digital energy journal
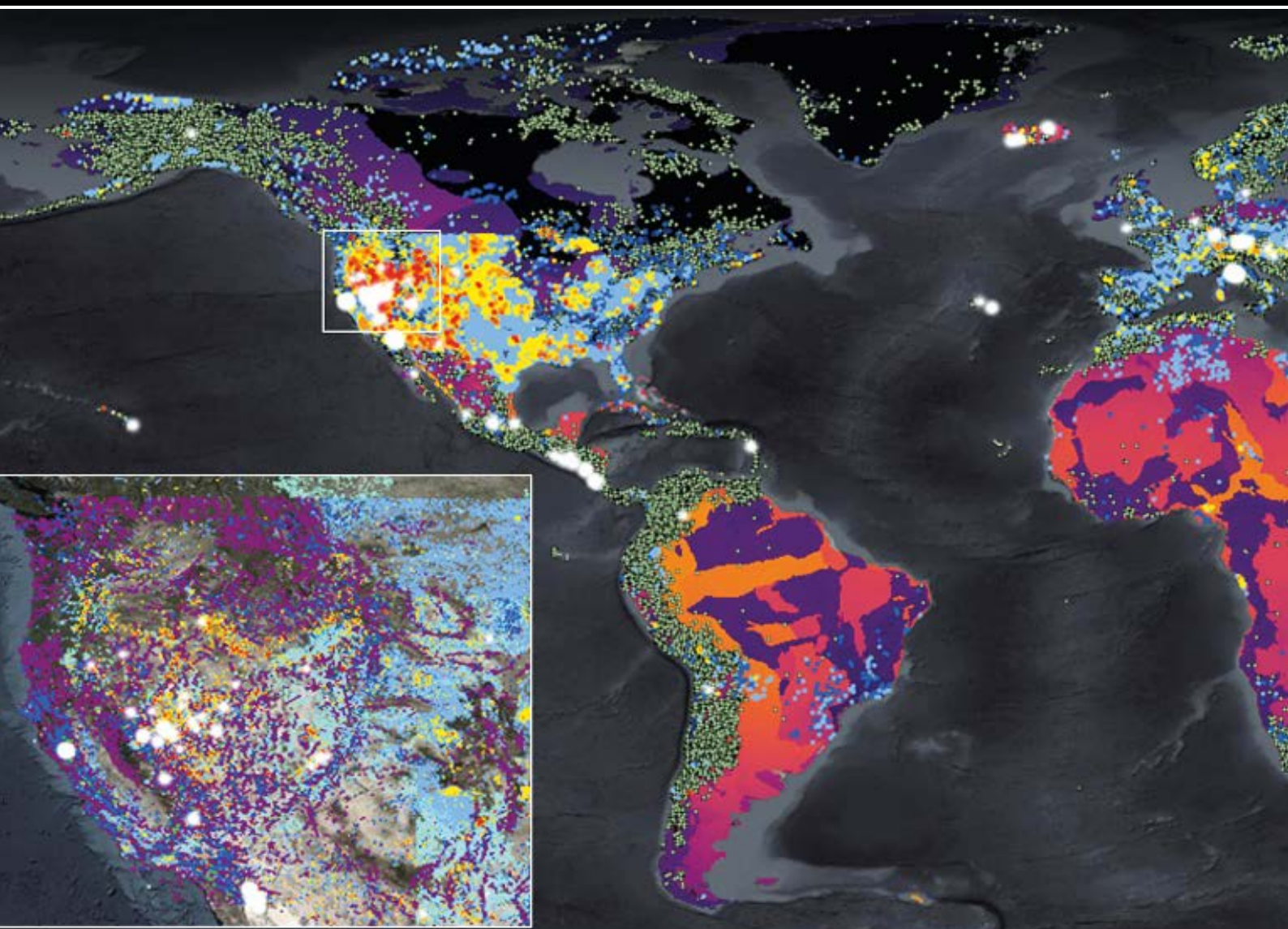
Improving your cyber 'posture'

What does 'intelligent' in 'intelligent field' mean?

New ways to use low code

3D imaging tanks using electric fields

March - April 2022

DECARBONISATION

- Tracking emissions from acquired oilfield services
- Driving lower emissions in tanker shipping
- GRI's new oil and gas reporting standard

Finding Petroleum

Cover image: *Geoscience company CGG released its "GeoVerse" Geothermal Resource Assessment study to support evaluation of geothermal energy potential and help identify new sites and regions. The study draws on CGG's well, seismic and interpretation database and experience in over 130 geothermal projects.*

Opening

UK energy sector top cyber target – IBM

IBM Security's "X Force Threat Intelligence Index", released in February 2022, said that the UK energy industry was the UK's top target for cyberattacks, accounting for 24 per cent of all incidents.

The next biggest sectors were manufacturing and financial services / insurance, which each received 19 per cent of all attacks.

The UK was also in the top three most attacked countries in Europe in 2021, along with Germany and Italy.

The survey looked at attack patterns and security trends over January to December 2021. The sources of data included network and endpoint detection devices, incident response engagements and phishing tracking.

"Cybercriminals worldwide are becoming increasingly resilient, resourceful, and stealthy in their pursuit of critical data," said Laurance Dine, global partner, X-Force Incident Response, IBM.

It "highlights the importance of adopting a Zero Trust approach to security," he said.

"Businesses must start operating under the assumption of [being] compromised, putting the proper controls in place to defend their environment and protect critical data."

Types of threats

Ransomware is still a major problem, the study found. It accounted for more than 1 in 5 cyberattacks worldwide, or 15 per cent in the UK.

The "REvil" ransomware group, a Russian speaking group which was also behind the U.S. Colonial Pipeline ransomware attack, was responsible for 37 per cent of all ransomware attacks observed in 2021, IBM said.

Data theft was the most common attack type in the UK during 2021, making up 31 per cent of incidents.

Phishing was the top infection method used against UK businesses in 2021, leading to 63 per cent of incidents.

The number of network compromises caused by vulnerability exploitation rose 33 per cent in a year. Vulnerability exploitation is where a hacker takes advantage of an unpatched flaw or weakness in an IT system

Vulnerability exploitation was the cause of 44 per cent of ransomware attacks.

In Europe, 46 per cent of cyberattacks were caused by vulnerability exploitation.

Comments

"IBM Security's latest research highlights the constantly evolving nature of the global cyber threat, as adversaries seize on new vulnerabilities created by digital transformation," said Simon Hepburn, CEO of the UK Cyber Security Council. This is a self-regulatory body for the UK cyber security profession, tasked by the UK Government commented,

"With the UK's critical industries under constant threat, it's imperative that the UK rapidly expands its professional cyber security workforce by investing in training and professional development opportunities."

"Providing pathways for people to enter the profession as career changers or graduates, as well as ensuring people from all backgrounds have access to opportunities, will be key to achieving this."

"The IBM Security X-Force Threat Intelligence Index highlights the developing cyber threats we face globally, with Ransomware continuing to grow as the go-to attack method for cyber-criminals," said Julian David, Chief Executive Officer, techUK, a digital technology trade association.

"Clear growth in attacks across all sectors, notably manufacturing and energy, and the fact the UK is now one of the most targeted countries in Europe, the second-most targeted region globally, should harden all organisations' resolve to strengthen their cyber resilience".

The threats indicate the need for industry and regulators to strengthen their threat information sharing, increase standardising and combine know-how, said one data security organisation.

Your cyber risk posture and operational effectiveness

Two approaches for understanding and assessing your cybersecurity capability are to try to evaluate your 'risk posture', including understanding your vulnerabilities, and to improve your 'operational effectiveness'

To understand your company's current position with cybersecurity, two methods are to try to evaluate your 'risk posture' and to improve your 'operational effectiveness', says Luke Kenny, Cyber Advisory Lead with Trustwave, a cybersecurity company headquartered in Chicago.

"Risk posture" could be defined as how a hacker may see you overall, or your overall position. This could be evaluated in terms of the number of gaps you have in your security defences, and your organisational culture for avoiding vulnerabilities, and if you have particularly good defences around your most important data.

The "operational effectiveness" could be defined as how well your company is prepared for a hack, for example if you have rehearsed drills, and have your data in an easily accessible back-up.

Your risk posture

Over the past few years, many companies have sought to "harden their posture", Mr Kenny says.

Most hackers start by finding and exploiting your vulnerabilities, and then can go on to make attacks, such as with ransomware. So, it is important that you know where any vulnerabilities are.

You can determine your "risk posture" using vulnerability assessments, where an external company, who knows about common vulnerabilities, tries to find out if your company can be hacked, he says.

This analysis can look at which of your data are 'crown jewels', where the cost of any hack would be higher, and you need higher levels of protection. For example, you might put in controls to limit the access which your own employees have to it.

Trustwave offers this as a service, with methods ranging from automated vulnerability scans to "some proper hacking".

It can also include physical assessments, seeing if an unknown visitor gets stopped by people on the front gate or reception of the building, and if they are able to get access to any office computers. Essentially the service is to "do your worst as safely as possible," he says

Some companies are using software tools which send fake phishing e-mails to staff to see if they click on it – and if they click on it,

Luke Kenny, Cyber Advisory Lead with Trustwave

it gets monitored and they can be given a lesson.

"It is just another way of testing how people react to certain situations," he says. "60 per cent of data breaches are due to human beings - whether its malicious or not."

If you are considering acquiring a company, you may want to evaluate their risk posture too, he says. There was one story about a hotel chain which acquired another hotel chain and then found out too late there had been 'significant breaches' in the acquired company's systems, he said.

Part of the work of building up a 'risk posture' is understanding the threats you are facing in more detail. "A threat centric approach is really important," he says.

Sometimes cybersecurity consultants just run standard cybersecurity programs at a company, without understanding the specific threats facing that industry sector, or the types of attacks that might be typical.

Once you understand your gaps, following some kind of assessment, you get a "baseline" as a company, and can make a plan for where you want to improve," he says.

Phishing

In most companies, the most likely threat is still ransomware delivered through phishing campaigns, he says.

The best way to be prepared for ransomware attacks are well known: Data backups, making sure your defences are as good as they can be, checking firewall rules, and keeping systems patched.

