Finding Petroleum

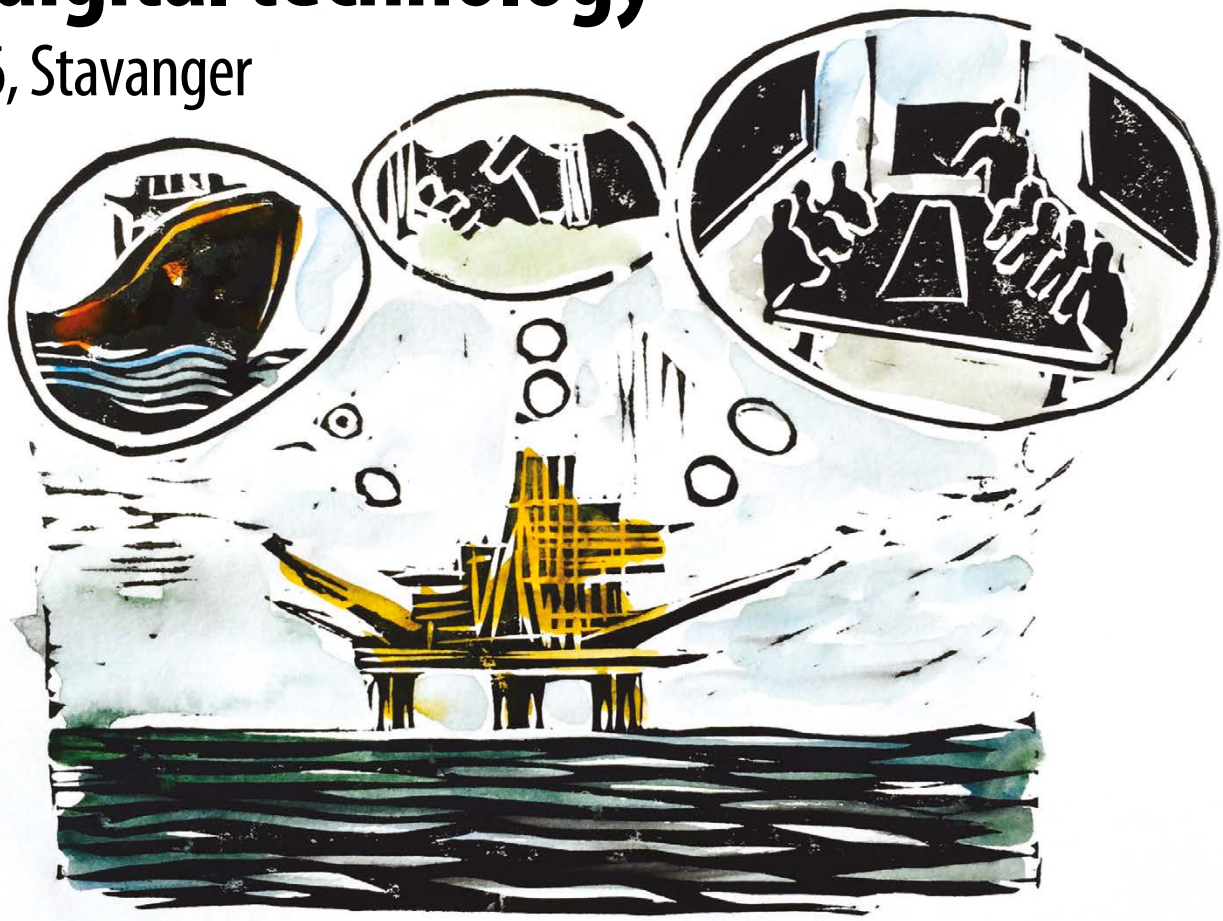
- Using the visualisation capability of our brains
- Improving production decision making
- Oil majors which keep master engineering documents on the cloud
- Maintenance more efficiently - with a more effective 'control of work' system
- Managing your engineering data with a data management framework rather than software

Event Report, Transforming offshore operations with digital technology, Dec, 2016, Stavanger

Special report

Transforming offshore operations with digital technology

Dec 2016, Stavanger



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Transforming offshore operations with digital technology

At our Stavanger conference in December 2016, we looked at ways that digital technology can do more to help improve offshore operations, including helping better manage documents and data, better ways to manage "control of work," the business case for enhanced 3D visualisation, and tools to improve production decision making

Digital technology can be used to improve offshore operations in many ways, including helping better manage documents and data, better manage "control of work," the business case for enhanced 3D visualisation, and improving production decision making.

