical support

One interesting issue is the low amount of technical support which production engineers get. A survey of 35 oil companies by New Digital Business found that geological and geophysical staff typically have one technical support person for every 17 professionals; drilling people have one for every 30 professionals, reservoir engineers 1 in 20, but production data people have one technical person for every 95 professionals.

Production data could be called "last piece of subsurface data we haven't grasped properly," said Jonathan Jenkins, COO of NDB.

Companies also have IT departments, but IT people do not necessarily have the understanding of the production domain that they would need to provide assistance.

"This whole idea of support and having the right type of support is all part of the fundamental building blocks of getting production data more easily trusted," Mr Jenkins said.

Steve Roberts

Steve Roberts, head of digital solutions with the Oil and Gas Technology Centre (and formerly head of field of the future with BP), attended the event and said he had found it a "really refreshing conversation."

"A lot of themes resonate with me," he said.

"I think time is right to make great steps forward. I had a privilege in BP of looking at global portfolio, here I'm looking at a regional portfolio. I think there's a chance to do some things. You're all struggling with the same sort of issues."

Intelligent Plant – an 'Industrial App Store' for production

Aberdeen company Intelligent Plant has built an 'App Store' offering modules to help improve production efficiency

Intelligent Plant of Aberdeen has set up an 'Industrial App Store where people distributing tools or 'apps' to help solve problems or improve productions can sell them.

So far, there are apps for monitoring plant and receiving notifications, connecting data to apps, managing controllers and analysing if they are over or under tuned, creating piping and instrumentation diagrams with real-time data, monitoring trends, analysing alarms, monitoring subsea valve performance, understanding compressor performance and getting automated alerts about a potential wax build up.

Oil companies can use and test the apps on a pay as you go basis, running them on the cloud, and if they want to take out a subscription the costs are typically about $10,000 per app per year, paid for on a monthly or weekly basis. The benefits from a useful app, if it can help prevent a few compressor trips, can of course be in the millions of dollars.

Intelligent Plant takes 10 per cent of any sales, compared to a 30 per cent cut taken by Apple's App Store. The app developer gets the rest.

Currently, "three or four" operators in Aberdeen are seriously looking at working with the apps, including Maersk Oil, which has done a trial with Intelligent Plant and is now planning to make it an integrated part of their operations.

"We want operators to stand up and say,"we are connected to this", you can now offer us technologies to use through this." Said Steve Aitken, consultant director with Intelligent Plant.

One oil and gas customer said they see it as a 'no brainer', in particular because they have seen the same tool being developed multiple times, because there was previously no way to share the work, or even let other companies know that the tool exists.

The tools can be built by people from within one oil company, and then sold to other oil companies. They can also be built by any outside software company or individual. Apps can be built by people who have knowledge of that specific domain (for example experience working with a certain compressor), data scientists, software people, or perhaps all three.

He, believes that tools like these can make a big contribution to helping oil and gas companies improve production efficiency (the % of total time where the platform is operational).

In the North Sea, this is about 70 per cent on average, but can be as low as 50 per cent. An increase in production efficiency means an increase in actual production.

There is plenty of data in oil companies which could be used to improve production efficiency. An analytics person who can gain access to the data, and pull out the right insights, can make a big difference.

Too often, the data is only available inside the software system of a company who built the system (such as the control system or historian).

Also monitoring software tools will usually need to store data as well as read data, so the oil company needs to provide access to a data store, which they don't usually like (Intelligent Plant provide a separate, but integrated data store if this is the case).

You can login at appstore.intelligentplant.com with a Google account, or set up a new account, and then see the apps, download them, connect them with your data, and that's it.

Advantage of the approach

The main advantage of the 'app' approach is that oil companies can test something out and see if it works before committing to pay for it (or paying upfront for software development costs for something they need).

The developers can try something out quickly (so they don't spend too much money to see if something works). If it works, they get a stream of revenue enabling them to constantly maintain and improve the tools.

In the old days, a software person might have an idea, and show it to an oil major. The oil company person says, "How much do you think this will save." The software person says, I don't know, I don't have your data to work it out, but it is clearly a lot of money. And I will need some money from you to develop it, and it will need to go on your network.

Then the oil company says, we'll have to buy a server for it, which is quite expensive, and it will cost money to deploy it, but we don't know what we're going to save.

It is possible the oil company will find some funding and take the risk that it won't work, but more likely that nothing will happen and the project doesn't get started.

Another common route is that someone from the oil company has an idea and builds a tool in Microsoft Excel to show that it should work, then he wants to bring in an application developer to turn it into software, connecting with the live database and sending automated e-mails if something is going wrong with the compressor.