One good tool to prevent against phishing is two-factor authentication. It means that if someone gets hold of your username and password, they still can't gain access. But it can't prevent an employee from wilfully giving someone access, whether they have been fooled or are malicious.

Operational effectiveness

To test out your operational effectiveness, Trustwave runs incident response workshops, and crisis simulation sessions.

These gather key executives and help them figure out what everybody would do if an incident happened, so the company is ready to recover its systems. Then they can rehearse it. This should mean that people do it much more easily in a real situation.

It means that "when you get attacked, you kick in to procedures you've tested. You are back up and running as soon as practically possible.

"You're never going to be watertight in terms of security. The best you can do is be prepared."

Methodologies

95 per cent of assessments which Mr Kenny does are based around the "NIST" framework, originally published by the US National Institute of Standards and Technology in 2014. There are sections for "identify", "protect", "detect", "respond," and "recover".

"It is industry recognised; companies can baseline themselves," he says. "You can cover IT as well as OT."

There is a similar framework in the UK produced by the UK's National Cyber Security Centre.

Some companies want to work towards cybersecurity certification such as against ISO 27011.

But there's an important message, that compliance doesn't necessarily mean you are secure, Mr Kenny says. For example, if your vendors and suppliers are not secure, and have access to your systems, that provides a pathway for a hacker.

"While it is useful to comply with something like that, it doesn't ultimately give you a good representation of where you are from a posture point of view."

OT

Often on oil and gas facilities there is no network segregation between IT and OT [operations technology] systems, which means "lateral movement of a hacker is very easy," he says.

"The OT legacy systems frequently don't have security embedded into design because they are old things," he says. "That's always a challenging area for clients to get visibility on."

Saeed Al-Mubarak – what 'intelligence' means

Saeed Al-Mubarak, chairman of the SPE Digital Energy Technical Section, shared his thoughts on what 'intelligence' means with respect to digital technology, where AI adds most value, his new 3D parts company and book, and advice for young graduates that skills can be more important than degrees

Saeed Al-Mubarak, chairman of the Society of Petroleum Engineers Digital Energy Technical Section (DETS), believes that digital 'intelligence' should be defined more as something which supports a person to make intelligent decisions, rather than 'intelligence' embedded in the technology itself.

He also shared his views on where AI adds the most value, and how skills may be more important than degrees to young graduates.

Mr Al-Mubarak was formerly the leader of Saudi Aramco's "Intelligent Fields" strategic team, among other roles.

He was interviewed on the "Progress, Potential and Possibilities" video blog by Ira S Pastar, CEO of Philadelphia company Bioquark, a company focussed on "curing a range of chronic degenerative diseases."

Mr Al-Mubarak's definition of the term 'intelligence', such as when we talk about 'intelligent fields', is a system which can be linked to the intelligence of a human being, he said.

Intelligent Fields "are instrumented with gadgets, equipment and control capabilities, surface and subsurface. They are integrated with solutions. It could be visualisation solutions, data driven solutions or physical solutions. With people who are managing these things to achieve certain targets."

"It means that managers and engineers can do intelligent actions using it. The reality is, if you don't associate a human being with any 'intelligent' device, then it lacks intelligence."

"All of that [technology] has to be built on the capabilities of the human, the intelligence of the human."

"If people ask, 'were the previous fields intelligent?' I would say, yes, they were operated with the available instruments of the day, by intelligent people. They built rigs, they built fields, using the available tools in a very intelligent way."

Mr Al-Mubarak does not define digital technologies in the sense that they are not analogue. "It is using the new technologies to improve our way of making decisions," he said.

"Now you can monitor a field, you can monitor your human resources, communicate with them over a headset, see them, give them advice, control devices remotely. All of this existed 15 years ago, but now it's more advanced."

Mr Al-Mubarak sees the main benefit of artificial intelligence (AI) as when it can help people make better use of the available knowledge.

"If you have more access to knowledge, you can understand what is going on, you will be eliminating uncertainties. If there is a decision you need to take, you would take the most appropriate decision."

In oil and gas projects, "no-one has a full set of knowledge. What we're trying to do, using basically physical based models or data driven models, is to get the maximum knowledge about a system".

3D printed parts

Mr Al-Mubarak's current project is a 3D printing company making spare parts called Monuments (see www.monuments.io), which he founded.

The idea behind the name is that 3D printed parts could be as permanent as monuments, able to cope with what they need to do in an industrial environment, he said.

Mr Al-Mubarak does not imagine that 3D printing will replace the current spare part supply systems in the short and medium term, but it can run alongside them and support them.

"I would advise everyone to buy a 3D printer and just explore," he says. "They are not too expensive, buy a tiny one. Even for kids, they can download files, they don't have to know 3D design, they will learn. This is what I recommend to any parent."

Skills not degrees

Mr Al Mubarak suggests to his own children, and to others, when they ask his advice, that they should definitely get a university degree to help develop their thinking processes. "Engineering is just a thinking process," he said.

"It is good to find things which really interest you, and to have freedom to choose."

But it is important to use this thinking ability to develop skills, not just to have knowledge. "Whatever you study, even if you are not studying, develop skills," he said.

The first oil and gas engineering textbooks were written by people who had worked out how to do things in the field, although weren't necessarily graduates. But they did develop the skills, he said.

The seeds for Mr Al-Mubarak's interest in digital technology was the skills he developed

Saeed Al-Mubarak, chairman of the SPE Digital Energy Technical Section

from trying to fix things in his house. "At home I'm the electrician, plumber, I install satellite dishes, fix PCs. What I've learned is mostly from my father and eldest brother."

"They gave me skills, going into this tiny little stuff. That's what gives me the edge in technology. I would recommend to anyone, go and fix these things."

When you work in an oil and gas company, including as a specialist in subsurface, reservoir management and simulation, or drilling, "don't expect that you will be solving equations and doing integration," he said. "All you need to work is a set of skills."

"You will see the discussion on AI and digital. I assure you that the 'handy' [hand working] skills are more needed. Certain skills are needed everywhere. Skills, not degrees."

Communication skills and other so-called 'softer skills' are also very important, he said.

Book

Mr Al-Mubarak recently published a book on Amazon entitled "Any Version of History is just a Story", which makes the argument that we should listen to opposing points of view and understand that they are just differing versions of what is going on.

"Why don't we just accept that history has multiple versions, any version of history is just a story. Just enjoy it, learn from it, and shake hands with others who have different opinions, disagreements are healthy as well. That is basically it. It calls for tolerance."

"I like different opinions - it is a healthy thing especially in meetings. I would rather attend a meeting with people with different opinions. But not fighting against each other. Then societies and companies would really grow.

Why Bunduq changed data storage architecture

Bunduq, an oil and gas operator in the UAE, changed its data storage architecture from QNAP and Netgear to OneXafe. This is why they did it

Bunduq Company Limited, an oil and gas operator based in UAE had previously been using storage architecture from QNAP and Netgear to facilitate their data backup processes.

It changed to the "OneXafe" data storage system from Arcserve, a company based in Minnesota, USA. Bunduq was finding its previous system had limited scaleability, complex maintenance, and not cost effective overall.

With the new system Bunduq was able to "improve scalability, and simplify its backup and replication process."

The system adopted was the OneXafe 4412 storage system. Each unit can store 12 x 12TB disks (1 terabyte = 1000 GB), taking up 2 rack units each. The company purchased 2 units and has 80 TB of data stored.

OneXafe's architecture is defined as "scale out", which means it is possible to add more components in parallel to spread out a load.

Bunduq operates the El Bunduq offshore oil field, which is 200km Northwest of Abu Dhabi, and 100 km East of Doha. It sits on the boundary between the UAE and Qatar, and is developed in a co-operation between both states.

Bunduq Company Limited has been in charge of operating the El Bunduq oil field for over 40 years. It was set up in 1970 with the purpose of developing the El Bunduq oil field into an asset for both governments. The field started production in 1975.

Bunduq's IT Supervisor, Muayad Fahmawi

Bunduq's oil production platform (photo source Bunduq website)

Today, the company employs a staff of over 300 people, as well as several rotating contractors. It has three offices in the UAE.

Technical details

A few years ago, Bunduq decided that it wanted to have a software defined data infrastructure (otherwise known as 'hyper-converged') which it thought would provide better stability and performance.

For its data storage and backups, it was using storage systems from QNAP and Netgear.

A weakness of this arrangement, according to Bunduq, is that there was a limit to how much data storage could be added, without adding more storage controllers or implement system upgrades. This meant that as the needs for data storage grew, the system would get more complex to manage, including tasks allocating storage systems to jobs, and moving data around.

"We needed a solution that would not only be compatible with our hyper-converged setup, but one that would also be able to manage the sheer volume of data we were generating and needed to back up," says, Bunduq's IT Supervisor, Muayad Fahmawi. "Our data growth is exponential."

"We had to have multiple backups in place to cover our disaster recovery site. But this was becoming complex and inefficient, we wanted to consolidate everything in one place."

The "OneXafe" platform was recommended to them by their UAE based IT service provider Unicorp Technologies LLc.

It offers what the company calls "scale-out architecture," which means that you can add more components in parallel to spread out a load.

Software tools

This solution provides good ransomware protection, by taking "immutable snapshots" of data every 90 seconds. "Immutable" means that the data cannot be subsequently changed, whatever capability any hacker manages to achieve on the system.

The snapshots are consolidated hourly, weekly or monthly, so the overall data storage volume is manageable. Customers set a retention policy of how long the data should be kept, such as one day, one week, or one month.

Mr Fahmawi also noted that the "management console. 'OneSystem', made it much easier to manage."

It is possible to expand storage as much as you want, either adding one more drive, or multiple 'nodes' in a cluster, without any configuration changes.

The amount of storage needed is minimised using "inline deduplication" and data compression.

Altogether it has 80TB of stored data on OneXafe, although the size without compression would be much larger. Last year the company received 562TB of data, but the compression reduced it to 73TB.

"It is an incredibly user-friendly solution, it's just plug and play. The implementation was quick, it fit in seamlessly and we didn't need any training. It requires limited monitoring, limited maintenance.

"It has been so effective that within a year we were adding a second box to the cluster to increase our backup coverage," says Mr Fahmawi.