Finding Petroleum explored some of these methods in a half day conference in Stavanger, Norway, on December 1 2016, "Transforming offshore operations with digital technology," with speakers from Intergraph, eVision, AVEVA, Datum360 and Fablabs.

This is a report from the Finding Petroleum conference "Transforming offshore operations with digital technology", held in Stavanger in December 2016

Event website

http://www.findingpetroleum.com/event/874d2.aspx

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

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Intergraph - managing documents on the cloud

Intergraph Process, Power & Marine is working with Shell, ConocoPhillips and ENI, among other leading companies in the oil and gas industry, to build document management systems, sometimes completely on the cloud. Jens Olav Nordanger, sales manager Intergraph PP&M Norway explained how.

Jens Olav Nordanger, sales manager, Intergraph PP&M Norway

Engineering software company Intergraph PP&M is working with leading oil companies including Shell, ConocoPhillips and ENI, to help them manage their upstream engineering documentation - some of which is kept completely in the cloud.

ENI has over 10m tags in its document management system, all stored in the cloud, said Jens Olav Nordanger, Norway sales manager, Intergraph PP&M, speaking at the Finding Petroleum forum in Stavanger on Dec 1, "Transforming Offshore Operations with Digital Technology."

The Intergraph PP&M software is also used by many small companies, the smallest being a Danish company with 6 employees.

The cloud-based document management system is called Smart Access and no desktop software is required to use it. It can be used on tablet computers as well as PCs and the software has automatic tools for checking the data quality and consistency.

A main driver behind using software like this is maintaining information quality in the company, Mr Nordanger said.

Researchers have calculated that having poor asset information can lead to costs equivalent to 1.5 percent of your annual sales.

If workers don't trust the corporate documentation, they will go back to information which they keep on their own computer hard drives or paper documents, which is not a desired outcome.

By keeping documents on the cloud, document handover (between an engineering company and an owner, or owner's project team and owner's operations team) can be much simpler. It is basically a case of giving someone else access to the relevant online documents, he said.

In the same way, owner operators can easily share documentation with other people involved, and engineering companies can pass their information to owners.

You don't need to take a 'big bang' approach to moving all of your documents to the cloud at once, you can start small, moving documents for one part of the asset, and get people comfortable with the system, and put all of the documents on the system gradually, he said.

One example was a vessel operated by Australian oil company Woodside Energy, where the company gradually set up an online document management system for a ship over 8 months, including doing laser scanning and adding in tag numbers.

Some oil majors insist that all of their suppliers store their documentation on the cloud service, as a condition of doing business with them.

Software

The software can manage any drawings and office documents. You can include 3D models in Smart Access, including 3D models of the landscape and seabed, and laser scan models. When entering data and documents, the software can check that you have all the right attributes entered, and the information is consistent.

It can do automatic analysis of pdf files, looking for tag and document numbers.

You can use the software to search for all of the relevant documents about a certain item such as a heat exchanger. You could automatically bring up a pdf file of electrical information, and get the tag numbers. You could also access a process drawing, such as P+ID drawn in AutoCAD. There might also be laser scan and 3D data available.

An employee can download a 'work pack' with all the documents they need to do a certain job onto their tablet computer, including videos. Once the work is done, any changed documents can be uploaded back to the database, so it is available to the rest of the engineering and operations team.

Intergraph PP&M is continually developing more interfaces with other software systems, including enterprise resource planning software (like SAP), maintenance management software, and asset performance management software (like GE's Meridium).

This means, for example, that when bringing up information from Smart Access, you can also bring up relevant information from other software, such as maintenance software showing when a certain task was last completed, or purchasing data from SAP.

In future, we might see more use of virtual reality, or screen projections superimposing real life, like 'heads up' displays on an airplane, taking the relevant data out of the software, Mr Nordanger said.

There could be 'computer enhanced vision', to help people who are reading gauges on the equipment, and provide instructions to help fix any problems.

About Intergraph PP&M

Intergraph is part of Hexagon, an enterprise engineering and geospatial software

company with around 15,000 employees.

The company specialises in technology to improve the design, construction and operation of plant and facilities.

Intergraph Smart 3D software is used for both building and plant design around the world to keep schematics information and 3D design drawings up to date, including electrical and piping.

Smart 3D Materials Handling software helps companies to ensure correct and accurate procurement processes, saving cost by removing material surpluses.

All of the software is also available in the cloud.