But this route is not ideal either, because the oil company person is not a software person, and the person who built it does not have any ownership over it (usually the agreement is that intellectual property is owned by the oil company). If it works, it won't be made available to any other company. If it breaks then the original software person will need to be available to fix it.

Integration to data

One of the biggest challenges of the approach is that it is very difficult to test out apps without access to the underlying data – and oil companies can be reluctant to connect an app hosted on the cloud to their data stores.

But technically it is possible to connect an app to a data store in an hour and a half, if the operational data is already available in an onshore network.

Intelligent Plant tries to help the app developers by giving them tools to help them integrate. They can also maintain control of their software, but let people access it through the (Industrial) App Store.

Examples

A commonly cited cause of the low production efficiency is compressors, which are prone to 'tripping' (switching themselves off due to a fault). Working out the cause of each trip can be very complicated.

Looking across the North Sea, analysis has shown that lack of maintenance is the cause of 15 per cent of lost production, but 55 per cent were due to operating practises, the problem was caused by something somebody did.

The alarm and event data analysis app was used to analyse 6 months of data for a compressor in the North Sea, and found there were 21 trips or shutdowns. For 6 of these, an operator pressed a button to shut it down. 15 were completely unplanned. The tool could be used to try to

determine which events were responsible for most of the shut downs.

Analysis of what else was happening when the trip happened should build up intelligence that can be passed onto an operator, telling them that a certain activity, done in a certain way, is likely to cause the compressor to switch off.

It is quite easy to calculate what savings could be made by avoiding compressor trips, by calculating how much production is lost due to the downtime.

There are also tools which can be used to try to understanding the relationship between the choke position and the production rate.

There are times when opening a choke valve on a well can actually lead to reduced production, for example if that well connects with a reservoir at low pressure, so if the choke is open it 'sucks' some of the higher pressure fluids from a neighbouring well back down. ""We've seen that on 1 in 4 (too high) wells," Mr Aitken said.

The Wax Intelligence app can trawl your data historian (such as OSI Soft PI), and find what it thinks are the subsea temperatures, and tries to determine whether they are of producing fluids or injection chemicals. If it is producing fluids below the waxing temperature you can receive an alert that they are about to block.

You don't need to show the app the tags on the data yourself, or build an asset model. The only configuration is to say where the server is, and where the app's data can be stored. (This saves considerable configuration time which in itself can make a project unviable, or cause it to fail through inaction).

NDB – helping a UKCS company organise its production data

Jonathan Jenkins, COO of oil and gas consultancy New Digital Business (NDB) presented a project where NDB has helped a UKCS oil and gas company improve its production data

Oil and gas consultancy New Digital Business was recently involved in a project to help a UK Continental Shelf oil and gas company improve the way it manages its production data, so it would be easier to analyse and gain insights from.

The work included improving the data which is generated from the oilfield, developing a single system which the data could be entered into which both hydrocarbon accounts and engineers could use, and actually loading up the data. From that point, it became much easier for engineers to build their own automated tools to look at the data.

Measuring oil production

The first step is to make sure there are good enough systems for actually measuring production at the oilfield.


Jonathan Jenkins

Measuring oil production from a well is a lot more complex than measuring flow into a car petrol tank.

The meters can be very inaccurate, and sometimes there are no meters on well heads at all. This means that flow readings need to be 'back allocated' – guessing how much has flowed from individual wells based on the reading from a downstream flowmeter, after flows have been comingled. This could mean a flowmeter at a processing facility or even a pipeline receiving terminal onshore.

Sometimes the oil flow includes water, and just 2-3 per cent of water in the oil flow can put pumps out of their specified operating parameters, Mr Jenkins said.

Flowmeters are fairly easy to install, they can be clamped around pipelines. "These things should be everywhere," Mr Jenkins said. "For whatever reason they are not."

Also, "they are often not calibrated. There's no schedule or process for calibration." Well tests could be completely useless if the flowmeters have not been calibrated beforehand.

Collecting production data typically takes about 30 days (based on an IDC survey of 40 oil companies around the world). The data is often e-mailed in spreadsheets.

Hydrocarbon accountants

Oil and gas companies typically employ hydrocarbon accountants, with a role of maintaining a master record of how much oil and gas have been produced. They typically receive the production data first. This data is then made available to the engineers.

However there can be a cultural difference between hydrocarbon accountants and engineers. Although they both working with production data, they typically rarely meet and work in a different part of the building.

The hydrocarbon accountants' role is to work out how much production comes from each well. They are more likely to have a background in accounting, not engineering. They need to record the volume of oil produced, allocate it to different wells.

Hydrocarbon accountants are typically working on monthly basis, while most engineers are working on a daily basis (although not all of them). The accountants are also trying to provide information as required in a contract, and show a company has fulfilled its expectations for production.

