digital energy journal

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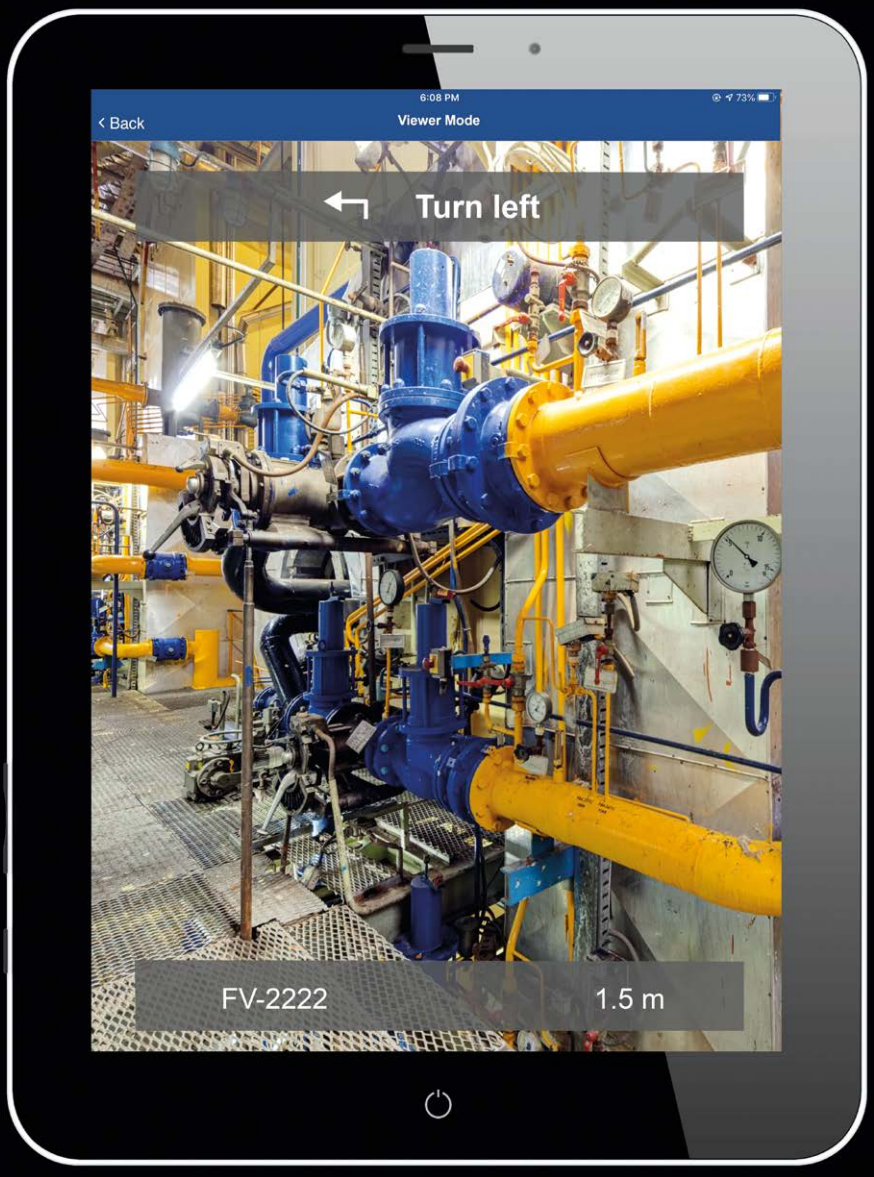

Using augmented reality in maintenance

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Cover image -
Augmented reality can be a useful addition to industrial plant performance management software, helping people find the right equipment and understand what they are looking at, says Emerson - see page 15 (will be page 14 after we put Katalyst article earlier)

Opening

Digital transformation at BP, Shell and Cimarex

Understanding the importance of data, re-organising around digital, changing roles of leaders, changing role of data scientists, and where we go from here – some of the themes discussed on Reuters' digital transformation webinar on June 17 with speakers from BP, Shell and Cimarex

Reuters Events held a webinar on June 17 with senior digital transformation staff from BP, Shell and Cimarex, all based in Houston.

Themes included how to re-organise an oil company so it can get more value out of data, the evolving role of data scientists as they become more part of the business, the required changes in leadership style, and where we go from here.

The full title of the webinar was "Upstream Oil & Gas Combats COVID-19 and the 2020 Oil Price Crash – Episode 3 The Future of The Oilfield."

Rob Kelly, BP

Rob Kelly, head of upstream digital with BP, said one of the most important things he has learned is the value of data. Before, "I knew data was important, but I didn't really understand why and how it worked," he said.

Mr Kelly has been working with digital technology for only two years – before that his role was VP technical functions in BP's global projects organisation.

"Without it [data], we really can't deliver, particularly if you want to scale across a company the size of BP," he said.

Understanding the value of data means recognising the importance of getting data out of spreadsheets and software packages, and putting it in open cloud systems, where it is possible to run analytics and algorithms on it, he said. "If your data is trapped in spreadsheets you can't do anything."

BP has a team focussing on its data strategy, including planning data "pipes" for how data flows between different parts of the company, and what happens to it.

BP is undergoing the "largest re-organisation of the company in its 110 years history," he said, with changes including replacing the traditional upstream and downstream segments with ventures focussed on specific products and businesses.

Bernard Looney, the CEO, has talked about "putting digital at the heart of BP."

"It really helps if the top person in the company understands," Mr Kelly said.

"This digital transformation - is [actually] a people transformation."

The company moved its 70,000 employees to the Microsoft Teams collaboration and communication platform during 2019. "it's been working really well," he said.

The company uses the term "digital" rather than "IT" partly because it sounds more appealing to people, he said.

The company is creating new roles in its upstream digital organisation, such as "scrum masters" who lead the Agile working process, and "product owners" who are responsible for getting something implemented.

It is appointing people in more traditional digital technology roles, such as software engineers, data engineers, user experience engineers and architects.

BP seeks to recruit people for data roles from within the company where possible. This means people with a background in other domains who have additionally learned data skills by themselves. In the past such people were largely recruited from outside, he said.

It might be useful if the company can find out ways to train people from an oil and gas background to be software engineers and architects. "We've struggled to do that so far," he said.

The company created a data science "community of practise" and 1500 people within the company chose to join it.

The company has probably seen most success in data science – although that's partly because there was a close affinity between data science and what subsurface people have always done.

An example of a successful project was one done in partnership with Palantir to look at optimising production, including with reservoirs and flowlines. The project started around 2015. A lot of the project time was spent finding ways to access data.

"That's the one [project] we had a lot of success with," he said. "We've been running with that for the last 4 years."

In terms of leadership, BP looks to integrate

the business together with digital projects "in an integrated participative way, not command and control," he said.

The new way of working "is about leaders supporting the team, and the team making the decision."

Leaders should be asking what the impediments are and finding ways to remove them. "It is a different way of working, a different question to ask," he said. "Dive right in, try to have an open mind, learn, it is not as difficult as you think."

In terms of cloud, BP's strategy is to use it wherever possible. "We're really pushing that, we're not there yet," he said.

For example it has moved its Schlumberger / Petrel software onto the Azure cloud.

BP learned the lesson to move to cloud after Hurricane Harvey in 2017, he said. The company had reservoir engineers working at home and couldn't access their data because it was stored on office computers, rather than on the cloud.

Now in the Covid period, reservoir engineers are able to connect to cloud "virtual machines" via the laptops. "Some of them are doing it on their phones."

Covid has helped push companies to use collaborative and cloud technologies. The technologies themselves have been around for a long time, but it was proving hard persuading people to use and rely on them, he said.

For example, in its project in the 2000s "Field of the Future", the company implemented a lot of technology but found a lack of willingness from staff to engage with it. It would put in systems to run offshore platforms from onshore, but people were saying they still wanted to have an offshore operations centre, and so the onshore one would never get used, he said.

Hani Elshahawi, Shell

Hani Elshahawi, Digitalization Lead, deepwater technologies, Shell, emphasised that data itself does not have value.

But it can be used to create something valuable, typically "in the form of insights," he said.

You can see data as your raw material, and something you want to take as far as possible.

Data should be treated as an asset. This means that "decisions about platforms and data systems will be treated as major important investments, as opposed to side activities," he said.

The critical success factors in digital transformation are the same as they have always been - having people with the skills to do it, having an organisational operating model, the ability to change, and leadership / mindset, he said. And it is important to be focussed on outcomes rather than technology itself.

Each business unit should 'own' the agenda for digital services in that business unit, choosing and funding activities most relevant to its desired outcomes. That ensures that the digital tools are "customer centric", delivering what is needed, he said.

This is better than having digital activities managed from a centralised IT or data management function of the company.

Some orchestration of digital technology will probably be needed in big organisations. "But it is a light touch, more about choosing processes, setting up accelerators and incubators, [sharing] learning," he said. "The business still owns the 'journey'".

Screenshot from the webinar

But also, the company can put effort into longer term "foundation capability building," not just focussing on short term outcomes, he said.

If you are following agile processes, the role of the "scrum master" should be more of a protector than a dictator or owner. "They shield the team and allow them to do their thing without unnecessary distraction from outside," he said.

Success in digital projects relies on the "full ecosystem", including academia for doing research, technology companies to develop tools, and service companies to integrate it with their offering, he said.

Digital transformation means developing new ways to collaborate and new business models – so that does mean working out how to share data in new ways.

As an example of collaboration, Shell selected the AI company "C3 AI", running on Microsoft Azure, to work with across the company, "standardising across upstream and downstream".

Leadership is moving from a top down hierarchical structure to a more organic system, more focussed on the goals and action than on boxes and lines.

"The role of leadership is more about showing direction and enabling action," he said. "You can't do command and control in this virtual environment very well."

Sha-Chelle Manning, Cimarex

Sha-Chelle Manning, VP Technology & Innovation, Cimarex Energy advised that "having some data science, architecture skills, even if it is a small course, gives you an edge."

"These roles and career roles are going to be critical to the energy industry," she said. "We are going to see continued growth in these skill sets."

You don't need to be an expert – just having a moderate amount of knowledge can be useful, like someone who knows enough of a foreign language to order in a restaurant.

Many people have a perception of data scientists as people who sit in a corner late at night eating pizza and playing table tennis. "That's simply not true anymore. They are the ones having a seat at the table with other business leaders now," she said. "Where data scientists were a couple of years ago and where they are now is completely different."

Data scientists are motivated by trying to achieve bottom line results for the business.

They are often under tremendous pressure to get new tools developed quickly.

Efforts so far have led to companies reducing drilling time per well from 40-50 days to "teens".

She said that there are some very difficult problems still to solve with analytics, such as finding better ways to optimise fractures and finding the right well spacing.

Further value will come from developing systems to support better decision making. "That's where we need to be going," she said.

The question of sharing data with other oil and gas companies and service companies "is the number one issue we have to talk about," she said.