In 2015, Intergraph PP&M acquired a company called EcoSys , which makes a project control software that helps owner operators worldwide plan and optimize project portfolios, control project costs, and improve project performance.

For more information about Intergraph PP&M, please visit ppm.intergraph.com.

Finding Petroleum

You can watch the talk on video at **www.findingpetroleum.com/video/1652.aspx**

eVision – making work management easier

eVision Industry Software is providing software for Statoil to help it manage its permit to work system, taking relevant data automatically from Intergraph document management software

eVision Industry Software, a company based in The Hague, Netherlands, is working together with engineering software company Intergraph on a project with oil major Statoil, to provide software to help manage and control work processes.

The control of work software will pull data directly from Intergraph's engineering documentation management system.

It should go live in the beginning of February 2017.

Statoil wanted the system to work on mobile computers, including tablets, right from the start, said Kasem Challiou, global alliance manager with eVision.

He was speaking at the Finding Petroleum forum in Stavanger on Dec 1, "Transforming Offshore Operations with Digital Technology."

Most clients start with the system running on desktop computers and then get it working on mobile computers as a second stage, he said.

eVision already provides permit to work software for Shell globally, on its upstream and downstream assets. BP is also a customer.

The "control of work" software enables a company to have a system of permits managing and controlling the work which is taking place. Having such a system enables the company to ensure that there is no work going on which the relevant people don't know about, and all work has been assessed as safe before it is done, and any necessary safety precautions, such as shutting of the electricity supply in the area, has been done before the work starts.

You can make sure that the work is in compliance with industry standards or regulatory standards.

Control of work systems were introduced partly as a result of disasters like Piper Alpha, which were caused by equipment being put into operation while maintenance work was being done on it, because the relevant people were not aware of the maintenance work being done.

Improving efficiency

eVision believes that its software can also save companies money, by enabling them to get better utilisation from their assets and workforce, Mr Challiou said.

Studies have shown that offshore oil and gas workers typically only spend about 48 per cent of their working day as "hands on tool time". Some companies say the number is lower than that, typically 30 per cent of the time out of a 12 hour offshore working shift as "hands on tool time".

Much of the rest of the time is spent sorting out appropriate permits.

With better ways to manage permit to work, there should be fewer delays waiting for permits, and so the "hands on tool time" can be increased, he said.

The work permitting process can be made more efficient by making it easier for staff to find the data they are looking for, and making it easier for people to work with the system on mobile devices, so they can access and update the system from wherever they are.

If people can work more efficiently, that will mean that more tasks can get done on time, and the maintenance backlog will be shorter.

Studies have shown there is usually a direct correlation between the length of a company's maintenance backlog and the number unplanned breakdowns they get, Mr Challiou said.

One company, which implemented the new software, decided to revise its procedures at the same time, and in doing so cut all its procedures down to 300 pages. The company also consolidated a number of different permitting systems, including a paper system, into one. Having just one system means that less time is spent training staff how to use it.

One company analysed the data from its system and found that the majority of permits were only activated until 7-8am, although staff normally started shifts at 6am.

It also found that most of the permits were completed between 3 -4 o'clock.

This meant that the workers were only working about 8 hours of the 12 hour shift they were paid for.

The company asked the shift supervisor to start working at 5.30am, 30 minutes earlier, and this led to workers getting their permits activated much earlier, by 6am.

The software can also help permits to work to be revised more quickly. There are often delays during a turnaround, when it becomes clear that a different piece of work needs to be done, and this needs to be communicated to the planning office, to issue a revised permit to do the work. A better permit to work management system

can reduce this delay, he said.

A further advantage is that some of eVision's clients have agreed to make their safety information freely available to all of eVision's clients within the software, on the basis that they don't have any competitive advantage over

their safety procedures, so they do not have any reason not to share the information.

Software

The software has been designed with what Mr Challiou calls a "Windows XP look and feel", with large icons.

This has proven popular with the workforce, he said. Once, when eVision suggested changing it, there was "a lot of rejection" from workers.

The software can provide an overview of all of the work happening today. There are tools for the relevant managers to check that all work planned for today complies with any relevant company safety regulations, and do any necessary risk assessments.

With the integration with Intergraph software, the eVision software can show relevant information from the company documentation. For example, if the work requires that a certain section of pipelines need to be isolated, the software can show exactly which valves need to be shut to achieve the isolation.

You can see the work you are about to do on a 3D image of the plant.