Sometimes, monthly production data is e-mailed to the hydrocarbon accountants, and daily data from the well historian is sent to the production engineers, which means there are two versions of the production in circulation in the company, and they might not reconcile.

Hydrocarbon accountants might struggle with the idea that a well can have negative production. Although an engineer will understand that it is possible that you might find that by opening a well, overall production actually decreases. This can be because the well connects to a lower pressure reservoir, and its pipeline mixes with the pipeline from other wells, and so 'sucks' flow out of the wells with a higher pressure.

Sandbox

A good data management system needs an entirely separate system for experimenting, where engineers can take samples of data and doing analysis on it with various software tools.

It is important to separate the master data from the sandbox data, so they don't get mixed together. When you want to know the production from a certain well on a certain date, you don't want to receive it in an old spreadsheet full of someone's calculations you don't understand, and broken links to other worksheet pages.

A solid data system

The oil company wanted a data platform which would provide a single version of the truth of production data, which people in all disciplines would be able to use. There would be a standard workflow for receiving data, checking it and entering it into the system. It would use standard data standards, not spreadsheets.

The oil company wanted to use the Energy Components hydrocarbon accounting software as the basis for this, because it had already acquired a license to use it. However it took "months of our time" configuring it so it would work for what both hydrocarbon accountants and engineers needed, Mr Jenkins said.

NDB's work included talking to users and understanding what they were doing, mapping it out, then creating a master workflow showing how the data evolves from raw data to reporting, and how the data store would need to be changed so the workflow could work.

NDB loaded up all the production data it could find into the system. Sometimes old production data is not available. For one major gas field, it could only access 3 years of data. The only available version of older data was within Schlumberger's Eclipse reservoir simulation software, which is very hard to get out.

Hydrocarbon accountants hadn't seen the need to keep copies of 3 year old production data, and engineers hadn't asked them, he said.

NDB has built systems to automate the data loading process. The data historian, recording data offshore, can automatically tag the data to identify what it refers to, so it can be automatically loaded into the data store. This also eliminates errors.

Some manual work is required, including allocating a co-mingled flow to different wells, if they don't have their own flowmeters. The data management processes "forced a whole bunch of new roles and responsibility onto people," he said.

As a result, "engineers and hydrocarbon accountants are friends, working on the same data, and working together," he said.

"The discipline of common data stores, minimal but essential process, has helped an awful lot," he said.

Dashboards and analytics

Once you have one version of the data, you can build dashboards from the live data, which the engineers all believe in – this oil company uses Schlumberger's Avocet production operations software.

If engineers already know that they are working on the right data, they don't need to constantly test their results. They don't need to be constantly searching for data from different well tests, historians and other sources.

You can start automating the processes which work on it. "Automated processes have been estimated to save 50 days per engineer per year," he said.

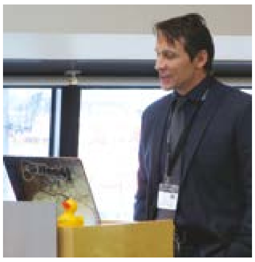
Some oil companies have asked how their data can be used to show how they can keep production fluids flowing better, linking together maintenance engineers, production engineers, subsurface people and facilities engineers.

Enabled by combining maintenance engineers and production engineers, subsurface people and all the facilities. "If that combined group people is working with data sources that they trust, it can make an enormous amount of difference," he said.

Staff are now designing new workflows, which can include collaboration. "That has made a fantastic difference to morale," he said.

Joe Chesak – experiences as a production analyst

Joe Chesak spent 5 years as a production analyst with an oil and gas company in Norway – essentially an IT technician embedded in a team of production and process engineers. This role afforded him insights into how best to give his production engineers a digital advantage



Joe Chesak

Joe Chesak spent five years working as a production analyst, essentially an IT technician, embedded in the production team of an oil and gas company.

His experiences in this role afforded him insights into how best to give his production engineers a digital advantage. And as a result he is off building some digital tools himself targeting production engineers, through a start-up company called Fablabs.

As the only "embedded tech" person in that Norway business unit his experience differed from those of IT department staff or IT consultants. The advantage of being an 'embedded tech' is that you live with the team, experience the rhythm of daily challenges, and gain a hands-on understanding of the business. Mr Chesak says, "Staffing this way goes a long way toward helping the company make the most of their data. It's actually a cheap way to increase productivity."

Aside from teaching production engineers a few tricks--how to write their own data scripts and automate laborious tasks--he was able to use in-house tools to assemble a more holistic view of the entire production environment.

In the US, Mr Chesak worked in a number of data centric roles including at Microsoft, Deloitte, Fujitsu, and a number of start-up companies on the US West Coast. He thought his experiences working in these companies, where the digital technologies and their data were core business, could be cross-pollinated, put to good use in the Norwegian oil company.