The expertise to organise subsurface data

Companies can easily get their subsurface and wells data very disorganised. Initiatives like OSDU can help, but only when you have people with the right technical expertise, either as employees or consultants

By Tina Roberts, Data Services Lead at E&P Consulting

During a subsurface and wells project, vast and expanding quantities of data will be acquired over time in disparate formats, and then distributed, loaded, and duplicated repeatedly among different databases.

Information may be incomplete, inaccurate, or uncertain.

Access to critical and accurate project data will often be too slow for real time decision making.

One problem is that the temptation is to keep populating new datastores without considering its state of accuracy. Technology is advancing at speed, with a relentless appetite for data.

Whilst data clean-up initiatives may be undertaken once a project is completed, the results often require ongoing maintenance, which can become neglected.

As a result, the same process begins with the same data silo or database, and often the same low-quality data.

In addition, a system of record or master datastore with subsurface and wells is often not clearly defined from the outset. This leads to duplication issues and sometimes even loss of original data.

A reluctance to save just the final copy is also quite common, increasing the risk for errors when referencing outdated versions.

The protracted absence of a centralised integrated, subsurface system of record over many years is highly problematic, and by settling on a system largely without relational integrity, the data management process is considerably more difficult.

With an increasing focus on data science and the use of scientific methods, processes, and algorithms to extract knowledge and insights from data, the need for accurate data is paramount.

One of the first tasks performed when doing data analytics is to clean the dataset you're working with. The insights you draw from your data are only as good as the data itself, so it's no surprise that analytics professionals spend an estimated 80 per cent of their time preparing data for use in analysis.

These data irregularity issues are not new or unique to a single company; they are universal.

OSDU

The OSDU Data Platform is a possible solution to the challenge of storing, organizing, migrating, and accessing subsurface data.

It was created with a a cross-industry collaboration, The Open Group OSDU Forum.

This Open-Source software is enabling unlimited flexibility in the use of data between applications and domains.

OSDU is a potentially complete solution for efficiently storing, managing, and publishing raw and edited data in one integrated system. You can ensure that data input is complete, accurate reliable and accessible, which is more important than ever.

Time and skills

Despite the OSDU Data Platform addressing several of the most common data management issues for the sector, the time and skills needed to take advantage of this may be limited, or even missing completely in some companies.

Since the 2014 oil price decline, many companies have been forced to review and cut operations costs including adapting projects, changing existing business models, and revising staffing levels.

Over time, data management staff levels have been reduced and teams are now significantly leaner, often only having time to do functional work.

Many companies are now proactively outsourcing digital domain expertise to acquire new skills and digital knowledge, as well as bolster their existing teams.

Highly skilled digital consultants are being appointed to work with internal staff, passing on use of the tools, as well as expert technical knowledge and providing clear and well-defined processes and documentation.

Having effective communicators who can articulate clearly across all technical levels within the organisation is essential and can expedite any quality improvement to clean and transform data.

Tina Roberts, Data Services Lead at E&P Consulting. Photo © Nick Ray

The deployment of experienced, skilled subsurface petroleum data managers and geotechnologists in this area is enabling companies to achieve high quality data and more accurate decision making.

To ensure data gives you the right results and real returns, and to embrace platforms such as OSDU, it requires the right people with the right expertise.

Tina is responsible for leading the Data Services team within E&P Consulting's Oil and Gas business, and for developing and promoting E&P services to clients in these areas. A geologist with 25 years' experience as an explorer and technical subsurface data specialist for Oil and Gas Companies, Tina has a rare insight into the demands of the business in addition to the opportunities new technologies can bring. E&P Consulting has offices in London, Houston, Aberdeen and India. **www.eandpconsulting.com**

Counting emissions from what we buy

O&G companies are getting used to counting direct emissions from their operations, such as from fuel use, flaring and fugitives. But they are also indirectly responsible for a lot of emissions made making the goods and services they consume. How should this data be managed?

The oil and gas industry works with many different suppliers, including manufacturers of equipment and parts, facilities construction companies, drillers, maritime companies and road transport providers, who emit carbon in the process of providing their services.

If an oil and gas company is going to count the total carbon emitted in the supply of fuels, they should also count these emissions. But how should the process be managed? We explored the topic in a Finding Petroleum webinar on Feb 11, "procurement emissions", with speakers from OFS Portal, Schlumberger, Microsoft and Future Energy Partners.

The challenge for a manufacturer or service provider of counting their emissions can be complex enough. But that is not what we are discussing here. For an oil and gas company, the challenge is working out where in the procurement process the request or demand for data should be made, and then how to manage the data.

An oil and gas operator may also want to use the data for selecting a provider based on their emissions.

And the data flows need to be managed to ensure that data is only counted once. Any reduction in emissions will be exaggerated if double counted, which means it may look that emissions are being reduced more than is actually the case – and actual decarbonisation is not being achieved.

Scope 3 categories

In the 'Scopes' of the widely used Greenhouse Gas Protocol, the reporting of emissions from 'Purchased goods and services' comes under Scope 3, Category 1. Emissions made when making 'Capital goods' [goods

Chris Welsh, chair of PIDX International and chair of the ETDX Working Group

used to produce other goods] come under Scope 3, Category 2.

Transport of the goods to the wellsite is counted under Scope 3, Category 4, 'Upstream transport and distribution'.

When an intermediate service provider, such as a driller, makes emissions when using the products the operator has bought, such as drillbits, it counts as Scope 3, Category 11, 'use of sold products.'

There is no legal requirement to report all your emissions in the various scopes so far, but it may come very soon. Companies are already being asked to report material emissions under reporting schemes such as the Global Reporting Initiative.

PIDX ETDX standard

PIDX, an organisation which develops e-commerce standards for oil and gas procurement, is developing a standard for exchange of emissions data between buyers and suppliers, called Emissions Transparency Data eXchange (ETDX).

Before the development of ETDX, PIDX was developing data standards for the purchases themselves, including for electronic catalogues and electronic invoices. It started work on ETDX in 2019.

The ETDX working group is chaired by Chris Welsh, who is also chair of PIDX International. The vice chair of the ETDX group is David Shackleton, who is involved in Carbon & Operational Data Management, Analytics and Optimization with Schlumberger.

Kadri Umay, Microsoft Principal Program Manager Data Platform, Azure Energy is a member, and leading work to integrate ETDX with the Open Footprint standard for emissions data. Mr Welsh, Mr Shackleton and Mr Umay were all speakers at the webinar.

Chris Welsh is also CEO of OFS Portal, an organisation owned by Baker Hughes, Halliburton, Weatherford, and Schlumberger which handles data for supply chain transactions in oil field services.

ETDX is initially restricting itself to just Scope 3, Category 1, 'purchased goods and services'.

It is about to start a pilot project involving an operator and supplier, to make sure the standard works with different materials, and to check that the data attributes work. "It's a complex operation," Mr Welsh said.

David Shackleton, carbon and operational data management, analytics and optimisation, Schlumberger, and vice chair, ETDX Working Group

More members to the working group are welcomed. "We want feedback, come to our group and help us," Mr Welsh said. "That's the benefit of PIDX, we agree the process across industry, we develop technologies and standards to help implement that process."

Data dictionary

ETDX uses PIDX's oil and gas industry "data dictionary" as a basis to define the goods and services which the emissions data is associated with. This dictionary includes over 3,000 different attributes.

For example, the "liner hanger" entry has data attributes for type, liner size, casing size, casing weight, material, connections. These attributes are in the data dictionary.

New dictionary attributes are being created for greenhouse gas emissions data.

The most important attribute is the emissions from manufacturing cradle-to-gate, and the unit of measure for that.

Then there is an attribute for the uncertainty level in emissions, or how trustworthy it is considered to be, for example "75 per cent accurate."

There is an attribute for emissions calculation methodology, describing who did the calculation, to what standard, and how it was verified. For example, "original equipment manufacturer's lifecycle audit, to ISO 14064-3 standards."

All of these emissions data attributes can form a data 'segment' of emissions data, which can be added into the supply chain documents.

Some goods may have emissions associated with their installation or operation, for example emissions made in installing a downhole pump.

Decarbonisation

Data exchanging, not creating

An important point to note is that the challenge being discussed here is transferring or 'exchanging' the right data between suppliers and buyers. The calculation of the emissions data is a separate challenge, which can be handled using other standard methodologies, and is not within the scope of ETDX.

For example the Greenhouse Gas Protocol has sample calculations in 15 different categories, Mr Welsh said. ISO standards define how to count emissions "cradle to gate", meaning to count the emissions from the beginning of manufacture of the product to when it leaves the factory gate.

The validation of the calculations is also a separate challenge – this would normally be done by an audit organisation, which would declare that the calculation has been done according to a certain methodology.

From an oil and gas company perspective, what is most important is that it knows how the calculation was done, and how it was certified, said Microsoft's Mr Umay.

"Ideally, if you're getting a scope 3 emission value from your supplier, then [there should be] a way of mapping it to the way that the supplier calculates the emission."

Oil and gas companies need to recognise that it will probably be impractical to count all of the emissions involved in providing a good or service. So a project needs to work out which emissions are most material and focus on those, according to its resources.

PIDX envisages that emissions data would be requested from suppliers at a certain level of granularity.

"We're trying to be sure we don't 'boil the ocean' and stick to the art of the possible," Mr Welsh said.

Communications with suppliers

The request for emissions data needs to fit into the standard communications chains between buyer and seller during the transaction.

The data exchange is increasingly done using digital methods according to a pre-agreed structure, known as an "orchestration". For example, the operator sends an order to a supplier, the supplier sends a sales or services order, and then provides the goods, ships and installs them, and then sends an invoice.

The provision of 'cradle to gate' emissions data for the goods should be provided at some stage, as part of these data flows.

A lot of equipment that the oil and gas industry uses is 'serialised' (with its own individual number) and stored in inventory for future use for example in maintenance, he said. So the emissions data connects to a specific item.

Data already stored includes technical attributes, quality records, manufacturing records, and source of the materials, such whether it is made from US manufactured steel.

Emissions data needs to be added to this, and fit with the supply chain working practises.

"From a suppliers' perspective it's a bit daunting," Mr Welsh said. Large suppliers may have the resources to do all the calculations, but perhaps not smaller ones.