In this way, eVision connects work processes with the plant, Mr Challiou said.

The agreement with Intergraph is non-exclusive – eVision is also willing to integrate with other software.

If the oil company is using SAP to manage (for example) purchasing, it can use eVision and SAP together to manage the procurement of the relevant spare parts for an upcoming task.

The software can also integrate with Oracle Primavera, a software tool often used for managing turnarounds (when an offshore asset is completely shut down for a period of scheduled maintenance).

About eVision

eVision sees itself as the market leader in control of work software for the oil and gas industry in Europe, and is 'very dominant' in the Middle East' and has a 'very strong pull' in the US and Asia.

It has received Eur 7m funding from the European Union under the Horizon 2020 project, which supports research and innovation in Europe.

The company is active in a number of other industries, including data centres, where there needs to be a system for managing electrical work, making sure the electricity supply in that part of the data centre is switched off.

Finding Petroleum

AVEVA – use the visualisation capability of our brains

"About three quarters of our brain power is used for visual processing," says Per Ivar Nerseth, senior product advisor at AVEVA. Working with visualisation software could be far better than using any text-based approach for businesses.

Per Ivar Nerseth, senior product advisor and account manager with AVEVA

Scientists have estimated that we use three quarters of our brain for visual processing, and only a quarter for everything else.

"We can process visual images about 60,000 times faster than text," he says. "Hence we make better, faster and safer decisions when we have strong visuals at hand."

This provides a strong argument for companies to implement software that enables offshore staff to work with information visually, rather than in a text-based manner.

AVEVA makes software to visualise and work with detailed images of offshore platforms in high resolution 3D. This software makes it possible to view an offshore platform at different scales and from different angles. It also offers the possibility to see relevant sections, and gain direct access to all project information in a single user-interface.

Mr Nerseth explains: "Consider the common 'lockout-tagout' safety procedure used widely in industry to ensure dangerous machines are properly shut-off and cannot be started again before the maintenance work is complete. It is much easier to understand this in a visual format rather than going through heaps of text manuals."

Good decision making is all the more important when people are working with complex information with inherent risk, as is the case of most offshore staff.

"While working visually," says Mr Nerseth, "our brains are better at filtering the important information from the non-essential elements"

Digital asset

AVEVA's core philosophy is that companies should create and maintain a digital asset for every physical one. The two need to be kept synchronised and up to date. The digital asset should also be fully integrated, rather than distributed across numerous different systems.

"Consider this," says Mr Nerseth, "the physical asset is mostly made of steel, whereas the digital asset is made of information. When managing the physical asset you focus on mechanical integrity. But when managing the digital asset your main focus is always on the data integrity in your system".

Lundin

AVEVA is working together with Lundin Petroleum in Norway, using its software on Lundin's Edvard Grieg platform, a brownfield project.

Lundin is using the AVEVA Engage software, which can visualise a 3D model of the asset and enable staff to work on it directly in a collaborative manner. Powering the visualisation software is the AVEVA's integrated engineering database, AVEVA Net.

As part of his conference talk, Per Ivar Nerseth shared a video describing AVEVA's work with Lundin using 3D data, and featuring Geir Sjøsåsen, operation advisor at Lundin Norway. (The video is on YouTube at www.youtube.com/watch?v=Zv636q7S-s8)

In the video, Mr Sjøsåsen emphasises that offshore personnel should only be executing work which has been planned. He explains that the visualised 3D model makes it much easier to plan the work onshore and avoid the risks on-site.

The biggest users of the software at Lundin are mechanical, electrical, instrumentation and processes personnel, working in operations as well as in the technical department. AVEVA's Asset Visualization software provides substantial help in engineering design and review processes. The users utilise the tool to schedule work and review the detailed engineering information associated with every part and component of the platform.

Also, the teams can see all the information needed – parts, equipment history and future jobs – in order to plan a job on one screen. They don't need to access multiple disparate systems to find information that they require to make decisions.

"It is also very easy to use," says Mr Sjøsåsen, "in all it takes about 15 minutes to learn how to use it. Different staff members can see the same visuals and work on the same set of data."

There is no need for anyone to physically visit the platform and take photographs to plan work. Measurements can be taken directly from the 3D visuals. Also the P&IDs don't need to be marked up on paper. With the integration of detailed engineering information, everything can be accessed and marked up digitally.

The integration of AVEVA Net's engineering database ensures that all of the tags, engineering drawings and work history are readily available. This makes it possible to search for objects by tag or object number.