Production engineers

"I wanted to get the right data to the production engineers, to give them full knowledge of what is going on when they make decisions," he said. "That's no piece of cake."

Production engineers are in a difficult position. They are called upon to assess a challenge and make a decision on how to proceed, within in a tight time frame, otherwise a decision will be made offshore.

Offshore staff are trained to make a decision quickly. Usually that results in a safe, 'default' decision such as shutting in a well, waiting for the system to stabilize, and reassessing. Though safe, it's generally non-optimal.

The difficulty can be to gather all relevant data and then vet the data before making decision from it. That requires cross checking values coming in from sensors, discussing with offshore personnel what the data indicates, and meanwhile assembling a multi-disciplinary team to go over options. If the data is unclear or does not meet the team's trust, then the decision shifts to engineering judgement. Because at some point the team must make the call.

The engineers' key barrier daily that there is always a cost for gathering the contextual information needed to move forward. A production engineer's best day is when every datapoint lines up pointing and a clear decision. "It's easy for me to say, but data is the core business of the oil industry", chesak said.

Experiences as "embedded IT"

Mr Chesak was originally hired to help the oil company streamline its production reporting, moving from an environment with plenty of spreadsheets to relying more on reporting tools such as Spotfire. However he eventually identified a bigger problem that he wasn't solving, which was that the data itself too often untrusted.

Getting engineers to fully trust incoming data started with a total assessment of sensor data and its paths through data infrastructure. It of course involved time of the engineers themselves. And it also involved the IT department who mainly handled outside vendors when building out data validation solutions. And as "embedded IT," Mr Chesak moved into a connector role for the big IT projects, reducing the language barrier between IT and Production people.

Mr Chesak has an MBA which he said had been a reliable guide throughout his career prior to working in the oil industry. But acclimating to oil industry culture was a singular challenge. Although he says that the MBA taught ow to persuade and influence people he ultimately got his best results by using his immediate team members as his front line of communication.

Building software

While the work was going on, Mr Chesak also participated in a number of sales meetings with big software vendors. "They were very slick presentations, hitting all the buzz words, particularly around Big Data. And like everything in the oil industry, the systems were big and expensive," he said.

"I often felt that perhaps a large complex software system was not the right answer. It should be possible to get better data to the engineers, in a process they could absolutely control themselves to work out how to improve production. And ideally such a solution would have a small footprint."

But how would this 'small footprint' software be built and bought? It is quite hard for the company to describe what they want and then find an external supplier to go off and build it. The communication around business needs is tricky.

A reasonable way forward is to prototype the software in-house, built on-site with stakeholders always available to see it progress. Mr Chesak did a great deal of software prototyping himself during his time at the oil company which he felt gave him an unfair advantage over the big players.

Topside constraints

Productivity could also be improved if it was easier to take the topside constraints into account in decision making. For example, the topside includes a separator to take water and CO_2 out of the oilflow, and it has capacity limits on each flow.

Topside processing is a shared resource of all wells. Even if the topside is spread across multiple platforms, it needs to be managed one system with all shared dependencies taken into consideration.

"But historically and still mostly true today, production engineers place their focus on tuning individual wells or small groups of wells, rather than trying to align production to the limits of the topside", he said. "It's just too much to consider. I think there are plenty of software choices on the market for managing wells, but not much for optimising the whole system."

There can be a sense of competition among production engineers, when individual engineers want to maximise production from the wells they have been assigned to manage. The danger of course is local optimization at the expense of thwarting a maximum global production from topside.

Alarms

Productivity could also be improved with a better designed alerting systems.

As an example, Mr Chesak once went offshore to a production control room, where several employees monitored a wall of screens, several alarm sequences were on. It was explained that the alarms were not concerning on their own, and that other contextual information made clear that they could be ignored.

He found it a big motivation when prototyping a system for onshore use. He said, "It seems to me that unless something is really going wrong, the most useful alert would be to tell someone that there is an opportunity to increase production here, or perhaps a need to simply choke back a well. But this requires that everyone trusts the data enough to not have to be shown the raw data. Then the computer can take over more of the logic, consider the context, and give a more granular alert or suggestion to the user."

Engineering judgement and organizational learning

The term 'engineering judgment' is not in the Oxford dictionary. Usually it means that the team needs to make a decision with a deficit or some distrust of the information the team has. And in such a case, intuition plays an important role, he said.

Intuition is a real and valuable resource particularly in the older generation of engineers. But when engineering judgement becomes a large part of the decision, then other data going into the decision is discounted, even for datapoints that are trusted, Mr Chesak said.

