

Oil Review

Oil · Gas · Petrochemicals

Middle East

VOLUME 24 | ISSUE 3 2021

Fujairah prepares for the fuels of the future

- 
- Saudi Aramco positions itself for the future
 - Chemical sector targets circular economy
 - Preventing cyber crime
 - Digitalisation drives autonomous operations
 - Pipeline coatings for better offshore drilling
 - Selecting the right valve

24
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Printed by: Buxton Press

Printed in: May 2021

© Oil Review Middle East ISSN: 1464-9314

→ Editor's note

OUR COVER FEATURE in this issue focuses on the storage and bunkering market, which is changing dramatically in response to climate change pressures, with the move towards the adoption of cleaner fuels (p20). Sustainability is also a hot topic for the chemicals industry, which faces many challenges on the way to achieving circular economy goals (p18). We also see how prospects for Aramco are looking up this year (p12) and assess the benefits of promoting a more diverse and inclusive culture in the industry (p16).

Our feature on cyber security discusses how companies can mitigate cyber threats, which can accompany increased digitalisation (p38).

In our technology section, the digital lead for ABB Energy Industries IMEA region outlines how digitalisation is accelerating the drive towards more sustainable and autonomous operations (p28), and we learn how KOC and Halliburton are collaborating on the implementation of an integrated digital oilfield to improve production efficiency and reservoir recovery (p24).

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Front cover image courtesy of Port of Fujairah

→ Executives' Calendar, 2021

MAY			
17-9 June	Middle East Energy 2021 (MEE)	VIRTUAL	www.middleeast-energy.com
23-27	OWI MENA	VIRTUAL	www.offsnnet.com/owi-mena
JUNE			
7-9 June	EGYPS	CAIRO	www.egyps.com
8 June	Webinar on Monetising Sulphur Emissions	VIRTUAL	www.alaincharlestraining.com/webinar/p-p
21-23	HSE Oman Forum	VIRTUAL	www.hse-forum.com/oman-2021
AUGUST			
16-19	OTC	HOUSTON	2021.otcnet.org
SEPTEMBER			
13-15	Oman Petroleum & Energy Show	MUSCAT	www.omanpetroleumandenergyshow.com
13-16	Gastech	SINGAPORE	www.gastechevent.com
OCTOBER			
4-7	GEO 2021	MANAMA	www.geo-expo.com
NOVEMBER			
15-18	ADIPEC 2021	ABU DHABI	www.adipec.com
28-1 Dec.	Middle East Oil & Gas Show (MEOS 2021)	MANAMA	www.meos-expo.com

Readers should verify dates and location with sponsoring organisations, as this information is sometimes subject to change.

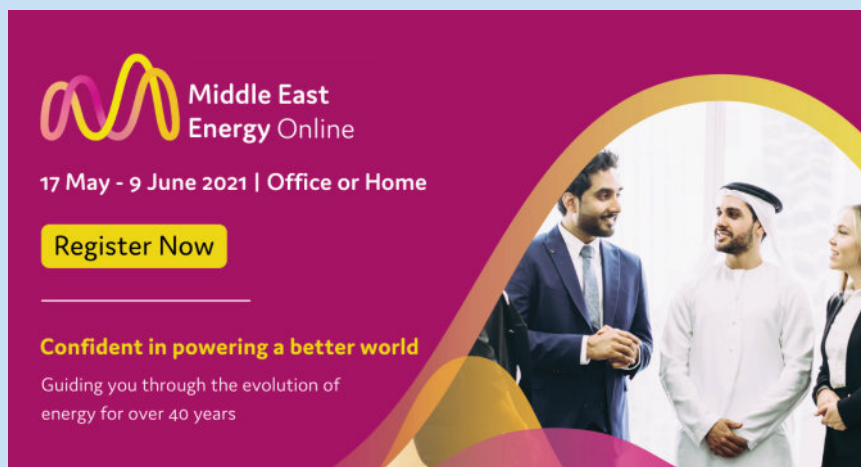
Middle East Energy (MEE) Dubai goes virtual

MIDDLE EAST ENERGY (MEE) Dubai has confirmed that the 2021 edition of the show will take place only as a virtual event. Starting on 17 May, four focus weeks will address the latest insights, trends and innovation across Renewable & Clean Energy, Transmission & Distribution, Critical & Back-up Power, and Energy Consumption & Management.

The virtual event, which underscores Middle East Energy's commitment to delivering positive networking opportunities for the energy industry, will focus on forging partnerships, providing insights and the ability to source the latest solutions. The platform will connect users with thousands of potential clients, partners and contacts across the energy market.

The four-week Middle East Energy Online event will include tech talks, interactive roundtables, panel discussions, thought leadership sessions and remote interviews. Networking opportunities will consist of hosted buyer meetings, fireside chats, breakout sessions, personalised meetings and speed networking sessions.

Claudia Konieczna, exhibition director, Middle East Energy, said, "Our role is to connect the



Middle East Energy Online

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Image Credit: Informa

The virtual event will address four key areas.

entire energy ecosystem, and we are confident we will do this through the Middle East Energy virtual event. We have an impressive lineup of industry experts, leading businesses, and networking opportunities to bring the global energy community together."

Middle East Energy (MEE) Dubai, formerly

known as Middle East Electricity, has revealed the 2020 edition of the show generated more than AED18bn (US\$4.9bn) worth of business.

Register now:
<https://registration.gesevent.com/survey/3n2h3jv9m1kul?actioncode=COM5>

OWI MENA offers unique opportunity for well intervention optimisation

RETURNING FOR ITS sixth year, the Offshore Well Intervention Conference, Middle East and North Africa, will be running virtually from 23-27 May. OWI MENA will offer the intervention community the opportunity to come together, exchange ideas and listen to the expertise of industry speakers in order to optimise well intervention efficiency in future campaigns.

Across the conference, each day will focus on a key theme:

- Day 1, Well Integrity: Understand how operators are predicting future well integrity problems to ensure that the wells remain safe, secure, and compliant
 - Day 2, Plug & Abandonment: Access exclusive P&A case-studies and see what P&A activity is ongoing across the MENA region
 - Day 3, Production Optimisation: Access the latest opportunities and technologies that enhance oil production including frac, re-frac and zonal isolation best practice
 - Day 4, Brownfield Management: Hear unique insights into production enhancements from aging wells through the use of new technologies and strategic planning
 - Day 5, Transformative Technology: Test new technologies that are transforming industry practises in our exclusive technology showcase hall
- Discussing these topics and sharing their latest best practice experience, more than 25 expert speakers will take part from operators such as ADNOC, BAPETCO Saudi Aramco, and Sharjah National Oil Corporation in addition to representatives from service companies including DR Independent, Gulf Energy, Welltec and more.

The annual event is a place where leading operators come together to



Image Credit: Adobe Stock

More than 300 senior well intervention decision makers are expected to attend.

discuss the current market, define their well intervention strategy, and identify new solution providers for future campaigns. With more than 300 senior delegates from the Middle East well intervention community expected to attend, the conference offers a unique opportunity to tap into this knowledge base and make new connections within this extensive network.

To receive the conference brochure with more details and to register for the event, visit: <https://offsnet.com/owi-mena>

A large-scale photograph showing a long, flexible pipeline being unrolled across a dry, hilly desert landscape. In the background, there are rugged mountains under a clear sky.

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HSE Oman Forum to provide a platform to debate critical HSE issues

HSE FORUM'S OMAN edition launches on 22-23 June – and it's going virtual.

Over the next few years, the Sultanate of Oman is seeking to break the cycle of its oil and gas dependency and has earmarked US\$106bn to invest in the non-oil sectors, including construction and manufacturing.

At HSE Oman Forum – 2021, delegates will hear from the most senior and influential entities from government, energy, infrastructure, manufacturing, construction and other thriving sectors, obtaining updates on the latest industry and regulatory developments that will allow them to best strategise for upcoming projects and to be HSE compliant.

“HSE Oman Forum – 2021 will offer a virtual platform to discuss ideas, exchange information and address occupational health and safety concerns,” said Bhumika Bhinde, event manager. “It will highlight best practices that will help mitigate occupational health and safety risks by integrating the latest technologies with expert insights on the role of effective leadership in HSE.”

This year's edition will feature six exclusive themes:

- **REGULATORY FRAMEWORK & VISION:** Gain access to regulatory updates and ministry initiatives to enhance skilled human resources for occupational health and safety
- **E-HSE – NEXT REVOLUTION IN OMAN:** Evaluate the scope and challenges involved in integrating emerging tech to monitor



The HSE Oman Forum is the latest in the highly acclaimed event series.

- health and safety in confined spaces
- **ENVIRONMENTAL FOOTPRINT:** Learn how effective waste management and go green initiatives for a carbon free future are contributing towards Oman's Sustainable Development Goal
- **ZERO INCIDENTS – FRAMEWORK:** Explore the best practices for root cause analysis and gain insight on effective safety leadership through case studies and proven methodologies
- **RISK OVERVIEW:** Review principle elements involved in risk assessment and the critical role of an incident reporting system for efficient process safety
- **HSE – POST PANDEMIC ERA:** Hear the

success stories of HSE virtual trainings and inspection and the impact of behaviour-based safety to tackle the pandemic situation. Speakers include Yousra Kindi, snr. behavioural safety adviser, Petroleum Development Oman; Fahad Alkiyumi, sr. QHSE manager, Oman Electricity Transmission Company; Willem Nel, general manager HSSE, Port of Salalah; Neelesh Sogani, chairman, IOSH Oman; and Porchelvan Nadanam, HSE manager, Huadong Ibri PV Construction LL

For further information, see the website at www.hse-forum.com/oman-2021 or email: vinay.nair@alaincharles.com

Oil Review Middle East hosts webinar to focus on monetising sulphur emissions

IN THE FACE of challenging economic conditions and increasing ESG concerns, reducing costs and minimising environmental footprint are top priorities for operators of refineries and petrochemical plants.

On Tuesday 8 June 2021 at 2:00pm (UAE), Oil Review Middle East is hosting a webinar in association with P&P Industries AG, a globally active green technology player specialised in

waste gas treatment, entitled ‘Utilise best-in-class conversion technology to monetise sulphur emissions’.

Martin Joksch – head of sales, Paul Piantino – business development manager and Peter Matheisl – senior sales manager at P&P Industries AG will present a case study on the commercial and environmental benefits of redesigning refineries’ and petrochemical

industries’ cast filter processes to offer a profitable sulphur recycling function. Attendees will:

- Understand how the combination of cutting-edge expertise can effectively convert sulphuric waste to commercial grade acid, SO₂, SO₃ or all, offering refineries and petrochemical plants a profitable waste mechanism
- Utilise unique practice processes to reduce emissions tenfold to guarantee your refinery easily achieves emission targets and complies with regulations
- Eliminate sulphur depots and understand how to make an alkylation plant profitable by producing oleum or even electronic grade acid from your waste.

If you are responsible for higher returns on effective waste management in your company, and are interested in learning how to monetise your sulphuric waste while also making your business sustainable, register for this insightful presentation here: <https://alaincharlestraining.com/webinar/p-p>

For further information please get in touch with Monisha Antony, project manager – Webinars, Oil Review Middle East. Tel: +44 (0) 20 7834 7676, email: events@alaincharles.com.



Webinar participants will learn how to monetise sulphuric waste while making their businesses sustainable.

The role of NOCs in the road to net zero

Liam Yates (senior analyst, Middle East upstream) and Kristina Beadle (analyst, carbon research) at energy consultants Wood Mackenzie discuss whether NOCs will follow the lead of the majors in setting ambitious emissions reduction targets.

NOCS DOMINATE THE global oil and gas space – producing 50% of liquids and 48% of gas in 2021. And as some IOCs diversify away from oil and gas as part of their energy transition strategies, this is only likely to increase.

But high levels of production result in high absolute greenhouse gas emissions from upstream activities. Of the almost 100 companies included in our Emissions Benchmarking Tool, NOCs account for nearly half of the top 20 upstream emitters (scope 1 and 2) in 2021, and take the top two spots.

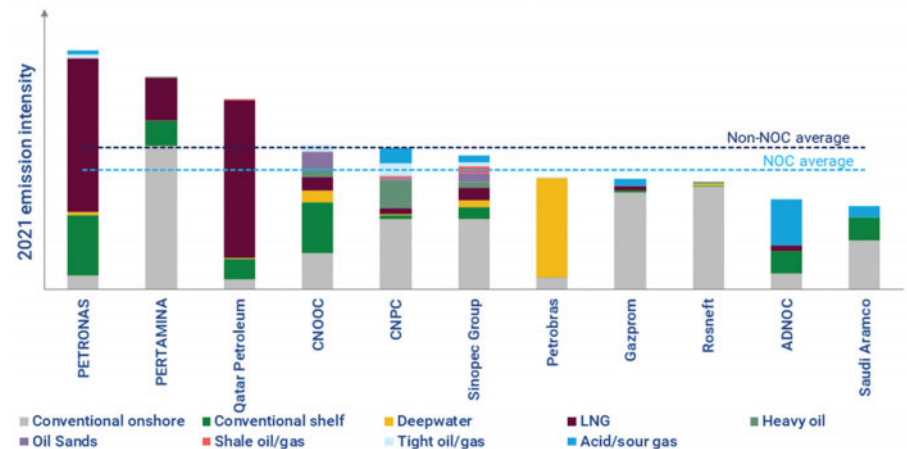
The primary role of many NOCs is to generate revenue and maximise resource extraction for oil- and gas-rich government shareholders – and they often have access to some of the best quality and lowest cost resources. And some governments are reliant on oil revenues for over 90% of government income. So, efforts to reduce emissions, or carbon taxing, are a significant threat.