You can bring up highly detailed information and carry out searches in various ways. For example, you can search for an object and bring up relevant associated documentation, and see when you last worked on it. All of this can be done from working on the single 3D model. "That's elegant," says Mr Sjøsåsen.

With the intuitive user features and isolation modes, you can choose to view a specific section of the asset. For example, you can select just the living quarters and hide everything else.

You can also use the software as a planning tool as part of a physical meeting, where everyone involved is present. In this way, it is easier to explain how the work should be done using a digital visualisation of the physical asset.

"We are a small company with few people," Mr Sjøsåsen explains, "if we want to work smarter and more efficiently we need tools to do so."

It also saves endless questions being asked of the offshore personnel, such as checking even minor things," Mr Sjøsåsen says. "It becomes easier for us onshore and we save our offshore personnel from a lot of fuss."

Adaptation and survival

AVEVA's Per Ivar Nerseth asserts that the oil and gas companies which survive will probably be the ones better at adapting to the new economic environment.

To illustrate this, consider the way that some US beer breweries survived prohibition in the 1920s. There were 1300 breweries in the US before prohibition, and only a handful were still operating when prohibition was lifted.

One brewer, David Yuengling, looked for a business opportunity which took advantage of the company's refrigeration equipment, and entered the ice cream business. The company continues to make ice cream to this day.

Another brewer, Coors, saw a business opportunity in the clay deposits next to company headquarters, and entered the ceramics business. Today they make more money from ceramics than from beer.

Another brewer, Blue Ribbon, entered the cheese market, because it had cellars which were useful for maturing cheese.

"You could say these companies were successful due to their resilience, innovation, agility and adaptability," says Mr Nerseth. "None of this had anything to do with technology."

The oil and gas industry's market conditions are also changing, due to incoming digital technology and the need to reduce costs, although perhaps not as much as US breweries in the 1920s.

Per Ivar Nerseth says: "The oil and gas industry may have much to learn from other industries which have been through big technological changes such as the retail industry – an industry which has introduced robotics in warehouses, and automated checkouts."

Watch the talk online and download slides at **www.findingpetroleum.com/video/1657.aspx**

Datum360 – focus on the data

Datum360 of Teesside, UK, offers a framework for creating your 'engineering data warehouse' on the cloud

UK company Datum360 offers a cloud hosted data SaaS management framework so you can manage your engineering data.

As a 'data management framework', it is simply a way to manage data requirements, and so perhaps much simpler than other data management software, said Lin Whitworth, director of client services with Datum360. "SaaS can be delivered in one day without the need for an IT project" he said.

He was speaking at the Finding Petroleum forum in Stavanger on Dec 1, "Transforming Offshore Operations with Digital Technology."

Datum360's Engineering Data Warehouse software is called PIM360, and it is available as a cloud based service. The company has a sister product called CLS360, which can be used to manage the class library (which indicates what data you need for each item), and the handover specification (which shows what information must be present when an asset is handed over from project development to operations staff).

The products are supplied as cloud-hosted 'software as a service'. Datum360 SaaS can run on a public cloud or private cloud.

SaaS product reuse one set of programming code many times, which demands and delivers reliability. Datum360 has a subscription model that allows the customer to pay monthly or commit to longer periods. The monthly subscription includes, implementation, maintenance and availability against and agreed SLA

CLS360 and PIM360 have been available for over 3 years now , and has been 100% available to all customers during this period.

The expertise of Datum360 staff in engineering data management is embedded into the design of the tool. It was also developed specifically for use as a cloud service, taking advantage of social media type functionality.

Single source of truth

The Engineering Data Warehouse (EDW) should be a 'single source of truth' for all of your company's engineering data, a place for people to find any kind of engineering data, Mr Whitworth said.

For this to work, there needs to be a robust system to manage change, or updates.

For example, if a process engineer has decided that the set point for a process safety valve should be changed to 25 barg, the new set point needs to be updated in the relevant documentation.

As the appliance is modified, approval from the Process Engineer and the creation of a detailed audit trail bring provenance to the new data value.

The Datum360 software has tools to manage the update to the engineering data.

A relevant project manager can see proposed updates to the data and make the necessary approvals, enabling the updated data to enter the master database. The software keeps an audit trail of who agreed to what.

Managing a Class Library

Information managers can spend a lot of time specifying requirements for the data that an organisation needs, and the CLS360 SaaS solution software aims to reduce the amount of time it takes, by providing a strawman specification and functionality for controlled change, he said. The class library can then be carefully managed, adding in an extra class of equipment, unit of measure or register when it is needed.