The shift to the 'engineering judgement' mindset can lead engineers to feel that there is not much to learn from the data when some of it is tainted. It may have been more true in the past when an individual decision was considered more of a case study, somewhat isolated from other decisions and cast studies. But these days with Big Data analysis techniques within easy reach of any oil company, all data is useful, incomplete or not.

"You want to have engineers who measure everything they do and record it so it gets into a system where they can use it for a continuous learning process," Mr Chesak said. "It's not the sexy part of the work, but given the inevitable digitization of the oil industry, it may become the best way to capture learnings from the past."

EnergySys – the cloud is transformational

The cloud means a big change in the way people acquire and work with software, says Peter Westwood, technical director of EnergySys


Peter Westwood

In the UK, "we're seeing more and more production data running in the cloud now. It is genuinely more efficient, more productive, they have real control over what they do with the business data. How they want to process it, manage it, calculate it, that's all stuff we put in their hands."

Many service providers say their product is on the cloud. But there is a difference between a "real cloud service", as opposed to software which is delivered via the cloud, he said.

A "real cloud service" should be something which companies can use straight away, on any device, with nothing to install. They should pay for it as a service, on a per-use basis, so you only pay for something you actually get a value from. You don't pay for any hardware.

The Service can serve an unlimited number of different customers. The service also directly serves people who use it, no intermediate IT staff are required.

Real cloud software will probably have been built specially to run on the cloud – if you take software developed to run on a desktop computer or server, make it available via the cloud, then it is not a real cloud service, he said. You can see this if you compare cloud native accounts software like Xero and software which has been put on the cloud, like Sage Online.

A similar argument applies if you are considering moving your in-house data centre to the cloud. "A lot of people think, if I take my data centre - and make that work in someone else's data centre, than I'm on the cloud. Sadly that doesn't solve the problem. You still have a load of kit which you are still to some extent managing."

One paradox is that some customers say they are 'cloud first' but use the term as a bit of an avoidance. "Almost always, that means 'cloud tomorrow'," he said.

Oil companies once saw IT as an asset, but recently have seen it as a cost centre, which they hate paying for. By going to cloud, it can become an asset once again. "IT becomes an enabling force that makes it safe for you to build systems that deliver reliable business growth," he said. "It is not all bad news for IT folk. "

Scale and sharing

The logic behind cloud is clear – the cost per user of computer power is much lower if the computer is housed in a vast computer centre, rather than in a company's own data centre.

It is similar to the gradual move of electricity generation from a generator on each street in the early 1890s, to city or country size power stations.

But no-one owns their own power station, and similarly no user of cloud services needs to own their own cloud system, unless they are a massive digital technology company like Google.

It fits with the cloud hosting business model that the cloud hosting company is not interested in providing personalised high level support – or will only do it for a large fee. "They expect you to understand how to get this going," he said. This is indicated by looking at Amazon Web Services pricing models. Business support for a data centre will cost a few $100s a month, but if you want full support, where you basically delegate all understanding and control to Amazon, it shoots up to $15,000 a month.

EnergySys

EnergySys provides cloud software used by oil companies to manage production data. The software is also used to manage pipeline flow data, LNG plant data and crude oil pipelines.

Sixteen years ago, EnergySys was mainly building bespoke production data management software for clients, all of which had to be built individually, although each implementation had some similarities, Mr Westwood said.

The software was installed on the oil companies' systems, and EnergySys delivered software upgrades.

EnergySys has used cloud services for its internal systems for a long time, but seven years ago the company realised that it would be much easier and more efficient to deliver its own products on the cloud. It made the decision to move all of the software hosting to Amazon Web Services. The performance improved, because of Amazon's investment "for example, they could afford much better disk arrays than we could!" Mr Westwood said.

EnergySys thought it could do IT well, and had years of experience running data centres, but it was nowhere near as efficient as the big cloud service providers.

Now EnergySys uses cloud systems for its entire business, including office work (via Office 365) and accounts (using Xero cloud software), Google for mail, Box for document management, basically everything, he said.

Mr Westwood said he felt enormous pleasure when he received the bill for renewal of the service contract for the company's in-house servers, some tens of thousands of dollars, and realised he could just throw it in the bin, because it would not need to run in-house servers ever again.

Cloud and security

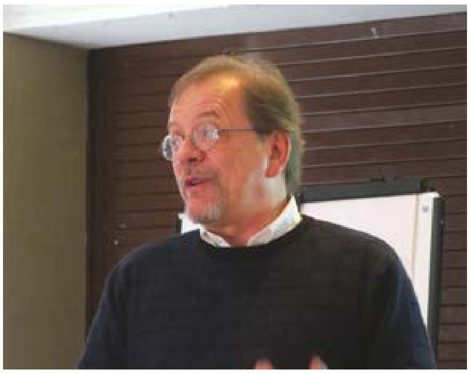
People often raise security concerns with cloud. But then you have to compare the cloud with the security of what it would replace, Mr Westwood said. "The reality is, [many of the] existing firewalls are a joke, they don't protect at all but [people are] comfortable with them.