Despite high absolute emissions, the 11 NOCs covered in our Emissions Benchmarking Tool fare better on an emission intensity basis. Those with large, long-life conventional portfolios, such as Saudi Aramco and Rosneft, have lower corporate upstream emission intensities than many of their peers, while those heavily weighted to LNG have a high scope 1 and 2 emission intensity.

The trend for carbon policy (such as carbon taxes) and emissions reduction targets is growing. But the risk to many NOCs is low, at least for domestic operations, with most governments unlikely to inflict carbon policy that will have an impact on domestic hydrocarbon revenues. However, there is growing global pressure for all countries to set emission reduction targets and policy, which may affect imported products as well as domestically produced products. There is also mounting pressure from investors for companies to reduce operational emissions.

High production and absolute emissions expose NOCs to more absolute value at risk if

NOCs with large conventional portfolios have lower corporate upstream emission intensities than many of their peers



Source: Wood Mackenzie Emissions Benchmarking Tool

Image Credit: Wood Mackenzie

carbon taxes are implemented, although generally lower emissions intensity and high free cashflow means many NOCs could tolerate extremely high carbon taxes. Of the 11 NOCs analysed, the average carbon tax for upstream company cashflows to break even at a 10% discount rate is over US\$400/tonne.

The NOCs are behind the curve when it comes to emissions reduction targets, with only three having set net zero ambitions: PetroChina, PETRONAS and Sinopec. Many have less ambitious, short-term targets and a handful, including Saudi Aramco and Gazprom, are yet to set any corporate targets. Several NOCs have ambitious production growth targets which will make any absolute emissions reductions challenging.

Last year saw a shift in focus for the European Majors, with all announcing targets to strive for ambitious Scope 1 and 2 emissions reduction targets and carbon neutrality by 2050.

So, are NOCs next? Increasing stakeholder and investor pressure, the

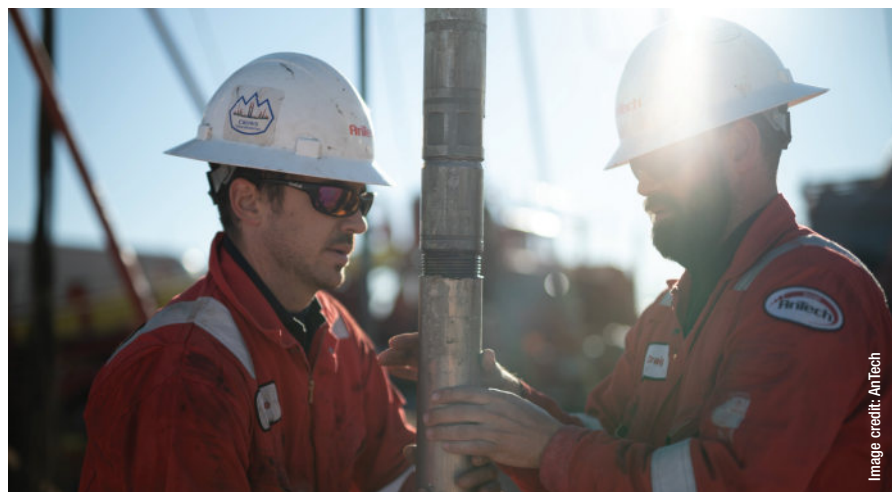
growing marketability of low-carbon products and the physical impacts of climate change are all motivating forces.

And emissions reduction could evolve into lucrative business opportunities, with many of the NOCs already well placed to take advantage. So-called “green LNG”, carbon capture utilisation and storage, as well as more low-hanging fruit such as reducing flaring and fugitive emissions are all under active consideration by several NOCs.

2021 could be a pivotal year, with COP26 in Glasgow in November tipping the balance towards the adoption of further emissions reductions targets. Setting a net zero target may not be achievable or desirable for all NOCs, but those with first mover advantage may reap the rewards of sustainability.

Government decision-makers have a difficult task in balancing NOC cashflows to fund day-to-day spending, maximising extraction of resources in a world moving away from hydrocarbons, while also juggling the risks associated with climate change. ■

Winners of Queen's Awards revealed



AnTech's directional coiled tubing drilling team on location in Texas, USA.

ESTABLISHED IN 1965, the Queen's Awards for Enterprise represent one of the highest official accolades for UK businesses which excel in a variety of fields. The winners of the 2021 Awards have been announced, with a number of energy companies receiving recognition for outstanding work in the most difficult of years.

AnTech

AnTech, a leading designer and manufacturer of products for the upstream oil and gas industry, has been honoured with the Queen's Award for Enterprise for International Trade due to its outstanding overseas growth within a three-year period.

Carly Sugden, finance director, said, "As a UK business operating in a highly specialised global industry, exporting is crucial to our success. Our overseas customers' requirements are fundamental in helping us improve and foster new product development offerings, as new markets bring additional technical or commercial challenges. Our global customer base brings a resilience against oil price volatility and the effects of regional recessions."

Silixa

A driving force in fibre-powered data solutions, Silixa has won the Queens Award's for Enterprise for Innovation for the commercialisation of its Carina Sensing System. This system takes the high-density coverage of distributed sensors beyond that which can be achieved by point sensors. This allows insight for the refinement of existing processes and the development of new applications to improve sustainability, reduce costs, and enhance operational safety across multiple sectors.

Mahmoud Farhadiroshan, founder and executive director Silixa, said, "The Carina Sensing System was developed with support from our investors Chevron Technology Ventures, Lime Rock Partners and Equinor Ventures and has been used by many of the major oil companies. Going forward, we believe that the system's passive monitoring capabilities will create huge potential across a multitude of emerging sectors and applications."

Sonardyne

Also honoured with a Queen's Award for Enterprise in Innovation is marine technology company Sonardyne, whose seabed deformation monitoring system provides engineers and scientists with new understanding of the seafloor and the physical processes that act upon it. Using a network of autonomous, battery-powered instruments deployed on the seabed, the system measures horizontal and vertical seabed movement, at a level of precision that was previously impossible. Initially developed for the offshore industry to identify geological hazards within oil and gas reservoirs, it has since been adopted by the earth science community.

Exceed

Due to 'outstanding short-term growth' in overseas sales over a three year period, during which time the percentage of total sales attributed to export grew from 20% to 60%, Exceed, a well management and performance improvement specialist, has won the Queen's Award for Enterprise for International Trade. Exceed operates across the globe, having project managed 70 wells, delivered performance improvement services on 37 well projects and supported the delivery of 130 decommissioned wells in the UK.

Eni secures onshore Block 7

ENI, THROUGH ITS subsidiary Eni RAK, has been awarded Block 7 located in the onshore of Ras Al Khaimah, United Arab Emirates. The exploration and production sharing agreement was signed between the chairman of Eni RAK, Fuad Krekshi, and the chief executive of the Ras Al Khaimah Petroleum Authority, Nishant Dighe, in the presence of His Highness Sheikh Saud bin Saqr Al Qasimi, member of the supreme council of the UAE and ruler of Ras Al Khaimah.



Block 7 covers an area of 430 sq km onshore Ras Al Khaimah.

Block 7 covers an area of 430 sq km onshore Ras Al Khaimah. Eni RAK will act as operator of the block with a 90% participating interest and Ras Al Khaimah's National Oil Company RAK Gas as a partner with a 10% stake.

Block 7 represents an underexplored acreage in a complex thrust belt geological setting, similar to that of the recent discovery of Mahani in the adjacent Sharjah Emirate. The newly-acquired 3D seismic will allow the joint venture to assess the geological setting of the area and eventually unlock its hydrocarbon potential. The presence of the existing gas processing facilities in the Emirate would also allow a rapid development of any discoveries.

Eni is already present in the Emirate of Ras Al Khaimah operating offshore Block A where, after an initial geological and geophysical study period, preparations for drilling operations have started.

The acquisition of Block 7 represents another step in Eni's positioning in the Middle East and in the UAE in particular, where Eni holds the largest exploration acreage among the IOCs present in the country with more than 26,000 sq km gross, comprising eight exploration blocks onshore and in shallow waters offshore across the Emirates of Abu Dhabi, Ras Al Khaimah and Sharjah.

CH_2O SiH_2Cl_2 Cl_2 H_2S SiH_4 C_3H_8 O_3 H_2 C_2H_2 H_2O_2 $(\text{CH}_3)_2\text{O}$  CH_4 N_2O NH_3 C_7H_8 CO_2 $\text{C}_4\text{H}_8\text{O}$ O_2 C_6H_6 CO

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Dana Gas and Crescent Petroleum resume Khor Mor expansion project

DANA GAS AND Crescent Petroleum have announced the full resumption of the expansion project at the Khor Mor field in the Kurdistan Region of Iraq (KRI), which the companies jointly operate on behalf of the Pearl Petroleum consortium.

The KM250 expansion involves further investment of US\$600mn to add 250 million cubic feet per day of much-needed additional gas production to supply the local power stations. The project construction work had been put on hold due to the COVID-19 pandemic but is now on track for a new target start date of April 2023, after agreement to lift the force majeure with both the Kurdistan Regional Government (KRG) and the contractor.

Under a Gas Sales agreement signed in March 2019 with the KRG Ministry of Natural Resources, Pearl Petroleum will sell the additional quantities of gas to supply the power stations with affordable and environmentally cleaner fuel, and further enhance electricity supplies.



Image credit: Dana Gas

The KM250 expansion involves further investment of US\$600mn to add 250 million cubic feet per day of much-needed additional gas production to supply local power stations.

‘Middle East economic growth to accelerate by H2 2021’

THE ROLLOUT OF coronavirus vaccines should allow a return to relative normality in the Middle East in the second half of 2021, while many of the region's economies will benefit from higher commodity prices and stronger external demand, according to a report Economic Update: Middle East Q1 2021, compiled by Oxford Economics and commissioned by ICAEW.

According to the Economic Update report, the Middle East's GDP forecast for this year stands at 2.5%, similar to the average rate from 2010 to 2019 (2.6%). This follows the unprecedented decline seen in 2020, estimated to be 5.2%.

The report observed that 2021 has got off to a slow start for the global economy due to containment measures aimed at bringing COVID-19 numbers under control. Likewise, countries in the Middle East have had to clamp down, imposing restrictions on travel and their domestic economies to curb the spread of the virus.

The vaccine rollout has been uneven but has progressed particularly well in the UAE and Bahrain, where a relatively large percentage of the population has been vaccinated compared to neighbouring countries and global peers. Overall, according to ICAEW, GCC GDP will grow by 1.4% in 2021, after an estimated 5.4% contraction in 2020.

BP announces gas production from West Nile Delta development

BP HAS ANNOUNCED gas production from Raven field, the third stage of its major West Nile Delta (WND) development off the Mediterranean coast in Egypt.

The approximately US\$9bn WND development includes five gas fields across the North Alexandria and West Mediterranean Deepwater offshore concession blocks in the Mediterranean Sea. BP and its partners, working with the Ministry of Petroleum, have developed the WND in three stages.

Raven follows the Taurus/Libra and Giza/Fayoum projects, which started production in 2017 and 2019 respectively. It produces gas to a new onshore processing facility, alongside the existing West Nile Delta onshore processing plant.

Bernard Looney, BP chief executive, said, “Completing this major multi-stage development in the face of many challenges is testament to BP's long-term commitment to Egypt and our excellent working relationships with partners and the Government. West Nile Delta will make an important contribution to meeting Egypt's growing energy needs, by providing a cost-competitive and resilient gas supply from the country's own resources.”



Image credit: BP

Raven is currently producing approximately 600 mmscf of gas per day.

Lloyd's Register partners with Falkonry to strengthen asset performance solution

LLOYD'S REGISTER HAS partnered with the innovation leader in Operational AI, Falkonry, to combine its predictive digital twins with asset performance and risk management solutions for heavy industry, including chemicals and oil and gas.

The technology partnership will harness Falkonry's Operational AI Digital Twin solution, called Clue, to identify equipment conditions, providing instantaneous alerts on suspect and undesirable behaviour. Lloyd's Register's AllAssets will then enhance the actionability of these alerts through its risk analysis and extensive library of 10,000 recommendations.

The resulting Digital Twin solution is expected to help to generate a holistic plan for ongoing maintenance activity based on new operational conditions, reducing unscheduled downtime.

With this, owner operators will gain a seamless view of risk and real-time conditions based on operational data, creating an end-to-end improvement loop that expedites decision making, delivering the ultimate in equipment performance through modern, digital intervention.

With more than US\$1 trillion per year lost on unplanned downtime, owner operators seeking to improve uptime and reduce costs have much to gain from improved operations and maintenance strategies. Typically, companies monitor equipment behaviour based on operational data but are unable to combine that with risk to effectively prioritise their interventions – creating a compelling case for introducing greater use of artificial intelligence and machine learning capabilities combined with solid engineering expertise.