A question for oil and gas companies is at what point the emissions data should be transferred. Suppliers could be asked to add it to their invoice. The document which says how much money the customer should pay also states the emissions made in creating the goods.

Technically this may mean a small amount of additional information. But there are questions about how suppliers calculate the data, and what happens if they don't. If operators regard a suppliers' non delivery of emission data as justification for not paying the invoice, suppliers are unlikely to tolerate it. At this stage, they have delivered the product, and may have installed it in a well.

So the invoice isn't necessarily the right place to require emissions data to be presented, he said. "It can be a separate document which goes along with it."

For example, it is common for suppliers to fill in a 'service entry sheet', commonly known as a 'field ticket', when services are provided to an onshore well site. The emissions data could be provided at that point, 'here's your emissions related to that delivery.'

From an oil and gas operator's perspective, it means that each line item on every invoice they send may end up with emissions data associated with it.

Some operators receive 10,000 invoices a week, each with 10 lines on them. So, they get 100,000 emissions data elements they need to record somewhere. "Are the operators even ready to take that level of granularity?" he asked.

But some organisations have stated aspirations to be carbon neutral by 2030, which is not very far away. They will need this level of detail to work out if they really are carbon neutral. "Within 1-2 years, we [need to be] ready in our vision."

PIDX aims to take a balanced position in the relationship between operators and suppliers. It keeps its management board 50:50 operators and suppliers.

The challenges are, "we can't run too quickly and outpace supplier capability; we can't run too slowly, so someone goes off and does something different," Mr Welsh said. "We

Kadri Umay, Microsoft Principal Program Manager Data Platform, Azure Energy

need to work on what would be practical."

"If we don't do something we'll be told what to do, and that might be way more costly than doing it ourselves. We're trying to self-regulate ourselves before regulation comes. It could be billions of dollars more expensive."

Schlumberger perspective

David Shackleton, who is involved in Carbon & Operational Data Management, Analytics & Optimization with Schlumberger, noted that most of the oil service companies have already done a lot of work to calculate their Scope 1 and 2 emissions, but Scope 3 is very challenging, because it relates to emissions created outside the company's direct control.

Schlumberger has publicly announced targets to reduce scope 1 and 2 emissions by 50 per cent by 2030, and to reduce scope 3 by 30 per cent by 2030, he said. It wants to achieve net zero by 2050, with minimal reliance on offsets.

Schlumberger has signed up to a project called "Science Based Targets Initiative," which over 1,000 companies have also joined, agreeing to set science-based targets. This implies that if they meet their target, the company will play its due contribution to keeping global temperature rise under 1.5 degrees C.

But a big area of its emissions are those caused by use of its products and services, such as a company drilling using Schlumberger services, which comes under its scope 3. Over 75 per cent of its emissions are created by the users of its products, it calculates.

To help here, it identified 100 different solutions which could be used by its clients to reduce their carbon footprint. Then it looked very carefully at the top 10.

The main areas include helping clients reduce fugitive (unintentional) methane emissions,

and reduce flaring and venting of methane. It also looked at way to improve the efficiency of drilling.

There are a number of products 'underneath' being developed, such as ways to increase electrification of energy use in the field.

Schlumberger plans to develop many more services to help reduce emissions, which it calls "transition technologies".

Microsoft perspective

Kadri Umay, Microsoft Principal Program Manager Data Platform, Azure Energy, discussed the digital models side of emissions data. Microsoft offers tools to manage this data on its Azure cloud.

Many companies have been reporting emissions annually. While this may be fine for some time, "we foresee there might be increasing pressure from stakeholders to do this more frequently and provide more transparency into the reported data, and provide more detailed reporting," he said.

This pressure "is going to keep on increasing as we move to energy transition or net zero targets."

This will mean working with data will get more complex and need more automation.

Much of the work of doing annual reports is done in Excel, with company staff copying data into a spreadsheet. Often, companies develop their systems for counting emissions from scratch. "As we move to a more frequent and more transparent reporting structure this is going to be slow and unacceptable," he said.

Data needs to be shared "with different data formats and shapes," he said. "That's a problem for all of us."

One relevant standards body is The Open Footprint Forum, part of the Open Group, which is developing standard data structures for common types of emission data. It is developing standard APIs for integrating the data structures with software developed outside the standard. It is also developing calculation methodologies.

Its data structures could be incorporated in the ETDX standard. PIDX is working together with Open Footprint to make sure effort is not duplicated, and Microsoft is working with both PIDX and Open Footprint, Mr Umay said.

Data can be stored in a 'data lake' system, using data formats developed by Open Footprint. This data can be shared through a software API and common schema, so other people can see exactly how the calculation has been done.

The actual calculations are not done within Open Footprint, but there are many third-party online services which can be used to calculate the emissions, he said.

Software can be developed which can export the data from Open Footprint in whatever format regulatory agencies are asking for. So once data has been put in the data lake, the reporting in multiple different formats can be automated. Customers do not need to recalculate it over and over again.

In the same way, software can also enable supplier companies to share their calculations of the emissions footprint of their services and products with their customers.

"We're building this capability of extensions into the platforms we're building, so where new regulations come in we automatically embed it in the platform," he said.

"Small companies, which don't have the IT horsepower to build [themselves], can plug into those services."

Azure's own case study

A case study of how a supplier can provide granular emissions data in standard formats is available from Microsoft itself, in the emissions data it provides associated with its Azure cloud computing service, Mr Umay said.

Azure customers can login and see all the 'tenants' they have on Azure and the emissions involved in servicing the cloud computing to run all of them, he said.

Microsoft provides a "sustainability calculator" as an application on its Power BI (Business Intelligence) software, for working with the data.

Data is available in standard formats or in software systems with API access.

So, there is a high level of transparency in this supply chain data. "That solves the problem of flowing data through different systems and different reporting standards," he said.

Drill bits use case

The ETDX working group developed a 'sample use case' for an operator on the Norwegian Continental Shelf drilling a well which needs 3 different drill bits.

The drill bit supplier receives the order, manufactures the bits, and needs to record the total 'cradle to gate' emissions for the drill bits.

The main focus of the pilot project was counting embedded emissions in products, such as drill bits," Mr Shackleton said. "Many equipment manufacturers have these numbers available and have looked at it in a lot of detail."

Border tax on suppliers

Another reason that suppliers may want to get better at counting emissions is that the European Union is planning a carbon border tax from 2026, Mr Shackleton said.

It means that companies importing into Europe will need to show that they have paid carbon taxes on emissions embedded in their products, or otherwise pay a levy at the border. The purpose is to level the playing field between suppliers inside and outside the EU, avoiding a situation where outside suppliers don't pay any carbon taxes, while inside suppliers do.

"There's lots of reasons why companies are paying close attention to scope 3 emissions," Mr Shackleton said.

How to start

Where should suppliers begin? "The key is [just] starting to report, or continuing to report," Mr Shackleton said. "Start by estimating values. You need to be working towards measuring and calculating emissions more accurately."

"The transparency is the key thing. Making note of methods that you've used, sources of data that you've used, the numbers that you're putting down. In terms of methodologies, I'd start with the ISO standard 14064."

ISO 14064 has separate parts for how to do the audits, how data should be verified, and how to determine the competency of the organisation which validates the numbers.

Machine learning

Speakers were asked about where machine learning might help with emissions data.

Microsoft's Mr Umay replied that machine learning might be used for "simple use cases" like predicting carbon emission profiles, or predicting emissions before they happen.

"The low hanging fruit is predicting anomalies in emissions and finding the root cause for those."

Machine learning could also be used to analyse satellite imagery to identify sources of methane leaks. "It's a very complicated process, you need to look at weather conditions, wind flows to identify where the emission might have come from."

In future it may be possible to find correlations between industry activities and where the highest emissions occur, and so identify what change to operations would make a big impact. "There's a whole lot of optimisation scenarios that come into it," he said.

"You need to optimise either the supply chains, or you need to optimise the processes itself.

Driving decarbonisation in tanker shipping

Tanker shipping is a major source of emissions in the oil and gas supply chain, and there are big efforts to drive them down. But oil and gas companies, as vessel charterers (hirers), have only indirect control

Tanker shipping makes a lot of CO2 emissions, and the oil and gas industry uses a lot of it. Driving down emissions is a big challenge because of the multiple parties involved and multiple layers to the problem.

Oil and gas companies don't generally own their own tankers, they charter (hire) them in. Ideally they would know about the emissions from each ship at the point they make a decision of which tanker to take, so they can choose accordingly.

But nobody knows what the emissions will be before they charter the ship. There are third party services which aim to predict it. But they also do this based on limited information. And if an oil company makes a decision purely based on this information, they remove the incentive from the tanker operator to actually try to reduce emissions.

Digital Energy Journal's sister company, Digital Ship Vessel Performance Optimisation, ran a webinar to explore the issues on Feb 16, including speakers working at an oil and gas / biofuels company charterer (Neste of Finland), and at tanker operator (Minerva Marine of Greece).

Charterer's perspective

Risto Kariranta, Shipping Performance Manager, Fleet Operations with Neste gave an oil and gas and biofuels company perspective. Neste, based in Helsinki, Finland, is a supplier of fuels, plastics and chemicals, including biofuels and fossil fuels. It charters (hires) the tankers it uses from tanker operators. The tanker operator has responsibility for operating the vessel, including providing and managing the crew.

He explained that one of the biggest decarbonisation challenges for tanker charterers is to gather data about all voyages, in terms of emissions per tonne mile. But this is a good starting point for working out ways to improve.

Charterers have multiple reasons for wanting to gather emission data and decarbonise, from regulation, customers, and its own internal drivers.

On the regulatory side, both IMO and the European Union rules are demanding better transparency of emissions, he said.

The customers, the purchasers of fuels, are asking for data about the full greenhouse gas footprint for transportation.

This is particularly important for provider of biofuels. A biofuel emits CO2 when combusted like any other fuel; and it absorbs the same amount of CO2 from the atmosphere when it grows. If that was all the carbon factors, it would be carbon neutral.

But its greenhouse gas footprint becomes positive due to carbon emissions from its farming, transport and processing. The fuel's premium value is justified by its semi carbon neutrality. That is why accounting for and reducing transport emissions is so important.