Software demonstration

Elle Forrest, information consultant with Datum360, did a live demonstration, showing a system with 71,000 tags, with data stored on PIM360 systems, hosted by Amazon Cloud.

A typical task for a customer might be to bring up all the data needed for a specific project, for example an electrical load list or a register of pressure safety valves (PSVs).

Following any modification to the asset, the data can be updated, and updated data can be temporarily stored in a 'Engineering Information Change bubble', separate to the live information. It is only added to the live information when an authorised person believes that it should be.

For example the maintenance manager might telephone a company process engineer, and say, "I've loaded some new tags into Workpack 49, and you let me know if you're happy to publish it."

The process engineer can look at the information, and check (for example) the PSV has been given the right set point.

It is possible for any PIM360 user to see the various updates which have happened over the day, and what the previous values were.

This detailed audit trail of engineering data change helps to build trust in the data.

Fablabs – helping improve production decision making

Stavanger start-up company Fablabs AS is building a software tool to help improve production decision making, taking advantage of knowledge which production engineers already have

Joe Chesak, company founder, Fablabs

Stavanger start-up, Fablabs AS is building a software product to help oil and gas production engineers make better, faster decisions. The product, Production Tuner takes advantage of the usual metrics and knowledge engineers already have. The inputs are the well flow characteristics, including the flow rates per well, well site pressures, operating pressures. You have constraints on flow rates, and how much of substances like H2S and CO2 you can have in the flowline. The software runs on the cloud, and takes a live feed of operational data, usually from historian software.

The software aims to monitor real-time production data and harness production engineers' knowledge in a software rules system, to automatically work out how, where, and if it makes sense to adjust the current production set-up.

Company founder, Joe Chesak, worked as a senior engineering analyst with ConocoPhillips from 2011 to 2015, embedded with the company's production optimisation team. In that role, "I really learned the business, I learned also that any new solution has to fit with how people work," he said.

The software considers a limited range of parameters – the "gas lift" rate per well, choke settings, and routings on the topside. This reflects most of the options that oil and gas production engineers actually have to improve production rates, Mr Chesak says.

Production engineers face the daily challenge of identifying system bottlenecks and then working out the risks and benefits of taking corrective measures. Their production environment is inevitably resource constrained, and that spawns a complex decision environment. It's what inspired Production Tuner. "The more complex your environment is, the more benefit you'll see from this tool," says Mr Chesak.

The pace and uncertainty of life offshore is the other half of the story. Engineers have to be aware that something else might change while they are implementing a change. "Platforms are like ongoing construction sites," he said. When engineers are under pressure to act quickly, it can be tempting to choose the easiest option, not the one which will lead to the best production, he said. With a deficit of actionable knowledge, that's a good decision.

Making adjustments to production systems can require a lot of team effort, and often conditions change before those adjustments are complete. So the expected time it takes a team to execute can be the key driver for ranking options. This uncertainty of the environment impedes decision-making, and in fact can be paralyzing. If the flow parameters justify a change in configuration near the end of a shift, then there is that temptation not to do anything and leave the decision (and work) to the next shift, Mr Chesak says.

The software aims to make this decision-making easier by presenting the few best action plans, along with the effort required by each, and what their expected benefit to production will be, Mr Chesak says. Mr Chesak believes that the software will enable companies to increase production by 5 per cent, with little change to how they do their work.

In these lean times for oil and gas, cutting costs is priority one. By making the most of an operator's given resources, it should allow for a reduction in the amount of exploratory drilling necessary to achieve production targets, he said. It may give operators reason to decide against cementing in older wells, because even a low producing well may fit perfectly in a high produciton scenario with other wells.

Fablabs is currently looking for a Pilot Project Agreement, and investment funding, to develop and test the technology further. And in conversations with companies he asks for a 'statement of interest' to help secure funding through Innovation Norway.

Using the engineer's knowledge

The theory behind the software is that production engineers, who often work on the same wells for years, already have a unique knowledge about the 'personalities' of those wells: how a well responds to changes and different scenarios. The software aims to encapsulate this additional knowledge as 'rules' within the software. The key data captured and stored by today's production systems has been largely unchanged for decades. But the reports based on only that data do not tell the whole story of how engineers make decisions.

The term 'engineering judgement', occasionally used to fill in gaps in engineering reports, includes intuition, which encompasses real knowledge, knowledge that does not have a home in the reporting systems, says Mr. Chesak.