For smaller companies, sharing data might mean you can do more with it. Companies compete on their ability to interpret data, not just to have it.

"We advocate sharing data," she said. "That's not always what our peers would say."

It is useful to have the skills to make the right decisions on how to partner with service companies and other organisations, such as whether to buy or build software.

It is important that leadership is "bold" – including in being able to face "entrenched groups" which show more resistance to change.

Leaders need to have a clear idea of how they define success, and one which other people can understand, she said.

OGTC – finding pay from old well data

The UK Oil and Gas Technology Centre (OGTC) supported a project with Sword Group, Energective, Earth Science Analytics and Merkle Aquila to develop a repeatable process to search old well data for missed pay

The UK Oil and Gas Technology Centre (OGTC) has run an interesting project over the past year to see if it is possible to develop a repeatable process to identify missed pay (hydrocarbons), looking in old well logs.

Four data management and analytics companies took part in the project – Sword Venture (formerly DataCo + Venture Information Management), Energective, Earth Science Analytics and Merkle Aquila.

The project had funding and data from BP, Shell, TAQA and Total, and further data from Apache, CNR, Enquest, Equinor, Marathon Oil, and also the UK National Data Repository and the Norwegian Petroleum Directorate. There was 7 TB of data in total, some going back to 1969.

The researchers worked on a data set from the Northern North Sea, an area chosen because of a large number of decommissioning projects coming up.

Sword Venture looked only at data conditioning, with an aim to put the data into an integrated, clean data set, which could be passed on to Earth Science Analytics and Merkle Aquila, to try to gain insights from. Energective took on the "full stack" of both conditioning and analytics.

One of the most promising approaches, pursued by Energective, was to apply the Thomas Steiber model, which was actually developed in 1975, as a means to explore how much pay is present when it is in a number of thin layers, rather than look for a single thick reservoir.

Of 446 wells thought to be suitable for the study, 131 wells had some Thomas-Steiber pay, and 68 were found to have greater than 20 feet of bypassed [undeveloped] pay. A majority of these wells are in blocks which are licensed. So if the analysis is correct, the license holders could start work developing those reservoirs right away.

Sword Venture

Sword Venture (formerly DataCo) limited its work to data conditioning, with an aim to develop a structured process for taking a range of old well log data to a standard suitable for another company to run algorithms and analytics on.

Sword Venture is part of Sword Group, a large IT service company based in Luxembourg. It acquired Venture Information Management in October 2017, and DataCo in November 2019, to form a merged company focussing on E&P data and information management. This OGTC project was started by DataCo before the acquisition.

Chris Frost, data analytics lead with Sword Venture, said that many manual processes have been developed for working with old well data. The challenge with automating them is that a lot of personal judgement is required as part of these processes, where a machine needs everything defined in rules.

For example, about 1300 "mnemonic variations" (things which people had observed) were applied in making an automated system for joining well logs.

The first step was to try to identify which wells would be most useful to include in the project, and see if their data was available. The company wanted to get data from wells spread across the region, not close together. It wanted to find wells in comparatively unexplored areas, as considered the most likely place to find new pay.

75-80 per cent of the data was embedded in reports which were only able as scans of typed reports, so needed optical character recognition (OCR) to put in digital format. Extracting data from many of the reports was beyond the best available OCR engine, he said.

For the readable data, text analytics engines were used to try to identify key words or an understanding of what the data described.

About 10-20 per cent of all the data was not accurately named or labelled, and data from 30 per cent of wells was incomplete, he said.

The next stage of the work was to try to identify certain data points in each well, such as the formation top (the depth where the formation begins).

This was recorded in different ways in all of the reports, so was hard to extract.

Sword also tried to splice together well log files to form "joined well logs", a single coherent digital well log for the whole well.

There could be multiple log files for the same well. It wasn't always obvious what the data source and validity was.

Normally, if a log file is questionable, people can go back to look at the source documentation, but the large number of wells made this impractical.

The company developed an analytics engine which could split data from the headers, map the columns, and do a statistical quality control, and try to pick the best curves to use.

The company built a classification system, for the various data types.

It tried to evaluate the well path data, describing the shape of the well. Some of the well path data sets had been through multiple software systems, or loaded without proper checks, he said.

There is also 'digital data' (data already in a digital format) available from the OGA / NPD data sets.

With all of this information together, a next step was to try to generate Computer Processed Interpretations (CPIs), making calculations such as permeability and porosity from the well log data.

The project ultimately created 1101 joined well logs. 1.7m curves were checked in this process and 215,000 curves were mapped. Normally it would take 4,400 person hours to do this (about 2 days for each one).

Also 7099 existing joined well logs were processed, and 3244 formation tops.

There were 27 quality control metrics for specific curves – and altogether 15,000 quality checks were done.

3272 well bore data sets have been parsed, standardised and quality controlled.

CPI logs for 700 well bores were digitised.

The second phase of the project, aiming to complete around Aug-Sept 2020, includes further improvement to the workflows, better curve picking and more thorough depth matching.

The company is working through key well reports for 5000 wells, ready for data extraction.

It would be useful to combine the well data with all the other subsurface data from the region, he said.

Energective

Energective tackled the full chain of data conditioning and analysis. It had a particular focus on the Thomas Steiber method, developed in 1975, which is good for evaluating thin oil layers.

Energective is a data intelligence company particularly active in the oil and gas sector, but with projects in other sectors, including shipping and aviation. The company has offices in Houston, Aberdeen, London, Beijing and Hong Kong.

The company's clients include BP, Devon Energy, Marathon, Occidental, Equinor, ConocoPhillips, BHP Billiton, Talisman, Hess and

Apache. Its staff include data managers, data scientists and geoscientists.

It was already engaged in work to develop standardised processes for working with old well data and seismic, before starting on this project.

It calls the process a "data factory", aiming to develop what it calls "expert aided automation," where a computer does the bulk of the work bringing in an expert when called for.

For example there can be algorithms to assess the level of error. This means a person only needs to get involved when the error goes above a certain level, and to review the end results.

Well data

Energective has already applied its data cleansing and conditioning workflow to over 100,000 wells worldwide, and over a million curves, including over 3,000 wells in the Gulf of Mexico, and all 50+ year old wells.

It has 3,000 data quality rules, for the processes of conditioning, joining and analysing files.

The analytics can be used to predict sonic (interval seismic travel time) and rock density. These can then be used to calculate porosity, and do full conventional petrophysics analysis, Thomas-Steiber evaluations and then geophysical prediction.

It is also developing algorithms which can fill gaps in data based on the data around it.

These algorithms can be tested using "blind tests" – such as by removing a section of well log, and comparing a computer prediction to the actual log. In these cases, it is preferred to get accuracy level of above 95 per cent – and any results of worse than 85 per cent will not be accepted, said John Logel, head of geoscience.

Ultimately it aims to get a 'master data set' with no duplicates / replications, a consistent model with a single petrophysical "philosophy", which can be easily searched and visualised.

In this project, Energective compiled composite (joined) logs for 3486 wells, which were properly tied to depth, quality controlled and edited, and then subjected to a petrophysical analysis.

Seismic and rock physics

The company has also developed a workflow for seismic data to go together with the wells data, automatically picking formation tops, faults, horizons and sequence boundaries in seismic.

It is able to build up a rock physics database of the properties of the various clays in the subsurface, making an estimate of the compressional seismic velocity, from adding together the properties of its constituents, if there is no direct density log.

By using this rock physics database to condition the seismic data, it has found that the correlation co-efficient between seismic and logs is average 9 per cent better than normal, and within a range of 2 - 19 per cent, Mr Logel said.

Reports data

For the well reports, it has a analytics engine which can classify each page.

There is some Natural Language Processing. Spencer Hanzik, director of technology, presented an example where you could ask a question "why was this location proposed" and it would find some text in a report saying, "this location was proposed due to.."

Thomas-Steiber model

One process of particular interest for the OGTC project was the Thomas-Steiber model, used to look for thin by-passed pay.

This method was developed in 1975, and looks at the configuration of thin layered sand-shale sequences. It means looking at the "sequence stratigraphic information", not just individual layers (lithostratigraphy).

The thin layers of sand between shale "have been found around the world to produce at very good rates, and usually very low water cuts," Mr Logel said.

They are often ignored because they are thin, and because some logging tools are not high enough resolution to identify them.

The model can only work on wells which are vertical or near vertical.

The Thomas-Steiber method does not discover new pay, but can identify that the reservoir can be larger than otherwise thought.

In the OGTC project, Energective ran the Thomas-Steiber model on 446 suitable wells.

Of these, it found 131 wells which had some "Thomas-Steiber pay", and 68 were found to have "greater than 20 feet of bypassed pay," Mr Logel said. A majority of these wells are in blocks which are licensed.

Western Canada example

Christa Burry, senior geoscience advisor with Energective, explained how the company applied some of these techniques on a project for an operator of a mature oil field in Western Canada. There were 22 wells drilled between 1978 and 2011.

The Thomas-Steiber model was applicable to all of the formations.

The company's initial analysis took just a day, and led to plans for further well tests.

One of these well tests identified that the upper portion of a well drilled in the 1970s could produce 11 bopd. This flow rate could then be improved by drilling horizontal wells.

For another well, it identified that there was a new reservoir which still had its "virgin" pressure, and could be produced.

"it was basically 3 days from the start of the project to getting some results, collaborating with the operator, adding their expertise," Ms Burry said. "We came out with some really interesting things."

Earth Science Analytics

Earth Science Analytics, a geoscience specialist analysis company based in Stavanger, worked on the OGTC project, taking on the data conditioned by Sword Venture.

The company has 34 staff, of which 30 are geoscientists.

It makes a cloud based software platform called EarthBANK, which can be used to store and visualise well and seismic data, seismic inversions, well formation tops (the depth in a well of the top of a formation) and other subsurface data.

The software has "explore" functionality, which can be used to see different wells, what data is available for them and for what depths. You can also see the spatial coverage of the data, and identify data gaps.

You can choose to see different layers, such as dry wells, wells with hydrocarbons, faults, stratigraphy, lithology, porosity, measured depth of formations and other structural information. You can choose to see wells in different reservoirs and different national waters.

The data bank from Sword Venture contained 70 different types of data with 1000 formation tops (height of a top of a formation within the well) and 30,000km of basic logs.

There was 155km of computer processed interpretations, calculating porosity, lithology and water saturation from the well logs.

Finding pay

The company chose data from 514 wells which had been classified as "dry" to analyse, and also looked at water saturated intervals where pay had not previously been found.

Pay may have been missed for a specific reason, and these reasons might be helpful to understand when looking for it now, said Daniel Stoddart, principal geo/data scientist with Earth Science Analytics.

For example, pay could have been missed due to poor petrophysical evaluation, bad hole conditions, or the pay interval happening at a "casing point" (where the hole diameter changes).

It is possible there would be missed pay above

a large field, perhaps because the field was slowly leaking oil.