Many charterers also have their own internal targets for reducing its 'Scope 3' emissions, which includes emissions from the transport services it buys, delivering feedstock to the refinery and product to customers, he said.

Risto-Juhani Kariranta, shipping performance manager, Neste

Data from vessels

A major charterer uses a lot of shipping companies to transport cargoes, he said. But every shipping company has a slightly different reporting system."

For some vessels, charterers rely on estimations of fuel consumption. These can be generated by service providers such as NAPA, which has a performance model for every vessel in the world, based on data about actual operations of the vessel where available, and data modelling.

 "It's not 100 per cent accurate, it's indicative enough to start," he says. If it is checked it against vessels where we the fuel consumption and the accuracy is known, "it is maybe within 5-10 per cent of the reality."

Translating data from the different formats of different companies into one standard, so data can be compared, takes a lot of effort.

Perhaps in future there would be a broker service, to take emissions data from shipping companies in whatever system they use and put it into the format which the charterer uses, he said. This would also make life easier for shipping companies, which currently see all of their charterers are asking for data in different formats.

Data can be initially gathered for a variety of different purposes, which means it isn't necessarily compatible with the vessel performance calculations.

An ultimate aim is to have data for every parcel of cargo, including the miles of the voyage, tonnes of cargo carried, the fuel consumption, a data quality estimate, the overall emissions, emissions per mile, emissions per tonne of cargo, and finally emissions per tonne mile.

With systems such as this, it is possible to aim for a certain reduction every year. With every completed voyage, a charterer can see whether it is on track to achieve that reduction. So, in one example, a baseline of 3 per cent reduction a year. If the charterer achieves emissions of 10.65 g/tonne mile, compared to 11 in the previous year, so a reduction of 3.18 per cent, slightly ahead of target.

It can also give its chartering managers CO2 'budgets' for the year, with demands that they need to take measures to keep within the budgets – and some measures are more costly than others.

Data driven planning

Another tool is data driven planning. For example, "gathering statistics about our vessel port calls, how much time they are spending in the port," he said. This includes data about average loading and discharge speed, and average duration, for each vessel. "We have a long history of each vessel in the fleet."

With this data, it is possible to create models to predict how long a vessel will stay in the next port, based on the planned cargo amount, cargo operation, terminal, and vessel leg. It is not 100 per cent accurate but it is really good for planning purposes."

There can be a transportation planning system for cargo parcels, which can compare different 'scenarios' or routing plans, based on the time they will take, the emissions, and the costs, based on estimates of both voyage time and port time.

Mike Servos, Energy and Environmental Manager, Minerva Group of Companies

"I think it's all about teamwork, getting these kinds of goals. You have to work quite a lot with the data and understand what it means. We have unlimited possibilities to learn from the data and find new ways to operate our fleet."

Data quality can be hard work, he said. Typically a charterer "has to enforce processes that [ensure] we get more accurate data."

"We do not get always perfect data. It's a continuous issue, we can never reach the level that we have absolutely correct data. Its hard work. Step by step you learn your own data, how it is formulated, and how to combine that with each of the sources."

Tanker operator's perspective

Mike Servos, Energy & Environmental Manager of Minerva Group of Companies of Athens gave a tanker operator's perspective on decarbonisation. Minerva Marine operates 73 vessels in total, including 57 oil tankers of various sizes and 5 LNG vessels according to its website.

One of the biggest upcoming financial drivers is likely to be a regulatory one, the inclusion of shipping in the EU Emission Trading Scheme, he said.

The ETS scheme has been operating since 2005 in the European Union, where heavy industrial CO2 emitters are required to purchase permits to emit, at the current carbon price.

The maritime sector has not been covered by the scheme up to now. But from 2023, maritime is expected to be included, with companies (or their charterers) required to purchase credits for emissions for voyages calling at EU ports, with a phase-in period up to 2026.

The EU has made an initial proposal of how much of a ship's emissions would be included, and there is also a proposal under discussion which will include much more of a ship's emissions.

According to Mr Servos' calculations, the cost of buying allowances under the initial proposal, for a single round trip with an Aframax from the US to the Netherlands, will be Eur 39,600 in 2024, Eur 89,100 in 2025, Eur 136,000 in 2026 and Eur 198,000 in 2027.

Under the 'discussed proposals', this will rise to Eur 124,740 in 2024, Eur 249,480 in 2025, Eur 378,000 in 2026, with no further rises.

This is based on a carbon price of Eur 90 / metric tonne, although the carbon price may rise, Mr Servos said.

Maritime industry associations would like to see the carbon costs paid directly by the charterers (the oil and gas companies), with charterers also taking the risk that the costs rise after the contract has been signed.

Another incoming European Union regulation is "FuelEU maritime" which sets gradually tightening limits of greenhouse gas intensity of fuels for vessels operating in the EU economic area.

This is designed to be calculated on a 'well to wake' basis, so include emissions from the transport and distribution of fuel to the ship.

A further hit comes from the EU's Energy Taxation Directive, which proposes a tax on heavy fuel oil, of 0.9 Eur per gigajoule, or 37-39 euros / metric tonne of fuel for voyages in the EU. LNG and LPG see a reduced tax of Eur 0.6 per gigajoule or Eur 29 per metric tonne, but only until 2033.

Data gathering

"I would like to stress that IMO DCS [data collection system for fuel oil consumption] data alone is not sufficient to establish the performance baseline required, to have an effective decision-making system," he said.

You will probably need digital tools to gather and work with data.

Minerva built its own system from a mixture of in-house development and outsourcing development. "This allows us to have full ownership of the platform and customise it to business needs, giving us competitive advantage. [Building] it was a slow process, but it is worth the effort."

Minerva collects high frequency data from sensors on the ships, and integrates this with data from noon reports, and data from weather providers. It is able to ensure that validated data is always available.

"Many of the sensors currently onboard were not designed for the purpose for collecting the data."

if you make the proper selection of appropriate sensors from the start, that's 50 per cent of the work to be done," he said. "There are many products claiming that they can deliver the required accuracy, but at the end of the day, it's not [delivering]."

When it comes to crew, crew members who are 'online' (digital technology users) tend to adapt much faster to the instructions that they are given, he said.

"We experience significant improvement when it comes to operational measures that we need to implement on board the vessels. From discharging, or auxiliary load management. [Online crew] adapt much faster to these changes."

"They know that their performance is being monitored and evaluated."

Once data is gathered, there is a difficult task of cleansing the data, or to "identify outliers, or any other hidden malfunction within your data," he said.

Data analysis

The company did a lot of work on hull and propeller efficiency, which had been identified as the easiest way to improve performance of a vessel. "It made sense to start from there."

It used data analytics to try to understand where improvements could be made and then cleaned the hull and propeller at the right time

As a result, "on a business as usual scenario we have managed to achieve a 6 per cent reduction in the daily fuel penalty attributed to fouling," he said.

Then the company invested in improving the efficiency of its cargo discharging operations, beginning by collecting high frequency data from pumps and steam systems. "We have managed to improve efficiency of discharge operations by 30 per cent over the last 2 years," he said.

There can be some debates with crew about whether it is necessary to keep a second generator running, if the data says it is not necessary, but the crew feel it is important for safety reasons, avoiding a black out from lack of power. "We never sacrifice the safety of the vessel in order to increase its efficiency, just to save a small amount of fuel. Whenever needed, the second generator would be running," he said.

New O&G sustainability reporting standard from GRI

GRI has developed a new "sustainability reporting standard" for the oil and gas industry. Here's how it works

The Global Reporting Initiative (GRI)), an independent standards organisation, has developed a new sustainability reporting standard for the oil and gas industry.

GRI's purpose, in its own words, is to "help businesses, governments and other organizations understand and communicate their impacts on issues such as climate change, human rights and corruption."

Many companies make corporate social responsibility (CSR) or environmental, social and governance (ESG) reports, to tell their story to governments, customers and investors.

GRI makes a framework to gather and report this information in a clear manner, and so (in theory) it can be easily compared with reports from other companies.

It says its sustainability reporting framework is now the most widely used in the world, including by companies of all sizes, governments, non-governmental organisations and other industry groups. This includes 63 of the world's largest 100 companies, and 75 per cent of the 250 largest companies (Global Fortune 250) in 2017.

The standard is a framework for making "full disclosure of all emissions", showing how companies are reducing emissions, and an account of "all impacts."

It is called "GRI Sector Standard for Oil and Gas". It covers exploration, development, production, storage, transport and refining, and covers both direct (Scope 1 and 2) and indirect (Scope 3) emissions.

The standard is available for free download from the GRI website. Oil and gas companies can use it now if they wish to, although it comes into 'force', i.e., becomes the expected format for oil and gas reporting (if they wish to follow GRI standards), from Jan 1, 2023.

Topics in the report are: GHG emissions; climate adaption, resilience and transition; air emission; biodiversity; waste; water and effluent; closure and rehabilitation; asset integrity and critical incident management; occupational health and safety.

Environmental practises; non-discrimination and equal opportunity; forced labour and modern slavery; freedom of association and collective bargaining; economic impacts; local communities.

Land and resource rights; rights of indigenous peoples; conflict and security; anti-competitive behaviour; payments to governments; public policy.

Organisations determine which of the sections are 'material' (i.e., topics which represent the organization's most significant impacts on the economy, environment, and people) and then follow the guidance for what to disclose.

The oil and gas document is 93 pages, but links to further documents with detailed information about how to report each section.

Industry perspective

"GRI has long been helping companies to advance their sustainability reporting and communicate their impacts on key issues, and IPIECA has enjoyed a constructive relationship over many years," said Brian Sullivan, Executive Director of IPIECA, the International Petroleum Industry Environmental Conservation Association, who also had a 23-year career in BP, from 1988 to 2011.

"Our members are committed to sustainability reporting, with many using the GRI Standards to guide the development of their reports."

Alexandra Russell, Chief Risk Officer for energy company Sasol, said, "for Sasol, having just launched its new emission reduction targets, the Sector Standard for Oil and Gas is an important tool through which Sasol is able to position its insights as it transitions."

"As we progress along the journey, the GRI Standard also allows us and other industry players to re-evaluate data in the context of the identified drivers of change."