"I was working with a client who had a 'super secure firewall'. We set up a VPN connection to it. It could only use TLS 1.0 which is a terrible weak and unpleasant bit of technology from 10 years ago which has loads of known exploits. They've never upgraded the technology in their CISCO routers because they are too scared to change it."

The stuff in the cloud is so much better [for security], better managed and designed, updated regularly."

Energistics – developments with PRODML

Oil and gas standards organisation Energistics is continually improving PRODML, the data exchange standard for production data. CTO Jay Hollingsworth presented the latest developments



Jay Hollingsworth

Energistics, a data standards body based in Houston, has a released a new version of its PRODML standard for exchanging many different types of production-related data.

The new version includes a standard for sharing fibre optic distributed temperature sensing (DTS) and distributed acoustic sensing (DAS) data from oil wells.

This standard was requested by a number of PRODML users including Shell, who could see many of the DTS vendors developing their own proprietary communication protocols, and wanted the industry to develop a standard system before the proprietary ones become too embedded.

Energistics is also making the associated documentation easier to work with by software developers, and similar to documentation that software developers usually work with.

There was a common problem that oil companies were asking an IT manager to look at how hard it would be to implement the standard, and the IT manager would just see pages of complex documentation, and pluck a figure out of the air, like $1m and one man year. This would kill the project.

Version 2.0 includes a standard for exchange of Pressure Volume and Temperature (PVT) data for gas, for example between a measurement company and an oil company. This was requested by ExxonMobil and Chevron. Previously, the data would be provided as a pdf, and oil companies would need to re-type it into the system.

Energistics has also developed a simplified version of PRODML. This is suitable for when oil company joint venture partners, and governments, just want a simple monthly production figure.

Energistics has also made it possible to use data from its different standards together – such as well bore data from its WITSML drilling data standard, and reservoir data from its RESQML reservoir data standard together with production volumes from PRODML.

Energistics recently developed a new way to transport data, called Energistics Transport Protocol.
Previously, data was exchanged via constant polling – the receiving computer would ask the sending computer several times a second if there is any new data. Now the data can be streamed.

The transport protocol has been purpose built for the upstream oil and gas industry, and is simpler than many other protocols developed for various 'internet of things' purposes. But it also has functionality which the other ones don't have, which is useful for oil and gas.

Background to PRODML

PRODML was designed as a standard way to move production data from one application to another, for example, from an offshore meter to a cloud based database, or software tool. It has been around since 2005.

Many oil and gas companies have developed some kind of 'digital oilfield' system. It basically means having real time surveillance of production, taking data from the oil field to the analytics systems. The production engineers can use the data to optimise how the field is operating, and use that to change operation parameters.

Making everything fit together, from the automation systems to the analytical systems, really needs data standards, Mr Hollingsworth said.

Really high frequency data, such as real time process control, can be handled better using a real time data standard, typically managed by the OPC Foundation. PRODML is more for where data is gathered on a delay, monthly or yearly basis, which happens in applications which production engineers typically use for field optimisation.

Energistics also has two other major standards, WITSML for drilling and RESQML for earth modelling. But PRODML and production data is quite different to these, Mr Hollingsworth said. Drilling data covers a "pretty limited set of information". The earth model has a "lot of stuff in it but it's kind of cohesive."

But the world of production is very different, including everything from operational information (who is at the well, when did the helicopter last come), the results of well tests and lab analysis,
"There's lots and lots of data that's fundamentally diverse that all gets lumped together in the world of production," he said.

PRODML can also be used for production reporting to governments. Governments and individual states often develop their own systems for how operators are going to report monthly production volumes and well tests. If everybody used one format, it would make it much easier for oil companies, and also make it more viable to build and sell software to handle it automatically.

There have been a number of pilot projects. One of the first was led by Chevron, in 2006, to post joint venture production data in the cloud.

Another pilot project was with oil company Pioneer Natural Resources, which wanted to do production analytics and visualisation with Spotfire, bringing data in to Spotfire in a standard format, rather than having many different ways to bring the data in.
There was a pilot project for distributed temperature sensing data, where a fibre optic cable is used to record temperatures, linking this data with data from their PI Historian.

BP had a project to try to keep track of the pipeline network flow model, so people could see how the pipe is connected together in a standard way, including showing which valves are closed, or which pipelines are damaged and shut off.

Conoco Phillips wanted a standard for production reporting and updating their network flow model. Statoil wanted a way to optimise their downhole control valves. BP wanted a way to set safety points for gas lift optimisation.