Dr. Claus Reimers, senior vice-president, digital products, Lloyd's Register, said, “By using real-time data to address challenges before they occur, plant operators will have a better understanding of their asset health on a day-to-day basis, supported by a significant library of solutions to prevent downtime. With our risk and maintenance modules, combined with superior data insights from Falkonry Clue, operators can ensure that their efforts are being focused on the right equipment at the right time, reducing uncertainty and risk in decision making.”

Dr. Nikunj Mehta, founder and CEO, Falkonry said, “We are thrilled to partner with Lloyd's Register to offer a solution that brings asset risk management and digital technology together.”

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Safaniya is the largest offshore oilfield in the world.

Image Credit : Aramco

Looking forward to a brighter future

With higher oil prices, a 30% year-on-year increase in net income recorded in the first quarter of 2021 and the resumption of key projects, Aramco can look forward to brighter prospects this year.

THINGS SEEM TO be looking up for Aramco. Despite the trials and tribulations of the past year, Aramco posted a 30% year-on-year increase in net income to US\$21.7bn for the first quarter of 2021 and declared a dividend of US\$18.8bn to be paid in Q2. The results were underpinned by higher oil prices and an improved economic environment in the first three months of 2021, according to the company, which said its operational flexibility, financial agility and the resilience of its employees also contributed to the strong performance.

Average total hydrocarbon production stood at 11.5mn bpd of oil equivalent in the first quarter of 2021, including 8.6mn bpd of crude oil.

"Given the positive signs for energy demand in 2021, there are more reasons to be optimistic that better days are coming. And while some headwinds still remain, we are

well-positioned to meet the world's growing energy needs as economies start to recover," said Aramco president & CEO Amin H. Nasser.

It has been an eventful year for the oil giant, with recent developments including the launch of the Dammam 7 supercomputer, the acquisition of a 70% stake in SABIC, another step in its transformation to become a major global petrochemicals player, and the Kingdom's first blue ammonia shipment to Japan.

"We made further progress towards our strategic objectives during the quarter and our portfolio optimisation programme continues to

“ We made further progress towards our strategic objectives during the quarter.”

identify value creation opportunities, such as the recent announcement of our landmark US\$12.4bn pipeline infrastructure deal," said Nasser. Under the deal, Aramco sold a 49% equity interest in Aramco Oil Pipelines Company, a newly-formed Aramco subsidiary, to a consortium of investors led by EIG Global Energy Partners. The cash will be used for 'general corporate purposes'. Further such initiatives to monetise the company's assets can be expected, following the creation last year of a division focused on portfolio optimisation. There are even rumours that the company could be looking to bring external investors into some of its oil and gas assets, or possibly selling off stakes in its operations.

In common with its counterparts, Aramco has been forced to cut its cloth, seeing net profit in 2020 dive by 44% as a result of the impact of the pandemic and plunging oil prices. Expenditure for 2021 is set at US\$35bn, significantly lower than the planned US\$40-45bn, although the impact has been mitigated to a certain extent by increased capital and operational efficiencies. The company has also delayed some projects and suspended drilling in some areas. The Baker Hughes rig count indicates that there were only 60 active rigs in March 2021, compared

Image Credit : Aramco



Aramco is focusing increasingly on gas development.

with 114 in March 2020.

However according to a recent report in Argus, the company has resumed tendering and development work on three major offshore oil expansion projects that would boost production capacity by 1.15mn bpd by 2024. The Saudi oil giant has issued tenders for development work at the offshore Zuluf oilfield with a capacity of 825,000 bpd, which is planned to be increased by 600,000 bpd, according to Argus. The expansion project, initially expected to start up in 2023, is now expected to start operations in late 2023 or in early 2024.

Work on the expansion of two other offshore oilfields, Marjan and Berri, had already started at the end of March, said Argus. In July 2019, Saudi Aramco awarded 34 contracts worth a total of US\$18bn to boost the oil production capacity of the two fields by a total of 550,000 bpd to sustain production capacity.

In November 2020, Aramco awarded major long-term agreements (LTAs) to eight companies to boost oil and gas production in brownfield projects, covering EPC, start-up and commissioning. The move is focused on developing partnerships based on sustainability and new technologies, with a strong focus on local content.

“The company has resumed work on three major offshore oil expansion projects.”

Focus on gas

While oil remains the mainstay of the company's operations, gas is an increasing focus, to provide feedstock for the petrochemical industries and replace the burning of oil in power stations. Indeed, the development of gas resources and the transition to cleaner fuels are among the key objectives of Saudi Arabia's Vision 2030 plan. Saudi Aramco achieved a milestone in August, producing a single-day record of 10.7bn standard cubic feet per day (bscfd) of natural gas from its conventional and unconventional fields.

In February 2020 Aramco announced regulatory approval of the development of the Jafurah unconventional gas field in the Eastern Province, the largest non-associated gas field in Saudi Arabia to date, with resources estimated at 200 trillion cubic feet of rich raw gas. Production is set to commence in 2024. Other projects include the Haradh Gas Increment Program, South Gawar Field Development and the Hawiyah Unayzah Gas Reservoir Storage (HUGRS) project, the first underground natural gas storage project in the Kingdom. The project, located 260 km east of Riyadh, includes a plant with an injection facility that will inject surplus pipelines gas into an existing depleted area in the winter months, which can be withdrawn from here when needed to meet the high demand in the summer. Siemens Energy received a contract from EPC contractor Samsung

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Engineering last July for compressor systems for the project.

Aramco recently issued a new tender aimed at expanding the Ju'aymah natural gas to liquids (NGL) facility.

Also a priority is the ongoing integration of SABIC as the chemicals arm of Aramco and the growth of the chemicals and refining business. Speaking at the IPTC conference in March, Aramco Upstream business line head, Nasir K. Al-Naimi, said Aramco envisages a "much larger refining and marketing business, growing to 8-10mn bpd with substantially more chemicals, which will be integrated with our refineries, and take advantage of the research we are doing on direct conversion of crude into petrochemicals."

With the move to cleaner fuels, an area being explored is the conversion of hydrocarbons to hydrogen and then to ammonia, while capturing the CO₂ created during the process. In August, Aramco exported the world's first shipment of high-grade blue ammonia to Japan for use in zero-carbon power generation, a significant step towards sustainable hydrogen usage.

Another focus area is non-metallics. The company has set up a joint venture with Baker Hughes to commercialise a broad range of non-metallic products for non-metallic applications in the energy sector.

Pushing technology boundaries

Technology and innovation are key to delivering more energy with fewer emissions, as the company seeks to reduce its carbon footprint. Al-Naimi commented at the IPTC conference,

"The importance of cutting edge technology cannot be underestimated. To ensure energy security and reliability for the world going forward, three factors will be critical to success. They are groundbreaking technologies; innovation; and collaboration among oil and gas companies, new energy companies, energy equipment manufacturers, service providers, technology developers and all other stakeholders, including governments."

“Technology and innovation are key to delivering more energy with fewer emissions.”

In January, Aramco partnered with stc, a leading telecom and technology services company, to launch one of the world's most powerful supercomputers, Dammam 7. Its high-performance computing capability of 55.4 petaflops presents new opportunities in both exploration and development, enhancing



Image Credit : Aramco

Aramco's ability to predict the location of new reserves using sophisticated imaging and artificial intelligence deep learning technologies.

Dammam 7 supports Aramco's digital

transformation programme, complementing a suite of advanced technologies that are reshaping core operations, driving efficiencies and reinforcing Aramco's industry leadership. ■

Welltec signs long-form contract with Saudi Aramco

GLOBAL TECHNOLOGY COMPANY Welltec has announced the agreement of a Long-Form Contract (LFC) with Saudi Aramco. Following an extensive approval process, the deal will see Welltec deliver completion products and services across the Saudi Aramco portfolio in any environment.

"Welltec began installing WAB (Welltec Annual Barrier) metal expandable packers for Saudi Aramco in 2014 as part of a technology trial, and the award of a long-form contract demonstrates how far we've progressed since then," said Kevin Wood, well completions sales director for Welltec Middle East.

Wood added, "Confirmation of this award represents a major step in our partnership with Saudi Aramco, which also enables us to continue along the path of exemplary service quality in the execution of completions. With more products being qualified through Saudi Aramco this year, and the addition of an in-country Welltec manufacturing facility, it's greatly appreciated that Welltec have been recognised through this award."

"The LFC is the highest level of contract in the Saudi Aramco procurement processes," explained Hani Sagr, area vice president for Welltec Middle East. "It provides the best possible foundation for the provision of our technology and services to Saudi Aramco, enabling us to continue growing our partnership as well as our overall presence in the region."

"The qualification process included a number of site visits, inspections and audits, with full and detailed reports covering the entire Welltec organisation with particular focus on our manufacturing process," added Sagr. "This is not only an excellent recognition of the great teamwork between Welltec and Aramco, it also highlights our commitment to the IKTVA program geared towards in-Kingdom value creation."

The combination of this award and the continued expansion of in-house manufacturing at a local level serves as an excellent platform for the future and continued growth in neighbouring countries, the company commented.

Lamprell awarded EPCI contract

LAMPRELL, INTERNATIONAL SERVICE provider to the energy industry, has been awarded an Engineering, Procurement, Construction and Installation (EPCI) contract by Saudi Aramco as part of their Long-Term Agreement Programme (LTA) with Lamprell. This is the organisation's second award under the LTA framework. Scheduled for completion in 2022, the scope of work includes the supply and installation of three drilling jackets and two new single well observation jackets/decks.

Christopher McDonald, CEO, Lamprell, said, "We are very honoured to have been awarded a second contract by Saudi Aramco and look forward to delivering the project safely and on time. This is an excellent result for the business and has resulted from many months of dedication and rigour from our bid and proposals team. With Saudi Arabia very much part of our oil and gas focus, this award represents a significant success for us."

In February, the company won an EPCI contract for two offshore production deck modules and associated pipeline and subsea cables in Saudi Aramco's Marjan Field.

King Salman Energy Park (SPARK) makes headway

KING SALMAN ENERGY Park (SPARK) in Dammam is on track to become the world's leading energy-focused ecosystem.

Dubai-based Oilfields Supply Center Limited (OSC) awarded a contract to India's Larson & Toubro in April to design and build one of the world's largest oil and gas supply bases at SPARK, with a total investment of US\$570mn.

Measuring one million sq m. and including multiple areas and zones, the base is critical to localising the entire energy supply chain, enabling investors to supply the wider region and derive maximum benefit from their presence at SPARK, a fully integrated global energy and industrial hub designed to fuel the growth of the energy sector as well as driving the diversification and localisation agenda.

Dr Mohammad Yahya Al-Qahtani, chairman of the SPARK board of directors, said, "Strategically located in the centre of the region's energy market, SPARK is focused on offering investors easy access to demand for energy products and services. OSC's supply base is a key component of this strategy to create an environment favourable for



OSC rendering.

international and local companies as well as SMEs to accelerate localisation in Saudi Arabia. OSC offers pre-built industrial solutions that reduce the risk of the establishment phase for investors, in addition to offering a full suite of support services. The base is expected to create thousands of jobs in the energy fields."

Iqbal Mohammad Abedin, director and general manager of corporate affairs at OSC, added, "We anticipate an increase in demand

for our industrial facilities; all phases of work will be completed in the last quarter of 2023."

It is forecast that foreign direct investment in SPARK will exceed US\$2bn over the next two years, with companies such as Schlumberger, Halliburton, Yokogawa, Baker Hughes, Halliburton, TAQA, Al-Rushaid Group, NAPESCO and Sawafi-Borets developing industrial facilities, factories and services centres. By 2035, the park is expected to provide up to 100,000 jobs and localise more than 350 new industrial and service facilities.

Spanning an area of 50 sq km, SPARK supports investment in the oil and gas, refining, petrochemical, power, and water production and treatment industries. It has completed 80% of its first phase, which consists of infrastructure, roads, utilities and real estate across 14 sq km in addition to a dedicated 3 sq km logistics zone and dry port.

SPARK has a strong focus on environment protection and sustainability, and is the world's first industrial city to achieve Leadership in Energy & Environmental Design (LEED) Silver certification.

Image credit: King Salman Energy park

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The impact of diversity and inclusion in oil & gas

Vidya Ramnath, president, Automation Solutions Middle East & Africa (MEA), Emerson, discusses the benefits of promoting a culture of diversity and inclusion in the oil and gas industry.

AS DIVERSITY & Inclusion is often recognised and referred to as a single concept, these two ideas stand as separate thoughts that operate hand-in-hand. Both concepts require distinct acknowledgment and understanding from all parties, but remain interrelated.

In terms of etymology, diversity is the full spectrum of human demographic differences that includes race, religion, gender, gender orientation, age, socio-economic status, or physical disability. On the other hand, inclusion is the cultural and environmental feeling of belonging, where it can be assessed as the extent to which employees are valued, respected, accepted, and encouraged to collaborate and contribute in the society, organisation, or group that they are part of.

Diversity may be the platform that supports the development of an organisation, but it is the inclusion that elevates that initiative.