The standard was initiated and approved by the Global Sustainability Standards Board, the independent body responsible for setting the GRI Standards.

GRI Perspective

Mia D'Adhemar, head of sector program with GRI and a former senior corporate affairs advisor with the exploration division of Woodside Energy, said that the four environmental topics identified as 'likely' for oil and gas are air emissions, biodiversity, water and effluents, and waste.

The "waste" topic also includes decommissioning wells and equipment, and other impacts of that, such as loss of local employment or staff retraining. Tailings is covered under 'waste', although it is only relevant in oil sands mining.

There are two safety related topics, 'asset integrity' and 'occupational health and safety'.

There is a topic on impact on local communities, which can be negative for oil and gas projects, for example if there is an influx of people seeking work, or if land used for oil and gas is unavailable for other causes.

A further topic is "responsible business", including anti-competitive behaviour, corruption or hidden payments to governments.

There are a number of references to the Extractive Industry Transparency Initiative (EITI) standard, such as in anti-corruption, where it covers transparency of contracts and beneficial ownership.

A company can make a judgement that they do not think one of the categories is 'material', or they do not have a big enough impact to need to count it, if they provide a short explanation. For example, companies operating offshore do not have any impact on rights of indigenous people.

Miguel Perez Ludeña, research lead at GRI, adds that GRI does not suggest any specific methodology for counting emissions, although there are various standard methods available.

He suggests that oil and gas companies could do "scenario analysis" as part of their ESG reporting, to consider how their sustainability performance might change depending on what happens in the world – such as if regulations on emissions get tougher and goals get more ambitious.

ROCSOLE – using electric fields to 'see' inside tanks

ROCSOLE has developed technology to 'see' inside tanks, pipelines and separators, using a electrical tomography. It has won three OTC awards and other innovation awards

ROCSOLE of Kuopio, Finland, has developed technology to 'see' inside tanks, pipelines and separators, using an electrical field and interpreting the conductivity and permittivity values of the various fluids and matters. It can look for deposits including wax, scale, sand and heavy oil; it can map emulsions, where one liquid is mixed in another via fine droplets; and it can be used to image flow regimes, froth and foaming.

A low voltage electric field is passed through the vessel being imaged, to see how much the material polarises in response to the electric field. This polarisation is detected with a sensor. A number of electrodes and sensors are used, taking multiple readings, at a rate of 10 readings per second.

In November 2021, the company raised Eur 5m in a "series A" funding round for the technology, with funding led by Springvest Oy, a Finnish investment company.

It follows the company piloting the technology for a number of years in a variety of industries and starting commercialisation during the 2020-2021 pandemic.

The technology is one of a group of methods, known as tomography, for seeing inside solid objects and building a 3D image. Other forms of tomography are ultrasound, X-ray imaging and radiation devices.

The technology was originally developed at the University of Eastern Finland, which has campuses in Kuopio and Joensuu. ROCSOLE is an academic spin-off company. ROCSOLE has also registered a number of patents for it.

While the basic science is not new, ROCSOLE is the first to do it on an industrial level for harsh process operating conditions, with high frequency data making high resolution images, Mr Tienhaara says.

ROCSOLE has a head office in Kuopio Finland, and other offices in Dubai, Houston, Oslo, Kuala Lumpur and Sao Paulo through partner companies.

Mika Tienhaara, CEO, was appointed in 2020. His former role had been CEO of the startup company Ascom Separation and co-owner of ProLabNL, one of the largest industry test facilities for process equipment and technology in Arnhem, Netherlands. Both companies were acquired by Sulzer Chemtech in 2014.

He has also worked in Aker Solutions as an innovation manager, and been involved as an owner / manager in six start-up / early phase venture companies.

In March 2022, ROCSOLE received an Offshore Technology Conference (OTC) "Spotlight on New Technology" award for its system for detecting and analysing sand in oil and gas separators.

This is the third year in a row it has won an OTC award. In 2020 it won an award for its Liquid in Tank Inspection (LITI) product, and in 2021 it won an award for the Deposition In-Line Inspection (DILI) system, for inspecting pipelines.

The technology

To define the technology technically, it measures changes in both conductivity and permittivity, the measure of how much a material polarises (becomes charged) in response to an applied electric field and allows a current to flow through.

The electrical tomography system needs an electrode to create the electric field, and a sensor to measure the response. The visualization and imaging are enabled through the unique software.

The electrodes can be positioned along a vertical column (for a device being placed into a tank), or around the outside of a pipeline. There can be 10 cycles of electrical charge areinjections per second.

High resolution images can be created from the data recorded by the sensors, which can then be analysed using machine learning based techniques.

The images have a millimetre scale resolution for pipelines, and a centimetre scale resolution for separators.

Separators

In separators, an additional benefit is that the imaging can supplement data from sensors in the separator, used for troubleshooting and production optimization.

"The root cause of separator failures on upstream facilities, on more than 50 per cent of the cases, comes from instrumentation [failures]" Mr Tienhaara says.

The conditions inside a separator can be quite extreme, with high temperatures, pressures, sand, sludge, wear and tear, he says. And many instrumentation types cannot be used inside separators.

Mika Tienhaara, CEO ROSCOLE

Competing methods

In the oil and gas sector, an alternative technology commonly used to try to 'see' inside vessels is the nucleonic gauge, which involves radioactive sources and detectors.

"Nucleonic devices are difficult to handle and operate safely, and need a lot of administrative work and specialised training," Mr Tienhaara says.

They can also take 15-20 minutes to make a reading, compared to less than 5 seconds for the ROCSOLE device.

And radiation based devices usually measure density, which means they can only get a limited understanding of how an emulsion – for example, oil mixed with water, and water mixed in oil, can both have the same density.

It can be possible to take fluid samples manually, but this is manual work and can be time consuming, he says.

Subsea pipelines project

ROCSOLE has a separate project to develop the technology for use in subsea pipelines, to detect deposits.

It has funding from Shell Technology Ventures, Repsol Venturing Company and Equinor. The system will be piloted in the North Sea around Autumn 2022.

The technology is installed on a "pig" (a device which travels along the pipeline propelled by the flow of its contents). The pig has a power storage (battery), electrodes, sensors, and data storage.

As it moves through the pipeline, it records data about deposits on the inside of the pipe-

The Rocsole device to 'see' inside tanks

line. The data is sent to cloud servers when the pig is retrieved.

Analysis of the data can show whether there are gas hydrate formations and other deposits. The device will also be able to understand how oil and water are mixed into an emulsion in the pipe.

A 26-inch pipeline could have a deposit layer of just 1mm, but that can impact production, Mr Tienhaara says.

Because it is hard to detect pipeline deposits, companies will often use scale removal techniques, such as anti-scalants, even if they are not sure if there is any problem, Mr Tienhaara says. These techniques can be expensive.

Radiation based testing cannot be installed on a pig because it is not possible to do radiation based testing continuously, he says.

But with the ROCSOLE device, they have a relatively inexpensive way to test the pipeline, they only need to use scale removal techniques when they are sure there is a scale problem.

ROCSOLE has a testing centre with a pipeline (known as a 'flow loop') where it simulates how deposits on the pipeline can be detected from the data gathered by the device.

A challenge with incumbent technology is that the used devices need to be close to the inner surface of the pipe to read the deposits.

This is not the case with the ROCSOLE device, which is significantly smaller than the pipeline diameter. Also, pipelines can be as long as 100km, and they are not straight or horizontal. There are risks that the tools can get trapped in the bends in the pipe, a problem which is very costly to fix and avoided with the ROCSOLE device.

Marketing approach

With his background in technology sales and business development, Mr Tienhaara is adopting more than a 'purely technology' approach to marketing ROCSOLE, seeking to give people strong reasons to change to this technology from what they are currently using.

"Many entrepreneurs think their technology is the best on earth. Then they are not listening to the customers or looking at the user side of it," he says.

If you take this perspective, as many start-ups do, that your role is to sell a device to a company to do a certain task in the value chain, "it is almost impossible to disrupt in that way."

digital energy journal

Low code and integrating / customising enterprise systems

If you need to customise and integrate enterprise software, it may be easier to do it using low code tools, rather than try to integrate it together directly yourself. Mendix explained how it can work

You are probably already familiar with the idea of 'low code' or 'no code' software platforms, which promise to make it possible for someone who is not a software developer to build software.

But the software challenge oil and gas companies face is often not building something new entirely, but integrating or developing add-ons to their large and complex corporate software packages, such as for maintenance or product management.

Low code tools may be able to help here – if the low code company can provide "connection building block" tools to connect to the enterprise software, and then it can be used to make customised tools in low code which work with them.

Capability of low code

A first step here is understanding what low code can and can't do.

The code is usually built by putting together graphic elements on a screen. This means you don't need to be a coder to create code. But it might also limit the flexibility or its usefulness for more complex applications, where you would really need to make all the code yourself.

But low code can do much more than support applications to enter and retrieve data from a database. "I think we have moved significantly past the point of digitalising forms already," said Sebastian Bersch, director of manufacturing cloud with Mendix, speaking at a webinar.

Mendix is developing 'template' apps for more complex tasks such as managing operation quality, making execution plans, querying suppliers, managing an inspection program, collecting results, and triggering actions following non-conformance, he said.

"We're pouring massive investment into expanding the amount of use cases that low code can address."

There is a separate version of the Mendix system for IT developers with full coding skills. "We are the leading platform in terms of allowing you to incorporate full coding into the space you work on. Not all things can be done in low code," he said.

Connecting with enterprise systems

If you work for a big corporation, or even if you don't, you are probably familiar with the challenge of multiple corporate systems.

Mr Bersch gave an example of someone who wants to arrange a meeting for a team in a company office in another city. There are different corporate systems to book a meeting room in the office, to book a seat to work in the office after the meeting is over, to upload vaccination certificates in order to get authorisation to travel, to apply for cross border travel, to book the hotel, and to get hotel costs reimbursed.

Individually, none of these systems have a high level of complexity, in terms of their data load or complexity. But the task of using them all together can get very complex.

"Complexity is all around us. We always see it is defined by the degree of difficulty and degree of time [things need] to come together," he says.