The pilots were also aiming to show if data could be stored in a cloud server, and computing down on the cloud. For example a cloud based system could compute the optimum set points for a gas lift optimisation, which can then be fed back into the control system.

Saudi Aramco forces all of its drilling vendors to use WITSML, to make it easier, and now it is doing the same with PRODML.

Norway

In Norway, the government wanted a production report which could be read by both humans and computers.

So they use PRODML for data reporting. Sometimes the complex version of PRODML is needed – if there is a complex system of platforms connected by pipes and oil discharged to tankers in different places.

The Norwegian Petroleum Directorate didn't want to check operator submissions themselves, so it asked the industry to find a way to guarantee that the data is correct before it arrives. So the industry created an organisation called EPIM, which receives the transmissions and runs a series of checks, to see if data is complete and self consistent, before submission to the government.

About Energistics

Energistics makes data exchange standards. Put simply, it is about locking together people from the oil majors and software companies and saying that they can't leave until they have agreed on how they will exchange information.

"It is pretty much that simple. You get people who are using the data to decide how they are going to exchange it," he said. The standards are developed by members not Energistics staff.

There are a number of groups developing oil and gas standards, and not much overlap between them. There is some space where noone is making standards. Some standards are primarily for data storage, but Energistics is primarily focused on data exchange.

Some other standards groups include PPDM, developing a standard data model for storing data; SEG making a standard for transfer of seismic data; PIDX for e-business transactions; PODS, Pipeline Open Data Standards; and the MIMOSA standard is used on maintenance information.

Time looking for data

Jay Hollingsworth noted that the commonly heard phrase, that geoscientists spend 60 per cent of their time looking for data, is probably not true. It would mean they spent 3 days a week for their entire career looking for data which is a bit crazy.

But what is true is they spend 60 per cent of their time trying to reach the point where they have a trusted data set they can use to do analysis with – to start doing their job, basically.

For example, you find that wells are in the wrong place, because the positions were recorded using a different datum system.

"Reaching the point of trusted data is a really important thing," he said. "Geoscientists do spend a large amount of their time trying to get to that point. Petroleum engineers are struggling to get to the point where they have a piece of trusted data."

Eigen – time for a better system to spreadsheets

Western business saw enormous improvements in productivity, and share price growth, during the period of about 1980 to 1999, which were also the first two decades of the spreadsheet. But since then, productivity improvement and share price growth have stalled, which may be an indication that it is time to move on, said Eigen's Murray Callander

Murray Callander

Today, we have much more widespread access to data than in we did a couple of decades ago - but people don't all come to the same conclusion in their analysis of it.

So perhaps we are moving now to a new way of working, geared more to flexibility and autonomous working structures, rather than one where we expected to find all the right answers from looking at a spreadsheet, said Murray Callander, CTO of Eigen.

This should lead to a different way of working – which is far more iterative and agile, where you can see how something turns out and then change it.

"I think we're on a 30 year journey," Mr Callander said. "I believe spreadsheets are holding us back. We need to change the way we think about stuff."

Work on spreadsheets could be traced to 1969, when Rene Pardo wrote the 'LANGPAR' language for programming arrays at random, gaining a patent in 1982. In 1979 Apple's "VisiCalc" was launched. Microsoft Excel was launched in 1985, becoming the market leader in the 1990s due to the growth in Microsoft Windows. And it has been used to run oil and gas operations ever since.

The FTSE share price index rose steadily over this period, from 1981 to 1999, and companies got much better at planning and analysis, perhaps largely with the help of spreadsheets, which could be used to help understand better what has been going on. It was also an era of 'command and control,' where a leader aims to understand a situation (probably with the help of spreadsheets) and make decisions.

However, if you look at the FTSE share price from 2000 to 2016, there is no steady growth, just ups and downs, a totally different picture. So perhaps this indicates that the value from the spreadsheet, and the 'command and control' thinking it led to, was exhausted by about 2000.

About Eigen

Eigen's background is as a consultancy developing data management services, but it started developing a standard data 'platform' for the oil and gas industry in 2007 when it realised it had met the limits of Excel.

"I had a dream of a data model and a way you could link stuff. We started building that," he said. We have technology platform with a new data model at the core. You can collect all the data together and view it from any angle and then do work. It can include live and static data linked together. "

It avoids the need for people to build their own spreadsheets, which then get e-mailed around, so you have massively duplicated fragmented information. 1 physical pump can be represented in thousands of different digital files. "We want one physical version, 1 digital version," he said.

Interesting trends

Interesting technology trends happening at the moment are additive manufacturing, cyber physical, AI and digitisation, he said.