Having been a significant topic on the business development agenda over the past several years, diversity and inclusion may be an ambitious feat, but not impossible to achieve – and may have already been developed and nurtured into flourishing enterprise programmes over the few years of incubation. However, it is a glaring fact that the energy and oil & gas industry to date still lacks a strong track record in championing and cultivating diverse talent.

Based on the Women's Human Rights Report Series, it is evident that women are significantly under-represented, especially in most prominent extractive industries such as oil, gas, and mining.

A clear picture of this has been painted as described in Catalyst's research where they have stated that there are fewer women in the oil and gas industry than almost any other major industry. Women account for less than a quarter (22%) of employees across this industry, while gender diversity decreases as the ladder of authority goes up. Across the globe, the percentage of women accounts for 27% of entry-level positions requiring college degrees, 25% of mid-career roles, 17% of



Image Credit : Adobe Stock

Oil and gas companies are increasingly realising the benefits of a more diverse and inclusive culture.

senior/executive-level roles, and only 1% of women leaders at the CEO level.

Even though the oil and gas industry is faced with these numbers, the workforce remains hopeful for change. Based on a survey conducted by the New Mexico Oil and Gas Association, 91% of respondents believe that the industry is experiencing an era of monumental change and 94% believe that diversity of thought and experience is key in navigating the disruption.

And they are right when they say that the industry is changing – the landscape is shifting, and the industry is in significant need of skilled young talent.

The oil and gas sector is facing a slow, yet

inevitable challenge of an ageing workforce – the impending "crew change" where experts are expected to hand over their key to a younger generation. The industry will require a continuous influx of a skilled younger workforce to ensure that their ROI is protected in terms of productivity – a vital component in any company's success.

With these challenges thriving in the absence of diversity, organisations will continuously miss the mark on achieving key insights and innovations, two components that can drive opportunity and growth. To address these issues, leaders are called upon to invest in building a diverse talent pipeline that spans across all levels, as well as to

inspire their people to eliminate the unconscious bias against inclusion – the very bias that keeps their talent from succeeding.

In Emerson, the working environment is cultivated based on trust and support starting at entry-level positions all the way up to the C-suites. The organisation is dedicated to a culture of inclusion – one of Emerson's major causes – wherein they recruit, hire, and promote people in all job classifications with equity and without discrimination. This also includes investing in people with specialised programmes to ensure that they are prepared for the knowledge and training needed to rise in their careers. This approach by Emerson to foster diversity and inclusion is built around three pillars: people, culture, and communities.

With a great appreciation of diversity within Emerson, the company continuously develops Women in the Workplace which plays a major role in the achievement of its diversity and inclusion goals. Emerson's efforts led to the recognition of its peers in the region as they were identified as one of the top three companies in the Diversity & Inclusion category of the ADIPEC 2020 Awards.

With the release of its 2019 Corporate Responsibility report, Emerson highlighted how it has combined industry-leading



Vidya Ramnath, president, Automation Solutions Middle East & Africa (MEA), Emerson.

technology and groundbreaking innovation to make a positive impact on employees, customers, and communities globally. Emerson aims to empower safer and sustainable operations worldwide through transforming not only their operations but those of their customers as well. A key CSR

Image Credit: Emerson Automation Solutions

programme led by Emerson included people investment, which was featured in the 2019 Employee Culture survey, where the organisation saw progress in the effort to cultivate a positive workplace. The membership in Emerson's Women in STEM resource group has also grown by 27% around the world. Emerson also developed the "We Love STEM" campaign – a series of videos for children that showcased topics such as the importance of female role models in STEM.

Emerson believes in bringing together a diverse group of people from a variety of backgrounds and cultures, promoting the birth of new ideas and exciting energy levels. The organisation is committed to creating a diverse and inclusive work environment, recognising how it contributes to the rich exchange of ideas that inspire innovation, bringing the best solutions to its customers. ■

Vidya Ramnath is Emerson Automation Solutions' first female president for the Middle East and Africa region. Starting in her career as a mechanical engineer, Vidya has moved up the ranks and was acknowledged by Forbes in 2020 as one of the Middle East's 100 Most Powerful Businesswomen.

OGUK launches diversity and inclusion report

OIL AND GAS UK (OGUK), the leading representative body for the UK offshore oil and gas industry, has issued a publication entitled: *Building a Baseline – Diversity & Inclusion Survey Report*.

The OGUK Diversity & Inclusion Task Group (D&ITG) was created in 2019 to drive the agenda on diversity and inclusion in the sector, catalyse action and share good practice. Last year, it launched the first ever industry-wide Diversity and Inclusion (D&I) survey to engage directly with the workforce and gain a more complete understanding of the current position of diversity and inclusion in the sector, in order to focus its drive for change and ensure continuous improvement. Around 1,600 people from more than 100 different organisations across 23 job families completed the D&I survey, providing a powerful insight into some of the key challenges for the industry. The survey data has enabled OGUK to identify five specific areas for improvement and focus over the next 12-18 months:

Inclusive and diverse leadership and culture:

Culture is pivotal to the success of any D&I initiative and this starts at the top. 'D&I leadership and awareness' and 'a more diverse leadership team' were in the top five activities identified to create a more diverse and inclusive workplace identified by respondents to the survey, and it is clear that a committed focus and a determination to drive change in this area has the potential to be transformative.

Inclusive recruitment and flexible pathways:

Inclusive recruitment was also identified by respondents as a critical activity to improve D&I. Disabled employees, in particular, highlighted that access to career opportunities was an issue for them. Women scored lower than men on how they feel they are perceived at work, and were more likely to view lack of flexible working as a barrier to career progression. The percentage of ethnic minority graduates does not translate to an equivalent representation in the sector, and it will not be possible to change the gender demographics of the sector through graduate recruitment alone.

More flexible pathways and entry routes into the industry will therefore need to be developed in addition to the development of more inclusive recruitment practices.

Diversity and inclusion in SMEs:

Smaller or medium-sized supply chain companies are less likely than operators and larger supply chain companies (more than 1,000 employees) to have a strong D&I culture. Mid-size companies (251-1,000 staff) scored lowest, with lacking clear D&I targets and the ability to measure the impact of D&I in the organisation identified as the key gaps.

Flexible working arrangements:

Flexible working was also identified by respondents as a top activity to create a more diverse and inclusive workplace, and the number of employees across the industry working flexibly at the moment is very high. However, 49% of respondents to the survey only started working flexibly as a result of the COVID-19 lockdown, and 17% of respondents have never experienced any flexible working arrangements, particularly those working in offshore, operational, terminal or facility management roles. There is a clear opportunity to do more in this area.

Focus on 31-40 age group:

This age group are the next leaders of our industry and yet score the lowest compared to other age groups in relation to their organisation's D&I commitment and culture. This important mid-career stage often finds employees pulled in multiple directions with new family responsibilities and/or increased operational or new management responsibilities. If this age group does not feel supported, the industry runs the risk of marginalising or losing diverse talent and undermining its efforts to build a more diverse and inclusive culture at this pivotal stage.

For further information, see www.diversityandinclusioninenergy.co.uk

Challenges on the way to a circular economy

The adoption of digital technologies is critical for chemical companies to progress towards challenging circular economy goals, says Paige Marie Morse, industrial marketing director, Aspen Technology.

ACROSS THE CHEMICAL industry, sustainability is a hot topic for organisations, customers and investors alike. To remain competitive and relevant in the marketplace of tomorrow, companies must work to grow the “triple bottom line,” balancing the impact of their operations on people, planet and profits. ARC Advisory Group recently confirmed that most global chemical companies have sustainability initiatives in place, and they view digital technologies as critical to progressing their work, although many are struggling to adequately resource their efforts.

Surprisingly, the pandemic has only served to emphasise and renew the focus on sustainability. The collective health of communities and our planet, and the interlinked nature of climate, ecology and social crises, have all become clearer in 2020. Corporate resilience and long-term survival are common discussions these days, in boardrooms and investor events (albeit virtually at least for the foreseeable future). Sustainability is here to stay.

Meeting corporate sustainability goals

The sustainability challenge for most companies typically unfolds across two different timelines: short-term efficiency improvements to help reduce carbon emissions, water use and waste production for current operations, and longer-term efforts to develop new energy sources and products for the circular economy. Resource efficiency improvement remains an important immediate activity area for manufacturers who could see

“The sustainability challenge for most companies typically unfolds across two different timelines.”



Image Credit: Adobe Stock

The path to a circular economy will not be an easy one for chemical producers.

as much as a 30% reduction in energy use, according to the International Energy Agency (IEA). The IEA is urging countries to link pandemic recovery funds and energy efficiency improvements to encourage progress.

Achieving a circular economy: an ambitious goal for chemical producers

Developing solutions to address the challenge of the circular economy exacts particular demands for the chemical industry. This concept takes the broad view that products and processes must be completely redesigned to cut emissions and waste, while also working to extend material use and regenerate natural systems.

The targets are ambitious, and businesses have a long way to go. In its recent report, *Winning in a Circular Economy*, Accenture says that of the 140 million tons of chemical

products consumed in Europe each year, only nine million tons becomes available in recyclable waste streams. The report also explains that almost 70% of the material consumed is neither accessible for recovery nor recyclable since the chemicals are either dispersed in the environment or unable to be separated from the final product.

In early December 2020, BASF held its annual research press conference to present its Circular Economy Program as well as some of the challenges the company is encountering as it ramps up sustainability efforts. BASF has more than 20 circular economy projects underway currently with an aggressive target to convert 250,000 tons of recycled and waste-based raw materials into new products annually by 2025. “The path to a circular economy will require enormous effort on our part,” said BASF CEO Dr. Martin Brudermueller. “I am absolutely convinced that this is the way of the future: our success will

have a direct effect on our future profitability and competitiveness.”

Innovation strategies are fundamental for chemical companies to progress toward circular economy goals, and digital technologies are critical to accelerating this effort. Innovative supply chain solutions are already helping companies to better integrate post-consumer materials into their value chains, while advanced process control technologies are helping to lower energy use and waste generation in production processes.

Adapt your processes, stay profitable with AI-powered hybrid modelling

For longer-term product and process development, process simulations help researchers quickly screen a variety of alternatives to select the most viable and cost-effective option, whether for new polymer production or for chemical recycling processes, while also comparing the energy demand and CO₂ emissions for each alternative. And these simulations are even more accurate and accessible using Aspen Hybrid Models, which combine artificial



Paige Marie Morse, industrial marketing director, Aspen Technology.

Image Credit: Aspen Technology

intelligence (AI) with first-principle model design and domain expertise. Engineers can now build enriched process models faster using machine learning to leverage simulation or plant data, integrating application knowledge including first principles and engineering constraints, without requiring deep process or AI expertise.

The value and importance of using AI to speed progress toward circular economy goals is highlighted by the Ellen MacArthur Foundation, which works to develop capabilities and policies to drive circular economy progress worldwide. AI is particularly valuable to aid design of circular products, enable new business models, and to optimise infrastructure. Ambitious global climate goals will require faster solutions and coordinated activities to ensure progress.

“AI technologies can be applied to three key aspects of a circular economy: design circular products, components and materials; operate circular business models; and optimise infrastructure to ensure circular flows of products and materials,” says the Ellen MacArthur Foundation, in its report *Artificial Intelligence and the Circular Economy*, 2019. ■



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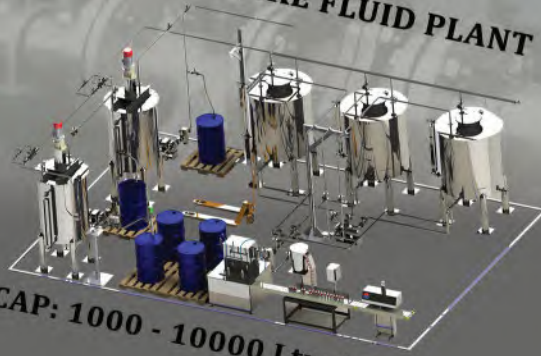
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Port of Fujairah prepares for age of transition

At the 12th International Fujairah Bunkering & Fuel Oil Forum (FUJCON), speakers discussed the volatility of the future storage and bunkering market, as an array of fuels are set to come to the fore, and how ports will have to adapt to accommodate this.

THE PORT OF Fujairah is one of the largest commercial ports in the Middle East and is of immense strategic importance for maritime businesses that require service in the region. At the 12th International Fujairah Bunkering & Fuel Oil Forum, organised by Conference Connection, attendees were treated to a host of speakers who explored the development of the port from the beginning of its operations in 1983 to its wide influence today where it holds a variety of accolades such as the second largest bunkering hub in the world, the largest commercial storage capacity for refined products in the Middle East and ranks in the top three largest storage hubs in the world.

Speaking on the importance of the port, Salem Al Hamoudi, director of Fujairah Oil Industry Zone, commented, “Fujairah is perfectly located to bridge the time zone gap between the east and west and benefits from state-of-the-art waterfront infrastructure. Oil storage capacity has seen a growth from 3.2mn cu m in 2011 to more than 10mn cu m in 2018 with 16 national and international oil terminals operating. There are plans for the port to expand its refining capacity to cater for the growing demand for bunker fuel and boost its storage capacity to exceed 17mn cu m in the next three to four years.”