Perhaps the well was drilled at a time companies were only focussing on the large hydrocarbon discoveries, and were not interested in thinner zones above and below them. "You can only guess on that kind of thing. I think there's always a back story," he said.

For example, a number of wells have been discovered which penetrated reservoirs below the giant Brent field, but this was not noticed at the time, he said.

It may be possible to see pay today which could not be seen at the time of drilling, due to advances in subsurface techniques which have happened since then, such as improved seismic resolution.

Perhaps the pay was missed simply because the person who knew about the reservoir was pushed out of the company, in one of the many down cycles of the industry.

It may be possible to find missed pay by searching for areas which have high porosity and low water saturation, indicating that the rock may be holding something, but it is not water, Mr Stoddart said.

Workflow

Earth Science Analytics workflow with the OGTC data set was to look for key attributes in the data and analyse them.

There were 90 different data types altogether, including different log types, core porosity measurements, oil show information, and well test data.

The software visualisations were helpful in finding outlier wells which have some different characteristics to the ones around them.

They could be outliers due to errors in the data or its interpretation, such as data having a negative porosity value. Data obviously wrong can be removed, although sometimes you need to get expert advice about whether certain values are possible, for example a sonic velocity outside the normal range.

Some well data was in the wrong units. Some data showed that the hole diameter was smaller than the drill bit size, which indicates an error.

The software tool allows the editing of single and multiple wells, and also to go back to the original data if you realise later the editing was a mistake.

The most useful data was the porosity (which can be calculated from sonic logs, density logs and neutron logs), water saturation (from the effective porosity and the resistivity log), and lithology (different rock types have a different signature in the logs).

The next stage is called "feature engineering", using domain knowledge together with data mining to extract "features" out of the data.

It aims to make what it calls "ensemble models", putting multiple pieces of data together. So you can end up with average (mean) porosity and water saturation for each well.

The data can be used to calculate how much of the reservoir is capable of storing hydrocarbon ("net reservoir"), how much hydrocarbon resources might be there ("net pay"), and how thick the reservoirs are.

Then the possible reservoirs can be visualised, classified and ranked, with calculations of metrics such as net to gross reservoir, net to gross pay, the parameters geologists need for their reserves calculations.

The analysis can also show geologists areas to look at in more detail. If the calculation identifies a pay zone of 3-4 metres thickness, further evaluation may find it is the edge of a much thicker reservoir.

Average water saturation does not give a strong indication of pay by itself, because pay zones have been seen to have water saturation over a wide range, Mr Stoddart said.

Merkle Aquila

Merkle Aquila, a UK data science company, also worked with the data set conditioned by Sword Venture.

The company did not have any prior oil and gas subsurface domain expertise, but had previously done some projects in other oil and gas sectors, including with automated reporting, dashboards, asset management, and vision systems for robotics.

The company was formed from the acquisition by US company Merkle of Edinburgh data science company Aquila. It employs 130 data translators, data engineers, and data scientists, with offices in Edinburgh, London and Derby.

The role of "data translators" is like a project manager, identifying business priorities, focussing on value creation, workstack prioritisation, solution delivery, he said.

Data engineers are developing automated methods for handling data and deploying tools to do it, while the data scientists extract knowledge and insights from the data.

The company wanted to develop an automated system which would follow the established manual methods for working with well data and predicting pay, which a geoscientist would follow, said Steve Sinclair – senior data science manager with Merkle Aquila.

But this automated system would act with less bias than a person would. Perhaps human bias is a cause of missing pay first time around, he said.

The workflow was to explore and understand the data, looking for features in it. Then create analytics models and analyse their output. "There's a lot of tweaking and going back and forth," he said.

The company received 60,000 files from Sword, covering 3,000 wells. It initially looked very frightening in terms of its complexity, he said.

The company decided it would focus only on the well log files and computer processed log interpretations (CPIs), and leave out most of everything else, including image files and documentation. This reduced the data set to 5,000 files.

The well logs did not contain any indication of where oil had been found, or where it was known to be missed. This made it hard to train and assess the algorithms.

There were only 200 CPI logs, and it was not clear if there was any bias in the choice of which wells they were created for, for example if they focussed on similar sorts of fields or similar depth intervals.

The "feature engineering" work looked for trends and clusters in the data, as basically an "outlier detection tool."

"Dimensionality reduction techniques" were experimented with, which aim to find the most significant data, to make it easier to compare wells.

The normal approach a human (expert) might take is only to look at 0.1 per cent of data from a handful of fields and make predictions from that. But that technique can't be easily applied to 3000 wells, he said.

The company made a dashboard to make it easier to visualise data, comparing wells, pay predictions and clusters, showing data at 80m intervals, running on Azure Databricks.

Many different modelling types were tried for the prediction model, including "random forests" and "deep learning models", with a tool called "machine learning flow" to record the output of different techniques.

It may be easier to do machine learning in oil and gas if data was stored in a consistent way at different oil companies, he said.

You can watch the videos online at

www.youtube.com/watch?v=hxgpHlvvwik
(part 1 – Sword + Energective)

www.youtube.com/watch?v=MJT5q-P3Pds
Part 2 – Earth Science Analytics / Merkle Aquila)

How BP is moving to cloud

BP is gradually moving all of its data systems to the cloud using Microsoft Azure. Diana Kennedy, VP strategy for the IT department, explained how it has been going so far

BP made a decision three years ago that "cloud first" would be core of its digital strategy, said Diana Kennedy, VP strategy, architecture and planning for BP's IT department. This was a useful "North Star" in providing guidance as to where the company should go.

"We knew that 'cloud first' was the right answer for us, and we also knew we weren't there," she said.

She was speaking at an online conference session of "COGX - Global Leadership Summit and Festival of AI & Emerging Technology" on June 7.

Three years ago, the company was operating 8 physical data centres, some containing very old equipment, and some with leases about to expire.

"I'm super delighted to tell you we closed the Americas data centre 2 weeks ago," (late May 2020), she said.

The chief executive, Bernard Looney, has declared his intention that BP should become the "digital leader" in the energy industry.

It is much faster to configure new software and associated infrastructure on the cloud – a matter of weeks, compared to 3-6 months on conventional data centres, she said.

By moving everything to cloud, it makes it easier to focus attention on the applications, rather than how they are being hosted. It also makes cybersecurity easier to manage.

The company's first cloud projects could be described as trying to do the same thing as the company was doing in its in-house data centres. But then, "you lose all the benefit of the cloud," she said.

An example of a project which makes good use of the cloud is the system to handle large amounts of sensor data from oil production systems, and analyse the data to spot trends and make predictions.

It has enabled the development of "quite sophisticated machine learning models to improve reliability and availability of our facilities", she said.

It has been achieved through the flexibility of the cloud infrastructure, and the ability to "build solutions super quickly", including using "orchestrating components" [automatic configuration and management tools].

BP's retail division, selling gasoline, was able to develop an app "BPme". Customers enter the gasoline pump number on their app and how much money they want to spend. The system cuts off the pump after that value of fuel has been delivered to their car, and bills their credit card.

This "could only have been possible through our cloud infrastructure migration and the orchestration of cloud products," she said.

The company also re-organised its entire "digital organisation" into a set of services, underpinned by DevOps and delivering through Agile. "That was a mammoth undertaking in itself," she said.

What was traditionally the "IT department" is now a unit of the company providing a range of different online services, including capability to develop applications while they are in operations (DevOps), and operate in an "Agile" way, such as through time limited "sprints" to try to come up with a "minimum viable product".

BP is doing a "huge global reskilling" of its organisation, through a range of initiatives, including use of internal experts.

The company started by training its technical staff to use cloud based tools and technologies. It soon realised it needs to train the business decision makers who use the technologies too.

It helps if you can find ways to make digital technology look more attractive to people, for example by talking about machine learning or new apps, which people get excited about.

Ms Kennedy uses the analogy of a parent putting cheese on broccoli to persuade children to eat it. The "broccoli" in this case is the substance of the big new cloud foundation.

Collaboration

To try to encourage more collaborative work, BP staff are now assessed for how much they help others in the company and share their knowledge, as well as what they have done themselves.

BP uses Microsoft Teams across the company to support collaboration, Ms Kennedy said.

"It takes time embedding that mindset of collaboration, multifunctional team working, the combination of physical and digital environments."

Use of the collaboration software much increased during the Covid-19 period, with calls to the IT helpdesk rising from 300,000 in February to 900,000 in April.

Microsoft

Michael Wignall, UK business group lead for Microsoft Azure, and BP's cloud service provider, also shared perspectives on the webinar.

Microsoft has seen that COVID-19 has driven big moves to digital technologies across all industries he said.

This includes supporting teamwork, online learning, sales and customer service – with associated challenges keeping cloud infrastructure running reliably.

Some domains Microsoft has been looking at include remote solutions for healthcare, remote HR management, online marketing, and digital supply chains.

The technologies themselves are not new, but they are being used more and in new ways.

Microsoft's current mission is "to empower every person and every organisation on the planet to achieve more," he said. The previous mission, "A PC on every desk and every home" didn't talk about what you did with the PC.

You can watch the talk online at **https://youtu.be/l1VowSZfRbU -** the webinar starts at 2.51.33

How to thrive as a data manager

Jane Hodson, information and samples lead with Premier Oil, shared some advice about how data managers can thrive in today's business environment, including when their employers are seeking to cut costs, while needing work done from home

Oil and gas data managers have two big challenges in today's working environment. The first is that they are sometimes seen as superfluous by management who don't fully understand their role and are seeking to cut costs. The second is that companies are reliant on staff being able to work effectively from home, which creates new demands on data managers.

Jane Hodson, information and samples lead with Premier Oil, and someone who has worked in the oil and gas industry since 1984, shared some perspectives on a webinar organised by the Society Petroleum Data Managers on June 2nd, "Remote Working - The Trials of being a Data Manager in the New Normal."

Ms Hodson's current role is to manage all the information produced by Premier Oil, including subsurface and geo-Petro technical applications, work required for regulatory filings and reports, and all of the samples from fluids to cores.

She formerly worked for BP, CNR, Venture, Centrica and, DataCo, and as an IT consultant, after qualifying as a radio officer for the merchant navy.

Proving value

It is helpful to have a good understanding of where your work as a data manager helps a company achieve its business objectives, such as finding oil, reducing costs and avoiding accidents, she said, in case you are asked to justify why your work is important.

Data managers often view their value in terms of tasks they can do which the company needs doing, such as load seismic data properly into software applications with the right co-ordinate reference system.

But whether or not this is done right, or whether problems can be fixed, can lead to big business impact.

Ms Hodson tells a story of when she was asked by her employer to try to work out why seismic data was not matching well log data. She discovered that the wells, drilled in the 1960s, had stopped using the right co-ordinate system (datum) partway through, so data was showing a hundred metres distance from where the well was actually located.