As part of implementing the software, there needs to be a dialogue with the engineers about their wells and connected infrastructure. As a side effect, an engineer understand her own decision process better and becomes more explicit in describing how she would approach the various scenarios. It is also possible to run an analysis on past decisions, asking an engineer why a certain decision was made.

The decision time itself can be legitimately seen as a barrier to execution. The tool might just help the team achieve the same decision they would have made before, but faster. This can have a big impact if it means that any problems have less time to become expensive problems, and engineers have more time to certify a software-suggested approach rather than start from scratch. They can also have more time to search for missing data, or an alternative to missing data, or fix problems with data communication from various sensors.

Alternative software

Mr Chesak has not seen any other tool on the market which does something similar to Production Tuner, he said.

There are many far more complex and expensive software on the market.

Perhaps the biggest competitor is 'integrated operations', where you have decision making offshore and onshore more closely integrated,

but of course that's less a software solution than a management/communications technique, with cross functional teams in war room type office spaces.

"Integrated Operations has been credited with a five per cent boost in production", he said, "Production tuner can achieve that again."

Constraints to maximising production

One common constraint to maximising production is that the topsides are only able to process a certain amount of water cut. There may be wells with high hydrocarbon production and high water cut, and so the overall flow from the well needs to be constrained, thus reducing hydrocarbon production.

There will be a number of wells feeding into the same topside processing system.

Companies typically have many tools to tune an individual well, but not a tool to optimise all wells connected to a single processing system, Mr Chesak says. "Local optimisations sabotage system wide optimisations."

Mr. Chesak described a scenario of a typical start to the day: the 6am production meeting. A new situation is identifed, that requires attention ASAP. In the meeting, the team reviews what happened, makes assessments and a preliminary decision about next steps, and starts planning how to do it. It may take a couple of hours to gather the rest of the data needed to see the whole picture, and then another couple of hours to assess what choices of action can be taken. It would be better if the engineer closest to the problem could have a set of recommendations ready available in-hand, based on an up-to-date model, at 5.59, just before the meeting. It would show what the current state is now, and what the options are.

The software

Production Tuner takes real-time data from sensors on wells, and on off-shore equipment. Together with well-test, well model data, and other well-specific operating information, the software runs analytics on the data, and runs models, to work out the optimum configuration. The system works on digitised knowledge, maintained by the engineers, that gets structured so that network computations can repeatedly run over it, he said.

The software continually monitors for certain offshore events and activities, and looks for ways the system could be running more efficiently.

Rather than merely trigger alarms, it offers alternative solutions targeting the root problem. The production engineers can then choose the one which best suits them.

It evaluates millions of viable scenarios, without taking up anyone's time. In selecting the best solution, it honours the unique constraints of each well, working out what the maximum output is for each.

The solutions are listed as a series of steps to follow. For example, it may suggest a series of three steps. First increase gas lift on a certain well by 20 per cent, which will achieve a production increase of 70 bopd. Secondly, to choke back another well by 50 per cent, which would decrease its output, but the computer has worked out that this is a price worth paying. Thirdly, to re-route a third well to a different separator, which will give an increase of 1100 bopd.

The team can review the choices, compare their gains, and decide how to proceed.

Typically an engineer might be responsible for 15 wells, and there are five similar people looking after their own sets of wells. No engineer can know the impact of any change on the overall system. With software like this, you can say "what is the best thing that I can do with my wells to increase total production today," he said. That's a lot more valuable to the team than "What can I do to improve this well's production?"

The computer might suggest a number of configurations which are better than the current state, but with a similar increased output, and then the team can select the configuration which is the team can implement most effectively, given current staffing, availability of materials, etc.

Alternatively the software can be used for running ad-hoc scenarios, over-riding the suggestion engine on parameters to see what the overall result would be. It's gives every engineer visibility unavailable today.

So which operators would be good candidates? The answer lies in the complexity of the decision process, which points to any production system with two or more separators, with topside constraints such as a maximum amount of water which can be handled, toxic gases, or slugging wells that should not be routed to the same separator.

Graph databases

The software is built up using graph databases, a database structure which allows different pieces of data to be directly linked together.

Graph databases have been around for 15 years, but mainly used in Silicon Valley until now, he said.

"You can model exactly how everything is connected to everything else," he said. "It creates a very elegant computational environment."

"When you make changes to the system, they are immediate and impact the system."