Speaking on the recent and future developments of the port Martijn Heijboer, business development manager, Port of Fujairah, added that since 2019 Fujairah has reached some great achievements and milestones including:

- The construction of a service harbour dedicated for utility vehicles to support the Fujairah anchorage area. The port itself can now hold 120 vessels.
- Commencement of the construction of a new deepwater bulk handling terminal which will handle mostly limestone for export but also aggregates from surrounding areas. This is expected to be finished by 2022 and will eventually be transformed into a multi-use facility.
- Completion of a two-year project which



The port of Fujairah has the largest commercial storage capacity for refined products in the Middle East.

Image Credit : Port of Fujairah

“Fujairah is perfectly located to bridge the time zone gap between the east and west.”

included the upgrading of existing container and general cargo terminal and construction of new container handling facilities.

- In terms of bunkering, the port has seen the implementation of IMO 2020 regulation and currently has four bunker barge berths for MGO (marine gas oil) and low sulphur fuel oil (LSFO) loading with 84% of volumes sold last year from these two sources. The Fujairah bunker market did not decline significantly in 2020 but actually witnessed a rather steady year for bunker fuels with close to 9mn cu m sold at Fujairah offshore anchorage.
- Record oil volumes handled at the Fujairah oil department. In 2019 there was a 50% increase from the previous year and 2020 nearly matched this despite the Covid-19 pandemic.

Heijboer continued, “We believe there is still room for growth and perhaps as early as

this year we could take some investment decisions to expand infrastructure. We also see expansion in the storage landscape with 2.4mn cu m in the pipeline related to extension projects, and see some terminals approving their connectivity with the port to accommodate more volumes.”

Heijboer added that there are serious talks around jetty expansions, which would be a great chance to add Liquid Petroleum Gas (LPG) loading arms and infrastructure alongside LNG-related facilities.

Bunkering fuels for the future

While the port of Fujairah is currently in a strong position, the representatives recognised that the market for bunkering and storage was dramatically changing alongside the increasing demand for action on climate change. The International Maritime Organisation (IMO) as part of its Initial Strategy to reduce greenhouse gas (GHG) emissions, has committed to cutting the carbon intensity of international shipping by at least 40% by 2030 and to reduce annual GHG emissions by at least 50% by 2050 (compared to 2008). The organisation has noted that a key factor in reaching these goals, will be the adoption of cleaner fuels and the Fujairah

representatives acknowledged that, in the not so distant future, significant investment will be required from ports to accommodate this transition away from fossil fuels. As Lars Liebig, managing director for Uniper Energy DMCC, commented on a separate panel at Fujcon, “No one who is buying green fuels will want it transported to them on a vessel which burns fossil fuels. Inevitably bunker fuels will become green as well.”

Liebig and his fellow participants explored a handful of these fuels of the future in more detail:

LNG

Touted as the ‘bridge fuel’ between oil and green fuels, much of the maritime industry has turned its attention to LNG bunkering as a low-hanging fruit to quickly reduce carbon emissions with a report by SEA-LNG and SGMF suggesting that greenhouse gas (GHG) reductions of up to 23% can be made by switching from oil-based marine fuels to LNG.

Many ports have already begun the transition of facilitating LNG bunkering. Saunak Rai, general manager of FuelLNG, noted that in Singapore, LNG bunkering is already in full swing with more than 300 truck-to-ship LNG bunkering operations carried out in a safe and cost efficient manner. Regular ship-to-ship bunkering has also commenced from 2021 with the FuelLNG Bellina, Singapore’s first LNG bunkering vessel. Rai believed that LNG bunkering could thrive in the market now and while it would require continuous investment, bunker providers could make use of much of the existing infrastructure already present in most ports.

Vivek Chandra, LNG entrepreneur from Australia, was optimistic on the future of this fuel, but took a more conservative stance, explaining that while there is an enormous amount of LNG infrastructure in place across the world, this is geared towards supplying large off takers like provincial gas companies and not towards smaller scale supply direct to customers such as bunkering. Additionally, he noted, there is the difficulty of regulations which take a long time to overcome, and so it would be a long while before this could be introduced to ports around the world. In short, LNG was still very much in its ‘infant stage’.

LPG

Turning to LNG’s distant cousin, Anders Onarheim, CEO of BW LPG, discussed his company’s experience with Liquid Petroleum Gas (LPG) whereby they plan to retrofit 15 ships to run off the fuel. He commented, “We see LPG as a reliable fuel, available in major ports with smaller ships able to do ship-to-ship bunkering and it can be made easily stored onshore. We have four ships on the water today, capable of loading and bunkering at the same time and able to use a combination of fuels due to the dual engines – they are performing very well. By retrofitting, rather than building new, we have generated



The Fujcon panellists discussed the future fuel landscape post 2020.

35% less carbon footprint and without too many complications. In the future, the LPG engines can be converted to take ammonia as well. If we want to think broadly, there are around 7,500 ships in total that could be converted to LPG fuel, and we think it is a very good alternative.”

The drawback with LPG is its relatively high expense which can, and has, held many companies back from making the investment. Onarheim admitted this was true but suggested that looking at forward prices compared to compliant fuel BW LPG are looking at getting a very nice pay back over the next five to six years.

Methanol

Chris Chatterton, COO of Methanol Institute, championed the use of methanol, a fuel which can be produced from renewable energy and can reduce CO₂, nitrogen oxides and sulphur oxides, not to mention its relative predictable pricing. Chatterton explained, “Methanol is already available in most ports around the world because it is a petrochemical building block and used in fuel blending products. It has been bunkered now for over five years in Sweden and we will likely demonstrate methanol bunkering in May in an EU port which will more or less just demonstrate its simplicity to do so.”

Liebig added, “It can be used already with existing infrastructure. You don’t actually need to change much with regards to storage/tankage/, bunker barges or onboard infrastructure – all you need are a few minor modifications on the vessel. Interest is coming and it is being pushed. There are concerns in the market from industry players but we just need to keep providing solutions.”

Biofuels

While often disregarded for the relatively high cost and lack of expertise surrounding it, there have been a number of voices and large companies paying increasing attention to biofuels which emit far less sulphur and carbon

emissions than traditional fuels and can also be blended with them. Taking an unwavering optimistic stance, Gary Hubbard, chief commercial officer of Neutral Fuels, spoke on the versatility and availability of biofuels as a viable alternative to fossil fuels. He commented, “Biofuels is a now solution. We know feedstock is available and I believe it can be a drop in replacement for diesel. They have been available in Europe since the middle of last year and every single metric has been positive. Power output is not reduced, emissions have been reduced. We are literally sitting here with a fuel that ticks all the boxes. The more that can be done in the global waste management sector to optimise our waste into usable biofuels, the cheaper this fuel becomes. Ultimately it is operationally sustainable as well as environmentally sustainable.”

A mixed fuelscape

As the panellists observed over the course of the session, the fuels discussed were just a handful of alternatives which have been put forward as an alternative to fossil fuels, to accommodate the transition to a carbon free world. In common with others not touched upon such as hydrogen or ammonia, each had positives but also drawbacks and it was clear that no single fuel would be the solution.

As Rai observed, the future fuelscape is really going to be a fuel mix, incorporating a host of alternative fuels which will be used alongside fossil fuels and, importantly, each part of the world will have a solution where this mix is different. Such a world will pose a challenge for ports such as Fujairah which will need to invest heavily in bunkering and storage facilities in order to accommodate this mix, however, as demonstrated by the first panel and reiterated by Liebig, Fujairah is relatively well positioned to do so, and is making the right investments to stay ahead of this change. If it continues to do so it will be on course to retain and even increase its importance as an energy hub in the Middle East and beyond. ■

Improve productivity while lowering costs

Apurva Sharma, team leader – industry management at Endress+Hauser, discusses the company's storage and bunkering solutions.

OPERATORS OF TANK farms and terminals face various challenges in an ever-changing environment: handle highly valuable products safely and efficiently, track capacity and turnovers, monitor quality, prevent overflow, and reduce loading and unloading times. To ensure a long-term competitive advantage, processes need to be flexible and expandable to adapt to new or changing conditions easily. Furthermore, a high standard of safety is required to reliably protect people, environment, and assets.

In such a situation, having reliable and modern measuring instruments, software and solutions help both owners and operators of storage facilities to reduce inventory costs, improve customer satisfaction and increase productivity. An important aspect of the complete operations is availability of high-quality online and real time data which will aid in effective decision making.

Here we see some of the measurement solutions for storage, inventory management and bunkering operations for all kinds of bunker fuels from heavy fuel oil (HFO), marine gas oil (MGO) to liquefied natural gas (LNG) that Endress+Hauser has to offer.

Storage and inventory management solutions

In times where a wealth of data is available, businesses often still lack the right information. From simple monitoring and visualisation of tanks and silos up to highly accurate tank gauging and inventory monitoring on a global scale, our solution for inventory monitoring guarantees complete inventory visibility 24 hours a day, seven days a week, anywhere in the world. Inventory monitoring solutions allow you to make transparent business decisions.

Endress+Hauser also supports in the optimisation of supply chain with individual software solutions for inventory management and the seamless integration of this data into the ERP systems.

LNG storage tank gauging

From the day of an LNG tank being commissioned, it may be years before it comes out of service. For safe operations and optimum availability, a typical LNG tank will have a wide range of measurement instruments to measure liquid level, liquid density, liquid and vapour temperature, liquid and vapour pressure, skin temperature and much more. Typically, each tank would be fitted with two level gauges configured as a primary and a secondary, and an alarm gauge. In addition, there would also be an LTD gauge for density profile measurement.

The primary and secondary gauges can be either servo and/or radar operated units also mounted on the tank roof. The purpose of these gauges is to provide continuous liquid level measurement, and average liquid temperature measurement. They provide redundancy on the measurement of level and temperature. The average liquid temperature is derived from a multi-point temperature sensor device.

The alarm gauge is often a servo or radar-based gauge configured

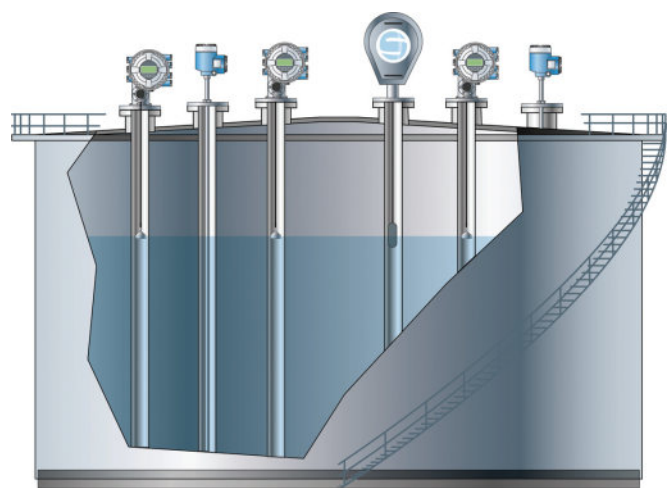


Image Credit: Endress+Hauser

LNG tank and instrumentation.

to provide volt free contact alarm status to an independent system. The alarm gauge is often connected to the LNG tank management system so that its operational status can be monitored.

The LTD gauge is a servo operated unit mounted on the tank roof. The purpose of the LTD gauge is to take accurate profiles of temperature and density throughout the liquid, and whilst not profiling provide continuous liquid level, temperature, and density measurement.

Bunkering metering system

Ship owners and barge operators have increasingly been installing special bunker fuel metering systems that ensure transparent and highly accurate bunkering. These systems contain Coriolis flow meters (MFM – mass flow meter), which have been tried and tested for decades in custody transfer applications. Even certain port authorities have stipulated these measuring systems for bunkering operations at their ports under strict control. Endress+Hauser has over 250 installations worldwide on various barges and vessels.

Advantages of using a mass flow meter-based bunker metering system

- Ease of operation
- Gains in efficiency
- Better process transparency
- Improved measuring accuracy
- Historical data storage – audit trail possible
- Safety

For LNG bunkering, Endress+Hauser can not only provide the metering systems but also Raman Analyzer which provides in-line real time composition of the LNG. This is a unique offering from Endress+Hauser. ■

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The KwiDF has grown into one of the leading digital oilfield implementations in the E&P industry.

Image Credit: Halliburton

Leveraging the digital oilfield to transform operations

Mohammad Al-Hamer, Kuwait Oil Company and Hemant Kumar, Halliburton discuss how the two companies are collaborating on the implementation of an integrated digital oilfield to improve production efficiency and reservoir recovery.

IN THE LATE 2000s, Kuwait Oil Company (KOC) launched a programme to bring digitalisation to the hydrocarbon producing fields in the North Kuwait (NK) asset. It started with a pilot project covering 49 wells (out of 1,200+ onshore wells in NK) to assess the value of digital technologies. Over the next decade, the programme, named KwiDF (Kuwait Integrated Digital Field), would grow into one of the leading digital oilfield implementations in the Exploration and Production (E&P) industry, both in terms of its scale and ambition. With the recent announcement of Phase 2, representing the expansion of Phase 1, KwiDF is set to leapfrog the digitalisation efforts across all KOC's producing assets in Kuwait. As KOC's technology partner, Halliburton will support this expansion, leveraging the DecisionSpace365 platform.

Business drivers for KwiDF

More than 70% of production globally comes from mature fields today – some of them producing for several decades. With age come operational challenges such as reservoir productivity decline, well integrity and flow assurance issues, equipment malfunction and unstable well behaviour.