This insight enabled the company to align the seismic with the well log data. It also led to the realisation that the company was planning wells in the wrong location, and needed to move its drilling rig. If it had drilled in the location it was planning to, it would have drilled into a different formation to the one it was expecting, which also could have been dangerous.

Other value adds provided by data managers include making data more discoverable, improving data quality, making regulatory compliance easier, reducing workload for others, and improving efficiency overall, she said.

If the company has a system for tracking requests to the data management staff, such as for data to be loaded or checked or new software, that can provide a body of evidence about what you have done, she said.

Relationships

Another way to provide and demonstrate value to the company is to be as helpful as possible to colleagues. If you get into the habit of asking geoscience professionals if there is anything you can help them with, it might help you to keep your job in a downturn, she said.

"You need to go to them [internal customers], so they know they can trust you, and once you've built that relationship, they will give you work," she said.

You can also provide assistance by monitoring what people are saying on company forums, she said. For example Premier Oil has a WhatsApp group for discussions about technology, which can sometimes be a better way to find out about how people feel about their digital systems than the ticket based system, she said.

Data management in lockdown

Another big challenge for data managers today is supporting geoscientists to work at home. Ms Hodson has been supporting a team of 35 subsurface technology users.

Many of the problems encountered turned out to be about insufficient home internet speeds, rather than with data or software, she said. Sometimes this could be solved by people asking their children not to use the internet at the same time.

Staff do their work via remote access to a server using tools like Citrix, so do not need large

data processing capability on their home computers, she said.

Covid also pushed people to embrace technology which they had been making baby steps toward for some time. For example, Premier Oil was in the process of moving to Microsoft Teams, but not everybody was using it. The pandemic forced everybody to use it. "It is the best solution for all of us, covering chat, e-mail, workspaces," she said.

Ms Hodson is currently managing a project, which formerly would have been kicked off with a 1 to 1.5 hour physical meeting. Instead, the whole thing was moved to Microsoft Teams, with information about the project schedule, tracking, updates on work people have done, in a shared online place.

"It has worked so much better than expected. The e-mails /conversations are all within the collaboration tools. We can chat, video conference. I could actually look at the work the person is doing – on a minute by minute basis if I need to. I'm finding it is working really well, we're totally on schedule," she said.

"We're not wasting as much time as we would do – including getting to meetings This is the way I'd like to do my projects [from now on].

Tips for home working

"I don't want to work virtually for the rest of my life, but don't mind it for a couple of days a week," she said. Many people feel the same way. "I think this has surprised a lot of people."

Careful time management and focus tools can be very useful in supporting productive home working, such as the idea of focussing on work for 25 minutes then having a 3-5 minute break, followed by 25 minutes more focussed work then a longer break.

Microsoft Outlook has basic task tracking tools, where you can record what time you started and finished something.

It is important to keep communicating with colleagues, including responding quickly to messages even if you do not yet have what they are asking for. This might be considered unnecessary when everyone is working in an office, because you might bump into someone. But for home working, if you don't respond immediately, people might think you are not there.

"I think the social connection is important whether remote or not remote," she said. "You have to build those relationships."

This article is based on a June 2 webinar organised by the The Society for Petroleum Data Managers, which is based in Stavanger. It can be viewed online at **https://youtu.be/tHviVMljn7c**

Exprodat – helping you plan onshore wells

Exprodat has made enhancements to its software to help companies plan onshore (shale) wells in complex areas

Planning onshore shale wells to maximise production is difficult. Both surface and subsurface can be highly complex, with a need to keep drill pads away from residential areas, parks, rivers and flood zones, and keep wells away from disruptive structural features while maximising their contact with the producing formations.

You need to make agreements with land / lease owners, and there can be many owners of small parcels of land.

This all needs to be done while working with high levels of uncertainty about what the reservoir is able to produce, and a need to minimise costs by having the maximum number of wells from each well pad (where the drilling rig is placed), and keeping wells a certain distance apart from each other, so you maximise how much of the reservoir you are able to produce with the fewest wells, says Chris Jepps, COO of Exprodat.

Companies want to know how its well pattern should change depending on whether only the proved reserve areas (1P) produce, or if certain proved + probable (2P) or proved / probable / possible reserve areas (3P) turn are also productive.

They want to know how far away from their drilled wells their acreage can be classed as "proved", in order to book acreage positions with the regulator.

"These are questions we see more than ever," he said.

Companies sometimes want to analyse possible well layouts just to assess the potential value of a certain acreage, or the value of a company which owns rights to it, or to assess whether the acreage is worthy of investment.

Software estimation

The software can quickly estimate the number of wells of a certain length and spacing that you can fit in your acreage under real world conditions.

It can assess the impact of certain factors or geographic features that require you to not operate too close. For example, you might need to keep drill operations away from a certain zones, or away from particular faults or mine shafts.

The Exprodat tools can be used to quickly make a model and so iterate it many times, in order to better assess dependencies and sensitivities.

Exprodat presented an example scenario, an area of land outside Pittsburgh, with some existing wells. There were 3200 different land 'parcels', with some owners having a number of different parcels. The parcels were irregularly shaped, with gaps between them. A driller would need to negotiate with the parcel owners before being able to drill or produce from their land.

Other constraints included rivers, flood zones and parks.

This was said to be an "extreme geometric environment", although such a situation is very common in shale plays.

The software has tools to allow you to model where you don't want to operate. You might say you don't want to be within 300 feet of a river, within a flood zone, within 1500 feet of a park, or drill through faults.

The workflow involves creating "well sticks" (a simple model of the horizontal section of the well), "pads" where you drill from, and production "halos" – regions you will be able to produce with this plan.

You can set which spacing you require between wells (in either distance or area), and the minimum distance you want one lateral to be from another in the subsurface. You can set a range of 'azimuths' for your wells (geographic bearings).

So you can find out how many wells you can realistically fit in the area.

You can model drilling pads at the top of the wells, and specify how many wells to drill from the same pad.

Then you can assign names & numbers to the wells and pads in order for them to be uniquely identified in future planning.

The software can then estimate the likely reserves you have yet-to-drill using a Monte-Carlo simulation engine which models how much you will potentially produce from the reservoir, running thousands of scenarios to work out the most likely outcome.

You can model multiple levels of laterals (one well above another, known as 'wine rack geometries').

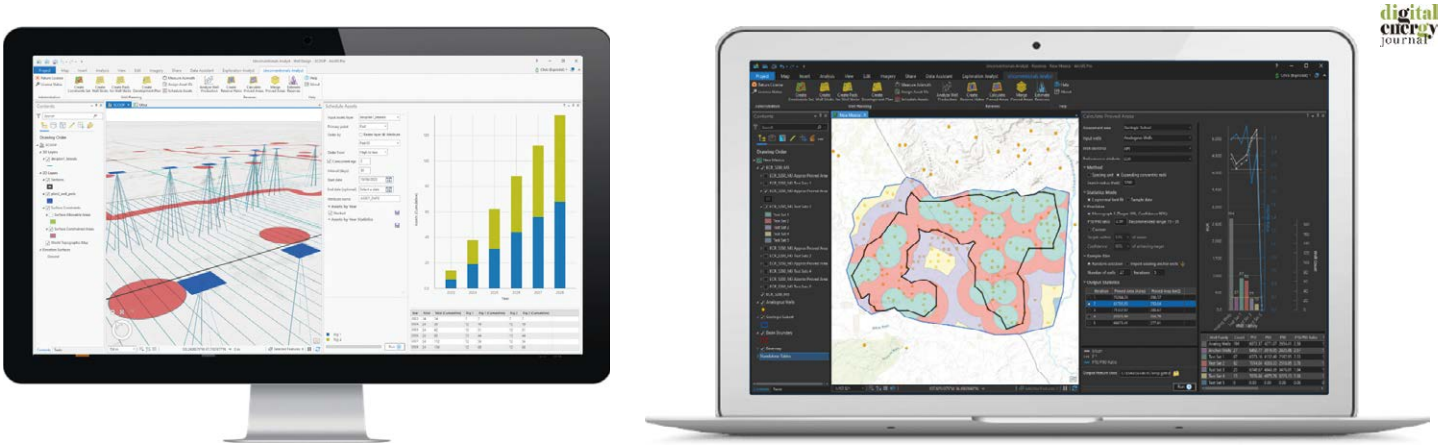
The software is called "Unconventional Analysis", and is provided as an "extension" to the Esri ArcGIS (Geographic Information System), an industry standard.

Software improvement

Exprodat is making enhancements to its software to make it easy to find the best way to place your wells and model reserves. Version 2.0 of the software will be released in summer 2020.

Improvements include a new tool to create pads for well sticks, enhancements to the well sticks modelling, and better systems to assign asset IDs. The reserve halos tool and reserves estimate tools are also new.

This webinar is based on "Enhanced Onshore Well Pattern Design for Operational Efficiency", by Exprodat held on June 18.



Screenshots from Exprodat's software

Katalyst - how O+G is moving to cloud

Oil and gas companies are increasing their spending on cloud applications by 15-24 per cent a year, estimates Katalyst Data Management. They are encouraged by their shareholders, and a desire not to look slower than their peers

A study by Markets and Markets on oil and gas cloud applications spend, predicts a 15 per cent growth rate from $4.9bn in 2019 to $9.4bn in 2024.

Craig Jones, business development manager with Katalyst Data Management, a UK specialist in subsurface data management, said he estimates that to be "quite conservative".

He says the oil and gas trend may be more like the global trend, where spending on cloud services increased 24 per cent in 2019 compared to 2018, according to analysis by IDC.

He was speaking at the UK Virtual Data Management "Luncheon" for the Professional Petroleum Data Management (PPDM) Association on June 24.

Oil and gas companies' move to the cloud is partly due to peer pressure. Companies want to tell their shareholders that they are moving to cloud, show that the oil and gas industry is not a "laggard," and that their company is not behind other oil and gas companies in doing it, he said.

They have shown sporadic interest in cloud systems since they have been available, but "We haven't seen this scale and consistency of interest before," he says.

Moving to cloud can reduce the costs of data storage and infrastructure. It can help make data more accessible. It can also make security easier to manage, he said.

Traditionally, oil and gas companies have been very protective of data and kept it behind firewalls. "We had experiences of how difficult it can be to get through these firewalls due to the philosophy of confidentiality and security."

The oil and gas downturn may drive both increases and decreases in spending on cloud services, he says. It may increase where people see cloud as a way to save cost, but decrease if they decide to put all possible projects on hold to reduce costs over the short term, and this can include the costs of moving data onto cloud systems.

Katalyst Data Management specialises in oil and gas subsurface data. It looks after 70 PB of customer data, which is stored in systems like Azure and AWS. The data storage is growing by 50TB a day.

Definitions

Mr Jones said that many customers do not have a great deal of understanding of the various cloud terminology, and presented his own definitions for some terms.

The term "cloud" could be applied to data stored on any computer other than your own one, he said.

You hear the terms SaaS, IaaS and PaaS.

SaaS, Software as a Service, is a software system hosted on the internet - but does not include any associated data computation or storage packages.