Finding Petroleum

You can watch the talk on video and download slides at
www.findingpetroleum.com/video/1656.aspx

Transforming Offshore Operations with Digital Technology, Stavanger, Dec 2016 Attendee list

Åshild L. Rødland, DRM Analyst, A/S Norske Shell

Ole Morten Faltinsen, Partner / Project developer, Adsign Ideutvikling

Rahul Gangurde, Automation Engineer, Aibel

Anita Sølga Lindtner, Aker BP

Bjørn Magne Løvaas, IM Manager BP Modification Projects, Aker Solutions

Per Ivar Nerseth, Senior Product Advisor and Account Manager, AVEVA

Stig Sundli, Delivery Head - EMEA North, AVEVA

Njål Vikanes, Sales Executive, AVEVA AS

Jarle Soland, Chairman of the board, Avito AS

Yoseph Ghezai, Reservoir Application Manager, Baker Hughes

Arne Kristian Hausken, Konsulent, Bouvet

Mats Gunnerød, Consultant / PDMS Administrator, Bouvet

Stein Roalkvam, Senior Consultant, Bouvet AS

Johannes Stavland, Manager, Bouvet Norge AS

Bjørn Svarstad, Maintenance Management Advisor, BSR Consulting

Kjell-Ove Todnem, Sr. Analyst, Technical Information Management, ConocoPhillips

Oddvar Skoland, DFO/COPENS Administrator, ConocoPhillips

Tram Tran, Entrepreneur Founder Information Data Petroleum Innovator, Consultant

Elle Forrest, Information Consultant, Datum360

Veronica Fenne, Manager, Deloitte AS

Kent Andersen, CEO, Draga

Arne Beyer, Business Unit Manager, Duxis

Bernt Eldor, Business development manager, Eldor AS

Tor Ove Holsen, Leader Document and Information Management, ENGIE E&P Norge AS

Svein Magne Leine, Project Leader, Eni Norge

Steinar Leiros, Application Analyst, Eni Norge

Kasem Challiou, Global Alliances Manager, eVision Software

Joe Chesak, CEO, Fablabs AS

Karl Jeffery, Editor, Finding Petroleum

katya jeffery, Delegates manager, Finding Petroleum

Rolf Berge, CTO, Harris CapRock

Tore Notland, IBM

Hans Magne Reinertsen, Department Manager, IKM Operations AS

Gaute Madsen, Sales Executive, Intergraph

Jens Olav Nordanger, Senior Sales Executive, Intergraph

Mari Helgeland, Marketing and Sales, Intergraph Norge AS

Eirik Sønneland, BDM, IOS InterMoor AS

Pål Hjertholm, MD, IOSolutions AS

Amare Leulseged, Research Engineer, IRIS

Gladys Hovland, IT Manager, Ocean Installer

Anniken Teigen, Senior Advisor technology, Petoro

Ragnar Sandvik, Senior Advisor, Petoro AS

Jonas Olsson, Financial Advisor, Petoro AS

Tor Eilev Bjerkerud, Development Manager, Presight Solutions AS

Anders Larsen, Managing Director, Protean APS

Matt Mohajer, Production Business Owner, Schlumberger

Solgunn Nielsen, DRM Analyst, Shell

Nigel Sams, Global Account Manager, Siemens Industry Solutions - COMOS

Ole Hodnefjell, Subsea Engineer / Sales Manager, Subsea Smart Solutions AS

Miguel Rocha Arteaga, Data Coordinator - Methods & Tools, Total

Terje Amundsen

Roger Endrè Nyseth, Senior Structural Engineer

Kristian Matre, Westcon Power & Automation

Kåre Topnes, Manager, Oil & Gas, Westcon Power & Automation AS

Solveig Bjørheim, Enterprise Content Management Lead, Wintershall Norge AS

Angunn Øvrebø, Information Management Coordinator, Wintershall Norge AS

What did you enjoy most about the event?

The presentations.

Angunn Øvrebø, Information Management Coordinator, Wintershall Norge AS

Building relations and speeches.

Nice to learn about the other vendors.
It was a fine oppertunity to meet and talk to others focusing on the same 'problems to solve'.

Njål Vikanes, AVEVA

The event was packed with a lot of interesting clients and partners. This is the best event in oil and gas.
Keep ut the good work.

Intergraph

No cover charge, easier to get approval - great presenters, the best was from Aveva and Intergraph.
Meeting people working with the same topics.

Delegate from ConocoPhillips Norway