“The labour-intensive mode of operations reduced visibility of the operating conditions in the field and delayed the response to anomalies.”

Fields in NK, several decades into production, had started to show signs of the same late-life challenges, including declining reservoir pressure, increasing water cut and frequent trips/failures of surface and downhole equipment, to name a few. Further amplifying these issues was the prevailing operating model in NK. Day-to-day production monitoring relied on the field technicians travelling to the remote well sites for data gathering. The asset specialist teams in the office waited for the data to come from the field so that they could do performance analysis, which itself would be a time-consuming effort given the sporadic data and lack of the right tools.

The labour-intensive mode of operations reduced visibility of the operating conditions in the fields and significantly delayed the response to anomalies, which often festered unnoticed until they caused production downtime. Costs went up too due to frequent well intervention activities needed to keep up the production.

KwiDF Phase 1 – delivering the foundation for growth

KwiDF sought to be an answer to these issues, with specific goals to improve well performance, unlock workforce productivity and reduce cost. The initiative was set in motion with KOC selecting Halliburton to implement a pilot project targeting the following digital capabilities:

- Outfitting 49 wells from NK Sabriyah field with wireless sensors and setting up appropriate technology infrastructure to bring real time data from the well sites to office
- Integration with existing KOC data sources and models including third party data sources (real time historian, production, completion and corporate), third party well and network modelling tools and in-house data sources

- Smart alarms for exception-based surveillance
- Work process automation to speed up engineering tasks (e.g. performance analysis, diagnostics, model calibration)
- Dashboards to deliver context-specific data visualisation to KOC users.

Nine well and reservoir management workflows were targeted for digitalisation, of which the ESP (Electrical Submersible Pump) surveillance and optimisation workflow became one of KwiDF's most important, given over 70% of the NK wells are producing with ESPs. The workflow delivered exception summaries, smart alarms, detailed well information, diagnostic tools and an optimisation engine. The latter allowed users to rapidly evaluate various opportunities for production gain such as changes in pump frequency or well head pressure, thus saving time for the KOC users who would manually perform those tasks.

The pilot demonstrated tangible benefits in terms of productivity increase and faster decision cycles. This encouraged expansion to 140 wells followed by a full-scale roll out of the entire solution covering nearly 1,200 wells and five gathering centres in NK, culminating in full operationalisation of Phase 1 in 2018. As part of that, a state-of-the-art collaboration centre was also constructed to facilitate inter-disciplinary collaboration and streamline communication between the field-based operations team and office-based technical specialists.

Phase 1 yielded a 4-5% production increase as observed by KOC, resulting from early detection of anomalies and faster response to them. Staff productivity multiplied due to work process automation, which minimised human efforts on low-value repetitive tasks such as data gathering, filtering, model update and production reporting.

“Phase 1 yielded a 4-5% production increase as observed by KOC.”

KwiDF Phase 2 – expanding and sustaining value

Phase 2 expands the KwiDF scope to target value creation in new areas such as reservoir management, production optimisation and operational efficiency improvement. Expansion identifies the following four key initiatives that will be deployed on top of the DecisionSpace 365 platform. The platform will leverage existing functionalities of Phase 1, but also deliver more advanced capabilities in the form of digital twins incorporating machine learning models and data from advanced subsurface sensors and IoT devices on wellheads and the pipeline network.

1. Intelligent reservoir management (IRM)

IRM will advance understanding of the NK reservoirs to enable field development planning and waterflood surveillance and optimisation. A full field digital twin integrating subsurface and surface performance models will be developed to aid evaluation of field development scenarios, including adjustments to waterflooding strategy. Near wellbore sensors will be deployed to measure field resistivity and achieve superior reservoir characterisation.

2. Well productivity and uptime optimisation (WPUO)

This initiative will augment the well performance management solution delivered in Phase 1. New digital capabilities such as predictive analytics developed using machine learning techniques will assist in early identification of abnormal well conditions and definition of optimal remedial action, thus maximising well uptime and productivity.

3. Integrated production optimisation (IPO)

Over the years, the complexity of NK operations has seen a steady rise. Asset teams are challenged to meet the production targets against dynamic flow bottlenecks in the production network and unplanned remedial or safety critical activities, rendering parts of the production system unavailable.

The digital enablement of IPO will centre on a digital twin,

underpinned by automated work processes and data visualisation, offering an integrated representation of wells, pipeline network and surface facilities. It will assist in running NK producing assets to their full potential through identification of optimal network routings and operating set points. It will also aid decision making on actions to mitigate unexpected production shortfalls caused by operational upsets.

4. Pipeline monitoring (PMON)

PMON will focus on maintaining productivity and integrity of in-field pipeline network by enhancing data and analytical capabilities. Additional sensors will be installed to allow continuous measurements of flow condition and assure the quality of the network model incorporated in the IPO digital twin.

The digital twins mentioned above, through on-demand simulation of the NK production system and its constituents (reservoir, well, pipeline network and facilities), will offer a deeper analysis of hydrocarbon flow behaviours and how they respond to changes to operating set points. NK asset teams can then identify flow bottlenecks, test various optimisation scenarios, review technical limits, and generate more accurate production forecasts.

A major concern in the E&P industry over using digital twins in large fields is their long computation run time that makes them unfit for faster decision cycles as required in daily operations management. KwiDF will address this constraint by incorporating a hybrid modelling approach in which data-driven algorithms are blended with a physics model to speed up model run-time, aligning it with a decision-making time scale. To keep the digital twins fresh and up-to-date, manual and time-consuming tasks related to data quality checks, model update, calibration and versioning will be automated. End users will only have to review the bad quality models flagged by the system through interactive dashboards.

Sustaining KwiDF

Open architecture will be the key in ensuring the longevity and resilience of the KwiDF solution to deal with the fast pace of technology changes and ever-evolving business needs. A well-acknowledged observation from many digital oilfields of the past has been the limitation, and in some cases failure, of rigid software solutions struggling to scale beyond their coded functionalities.

Open platforms on the other hand can scale much more easily without losing their performance and interoperability. Halliburton's DecisionSpace 365 platform underpinning the KwiDF solution exemplifies this principle. The platform offers flexibility to tailor and grow digital solutions through its open, technology-neutral, modular, and interoperable architecture. The underlying technology building blocks (data integration, business rules, analytics, workflow orchestration and visualisation) accelerate the solution deployment and time to value.

The ultimate measure of KwiDF success, however, will lie in how well it gets adopted by the organisation. End users will not just need to embrace the value of the system, but also be able to acquire the necessary skills and knowledge to make effective use of KwiDF in their day-to-day work.

To that end a change management programme has been put in place to encourage solution adoption and utilisation through regular communications, incentive schemes and on-the-job training. A dedicated team staffed with Halliburton domain experts and IT specialists will be formed to provide continuous mentoring and training to the KwiDF users in running the digital workflows and conducting the well and reservoir performance review cadence. The team will also gather user feedback for enhancements to the solution and report them to KwiDF management for future release planning.

In conclusion, KwiDF Phase 1 delivered a strong engine for digital transformation to KOC, generating momentum toward an efficient, agile and data-informed operating model. Phase 2 will further expand and accelerate that transition by unlocking newer opportunities for efficiency gains through smarter and more automated work processes and fostering the digital capabilities of the KOC workforce. ■

Enhancing offshore solutions through collaboration

Recently, there has been a flurry of strategic partnerships formed between companies eager to combine their expertise and manpower in order to improve their offshore services.

COLLABORATION HAS BEEN the word on everyone's mind in the energy industry over the last year as the effects of COVID-19 and the increasing emphasis on climate change have forced operators and service providers to re-evaluate their business strategies. This has been demonstrated most clearly within the offshore oil and gas sector, with several high profile companies forming strategic alliances to expand and enhance their offerings.

Offshore International and Mammoet

Abu Dhabi Ports' offshore logistics service provider, Offshore Support and Logistics Services Company (OFCO – Offshore International), has announced the start of a collaboration with Mammoet United Arab Emirates, a branch of the global engineered heavy lifting and transport services company, as part of a newly signed Memorandum of Understanding (MoU) between the two organisations.

OFCO will work closely with Mammoet to create a unique integrated package of on- and offshore turnkey transport and installation solutions for projects in the GCC. OFCO and Mammoet will leverage their respective maritime, engineering and logistical expertise, together with strategic positioning, infrastructure, and in-house assets, to create a joint value proposition.

This will not only provide customers with a streamlined, flexible, and cost-effective solution for handling their heavy cargo transport needs, but will also enable them to partner with a single service provider, rather than having to rely on several subcontractors to meet their supply chain requirements.

“Our collaboration will reduce the number of interfaces within the logistics chain of projects.”



OFCO – Offshore International and Mammoet will collaborate closely on developing a unique turnkey logistics offering for moving heavy and oversized cargo.

Paul van Gelder, CEO, Mammoet, commented, “At Mammoet, we always look for ways to improve the efficiency of projects for our customers. The strategic alliance with OFCO is a testament to that, as our collaboration will reduce the number of interfaces within the logistics chain of projects, enabling the planning and operations to be streamlined, and therefore realising the most efficient and cost-effective approaches.”

Halliburton and Optime Subsea

Halliburton has signed an agreement to offer Optime Subsea's innovative technologies as a service across its global portfolio as part of a new strategic alliance.

Optime's innovative Remotely Operated Controls System (ROCS) will be applied to Halliburton's completion landing string services. The companies will also collaborate to offer intervention and workover control system services leveraging Optime's Subsea Controls and Intervention Light System (SCILS) technology, a remote digital enabled system that complements Halliburton's subsea intervention expertise.

The alliance will facilitate umbilical-less operations and subsea controls for deepwater completions and interventions, delivering increased operational efficiencies while minimising safety risk through a smaller offshore footprint.

Safe Influx and Weatherford

In September 2020 Weatherford and Safe Influx signed a MoU to cooperate globally to revolutionise well integrity during the construction phase. This partnership has begun to bear fruit as Safe Influx has announced that the rig trial of the industry's first ever integration of MPD and automated well control technology has been completed following preparation from both companies and Finesse Control Systems. The combination of the Weatherford Victus intelligent MPD and Safe Influx's automated well control system provides automated secondary well control, which will allow wells to be drilled and constructed with the highest level of efficiency and integrity. This could potentially save lives as well as deliver substantial cost savings. ■



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Advancing autonomous operations

Ronan O'Sullivan, digital lead for ABB Energy Industries IMEA region, speaks to Oil Review Middle East about how digitalisation is shaping the post-COVID-19 recovery in the energy sector, and accelerating the drive towards more sustainable and autonomous operations.

THERE CAN BE no doubt that the COVID-19 pandemic has accelerated digital transformation, driving the need for remote and automated operations and forcing companies to fundamentally adapt their working practices.

ABB Energy Industries has had to adapt its operations in two key aspects, Ronan O'Sullivan explains.

"One is the service aspect and how we take care of our existing customers. Our service models have had to adapt to difficulties in sending people to sites. We had to overcome that very quickly through some of our digital solutions to connect our customers in the field with our subject matter experts sitting remotely, or where customers themselves were unable to get to their sites, connecting a subject matter expert sitting in their headquarters or at home. So it has certainly accelerated all the remote connectivity to enable us to provide services for customers.

"On the project side too, we've really had to adapt. Last year we launched Adaptive Execution, a project methodology leveraging years of experience which offers an optimised way of executing projects. So we incorporate our people, SMEs or an expert team that could be connected globally for a project, we look at the years of project execution, and have streamlined that into our adaptive execution methodology.

"The other part of it involves making more use of our technologies, and making them more modular and more standard, so that we can deploy projects globally in a more efficient and effective way.

"Last and not least, is looking at infrastructure as a catalyst, utilising cloud technology to have remote connectivity project execution on a cloud-based infrastructure, to allow that acceleration of project optimisation as a whole.

"We have brought all these key areas together in our Adaptive Execution."

The uptake from the oil and gas industry has been huge, O'Sullivan comments, as with



Ronan O'Sullivan, digital lead for ABB Energy Industries IMEA region.

“There’s a big acceleration around utilising data to run operations more efficiently.”

the current constraints, customers have to use what they currently have in a better way to run their businesses.

Utilising data

"What they have today is data, and the possibility of us connecting remotely. So there's a big acceleration around utilising data in order to run operations more efficiently, and really start moving the industry towards autonomous operations.

"How are we're helping with that? We've got various tools we can utilise from a data perspective, but what's really helped us focus is our launch last year of our ABB Ability Genius platform. That allows our customers to gather data from operational technology, IT and engineering technology, bring that together, contextualise it and be able to drive further value out of that data. That's been a big area of discussion for our customers.

"There's also the data gathering part, and that's where we've launched our Edgenius Operations Data Manager, which can take data from our various plants in a secure and efficient manner to a central location, whether that's a cloud or an on-premise data centre. We're seeing a big uptake on this, from data collection to data gathering, contextualisation and integration, and then applying our machine learning and even our advanced analytics and AI.

Image Credit : ABB Energy Industries



Euro Gas Systems is an ISO 9001 certified packager. As an authorized packager for Ariel, Waukesha, Caterpillar and other major equipment manufacturers, EGS brings world-class compression to the European, Middle East, Africa, Asia and CIS markets at competitive pricing levels.