IaaS, IT as a Service, is for when you want to buy access to a remote computer. For example, to do seismic processing.

PaaS, Platform as a Service, is where everything is provided for you, including software, IT and storage.

For example, if you use Microsoft 365 online, you may be storing your data elsewhere, in which case it would be SaaS not PaaS.

Finally people are starting to talk about "XaaS" to mean anything as a service, so no upfront fees for anything. Mr Jones explains this with the analogy of light switches, where you just pay when you switch it on, and nothing otherwise.

SaaS accounts for over 50 per cent of the spend, while IaaS is the fastest growing, and PaaS is second fastest growing. The biggest spending country is the US. We may see more SaaS companies becoming PaaS where they offer storage and compute capability as part of their offering.

AI and ML could be defined as making use of some of the many algorithms that have been developed which can crawl through large amounts of data.

To do this, it is necessary to make data available to the algorithms. It can be easier to both run algorithms and store data on cloud systems, but you don't necessarily have to use the cloud to do AI and ML.

It is important not to confuse cloud storage with data management. "Without data management you are just moving from one file system to another," he said. "Data management on the cloud is not trivial. don't believe anyone who says that it is."

For data management, it is helpful if you have tools which can query and search data across multiple data storage systems.

Confusing bills

A survey in 2019 by Flexera of corporate cloud users in different industries found that many customers were unhappy about their bills, saying that they were offered attractive headline rates which didn't tell the whole story, Mr Jones said.

Cloud service providers often have different rates of storage with play-offs between them. For example, data stored at the cheapest rates may not be available for analysis, and you may have to pay more to move the data around. There may be a minimum time duration you have to pay for. So commercial models can be very different to the monthly fee type models we are used to from software. "It can be very inexpensive to move data to cloud, but you get charged when you touch or look at it."

The study also found that the cloud "initiative" which most companies were planning in 2019 was to "optimise existing use of the cloud" (64 per cent). The second most popular initiative at 58 per cent was "move more workloads to cloud".

69 per cent of respondents to the Flexera survey said they are using a mixture of "public" and "private" cloud, or to put it another way, they still store some important data on their own computer systems, he said.

Supply chain "Global Interoperability Framework" proposal

Four e-commerce standards organisations, led by Chris Welsh of OFS Portal, have come together to develop a "Global Interoperability Framework" for how all e-commerce systems can talk to each other, which the members hope will speed up the move to e-commerce overall

Four e-commerce standards organisations have joined forces to propose the development of a "Global Interoperability Framework", as a means for different e-commerce systems to communicate with one another, thus enabling global interoperability between all the customers of these systems.

The project is chaired by Chris Welsh, CEO of OFS Portal and a member of the board of oil and gas standards organisation PIDX. Mr Welsh is also a member of the Board of ONCE (the Open Network for Commerce Exchange), one of the participating organisations.

Mr Welsh believes the existence of such a network could be a big benefit to the oil and gas sector in accelerating "end to end digital". Oil and gas is not moving to digital supply chain systems as fast as it could be, he believes.

"I think an eDelivery network with agnostic payloads (independent of any software company or service provider) could really accelerate interconnectivity across all players in Oil and Gas," he says.

You may recognise the problem this framework aims to solve, if you have struggled to deal with a purchasing system of a larger company as a supplier.

It is common that the purchaser has its own complex e-commerce system to make its life easier, but if you are a supplier just dealing with this buyer with a handful of transactions, it is a real headache working out how to use their system. The purchaser is not aware of this, because they are too powerful a buyer for anyone to tell them.

If the buyer's system was part of a global interoperability framework, the buyer would not have to do anything differently, but any seller could work with it, on whatever e-commerce system they choose.

Chris Welsh, CEO of OFS Portal and chair of the GIF project

As with any e-commerce system, it aims to support compliance, support process traceability, be cost effective, support service providers and provide a base layer of services,

How it works

The basic proposal is analogous to the frameworks for connecting together telephony companies.

Each telephony company has its own local network and customers, and systems for billing, managing phone numbers, and fixing faults.

But when a telephony company connects to another one, there is a standard system for how this is done – how calls are passed across, how checks are made about valid accounts, how billing is made between companies.

In the same way, many companies work with different e-commerce providers, which manage the messages associated with making orders, issuing invoices and receiving payments.

Until now, much of the development of business-to-business transactions has been around encouraging companies to join the same network (whether having the same provider, or communicating using the same standard).

But an alternative way to achieve a global network could be to set rules or frameworks for how the various e-commerce providers should connect to each other.

Note - the proposal here is not to create any new electronic system, just to set new frameworks for communications.

Also note that buyers would not communicate directly with sellers over this framework – it is for their respective e-commerce providers to communicate with each other (like one phone network to another) in what's called the four-corner model.

Organisations involved

Four organisations are involved.

Connect ONCE (ONCE), the Open Network for Commerce Exchange (USA), a collaborative forum for B2B e-Commerce. This organisation is chaired by Chris Welsh.

EESPA, the European E-invoicing Service Providers Association (EU), a pan-European trade association, whose members are active in electronic invoicing and supply chain automation.

OpenPEPPOL (EU) an association responsible for the development, maintenance and implementation of the PEPPOL specifications enabling cross-border e-Procurement. Its mission is to enable businesses to communicate electronically with any European government institution.

The Business Payments Coalition- BPC (USA), a volunteer group of organisations and individuals working together to promote greater adoption of electronic business-to-business invoices, (B2B) payments, and remittance data.

The associations first came together in 2019 to explore the idea.

Registers of endpoints and capabilities

There are two "registries" which are developed as part of the framework, in order to be able to send messages to the right location and which the recipient is able to work with.

The "Service Metadata Publisher" registry (SMP) has a list of the various "endpoints" connected to the network (the various e-commerce systems), and what automated messaging each of these systems is capable of.

The "Service Metadata Location" (SML) is a registry of the endpoints which can be part of a message, so the system knows where a message should be routed to.

Core concepts

There are four core concepts to the GIF approach, all starting with the letter 'D'.

The "Delivery" system - which is based on every trading party connecting to an invoicing service provider, and the invoicing service providers connecting to each other through the network. The invoice is just one document type for illustration purposes.

The "Discovery" - how information about one trading party is made available to another, including information about the invoicing service provider it uses. (This incorporates the SMP and SML, described above).

The "Data" - what is actually exchanged, such as the contents of invoices and orders.

The "Directives" - the various rules which govern how transactions should take place, including rules set by participants themselves.

The model aims to get maximum alignment of the various interoperability frameworks, and reflect broadly accepted technologies and building blocks, and can be open to innovation and evolution.

"Interoperability" here could be defined as the ability for buyers and sellers to trade together, sharing the necessary instructions and data that both need, irrespective of what systems they are using.

The GIF itself is a set of recommended practices, policies, standards and guidelines.

The working group has agreed on 18 critical business and technical requirements, drawing on a recent US Technical Assessment Report (for the establishment of a U.S. interoperability framework) and as another perspective a set of guiding principles for interoperability proposed by the European Multi-Stakeholder Forum on e-Invoicing.

Further information can be downloaded at **www.gifworks.io/download-document/**

AVEVA – how digital twin use is evolving

The way industrial companies use digital twins is evolving – with more sophisticated use to manage information, more use on industrial plants, and a slow move from 'description' to 'prediction', says AVEVA

The oil and gas industry first saw digital twins – "a digital replica' of the real thing" – as 3D models of an industrial installation.

Computerised maintenance management systems, helping us plan maintenance work based on fixed periods, could also be seen as a form of digital twin.

But now the way industries like oil and gas are applying digital twins is slowly evolving, with some companies using them to make predictions, not just descriptions, according to UK industrial software company AVEVA.

Companies are making digital twins with process models (such as for chemical flows), digital twins for asset performance management, and digital twins for maintenance planning and scheduling.

The 3D digital twins are getting more sophisticated, now being made from a wider range of engineering information, including process, mechanical, structural information, drawings, P+IDs, line diagrams.

The 3D views can show what is happening with assets right now, not just when they were in the condition as originally built.

Amish Sabharwal, EVP, Head of Engineering Business with AVEVA believes that digital twins can help transform the industrial world, as a the "foundation of asset performance management."

To illustrate the potential, consider the 'digital twin' which Google makes of our consumer world on Google Maps which make it so easy to find a coffee shop. Then compare this to the difficulty engineers in the industrial world have searching for information they need about their environment, he said.

One study found that about 4 per cent of the costs of unplanned downtime can be attributed to time spent looking for information, he said. And not having the right information can lead to poor execution of work.

Mr Sabharwal sees the world of oil subsurface data as an example of an industry which makes good 'digital twins' (such as reservoir models).

It may be that industries do better with digital twins for assets they cannot physically see or visit easily.

AVEVA recently did a survey of customers in different industrial sectors (including oil and gas, chemical, food and beverage) to ask where they thought digitalisation could make the biggest impact to their businesses, and the top answer was that they wanted to digitise their industrial plants.

Customers were asked what they see as the biggest technology trends. The top answer was cloud, and AI came "a little bit" further down the list. But the second biggest trend was the concepts of "intelligent information management systems", which could be another name for digital twins, he said.

Mr Sabharwal said that a 'digital twin' could be seen as analogous to another human being's understanding of the world, and our senses can be analogous to how digital twins gather data with sensors.

People store information in their minds, digital twins store data in historians. People use their models to improve how they perform in society and make predictions, and similarly digital twins are used to improve operations and make predictions.

For industrial assets, there can be separate digital twin models covering operations, process, maintenance and engineering data, although they are all looking at the same asset.

A digital twin's structure can be viewed as a pyramid, with asset information management (engineering information) at the base, and the pinnacle is where data is generated which helps improve the asset's performance, perhaps following pre-planned improvement "recipes".

A customer is GS Caltex, a refinery operator in Korea, which has developed a digital twin to improve reliability, reducing unplanned downtime, such as from better predicting problems with reactor fouling.

Digital engineering

Coupled together with the idea of a 'digital twin' is the idea of 'digital engineering', when the engineering model of an asset slowly evolves, with the same file being passed through the various people and stages who work on the design of the asset. When the design is complete, the digital model reflects the finished design.

The same model can then be used in simulation, construction planning, procurement, and operator training.

This is proving difficult to achieve, because many different people can be working on the design, from different companies, and with different working methods, Mr Sabharwal said.

Joe Perino, research analyst with LNS Research, speaking at AVEVA World Digital

And we do not yet have digital standards for how models can be described, enabling the files to be moved around different software systems, he said.

A further challenge is that the different organisations involved have different business goals – for example an EPC company wants to win business but then deliver the contract, while an operator cares more about the longer term health of the asset.

"The opportunity is around unlocking these spaghetti fragmented processes," he says.