On top of this complexity, the multiple options and time pressure can make it worse. "We see that in all sorts of domains and all sorts of businesses at this moment," he says.

Less transformation failures

Mendix sees tools like this as important in the pathway to improving digital transformation projects overall, or reducing the failure rate.

Companies are saying that 70 per cent of digital transformation initiatives don't reach their goals, and this can't necessarily be improved just by spending more money on them, he said.

There are stories of people going through cycles of excitement in their digitalisation projects, and then "breaking down a bit" as you realise things don't work as you expected.

One cause of failure is that many companies are developing software entirely themselves, and ending up with something which is very difficult to maintain, he said.

A task may begin with someone making a spreadsheet, which gets more and more complicated. It is given to someone with more Excel skills who builds macro tools.

Eventually it gets too complicated, or the only person who knows how to maintain it leaves the company, so a second spreadsheet is built. "This is precisely what we don't want," he said.

When companies want to integrate complex software systems together, a common approach can be to build new software, which interacts with multiple other software tools. This approach "isn't really working out," he says. It can drive more complexity rather than reduce it.

When the software systems are always evolving, employee needs are changing, and data types are changing, it means that the home-made software needs to be continually updated.

"We have an exponential number of different systems in place, that might or might not be administered by some IT personnel, that might not even be digitalised at all," he said.

No one size fits all

One reason why the future is likely to involve more low code apps is that there is so much diversity in what companies need.

To illustrate the diversity in how people work, consider that people in different companies can have the same job title, but a completely different role. For example, a 'product manager' may be orientated around specific products, or for a specific customer. "All those people have different things that they consider to be important, and different processes that they need to follow on a day-to-day process."

Meanwhile, "any software that you buy [off the shelf] can only have one particular approach towards representing workflows and representing data to customers."

So, off the shelf software is less and less likely to work, he says.

Keep enterprise software as it is

A benefit of this approach is that you don't need to change the enterprise software systems at all. You can implement and upgrade the core systems as closely as possible to the way they were designed by the software vendor, rather than trying to configure them to your own needs. Any customisation can be a layer on top, built using low code systems.

That makes it easiest as possible to maintain and upgrade these 'underlying systems', while also having the full flexibility to build workflows on top, he says.

By sticking with big software systems at the core, such as the PLM and ERP systems, and not having any need for these systems to undergo any complex integrations with each other or anything else.

Meanwhile, the company engineering staff running the core applications continue working in the environment they normally work in. Engineering specialists can be expensive, and you don't necessary want them to have to learn multiple software systems, they only need to

learn one, Mr Bersch said.

"They can collect the data they need in order to be able to make a decision - whether it makes sense to run the particular test."

"You can bring the information that they need together in this composable application built on Mendix."

Examples

For example, a Mendix app could be built which extracts purchase orders or supplier data from SAP software.

Someone might want a certain piece of data from Siemens' Product Lifecycle Management (PLM) software Teamcenter. With a Mendix app, they could do it from their smartphone, rather than have to log on to the PLM software.

An example app was built which takes data from an "industrial size coffee machine", which uses both Teamcenter PLM for lifecycle management, and is simulated using Siemens "Simcenter" software. The app also brings in field data from Siemens' "MindSphere" internet of things software.

The apps can be used to visualise data, such as showing how sensor readings change over time, or to review critical events.

Template tools

Mendix provides a number of pre-built integration tools, or "connection building blocks", which integrate with enterprise software packages including SAP. They can also integrate with software on cloud systems such as AWS.

It should be straightforward and inexpensive to integrate these tools with a company's existing enterprise software. They can be put together and adapted as needed.

Then Mr Bersch and his team have developed a number of templates which connect to the connection building blocks, which it makes available to Mendix users.

You don't need to use everything in a template, and you can take parts of it out and incorporate them in another application.

It can add up to form a "connected hub of information", accessing data from your corporate systems without any limitations.

"Mendix allows you to create applications which integrate data and logic from any source," he says. "We want to be open and extensible at every level."

It calls this the "composable enterprise," because you are building your company software by 'composing' multiple components.

Low code is "the only feasible and responsible way to go about building a composable enterprise," because it can be used to make add-ons to your existing corporate systems, Mr Bersch said.

Mendix also talks about "tailored application ecosystems", or in other words ways to quickly set up applications tailored to the needs of the organisation, based on the templates and also 'industry solutions', template apps set up for the needs of specific industries.

Then it has low code apps for doing specific tasks using the building blocks, such as for such as maintenance, work order execution, issue management, smart warehousing, product release functionality, marine issue management, product release, quality inspection, complaint management.

Access to the apps can be provided to people outside the organisation.

Any company can have its own catalogue of reusable components, which incorporate industry expertise.

If the right integration block isn't available, Mendix can provide a licensed developer who can build one for you, out of the 2000 on its register.

You can and try out the tools just by setting up a free account on the Mendix website. You can deploy the templates, see how they run, and change them if you want to.

Building low code apps

Using the Mendix platform, you can make your own Apps in a visual language, such as from moving icons around on a screen, rather than writing code.

An application in low code can be made by company domain experts, as 'citizen developers'.

Domain experts "can influence and collaborate in building [software]," he said. They "feel that something is made by them not for them. It aligns a bit better the expectations and the outcome."

The IT department can still stay in control of the data assets and core software, including monitoring and deployment.

Ecopetrol's water management system on AWS

Colombian oil and gas producer Ecopetrol (mainly state owned) has developed a "water intelligence and management" system together with Accenture and Amazon Web Services

Ecopetrol is the largest company in Colombia. It also has exploration and drilling operations in the United States (Permian basin and the Gulf of Mexico), Brazil, and Mexico.

The system covers the whole water cycle as it is used in oil and gas production, including access, usage, treatment, recycle/reuse and disposal.

It is made available as an 'open solution'.

The aim is to support Ecopetrol, and any other company that uses it, to be "water neutral", or to have no 'net' impact on water availability or water resources.

Ecopetrol should be able to use the system to reduce its water 'footprint', by understanding how it uses fresh water, and how its use can be decreased. It can also use it to improve how much produced water and wastewater it can re-use.

It also covers refining as well as production.

Accenture developed the solution, working together with Ecopetrol and AWS.

It hopes that the system will become an 'industry platform', offering all of the data needed to manage water on one place, rather than people having to go to multiple data sources.

Data sources include water volumes, water quality analysis, and costs.

The system can also support advanced analytics to develop ways to use water more efficiently.

There is also an aim to build an 'ecosystem' where other people can see data, including sharing data and promoting water re-use with other industries.

If the system needs high performance computing, large volumes of data storage, or machine learning tools, they can all be run on AWS Cloud.

"Our vision is for the energy industry to lead on technological solutions to achieve water neutrality," said Felipe Bayón, Chief Executive Officer at Ecopetrol.

"We will use this platform to accelerate our TESG (technology, environmental, social and governance) strategy, including our goals of reducing 66% of fresh water captured and zero discharges to surface water by 2045, improving the environment for the communities where we operate."

Equinor's SLIMM – index of spatial data for files

Equinor is developing a system for storing spatial data for multiple file types including videos, so you can easily find the file which relates to a certain place. Project manager Håvard Gustad explained

Norwegian oil and gas company Equinor is developing a system for storing spatial data from many different files including videos, photos, laser scan data and sensor data. So, it functions like a spatial index for the files.

The idea is that software systems which relate to a certain point in space, such as 'smart worker' tools for workers in the field, and digital twins of the facility, can easily access data which relates to that point by using the index.

There are many potential benefits. By having better access to all files which relate to a certain place, it might be possible to identify ways to improve safety.

There may be benefits from being able to compare today's data with historical data from that place, for example to detect new corrosion. Then it might be possible to identify interesting correlations using data analytics, for example that treating steel in a certain way is making corrosion happen faster or slower.

The data might be used to assist self propelled robots going to that place.

The system is only for files which contain an actual geographical co-ordinate. It does not include files which just connect to a geographical entity, such as a well.

It is limited so far to topside operation and maintenance challenges, and perhaps later will include subsea data.

The project is currently under development stage with a plan to release a 'minimum viable product' coming up to summer 2022.

The system is called SLIMM, "Spatial Location Information Model and Media files". It runs on Equinor's cloud-based platform "OMNIA".

Project manager Håvard Gustad is a specialist in data management and geospatial governance in Equinor. He has worked in Equinor for 15 years in IT and digitalisation, and also in offshore operations and maintenance.

He explained how it works, speaking at a webinar organised by the Society for Professional Data Managers (SPDM) on March 2.

How it works

Spatial data is a term for data which relates to a specific place on the earth, in this case defined by geographical co-ordinates.

SLIMM captures the spatial data on all media files, such as videos, photos, and sensor data.

This also includes video taken by drones and other robots.

Then, by searching this spatial data, it becomes possible for a person or another software system to easily retrieve all of the files which relate to that location.

For example, a 'digital twin' model of a facility can retrieve files which relate to parts of that facility, or a 'digital worker' software can retrieve files which relate to the worker's current location.

SLIMM has not been set up as one big product, but multiple small pieces, set up as 2-week stints using 'scrum' methodology.

Data product

Equinor has a "data product" philosophy, which means that data is provided by one company unit as a 'product' ready to be consumed by another. Like products you buy in a shop, a data 'product' should normally have a known quality, known 'owner' (or provider), and come with an expected service level.

SLIMM aims to provide a 'data product' according to this philosophy. For example, a picture taken for operational and planning purposes, but which has a spatial reference, can be made available as a 'data product' to inspection teams.

Equinor is planning to develop more services based on advanced analytics "once we have been able to deliver a few of these data products," he said.

So, for example, there could be systems for condition-based maintenance (based on data from sensors). This data can be further analysed to develop predictive maintenance plans.

Image orientation challenge

One challenge the SLIMM project aims to solve is to find a way to position a picture or video into a 3D model of the plant, with the correct orientation (the direction the camera is looking at).

The picture or video might be taken by an operator with a handheld device, a robot or a drone.

Currently smart phones usually add 2D co-ordinate references of the point any photo was taken. The height (above sea level, above the ground) could be added to this, so you have an x y z. But there is not yet any standardised, off the shelf way of adding in orientation to the reference data which goes with an image, Mr Gustad said.