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EGS produces air cooled heat exchangers (ACHE), based on several design models. Air cooled heat exchangers are the best solution for cooling process gas and auxiliaries for gas compression when there is no cooling water source available.

Aftermarket Services

EGS fully supports the equipment we sell. To ensure customer satisfaction of delivered products, aftermarket parts and service support is a focus point of Euro Gas Systems. We offer a wide range of services including start-up and commissioning, operation/maintenance programs and training for the end-users.



Digital technologies are enabling safer, more efficient and sustainable operations.

Image Credit: Adobe Stock

ABB has customers at varying stages of their transformation journey, O'Sullivan says.

"Some of our customers are very mature on the digital transformation curve; they already have connectivity to all their data sources, bringing it centrally and visualising it. Now they want to explore what they can do with industrial analytics and AI to drive value within their use cases, and deploy it on the problems they're trying to solve.

"With other customers we're having conversations around connectivity, from the smart sensing on equipment, to data gathering, to bringing that data into a central location and then getting more into analytics, machine learning and AI."

There is scope to do more, even with mature customers, he says, given that industry analysis indicates that only around 20 to 30% of data is being utilised by customers, whether OT, IT or engineering data.

"Whether it's a customer far along the digital maturity scale or one starting out on their transformation journey, there's an untapped potential. There are a lot of things we could do around that uncaptured data, even for the customers who are further ahead."

In the Middle East, there are some good examples of digital transformation driving real value. Abu Dhabi National Oil Company (ADNOC) for example, has complete visibility over its entire value chain through its Panorama command centre, where real-time data from across its operations is centralised, captured, centralised, analysed and incorporated into decision-making, enabling more efficient operations and significant cost reductions. By utilising blockchain, the company has been able to optimise the whole supply chain process.

Focus on sustainability

Turning to sustainability, an increasing focus for oil and gas companies, O'Sullivan comments that this goes back to the data piece, with real-time business environments

providing the ability, for example, to visualise the performance of multiple plants from a smart device, tablet or phone and generate real time data in order to optimise performance across plants. This facilitates decision making in key areas, such as maintenance, addressing questions such as, can we run the plant for six to eight months longer than the scheduled downtime? It provides the ability to make predictions and devise prescriptive maintenance strategies to sustain the plant and equipment long term.

“Utilising data, utilising AI, and then the automation piece; these three combined are the future.”

These technologies also minimise the chance of unwanted shutdowns or disturbances in the plant that could cause harm to the environment, or prevent particular processes from being carried out in a sustainable way, he adds.

Enhancing and improving asset predictability and helping customers adapting their end product for various market demands in the current shifting scenario are a current focus.

"Some companies are shifting what they're producing, so we are helping them to put together strategies to deliver an end product that's in higher demand now, for instance," he explains.

Accelerating autonomous operations

So how does O'Sullivan see the drive towards autonomous operations playing out?

"Certainly it's going to start with some fundamentals to build up to autonomous

operations, and that's going to be a driver around the utilisation of the data, so we're looking at IT and OT data integration, increased automation around our customers' processes, as well as the enhancements of digital twins and AI," he says.

"So utilising data, utilising AI, and then the automation piece; these three combined are the future. We already have use cases where customers want a single push-button start-up of a facility. That requires a lot of automation, a lot of advanced analytics and machine learning, and eventually AI.

"By enhancing automation and utilising digital technologies such as AR and VR, the worker in the field can have access to the control system and all the data to enable them to work more efficiently, with visualisation over process areas, equipment conditions and so on, so they have the information to perform tasks in a safe manner.

"It's about more data connectivity, more automation, and the utilisation of AR and VR into the mix. In hazardous areas there will be more use of robotics, both in terms of robotics working side by side with humans but also mobile robotics, performing tasks that will keep humans away from hazardous areas or tedious types of work, enabling them to focus on other aspects of the process.

"So we are moving to autonomous production with data-driven and AI, along with automation and the evolution of digital twins."

In concluding, O'Sullivan stresses the priority ABB attaches to deploying these digital solutions in a cyber-secure way and mitigating the threat of cyber attacks.

"It is critical to ensure that when you're adding in digital solutions and extracting data you are utilising what we refer to as reference architecture, so that these solutions and connectivities are handled to the highest of cyber security standards," he says.

"This is a big priority for us as the industry and our customers evolve towards autonomous operations." ■

Data-driven decision making for predictable production

Sandra DiMatteo, global director of marketing for digital twin solutions, asset and network performance at Bentley Systems discusses how to gain timely and accurate data insights to optimise asset performance and reliability.

DATA-DRIVEN DECISIONS ARE those backed up by hard evidence; reliable and trustworthy data rather than intuition, gut instinct, or guesswork. However, the abundance of data that is generated from IIoT (Industrial Internet of Things) devices and multiple siloed sources makes it difficult to analyse. The worst thing that can happen is that critical data is missing, remains hidden, or is incorrect. So, how do you know you have the correct information to make the right decision at the right time?

The tipping point for IIoT

The Industrial Internet of Things (IIoT) is at a tipping point. The cost of sensors, data connection and data storage is now a fraction of what it used to be. As a result, the amount of raw data being generated in plants from IIoT sources is growing exponentially, and many organisations cannot keep up.

For most plant managers, the vision of a completely autonomous plant is still a pipe dream. Every sensor added produces thousands of additional data points. As a result, making sense of the data to gain meaningful insights and get to the right decisions can be time-consuming and difficult if you are not sure of its relevance or accuracy.

Industry 4.0 can connect physical assets in the plant to their digital counterparts to improve the automation of plant operations and maintenance. Using edge computing to implement artificial intelligence and automated rules is a fast and easy way to alert personnel of problems that must be addressed. However, edge computing is still a silo and might not monitor all aspects of every asset over the long-term, nor understand interdependencies. To fully oversee a facility, you need a systematic, sustainable approach for tracking asset performance over time with visible, accessible and trusted engineering data.

Plant managers have embraced IIoT out of a desire to eliminate human senses from inspections, such as seeing a leak or hearing



Digital twins are empowering engineering, operations and maintenance to collaborate and capitalise on the opportunities of Industry 4.0.

Image Credit: Bentley Systems

“For most plant managers, the vision of a completely autonomous plant is still a pipe dream.”

a malfunctioning motor. Even with the explosion of sensors that can detect changes in operating conditions, the ugly truth is that plants remain highly people-dependent. To improve automation, plants need an efficient, effective and comprehensive programme that fully defines organisational and business processes, proactive and predictive asset management practices, and the right technology that enables the implementation and execution of real-time asset performance.

What prevents organisations from making fast and accurate decisions?

While big data was expected to make decision making easier, it has been difficult

for organisations to tap into big data's full potential because they have not learned how to harness and leverage their data in a way that validates it as trustworthy. Additionally, organisations are not analysing the data in a timely manner to gain insights. Data problems include:

- Availability – data simply does not exist
- Accessibility – data is stuck in departmental silos, in disparate databases or excel spreadsheets, and is hidden away
- Relevancy – data pertinent to the problem is not relatable
- Reliability – data is not trusted or reliable
- Processing – data is not in the correct format
- Volume – there is too much data to manage

By not having the right and necessary data in place, making the correct decision seems impossible. But when the right data is in place after it has been collected, managed, analysed, and shared, it provides critical information to decision makers, giving them:

1. Goal alignment: ensure that goals and

targets are met by first identifying your goals and then asking what the data can do for you to achieve them. You can then build a strategy around the data. This will save time in the long run because you are only using the data related to the goals.

2. Confidence: eliminate guesswork and estimates and ensure you make the right decisions with the knowledge that they were made with facts, straight from your trusted information sources. This not only makes decision making easier, but faster.
3. Insights: dive deep into your data and uncover patterns and events that would have otherwise remained undiscovered. With the addition of machine learning and artificial intelligence, you can gain more insight into future predictions and forecasts.
4. Real-time information: with a constant source of real-time or near real-time data, consolidated and analysed from multiple sources, you will always keep up to date with asset performance, eliminating late reports and unscheduled events.
5. Situational awareness: make data-driven decisions knowing what is happening and how to be prepared, including an understanding of what is working and what is not, how assets are performing, and how reliable equipment can be. With a digital twin, you can see the effects of decisions made both in the past and in the present, as well as simulate and forecast into the future.
6. Contextual visibility: with trusted information, you have the ability to bring your data to life. This doesn't just apply to operations and maintenance data, it applies to design and engineering data from 2D process diagrams to complex 3D/4D models and reality meshes within digital twins.

With data continuing to grow at an exponential rate, accelerating your digitalisation strategy is key to moving forward and remaining competitive. Digital twins help you to make trusted data-driven decisions with confidence. With digital twins, you can:

- Capture all asset information sources
- Improve data quality from CapEx to OpEx
- Ensure operational readiness and superior asset performance
- Lower operational costs
- Make information easier to find
- Ensure information is up-to-date
- Interpret, manage, and analyse data from one central source
- Improve the way information is presented
- Gain intelligent insights to make fast and accurate decisions.

Digital twins are crossing the chasm

In asset-intensive industries, digital twins are crossing the chasm to support operational excellence. Within a plant, digital twins empower engineering, operations and



Image Credit : Bentley Systems

Trustworthy engineering information enables plant engineers to determine why a change occurred and who caused the change.

maintenance to collaborate and capitalise on the opportunity of Industry 4.0. Digital twins help to overcome common pitfalls, such as data overload, systems integration and interoperability, and siloed data. Digital twins are open and connected data environments that can become a sustainable competitive advantage in the age of IIoT.

Automated rules, calculations, artificial intelligence, and machine learning are all valuable methods to enable faster and more effective decisions. However, engineering information for each must be complete, accurate, and available to ensure you are making the right decision at the right time. Otherwise, it becomes harder to mitigate costs and downtime when the asset fails.

In short, effective decision-making depends on always knowing the current state and status of the asset and becoming informed immediately when that state or status changes. This knowledge should include essential engineering information, as well as how to bring the asset back to the as-built, as-commissioned, or as-designed state when necessary.

Asset lifecycle information management is the backbone of the digital twin. Components, structures, systems, and operating states all change over time due to wear and tear, operator decisions, and overall plant conditions. Changes in any single asset can negatively impact wider systems and processes. Trustworthy engineering data enables plant engineers to determine why a change occurred and who caused the change.

We know that raw sensor data alone might not be useful as the complexity and interconnections of piping and process

equipment, systems, instrumentation, and control devices increase. Operations technology relies on analytics visibility as well as subject matter experts that can act based on the massive amount of data being generated. Digital twins can harness that raw data and create a trusted system of systems. They can connect data with processes and identify, consolidate, and analyse all relevant sources of data to make asset health more visible and drive informed decisions and measurable business results.

As assets are designed, commissioned, operated, and then redesigned, modified or added to, the digital twin and asset information model need to be kept evergreen. The convergence of information technology, operations technology, and engineering technology (or IT-OT-ET) feeds the digital twin. In addition to communicating the current state of the asset, the digital twin can perform operational and engineering simulations to model the performance of an asset over time and evaluate options to improve performance. Essentially, the digital twin connects the data from IT-OT-ET in a single view, allowing the team to validate, visualise, and analyse all plant data in any format and any data storage location. A digital twin environment that is open, interoperable, connected, and contextualised enables true collaboration between engineering, operations and maintenance.

Digital twins are transforming plants to keep them ahead of the competition, providing a necessary federated view of all necessary systems and data, which gives workers at all levels the insight needed for overall success. ■

Digitalising Egypt's national E&P assets

Karim Badawi, Schlumberger's managing director for Egypt and East Mediterranean, discusses how Egypt is leveraging digital to accelerate energy discovery and investment from operators across the globe.

IN TODAY'S DYNAMIC upstream environment, we face a more competitive landscape that demands greater efficiency in how we explore for energy. Our industry also faces new challenges emanating from a drive towards more sustainable energy production.

To address the many challenges our industry faces, we must be more agile and resilient. In Egypt, these tenets have been central to the country's energy sector's transformation and modernisation. For several years, Egypt has invested heavily in this sector, laying the country's groundwork to become a strategic energy hub for the region. Much progress has been made since the Ministry of Petroleum and Mineral Resources first laid out its modernisation programme's goals, including increasing its workforce skills through local training programmes and investing in key infrastructure projects, particularly in the midstream sector.

Now, as Egypt's programme matures, modernisation efforts continue to focus on unlocking the sector's full value chain potential as a growth and sustainable development engine. While there are many factors at play for Egypt to achieve this objective, a key enabler is digitalisation.

A prime example of this is the Ministry of Petroleum and Mineral Resources' work with Schlumberger on a national project for the digitalisation of the country's E&P assets. The recently launched Egyptian Upstream Gateway (EUG) is an industry-first platform that digitally showcases these assets to investors worldwide and leverages the latest digital technology and solutions to accelerate discovery throughout the country.

The launch of the EUG provides the Egyptian government with the freedom to manage its natural resources, promote investment in exploration and production, streamline interactions across its energy sector, and manage investor compliance for reserves development in a single platform.