Additive manufacturing, or 3D printing, might transform oil and gas logistics, if a certain part can be manufactured offshore rather than wait for a delivery. "Rather than transfer the thing you transfer information about the thing. All you need to transfer is some powder to the location," he said. Companies including GE and Weir Pumps are already printing components of jet engines and pumps.

It is also enabling more people to get involved in product design, including some interesting competitions. For example, GE ran a competition to see if someone could design an aviation engine mounting block which was lighter than the 2kg one it is currently using, basically made by drilling holes in a block of iron. The company calculated that the fuel costs of flying it around the world are £400,000 a year.

The winner of the competition designed a mounting block which had the same or better strength but 84 per cent less weight.

This can be seen as the "we don't know best – anyone got better ideas?" approach winning over traditional command and control, he said.

Another big trend is 'cyber physical', with much more sensors, leading to better decision making, and shorter gaps between the sensing and the doing.

"One of the issues we've got in the industry at the moment - we're not measuring what we need to know, we can't know if something is about to fail," he said. "We're going to need to measure more stuff, then we're going to need to act on it. We're going to need to capture the learnings from this."

The reasons which components fail can be very complicated, and the patterns can be hard to spot. But perhaps computers can spot them better than humans can.

Another trend is Artificial Intelligence. This has been in discussion since 1920, and is slowly becoming a reality.

There is no need to be concerned about AI taking jobs away – a humorous example is the story of Microsoft's "Tay" automated Twitter bot, which was programmed by people to speak obscene nonsense. This could be seen as an illustration of the limits of AI, Mr Callander said.

However AI may be able to perform better than humans in many areas, for example working out that a learning made in one part of the company's operations could be applicable in another.

A fourth trend is digitisation, which could be described as having "information about a thing" separate to the thing itself.

"When we build a physical asset we'll need to build a physical asset at the same time".

The quantity of data will continue rising exponentially, leading to a big demand for more platforms and standards to manage and share it.

"We don't know what the long term is. Let's do something that seems sensible, learn from it. We're going to need platforms that allow us to go step by step."

Improving production rates through new approaches to digital technology, Aberdeen, March 14 2017

Scott Petrie, Director, Techie Consultant, Problem solver, Analysis Logic Ltd.

Boyd Ross, Cetix

Phil Cruttenden, Director, CGI

Russell McDonald, Engagement Director, CGI

Derek Hendry, Directot, Consultant

Karl Jeffery, Editor, Digital Energy Journal

Murray Callander, Chief Technical Officer, Eigen Ltd

Richard Mackay, Consultant, Eira Ltd

Jay Hollingsworth, CTO, Energistics

Peter Westwood, Technical Director, EnergySys

Kirsty Armitage, Marketing Executive, EnergySys

Alan Bibb, IT Manager, ENGIE E&P UK Limited

Joe Chesak, CEO, Fablabs AS

Nick Gibson, Consultant, Geopetra Ltd

Mike Scott, Senior Managing Consultant - Intelligent Operations, Halliburton

John Dalton, Snr Managing Consultant, Halliburton

Jocsiris Delida, Heriot-Watt University,

Bruce Nicolson, Senior Control Systems Engineer, Intelligent Plant

Steve Aitken, Conusltant Director, Intelligent Plant Ltd

Graham Davidson, , Intrasoft Ltd

Alexander Petrie, Director, Left Field Associates Scotland Ltd

Jonathan Jenkins, Director, New Digital Business Ltd

Steve Roberts, Head of Digital Solutions, OGTC

Dan Mosca, Consultant, PA Consulting

Steve Harrison, Project Manager, Scottish Enterprise

Yngve Nilsen, Vice President, Sharecat Solutions

Sturle Drageset, Sales and Marketing Director, Sharecat Solutions

Cameron Douglas, Discipline Lead, Production Engineering, TAQA

Charles Adoga, Production Engineer, TAQA

Duncan Hart, Business Developement, The Data Lab

Lindsay Wilson, Project Manager, The Oil and Gas Innovation Centre

What did you enjoy most about the event?

It was a niche group of speakers who were brought together, all of whom had been in the trenches. So we heard great stories and real solutions were offered.
Joe Chesak (FABLABS AS)

Content and opportunity to network.
Alexander Petrie (Left Field Associates Scotland Ltd)

Enjoyed the presentations, they were well chaired. Got good comments from the audience and opened new avenues.
Steve Aitken (Intelligent Plant)

A good mix of perspectives upon the challenges of digital oilfield production.
Nick Gibson (GeoPetra Ltd)

High quality presentations - if I do say so myself!
Jonathan Jenkins (New Digital Business Ltd)

The presentations were generally thought-provoking but I always find hearing other people's views is the most informative part.
Graham Davidson (Intrasoft Ltd)