Demonstration

Mr Gustad showed an example of how SLIMM could work, and the challenges, using a video file from a drone inspecting a flare stack, in Equinor's research facility in Kårstø, just outside Stavanger.

Before the spatial data could be added to SLIMM, the co-ordinates needed to be corrected. The position was taken with a certain co-ordinate reference system, with a slight offset on the vertical, so it needed to be adjusted, he said.

This system can also be used on drone inspection data for wind farm turbines, looking for cracks. "It's the same perspective as an inspection on a flare stack," he said.

A second demonstration was a data set collected by self propelled robots, including optical camera and thermal camera images.

Some of these robots are themselves using data from SLIMM to navigate around the site.

The position data is converted onto a global co-ordinate reference system.

Once ingested into SLIMM, the images can be viewed on a dashboard. There is an API to make the data accessible to other 'consumers' of data.

There are tools such as a time slider, which makes it possible to access images from different points in time.

A third example is a robot taking a picture of a valve with a tag number. The tag data is also sent to SLIMM, so it understands that tag with this number is in this location.

Subsurface data

The project doesn't cover subsurface data – although this is handled within OSDU data schemas, which Equinor is also involved in. It is possible that the SLIMM system could be integrated with the OSDU open standard for storage and accessibility of oil and gas data.

"I have very good contact with the project leader for OSDU in Equinor," Mr Gustad said. "We see the resemblance in our architecture and what we are doing. We're not afraid that we are going to beat each other down. We see there are synergies here we can exploit."

Subsurface data is quite different to operations data, he said. There is a lot more 'sensors', including some which are continuously recording, such as fibre optics in wells. In comparison, a drone takin a few high-resolution pictures is much easier data to manage.

The oil companies tanker accident database

The Oil Companies International Marine Forum (OCIMF) and the International Association of Independent Tanker Owners (INTERTANKO) set up a 'Tanker Accident Database' to help understand the causes of tanker accidents around the world. They are keen to see more submissions

OCIMF and Intertanko set up an online Tanker Accident Database in 2019, with the aim that tanker companies could anonymously report any incidents. The aim was that the data could be analysed to identify trends or indicate where tanker companies and OCIMF should put most of their attention.

But so far, it has not been able to do any meaningful analysis of the data, because it does not have enough reports submitted, we heard in a webinar about the database on Feb 23rd, organised by OCIMF and Intertanko.

The database is carefully designed in two independent sections. In one section, tanker companies can enter and review their reports, which are connected to their company name and the vessel name. This data cannot be accessed by anyone apart from company staff and database administrators.

The completed reports are manually transferred to the second section of the database, which is hosted in a different country, on separate servers. In this process, all information which can identify a company or vessel is removed from the reports.

To provide assurance that the systems cannot be hacked, they are built to the "international cyber standard" ISO 27001. They are audited by external auditors to confirm that they achieve this standard. OCIMF and Intertanko have a database audit committee which can bring in external auditors at any time for further verification.

If companies believe there is a risk that their accident reports could end up being used against them that would be a big disincentive to filing.

For example, from charterers accessing data they are not supposed to see and deciding not to charter a vessel because it has filed more accident reports.

Tanker companies still have certain obligations to report accidents to the charterer of the vessel at the time the accident happened. But this is something separate.

The system is currently for seagoing tankers only, although there is a possibility it may be extended to inland waterway tankers in future.

Database background

The idea for developing the database arose in 2019 following a joint meeting of Intertanko and OCIMF's executive committees, seeking ways for the tanker industry and oil companies to better work together.

It was seen as a way of avoiding the problem of too much attention and even regulation going onto mitigating the wrong risks, after one-off events which are well reported.

For example, "IMO spent a lot of time debating electrical fixtures due to a single accident on an Icelandic fishing boat," said Phil Belcher, marine director, Intertanko.

Saurabh Sachdeva, publications and advocacy director, OCIMF, noted that in a former role at BP, he was involved in work to try to analyse accidents and make trends, so it could put its focus and training resources on the right issues. "It isn't easy I'm telling you; we struggled to figure out how to do it," he said.

But if it was possible to gather accident data from multiple companies, then it might be easier to identify trends, he said. "Collectively we can come together and make things better for the industry. It's not, 'one company can solve it all.'"

"If we can understand trends, where the weaknesses are, I think this database [would be] a great success."

How it works

The database is built and managed by MIS Marine, a company based in Birmingham, UK, which specialises in marine assurance technology.

The system is not an 'open repository', it is a structured system for collecting certain information so that it can be anonymised and then used to identify trends, said Dominic McKnight, managing director of MIS Marine.

The 'data collection' part of the system, operated by MIS, is designed so that the only people with access to the submitted reports are tanker operator staff entering and reading their own company reports, and database administrators.

During the registration process, MIS staff validate that people signing up have authority to report on behalf of the vessels, including from looking at their company e-mail address, company position, and address details. "These reports cannot be spuriously provided by those who have no right to report," he said.

Tanker operator staff first register all their vessels in the system, and then add information about accidents and other incidents, and what the root cause was.

The database takes a broad definition of 'accidents' – although it does not include near misses, due to concerns they might clutter the system.

Each report includes a field for the company name, ship name and IMO number, flag, class, and deadweight.

The data is asset identifiable at this stage, so the tanker operator can see which vessel the report is about. This also means they can check that they haven't entered the same accident more than once, and double check the report is connected to the right vessel.

They may also wish to use the data for internal purposes, such as tracking how many accidents each of their vessels have or comparing their own performance with global industry averages.

People only have access to data about their own vessels, they cannot see any data about any others.

There have been several requests to see the reported data, including from charterers, universities, banks and others, "which we politely decline."

Then for analysis, the data is manually moved to a second system, but with any identifying details stripped out, Mr McKnight said. Data such as deadweight can be converted to a band, so the analysis may be able to show, for example, that certain accidents are more prevalent in vessels with this range of deadweight.

There are three levels of data protection.

The first level is that the two parts of the system are physically separated. They are in separate countries, and the networks are not connected.

A second data protection level is that no-one from OCIMF or Intertanko has access to the data collection side of the system, and they have no role in the running of the database. Only MIS administrators can access the data collection zone.

A third data protection level is that a govern-

TANKER ACCIDENT DATABASE

IDENTIFYING BEST PRACTICE
THROUGH LESSONS LEARNED

ance committee can verify the data privacy and security, by enlisting an independent third-party IT company if they choose to, to do security auditing.

To make it as quick and easy as possible to use, the system is also designed to never ask for more information than it needs to operate, companies do not need to waste time filling in online forms, he said.

Data is added using drop down forms as far as possible rather than free text, so it is easier to analyse.

If companies already have their own in-house accident reporting system, it may be possible to connect it to the Tanker Accident Database via API, so that data is transferred automatically.

The system is not just for new accidents, companies can enter historic data if they wish to.

"We are looking to get the largest amount of data possible," Mr McKnight said. "Past data is just as important as future data. This is about trending and pattern matching."

OCIMF perspective

The database can offer operations and technical managers an opportunity "to learn what's going on," said Saurabh Sachdeva, publications and advocacy director, OCIMF. "This is about trying to work out how our industry turns up from an incident standpoint."

But while individual OCIMF members are known to have 6,000 incident reports in their records, the number of accident records submitted is much fewer.

Mr Sachdeva did not share specific numbers but a graph in his slide pack indicated that there have been between 10 and 20 accident reports submitted monthly between April 2021 and Dec 2021, rising to about 25 in Jan 2022, following some promotion of the service.

The graph also showed around 150 "vessels created" in the system every month from June to Dec 2021, rising to around 270 in Jan 2022. Vessel operator accounts created were 80-100 a month over Mar 21 to Jan 22.

Since OCIMF does not have insights into which companies are providing reports and which are not, it is hard to know the reasons why more companies are not submitting reports, he said.

"We need to be having 100-200 entries on a weekly basis to make it worthwhile, so we can get data to start benchmarking and getting some trends out of it."

Tanker operator perspective

A tanker operator's perspective on the system was provided by Stefanos Stylianos, safety, quality and marine manager with Minerva Marine, and chair of Intertanko's vetting committee. Minerva operates around 70 tankers.

Tanker operators and their crew can go through a lot of pain and costs after accidents and learn a great deal from them. It would make sense to share this learning as widely as possible, he said.

The database should support advances in best practise, and use of standardised terminology in describing incidents.

It is not just for major accidents like collisions and explosions. Tanker operators have many more minor incidents.

One recent example at Minerva Marine was an incident with a rotating disk which snapped, and part of it hit a crewmember's neck. "I learned quite a few things from it," he said.

Minerva Marine uploads every incident to the database. It takes a person 5 to 10 minutes to upload each one, he said.

Mr Stylianos only has experience from 70 vessels in doing his company data analysis. "What if it was from hundreds or thousands

of vessels? Everything would be much more accurate," he said.

Accident reports all provide a root cause, with a choice of human, vessel or management. "It standardises the categories of the root causes," he said.

Submitting in the database allows companies to demonstrate compliance with one of the stage 4 elements in TMSA3, 'incident analysis data is shared with industry groups,' he said.

Not OCIMF's incident repository

The tool should not be confused with OCIMF's incident repository, which is used for vetting inspection – this is connected to a tanker operator's obligations to report incidents to its charterers, Mr Stylianos said.

There were questions about whether it might be possible to submit data to the accident database, and OCIMF's Vessel Incident Reporting (VIR) at the same time. But the information is a little different, said MIS' Dominic McKnight.

The Tanker Accident Database is largely for quantifiable information, such as the ship's condition and the accident location.

But the Vessel Incident Repository is more qualitative information, including the immediate cause of the incident, and uploading any documentation. "The types of data didn't mesh," he said.

No reports yet

One webinar attendee noted that he had uploaded a few incidents from the company but has not yet seen any output or analytics as a result. "Unless I can see some tangible outputs, it doesn't really encourage me to upload incidents," he said.

"The big problem we've got is we don't have enough data in there," Mr McKnight replied. At the moment it is 'file and forget'. But you absolutely are going to get something back from it, as soon as the quantity of data is statistically meaningful. You will also see trends for the industry, and you'll be able to trend your own reports against that."

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