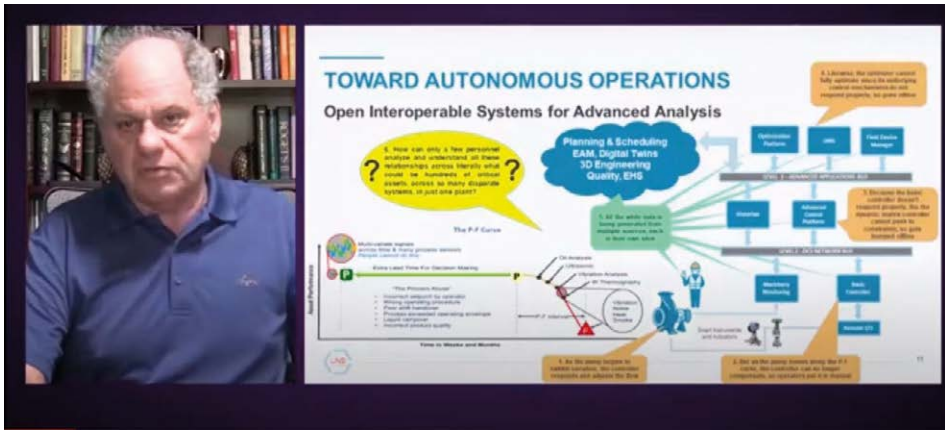
"If we put data in the middle between EPC, owner and suppliers - and have this bit of data on the cloud, everybody on the ecosystem can share this information in real time."

Mr Sabharwal estimates that this approach could lead to financial savings worth 15 per cent of the total cost of a $1bn project.

Joe Perino, LNS Research

Joe Perino, a research analyst with LNS Research of Cambridge, Massachusetts, presented his company's maturity framework for asset performance digital twins. It has five stages, which he labels descriptive, diagnostic, predictive, prescriptive and prognostic.

The first generation of asset performance systems were used only to plan maintenance based on fixed intervals, known as "computerised maintenance management systems" (CMMS).



A fixed interval maintenance system could be interpreted as a "descriptive" digital twin, in that it is based on the basic description of the asset, not using any condition data.

Mr Perino estimates that most people are still only doing periodic / diagnostic (condition based) maintenance. Maybe a third of companies are starting to adopt "predictive," where they try to predict problems before they occur, but have not yet done corporate wide rollouts.

The leading companies are looking at "prescriptive", where the computer system can suggest how any evolving problem could be solved, perhaps by accessing past records of what was done to solve a problem.

"Prognostic", the most advanced stage, means functionality to evaluate the likely outcome of any 'prescription', including with some kind of learning loop to gather data on critical equipment, and make better predictions. So it potentially replaces the need for "a team of engineers to look at the data and respond," he said.

Asset performance digital twins are not the only sorts of digital twins companies are using today, he said. We are seeing digital twins for utilities, electrical systems, control systems, supply chains, APC (Advanced Process Control) optimisation, energy management and financials, he said.

Getting multiple digital twins working together can be a big technical challenge, but it can lead to a truer representation of how a facility operates.

An asset digital twin can be integrated horizontally, covering the development of a plant from its original concept to engineering / operations / maintenance, and also cover the value chain as the product goes through the plant from feedstock to market.

In the past, most of the different parts have been in siloes and not well integrated, he said.

As an example of where integrated digital twins can add value, consider a situation with a pump connected to a controller and a machinery monitoring system. The pump will slowly degrade, the controller will see that and adjust.

At some point in the feedback loop, the pump will reach its limit, the controller will no longer be able to counteract, so the pump will typically be taken offline. This will lead to wider problems with whatever the pump was doing, and the whole system not operating to maximum effectiveness.

In a standard control situation, the controller would see the variation but not have much understanding why. But if you had a digital twin which incorporated the control system, the process flows, and asset performance, you might be able to understand it.

The ultimate goal of all of these tools is to empower the workforce, giving people the tools to fix any problem using their basic knowledge plus support, he said.

Massimo Perini, Infinium

Massimo Perini, maintenance excellence advisor at Infinium, an Italian manufacturer of lube oil additives, said that the company has a program "Connected Worker", to connect workers to the reliability and maintenance program.

The system enables process technicians to see process data directly while they are in the plant, and contact maintenance staff directly.

The company made big investments in digitalisation over the past few years, so it has "quite a robust digital backbone", enabling complete remote control of the assets, and some maintenance support.

Due to Covid-19, the company has been limiting the number of individuals going to a plant, and so the people doing the processes were not necessarily people who were most familiar with them. It has been very helpful having its standard operating procedures available digitally, so they can be accessible to staff via handheld devices, he said.

Andrew Webster, Accenture

Andrew Webster, who leads Accenture's engineering and capital projects consultancy business globally, said that Covid-19 meant that each project needed to be reassessed, so people can get a better handle on the new risks, including supply chain disruptions.

"We should assess whether some of these changes may be permanent, including collaborating with a distributed workforce," he said.

"Now is the time to revaluate current operating models - with a focus on lean, agile and digital," he said.

Companies are looking at how projects can be designed so they can be more responsive to change, and be more data driven, he said.

Companies are looking for ways to improve project and supply chain visibility, being able to anticipate problems before they occur, and using analytics to support decision making.

One example was a project with oil and gas EPC company Petrofac, which had an objective to use digital tools to improve safety and productivity, with a 'digital twin' of construction operations.

It would provide real time awareness of the location of equipment, people and work being performed, and an understanding of what had happened in the past.

Another project Accenture did was to reduce the risk of crane operations for Chevron, increasing workers' awareness of lift operations happening around them, and operators' awareness of what was happening around the lift.

It means that crane operators can digitally 'see' people they can't see visually. It uses wideband technology which can provide locations to 6 inches accuracy. It can also be used to warn people who are too close to a moving forklift.

Another example is a "project digital twin" which can predict schedule overruns, or predict schedule performance. It can be used to identify projects at risk, and show the specific sensitivities.

Mr Webster's role includes helping clients to digitise and optimise engineering, construction, supply chain, and manufacturing, driving effectiveness and efficiency.

This article is based on discussions at "AVEVA World Digital" held online on June 16-17

Emerson – augmented reality for asset management

Augmented reality can be a useful addition to industrial plant performance management software, helping people find the right equipment and understand what they are looking at, says Emerson

Emerson has added augmented reality to its "Plantweb Optics" system for managing industrial plant performance. It is useful for helping operators find the right piece of equipment, and see operational data superimposed on a video image of it.

This is particularly helpful for operators who are not familiar with the equipment, as is often the case during the COVID-19 period, when companies have reduced numbers of staff working on industrial sites.

The augmented reality services can be connected together to remote assistance, analytics and diagnostics services, providing a comprehensive tool to help companies keep equipment running in the best condition.

The software is entirely cloud based. It will be provided to customers as part of the next version of Plant Web Optics version 1.6.

Finding assets

When there is a problem with a piece of equipment, one of the first challenges can be finding the right piece of equipment in a complex plant, such as a valve which has been flagged as having a problem.

With the Emerson system, a field technician can point the camera of a mobile device at any piece of plant. The software can identify what the person is currently looking at, where they are currently located, and which direction they need to walk in to find the equipment of concern.

The direction to walk in can be shown as arrows superimposed on the camera's image on the device's screen (see cover photo).

Fixing assets

When it comes to doing maintenance or adjustments on faulty equipment, the augmented reality system can display useful "contextual" information about the equipment's operation, drawn directly from the control system.

This can include equipment health status, maintenance data, analytics data, and technical support information.

This means that people do not need to phone the control room staff, or look up on their devices, to access the data.

In an example demonstrated to journalists, the valve was showing that it had a "supply pressure alert". A worker used the system to find the valve with the problem, bring up data which was leading to the alert, see how long that problem had been happening and how current operations compare with normal operations, all supported by augmented reality.

Then the worker can use the system to be connected with someone who knows about the valve, who might be working at home. You can communicate with the remote person by audio or chat. Chat may be better if it is noisy.

The remote expert can advise the safety steps which need to be taken before working on the valve, such as the "lock out tag out" procedure to ensure that any connected equipment is shut off and cannot be restarted during the work.

Notes and videos from the live remote assistance sessions can also be recorded to build a knowledge library for use in future.

Better decision support

The motivation for developing the system came from customers saying that their efforts to improve workforce productivity were reaching a plateau, says Peter Zornio, CTO, Emerson Automation Solutions. Much of the productivity benefits so far had been driven by automation, enabling them to do the same with a smaller workforce.

Customers were saying that the best pathway to improving productivity further would be if they had better decision support systems and automated workflow.

Digital tools are rarely actually making decisions, Mr Zornio said. It is great if the analytics and other technology is advanced enough that it can make automatic decisions, but more of the time it is about enabling humans rather than taking over their work.

Mobility is a "key enabler" to all of this, if information can be given to people where they need it, they don't need to travel. "It is a superhot topic," he said.

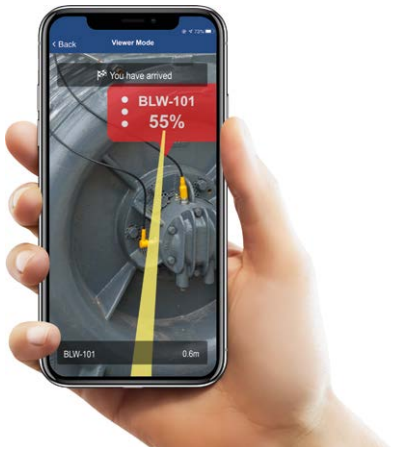
Companies want to be able to make more use of their in-house expertise, with remote experts supporting people who are doing the work on site. The remote support could be provided by semi-retired staff, or staff of a vendor company.

A last issue is "change management" – working out how to get new work processes "instilled" in the workforce. People have been working in the same way for decades in some cases, Mr Zornio said.

As described above, augmented reality can assist with all of this.

One of the biggest "change management" obstacles was the reluctance in some companies to allow mobile devices into a plant environment, often for fear of photographs being taken away. But as they see how useful remote support can be, their attitude to mobile devices is changing.

"[Accepting] the idea of using a device like that in daily work is one of the first big steps," Mr Zornio said.



Plantweb Optics

The core of the system is the Plantweb Optics software for managing the performance of the plant itself.

Plantweb Optics was initially released in 2017, as Emerson's "asset performance platform".

It contains an integrated asset model structure, with all of the various data about a plant, including process data, diagnostics and alerts, output from specialised software, connected and contextualised in an integrated asset model.

This can be used as a basis for doing analytics, making decisions, providing input to maintenance management systems, and making work orders.

The PlantWeb Optics can generate automatic asset "health scores". If it does not think an asset is in top health it can provide recommended actions.

There is a service informally called "WhatsApp for assets", where people can 'subscribe' to assets they are interested in, receive updates and communicate with other people working with them.

By assets, Emerson means instrumentation systems, valves, automation software / control loops and mechanical equipment such as pumps.

A plant includes individual physical assets such as tanks, pipes and manifolds (pipe connectors), which come together to make "complex" or "distributed" assets such as a distillation column.

The core of the project is the data integration – the augmented reality is like the "frosting on the cake", Mr Zornio says. "You need the data foundation before you get the Augmented Reality in and deliver the value."

Akselos – engineering simulation digital twins

Akselos makes "engineering simulation digital twins" – high resolution digital models of assets subject to stresses – which can be used to optimise designs and assess remaining operational life

Akselos, an engineering simulation technology company, has a technology to quickly develop "structural digital twins" to assess strength of structures, optimise designs and calculate remaining operational life.

It commercialises a method developed at Massachusetts Institute of Technology to conduct Finite Element Analysis calculations much faster, by creating a reduced representation of the analysis that "filters out" irrelevant data.

Akselos has offices in Lausanne (Switzerland), London, Houston, Boston and Ho Chi Minh.

Finite Element Analysis (FEA) is a standard technique used in engineering, based around splitting a structure into tiny "finite elements" and analysing them individually, then putting the analysis together to get an understanding of the strength of the overall structure. This is a widely used approach, but it is also well-known that FEA is highly computationally intensive which puts major limitations on the size and/or detail level of analysis that can be performed.

Akselos' product is based around what it calls "Reduced Basis FEA", which uses a reduced order modelling approach to break through the computational limitations of FEA and to enable highly detailed modelling of even the largest assets.

As an example, the company presented a project to assess whether a pressure vessel is safe, based on having new "C-SPAN" ultrasonic inspection data, measuring wall thickness.

Its model of the pressure vessel is highly detailed, with over 25 million "degrees of freedom", and hence cannot be solved with conventional FEA in a practical manner. This model is detailed enough to incorporate all of the C-SPAN inspection data, and due to the acceleration provided by RB-FEA the digital twin with inspection data incorporated can be analysed in a few seconds.

The software runs on the cloud.

When you add in new thickness scan data, you can see where material is thinning due to corrosion. You can do a quick calculation to identify high stress locations. The software can make a report "assessment of metal loss". You can prove you can still operate the pressure vessel safely.

Because models can be assessed so quickly, it is possible to try out many different models, when designing a new asset - such as with different material properties, thickness, geometry and loads.

This means you can reduce the amount of "over conservatism" you need, where you specify material to be thicker than the calculation says, to compensate for elements you are unsure about.

The software can use the model to calculate different failure modes resulting from cracks and corrosion.

Engineers can focus on models, while management can focus on the reports.

It has an "API 579" plugin which can do "fitness for service" assessment and auto-generate a report that summarizes key findings. This standards-based analysis includes both linear elastic and nonlinear (e.g. elastoplasticity), and thermal (e.g. thermal stress) analysis.

The process could be considered making a "structural digital twin" of the asset, incorporating the original design together with any updates, such as recent inspection data.

By observing trends in the structure over time, such as how fast metal is corroding, together with the structural calculations, it is possible to estimate how much longer the asset can be safely used.

Akselos has one project with a FPSO operator, to build a high fidelity model, which will show a representation of the whole FPSO, not separate localised models.

It has also been used on wind turbine designs. On an 8 MW wind turbine, one blade weighs 29 tonnes. Akselos can be used to optimise the structure of the blade, drive train and support column, trying out multiple designs and improving them. You can check any deviations to your plan to see what impact they would have.

Ryan Perdue, senior director of Akselos, and a mechanical engineer with a background in oil and gas, sees digital twins as a "missing link between data and information".

Many asset monitoring systems have very low accuracy, because people struggle to get any meaning or structure out of the data, he said. In contrast, Akselos's RB-FEA is based on first principles of physics and hence provides robust analysis and reporting for critical assets.

The software can absorb all of the asset data through design, commissioning, operations and decommissioning.

Sekal – using models to support real time drilling

Sekal of Stavanger develops computer models of drilling operations, which are run alongside the actual drilling, to give operators better insights into how close they are to operational limits, and sometimes to actively override the driller

Sekal of Stavanger, Norway, develops digital models of offshore drilling, which can run alongside the actual drilling operation, using real time data. They can help inform the drillers how close they are to operational limits, and identify problems occurring. The systems can also override the drilling controls in order to prevent operations going over limits.

There are hydraulic models (modelling behaviour of drilling mud), mechanical models (modelling forces on drill string and drag), thermodynamic models (how heat affects the drilling), working together in real time.

Sekal's modelling software DrillScene has been used on over 350 wells. The company estimates that using the software has saved 77 side tracks, where a secondary well bore is drilled away from the main wellbore, due to a problem with the main wellbore. This estimation is based on the proportion of wells which had side tracks where DrillScene was used, compared to the average.

One operator estimates that each side track costs $7.5m, so that adds up to big savings.

Problems can be detected by comparing the modelled and observed data. For example, standpipe pressure (total pressure loss due to fluid friction).

If the measured standpipe pressure diverges from the standpipe pressure expected from the model, it may indicate pressure loss somewhere else, perhaps due to pipe washout, where the diameter of the hole being drilled has ended up larger than the drill bit diameter.

The model can also identify problems happening or about to happen. For example, the model might tell you, you are about to get a hole cleaning issue (difficulty removing cuttings from the bottom of the hole). On the model, you can experiment with different rotation speeds of the drill bit, or mud flow rate, to see if it would fix the problem.

The software calculates the limits that the wellbore can tolerate, based on the models and the live data.

This is based on a calculation of Equivalent Circulating Density (ECD) and Equivalent Static Density (ESD), an expression of the force the drilling mud makes onto the formation. It needs to be high enough to resist formation fluids flowing into the well.

Getting the wrong mud pressure can also lead to stuck pipe, wellbore collapse. The pressure can also be reduced due to moving pipe or tools in the wellbore (known as 'swab').

The software may also be able to advise a client that, based on the data, there may be a pipe washout (where the wellbore has become enlarged). In that case the client can investigate it further. If washout gets too bad, the wellbore cannot be used, and the well is wasted.

The software can help companies see where they can go closer to operational limits without increasing risk, and so save time. For example, with a better understanding of how long it takes to remove cuttings from the well bore, you may be able to "trip" faster (remove drillpipe from the well).

You may be able to achieve a faster drilling rate of penetration. The "Smart Auto Rate of Penetration (ROP)" tool can assess what ROP is possible, taking cuttings transport into account. "It is quite accurate when we are calculating the bottom of the hole," said Asbjørn Sola, Vice President Sales & Marketing with Sekal.

Also when tripping out of hole (removing the drill string from the hole), the software can help you make sure you don't violate the pore pressure gradient (ensure you have sufficient mud pressure at the bottom of the well at all times to control reservoir fluids).

You can model how fast you can start up the mud pumps, ensuring that you don't make a fracture at the drilling shoe, and making sure pressure pulses are not too high.

The software may show that it is possible to reach the target flow much faster than the drillers previously believed, such as in 210 seconds rather than 270 seconds.

The system could be further extended to be able to identify whether a hole needs backreaming (rotating the drill string while pulling out of hole, to smoothen the wellbore). Some companies do this all the time as a matter of procedure, which takes up a large amount of time. The system could model whether or not there is likely to be a hole cleaning issue.

The models usually need to be manually configured for the well you are going to drill. The real time data to update them comes from the rig equipment, typically in WITSML format.

Example well

Sekal was asked to help a client who had seen a well collapse in the Gulf of Mexico and did not understand why.

The ECD was 12 lb/gallon, and they thought it needed to be above 11.46 lb/ gallon to stop formation fluids entering the well bore.

When they stopped the mud pump, they thought the ECD would drop to 11.6. But they did not take into account a temperature effect, which would take it to 11.54, so quite close to the limit.

They were tripping out of the hole, at 24 feet per minute, causing the ECD to drop to 11.41 lb / gallon, so below the limit.

SO formation fluids started flowing into the wellbore, causing it to collapse.

Sekal's modelling showed the maximum speed they could have tripped at is 10 feet per minute.

After this collapsed well, Sekal gained a new client.

Active intervention

The system can also provide active intervention, so it can stop the driller doing something which the well would not be able to tolerate. This is called "safeguarding".

In this case, it is like an anti-collision system on a car, which can automatically put on the brakes if the driver does not respond to the initial warning and brake. It is designed so that it should not do anything to increase risk.

Sekal's active intervention software, based on the same models, is called "DrillTronics".

It was first installed in 2013, and is now used on 8 drilling rigs, both floating and fixed.

For example, it can calculate the maximum pump rate and pressure, maximum torque, maximum velocity and accelerating of the drillstring to avoid surging and swabbing, calculated based on data from the drilling control system.

It is technically possible to expand the autonomous operation much further, but various reasons why this does not yet happen.

For example, it is possible to stop and start the mud pumps fully autonomously. But a driller might say, "I don't want to start and stop mud pumps in one go, I want to make sure I break the gel, activate the LWD [first]."

Automation has potential to reduce manning levels, but not completely- similarly to airlines, where we see that although planes can fly autonomously, we still have pilots. "I think there would still be a driller sitting in that chair for a long time," he says.

About Sekal

Sekal was acquired in 2019 by Japanese trading company Sumitomo Corporation.

The technology is based on 20 years of development at The Norwegian Research Centre (NORCE - formerly known as Iris), funded by Equinor, Chevron, ENI and BP and Norwegian Research Council. Customers include Equinor, Petronas OMV and BP.

This article is based on an OGTC webinar on June 19, "Tech20 Virtual: Cost and risk reduction realisation through Autonomous Drilling".

Hackers impersonate engineering contractor to drop "Agent Tesla"

Hackers have been impersonating Egyptian oil and gas engineering contractor Enppi to try to drop the spyware "Agent Tesla" on oil and gas companies, according to cybersecurity company Bitdefender of Romania.

Hackers have been impersonating Egyptian oil and gas engineering contractor Enppi to try to drop the spyware "Agent Tesla" on oil and gas companies, according to cybersecurity company Bitdefender of Romania.

Enppi (Engineering for Petroleum and Process Industries) is part of the Egyptian General Petroleum Corporation, and works in gas processing, oil production, refining, offshore facilities, pipelines, subsea and petrochemicals, with offices in Egypt, UAE, Jordan, Saudi Arabia, Oman, Syria, Lebanon, Algeria, Iraq, Kuwait, Yemen, Libya, Sudan, USA (Houston), Venezuela, Italy.

There was a spike in messages which appeared to specifically target the oil and gas sector on March 31st.

The "payload" for the hack was a Trojan (software packaged within something else).

Recipients were invited to submit a bid to supply equipment and materials as part of the "Rosetta Sharing Facilities Project", with the client being Burullus, an Egyptian gas company. The e-mail included a bid submission deadline and a request for a bid bond, in order to make it look legitimate to oil and gas recipients.

The Rosetta Sharing Facilities Project is real and linked to ENPPI and Burullus.

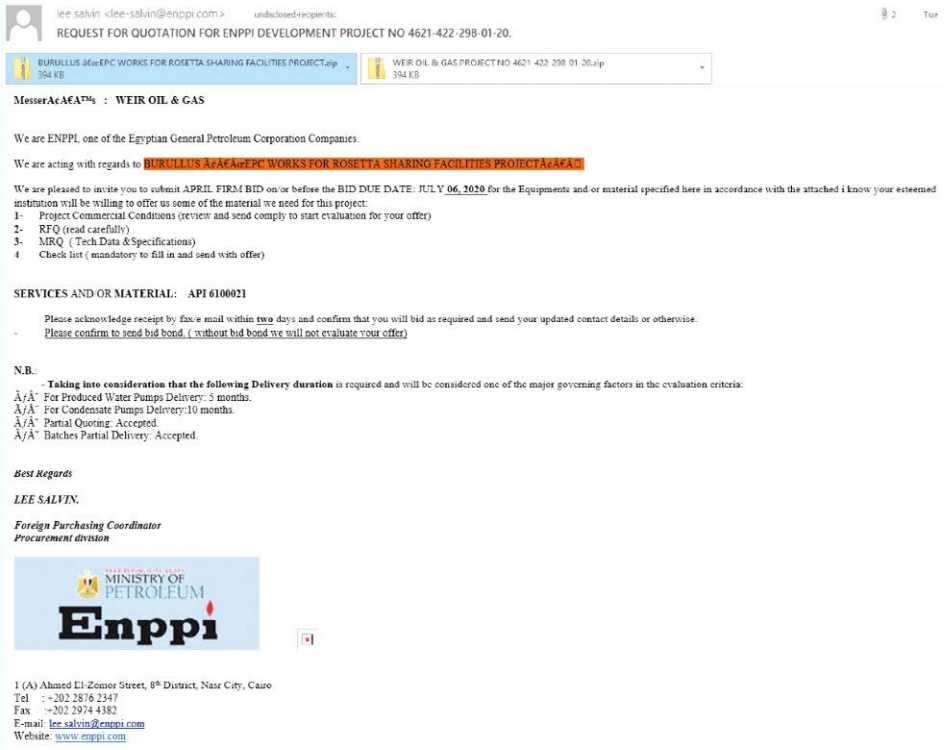
But when people downloaded an attachment to the e-mail, promising a list of materials and equipment being requested by Enppi, instead they got the Agent Tesla installed on their computers.

The software also included a keylogging capability.

The same hackers also impersonated a tanker shipping company, targeting victims in the Philippines.

The messages impersonating the tanker company started on April 12 but seemed to only target a handful of shipping companies in the Philippines over 2 days, Bitdefender says.

Bitdefender reports that the oil and gas industry was targeted with similar campaigns in 2017 and 2019, with similarly constructed e-mails delivering spyware.



lee.salvin <lee-salvin@enppi.com> undisclosed-recipients:

REQUEST FOR QUOTATION FOR ENPPI DEVELOPMENT PROJECT NO 4621-422-298-01-20.

BURULLUS â€œEPC WORKS FOR ROSETTA SHARING FACILITIES PROJECT.zip 394 KB

WEIR OIL & GAS PROJECT NO 4621 422 298 01 20.zip 394 KB

MesserAcA€A™s : WEIR OIL & GAS

We are ENPPI, one of the Egyptian General Petroleum Corporation Companies.

We are acting with regards to BURULLUS â€œEPC WORKS FOR ROSETTA SHARING FACILITIES PROJECT â€œ.

We are pleased to invite you to submit APRIL FIRM BID on/or before the BID DUE DATE: JULY 06, 2020 for the Equipments and/or material specified here in accordance with the attached i know your esteemed institution will be willing to offer us some of the material we need for this project:

1- Project Commercial Conditions (review and send comply to start evaluation for your offer)
2- RFQ (read carefully)
3- MRQ (Tech Data &Specifications)
4 Check list (mandatory to fill in and send with offer)

SERVICES AND/OR MATERIAL: API 6100021

Please acknowledge receipt by fax/e mail within two days and confirm that you will bid as required and send your updated contact details or otherwise.
Please confirm to send bid bond. (without bid bond we will not evaluate your offer)

N.B.:

- **Taking into consideration that the following Delivery duration** is required and will be considered one of the major governing factors in the evaluation criteria:

Â¡Â¯ For Produced Water Pumps Delivery: 5 months.
Â¡Â¯ For Condensate Pumps Delivery:10 months.
Â¡Â¯ Partial Quoting: Accepted.
Â¡Â¯ Batches Partial Delivery: Accepted.

Best Regards

LEE SALVIN.

Foreign Purchasing Coordinator
Procurement division

MINISTRY OF PETROLEUM
Enppi

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Website: www.enppi.com

The e-mail pretending to come from Enppi, containing the Trojan as attachment.

The spyware was programmed to try to collect sensitive information and credentials and send them back to the server smtp[:]//smtp.yandex.com:587.

Bitdefender has found that about a quarter of the reports came from 3 countries - Malaysia, Iran and the US – so they may have been specifically targeted.

It is intrigung that the hacker focussed just on oil and gas.

"The construction of the messages and the jargon used do show the attackers have a clear understanding of their victim's profile and use relevant language and information to seem believable and trick the victim into opening the rigged attachment," Bitdefender says.

The tanker shipping e-mails pretended to be sent by Glory Shipping Marine Co of Shanghai, with maritime specific text, being sent to a ship agent, requesting data for the Estimated Port Disbursement Account (EPDA) for a specific vessel.

The vessel referred to in the e-mail matched a real vessel transit happening the same day, under the same name. This makes the campaign look highly targeted.

"This serves as an example of the lengths to which attackers will go to get their facts straight, make the email seem legitimate, and specifically target a vertical," Bitdefender says.

It also notes a steady rise in cyber-attacks detected in the energy sector from September 2019 to March 2020.

The most attacks are on companies in the US and UK, with Ukraine coming "distant third".

The analysis is made using "unique IP addresses that belong to organizations in the energy industry," Bitdefender says.

The basic Trojan is called "Agent Tesla". It has been around since 2014 but undergone constant improvements and updates. There are reports that its developers provide it as "malware as a service", with different pricing tiers and licensing models. It can extract credentials, copy clipboard data, perform screen captures, grab data from forms, and log keys.

Busting data myths – Eigen

People commonly believe that data systems integrate, data lakes solve all problems, AI can untangle data, data scientists can estimate costs, and AI makes us more efficient, says Murray Callander, CEO of Eigen

By Murray Callander, CEO, Eigen

Many of us have been involved in projects to take data from one system and use it in another. The project seemed simple to start, but then got complicated and all sorts of thorns started to crop up.

This means you need to start doing the work without knowing how much it will cost.

Having one system reading data from another system can be possible, but that's not what people usually need. People need a digital system that carries all the understanding from the first system to the second one.

The project needs to be done systematically, starting with pilots, with an initial goal of gathering knowledge and reducing risk, rather than actually integrating systems together.

Data lakes solve problems

People believe data integration challenges will be solved if they can make data lakes, copying all the data from the various systems into one system, and then using that as source for everything else they want to do. The thinking being that this will make providing data into other systems much simpler and quicker.

But configuring a data lake is very complex, making sure it has the latest data and is a complete match against the source systems.

The data lake needs some kind of schema itself which needs to be designed, although you don't yet know how the data will be used.

It is hard to design a new function on top of the data lake without understanding the data which is fed into it. And it is very difficult to troubleshoot problems – you need to follow the whole data flow from the source to the data lake and to the software user interface.

The existing systems may have valuable features which you lose. For example, a sensor may have been connected to a data historian, designed to only store data when a value changes. But if you copy this data into a Data Lake with Interpolation enabled, it may generate one point every 1 minute. This creates much more data than ever existed in the first place and hides the original behaviour.

AI can untangle data

It is tempting to believe that someone can make an AI tool which can untangle and organize data for you. But this is an exceptionally hard problem for AI to solve.

An industrial asset which has been working for years will have lots of information in different systems, different formats, archives, name conventions, and lots of missing data.

Much of the data will be in spreadsheets, which is very difficult to extract, or pdfs or documents, which is even harder. The relationships between the data might not be written down anywhere. Field names in databases are rarely descriptive.

To train an AI tool to find and fix data problems, you need lots of examples of the data problems you are trying to sort out, so the AI can be trained.

Even if you could find an AI tool which could automatically categorise your data, you couldn't be sure it had done it correctly and had found everything – so it is very hard to use it as a basis for analysis.

There are indeed examples of where companies have built AI to work with unstructured data, such as where Equinor built a system to extract data from incident reports to understand risk. But that was for a specific purpose, with very high value, and certainly wasn't cheap or fast.

We could more precisely say that AI can be used to sort out your data but it's probably the most expensive and costly way of doing it.

Data scientists can estimate costs

Asking data scientists to estimate the cost of a project is like asking a bricklayer to estimate the cost of building a house.

A bricklayer could tell you how many bricks he lays per hour. But that's only useful if there's also an apprentice available to mix the cement and carry the bricks, and you know how many bricks your house will need.

In digital projects you have very little idea of the details of what you are building at the beginning.

Costs can easily get further underestimated as a result of people feeling under pressure to show they can deliver something useful for a low budget, or small companies being under pressure to win work. There are general human tendencies to underestimate costs and time, even from good technical people.

Murray Callander, CEO, Eigen

Bear in mind the cost of putting something into production can be ten times higher than the costs of making a prototype, with additional costs of validating technology, training and transitioning.

AI makes you more efficient

There are in fact AI tools that make you more efficient. One example was the time one of my kids asked me what plant we were looking at when we were out on a walk, and a mobile phone app told me it was a common milkwort.

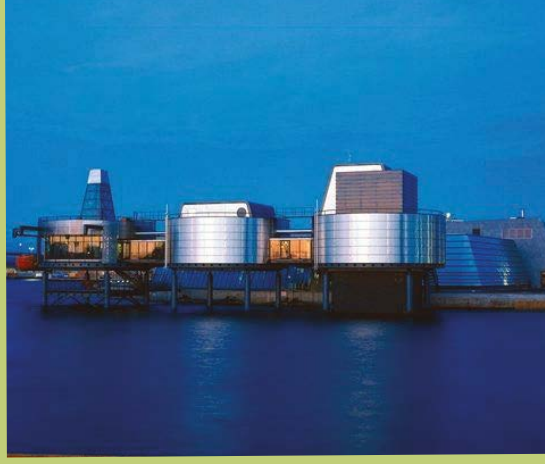
But plant identification is a very well defined problem with masses of existing, well catalogued, information, that can be used to develop and test machine learning models.

Most industrial asset data is not like this. There can be masses of data, but not well catalogued, and not with clearly defined problems, like "identify this leaf". And identifying a leaf is a comparatively simple problem.

One day we may have tools which can automatically analyse different types of industrial data, but we have to do a lot of data "cataloguing" before we can get there.

Finding Petroleum

digital energy journal



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Digital / from Malaysia – Oct 2019
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