The platform achieves two key objectives for the country: it enables anytime, anywhere



Image Credit: Schlumberger

Karim Badawi, managing director for Egypt and East Mediterranean, Schlumberger.

access to mission-critical subsurface and production data, eliminating the inefficiencies of the traditional National Data Repository (NDR) model, and it provides a robust, connected platform for promoting licensing rounds and connecting stakeholders with potential business opportunities.

Previously, Egypt leveraged physical locations to store vast amounts of subsurface information. This dated NDR model limited ease of access to international investors and the country's ability to ensure data integrity in the long term and enhance data security. This

NDR model is not exclusive to Egypt, and in fact, causes significant challenges for other energy-rich countries across the globe.

The EUG provides secure, remote digital access to data via an online portal, eliminating the need to travel to a physical location. The data is displayed to users in the context of a regional map, so it is easy to find, and as new data is added or existing data is enhanced with new processing technologies, it is instantly updated to all the platform's users. These updates ensure the data is kept evergreen, meaning everyone always has access to the same data.

With abundant subsurface information now easily accessible via the EUG, the country is realising key opportunities to promote its assets to a much wider audience. For example, the EUG is currently hosting Egypt's first digitally-enabled bid round, providing national and international investors with an array of information on the available lease blocks and the capability to participate in the bid round online. The current round, which ends on August 1, includes nine blocks in the Mediterranean Sea, 12 in the Western Desert, and three in the Gulf of Suez.

Existing asset holders now have faster access to data and reduced cycle-time through data evergreening. The platform also offers opportunities for portfolio expansion through trading.

International investors have digital access to regional insights and can order legacy and evergreened data instantly online. This access to data minimises the risk in decision making and maximises investment potential.

With the EUG enabling instant access to the most up-to-date and relevant data, as well as potential business opportunities, Egypt is now much better positioned to help operators de-risk investment decisions, improve subsurface models, and accelerate energy discovery.

As Egypt continues to evolve and modernise, this robust platform will evolve with it, creating more opportunities for Egypt to promote investment in the country from across the globe. ■

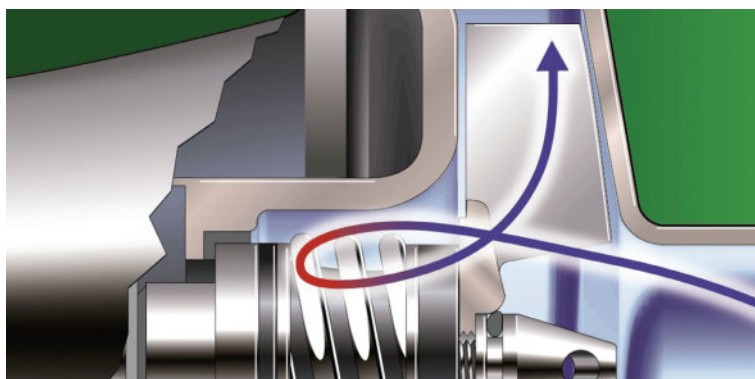
“The country is realising key opportunities to promote its assets to a much wider audience.”

Ensuring safe and reliable pumping operations

CENTRIFUGAL PUMPS ACCOUNT for more than 40% of all fluid transfer in industry. The centrifugal pump has a very simple principle; due to centrifugal forces caused by a spinning impeller, liquid is sucked in at the inlet and pressure is built at the outlet. No valves are needed, and a minimum of moving parts. Because of this a centrifugal pump is a low maintenance, reliable part in your process, if well selected.

But there are some factors that can influence the results of the pumping process and can even damage the pump severely.

A whitepaper from Verder entitled *10 ways to kill your centrifugal pump* outlines the 10 most important essentials to avoid damage and create a reliable, safe pumping process. These include selection of the right pump size; ensuring good mechanical seal configuration and the use of the right seal material; selecting the right installation format to avoid cavitation; selecting the correct process installation to avoid water hammer; exercising extreme caution in assembly-disassembly activities or operating a very good pre-screening from the bulk material to avoid pumping of foreign objects; selecting the right seal for variable or high system pressures; ensuring correct alignment by following the guidelines of the manufacturer on torque and forces; installing high spec



Centrifugal pumps are generally reliable and low-maintenance.

motors with condensation holes to kill humidity; and ensuring good electrical connections and the right switching frequency.

For further information and to download a copy of the whitepaper see <https://insights.verderliquids.com/10-ways-to-kill-a-centrifugal-pump>

Talking the torque

BIFOLD, A LEADING manufacturer of instrument valves and accessories, piping valves and pumps for the oil, gas and wider industrial markets, has adopted radio frequency-based torque transducers from Sensor Technology Ltd for two of its specialist test rigs to analyse the long-term performance and reliability of hard working valves and pumps.

When it wanted to assess the effects of wear on its long-life valves, the company set about designing a special test rig.

Engineer Andrew Laverick recalled, "We wanted to measure the power required to operate the valve to see how it changed over time and with long term use. It was clear that

the best way to do this was to measure the torque input over an extended period."

TorqSense transducers lend themselves to test rig uses because they are non-contact measuring devices. Attached to the surface of the transducer shaft are two Surface Acoustic Wave (SAW) devices, when torque is applied to the shaft the SAWs react to the applied strain and change their output. The SAW devices are interrogated wirelessly using an RF couple, which passes the SAW data to and from the electronics inside the body of the transducer.

Sensor Technology's Mark Ingham explained, "All you have to do is set up a TorqSense transducer in the test rig and fire it

up. The SAW frequencies reflected back are distorted in proportion to the twist in the test piece, which, in turn, is proportional to the level of torque. We have some clever electronics to analyse the returning wave and feed out torque values to a computer screen.

"TorqSense has been used on many test rigs over the years and I was delighted to hear the Bifold engineers say how easy it is to use and how robust the software is."

Bifold has since bought a second TorqSense, which is being fitted to a new test rig used to assess the performance of mission critical chemical injection pumps, as used at oil and gas wellheads and on process pipelines.

Amarinth supplies bespoke pumps for ADNOC Bu Haseer full field development project

AMARINTH HAS DELIVERED two API 610 VS4 vertical pumps and two API 610 OH2 horizontal pumps to the ADNOC Bu Haseer full field development project offshore Abu Dhabi.

The API 610 VS4 vertical pumps were specified for hazardous open drains in a space restricted area and so Amarith leveraged its expertise on other similar projects to develop a bespoke design where the super duplex vertical pumps could be split into sections for shipping and then assembled within the available space on site. The pumps were manufactured in super duplex stainless steel to handle the sour and toxic fluid, which includes high levels of Mono Ethylene Glycol (MEG), Hydrogen Sulphide (H2S) and high chloride concentration.

The API 610 OH2 horizontal pumps consisted of a scrubber condensate pump and a production



Amarinth API 610 OH2 pump being readied for delivery to the ADNOC Bu Haseer full field development project.

separator pump. Specified with a 600lb flange rating, which is double the usual for this type of

pump, Amarith used its experience gained in previous demanding projects to deliver a bespoke pump to meet the required rating. The API 610 OH2 pumps were manufactured in S6 austenitic stainless steel with chrome impellers to handle the aggressive mix of hydrocarbons, H2S and high chloride concentration in the water. After the pumps had been delivered, Amarith engineers travelled to Bu Haseer to assist with commissioning.

Oliver Brigginsshaw, managing director of Amarith, commented, "We are delighted to have delivered and assisted with the commissioning of this package of bespoke API 610 VS4 vertical and OH2 horizontal pumps for this full field development project. We look forward to further orders for the pumping requirements of Bu Haseer and the new fields as they are developed."

Selecting the right valve in oil and gas applications

A new publication from Elsevier provides a comprehensive guide to the selection and use of valves in the oil and gas industry.

“THERE ARE NO bad valves; just poor valve selection.” This is according to *A Practical Guide to Piping and Valves for the Oil and Gas Industry* by Karan Sotoodeh, published by Elsevier.

The guide covers how to select, test and maintain the right oil and gas valve. Each chapter focuses on a specific type of valve with a built-in structured table on valve selection. It presents oil and gas examples and challenges relating to valves, including many illustrations from valves in different stages of projects, helping readers understand valve materials, testing, actuation, packing and preservation. Covering both onshore and offshore projects, the book also gives an introduction to the most common types of corrosion in the oil and gas industry, including CO₂, H₂S, pitting, crevice and more. A model to evaluate CO₂ corrosion rate on carbon steel piping is introduced, along with discussions on bulk piping components, including fittings, gaskets, piping, and flanges.

Rounding out with chapters devoted to valve preservation to protect against harmful environments and factory acceptance testing, this book gives engineers and managers a valuable tool to better understand today's valve technology.

In a chapter on valve technology and selection, some important considerations and parameters that affect valve selection are discussed, the most important being the application.

The guide evaluates the characteristics of valves and relative advantages and disadvantages for the various applications. For example, the ball valve is often the first choice for the start-stop of fluid, being more robust in comparison to butterfly and wedge-type gate valves, while the butterfly valve is more compact, lighter and cheaper than the ball valve, but has less flow capacity.

While for double isolation in high-pressure classes and/or hazardous fluid services in different applications, modular valves called double block and bleed valves are often used.

Valve choices suitable for different applications

Application	Valve choices
Start/stop fluid	Ball valve, butterfly valve, wedge gate valve, through conduit gate valve, plug valve
Regulate fluid	Straight pattern globe valve, Y-type globe valve, axial on-off valve, axial control valve
Non-return fluid	Swing check valve, tilting check valve, dual plate check valve, nonslam axial flow check valve, piston and ball lift check valve
Double isolation	Modular valves, double wedge gate valve

Source: *A Practical Guide to Piping and Valves for the Oil and Gas Industry*

These, when closed, provide a seal against pressure from both ends of the valve with a means of venting/bleeding the cavity between the seating surfaces.

Valve size, dimensions and weight also need to be taken into account, with saving weight and space more important in the offshore industry than in onshore applications since there is limited space on a platform or ship. The face-to-face dimension of a water-type butterfly valve is much less than that of a ball valve. Additionally, a butterfly valve is lighter with less torque requirement for opening and closing compared to a ball valve, which could save the size and cost of the actuator or gear box.

Fluid type is another important consideration. Even metal seat ball valves are not recommended for very dirty fluid services, such as the jet water injection outlet lines from the separators in an offshore unit, due to possible seat damage during the opening and closing of the valve. TCG or plug valves are the acceptable alternatives.

Flow capacity is also to be taken into account. For example, butterfly valves are not selected for sizes, four inches and below in the Norwegian offshore industry because they cannot provide the required flow capacity in small sizes. While for valve selection downstream of pumps and compressors, axial flow check valves are a good choice since their low-pressure loss and high fluid capacity minimise pump and compressor energy loss and consumption.

Operation requirements are an important

consideration. For example, straight pattern globe valves are prone to cavitation, which can produce excessive noise and vibration and create localised stresses on valve bodies in addition to pitting, corrosion and erosion. Y-pattern globe and axial valves could be selected instead to reduce or eliminate this risk.

Additional issues to consider include tightness, cost, delivery time and client (end user) preferences. The guide gives the example of an export pipeline from platform to shore, where the valves selected are usually either top entry ball valves or TCG valves for inline maintenance. In the case study, the 38-inch CL1500 TCG valve won out on delivery time, but the top entry ball valve came out on top on cost.

The guide also describes a fast-opening (FO) valve selection experience in the flare system, where three types of valves – ball, butterfly and axial control – were evaluated for application of the FO application downstream of the knockout (KO) drum.

Another case study in this chapter covers valve selection for Category 2 dirty fluid services for offshore production platforms. ■

For further information and to obtain a copy, see https://www.sciencedirect.com/book/9780128237960/a-practical-guide-to-piping-and-valves-for-the-oil-and-gas-industry?utm_source=publicity&utm_medium=Cluster_email&utm_campaign=Pipeline%20engineering_cluster

HOT pipeline coatings enable hotter offshore drilling

Balanced glass transition temperature, flexibility, barrier and damage resistance properties permit deeper extractions and efficient reel-lay applications, says Dr. Jeffrey David Rogozinski, global product director – Fusion-Bonded Epoxy/Pipe, Sherwin-Williams Protective & Marine.

OFFSHORE OIL AND gas exploration is bringing new material compatibility challenges as producers drill increasingly deeper wells. With each kilometre of depth drilled, the extracted contents rise in temperature by around 25°C, forcing operators to reconsider some traditionally specified materials. That includes coatings applied to underwater pipelines to protect them from corrosion. Older coatings cannot handle the additional heat exposure and are prone to failure, threatening pipeline safety.

Thankfully, higher extraction temperatures are not hindering exploration activities. Newer high operating temperature (HOT) fusion-bonded epoxy (FBE) coatings can now accommodate pipeline temperatures up to 180°C, with room to handle even higher temperatures in the future. These enhanced capabilities are made possible by balancing several interrelated performance properties, including:

- **Glass transition temperatures (Tg):** Pipelines operating above the Tg of their applied protective FBE coatings face significant risks. The coatings may become pliable and lose physical properties above their design temperature, making them susceptible to degradation, loss of adhesion, disbondment and ultimately premature failure. Today's HOT FBEs feature higher Tg values, making it easier for pipeline operators to specify coatings with transition temperatures that are at least 5-10°C above the highest anticipated operational temperature of the pipe. At this threshold, the coatings will remain hard and glasslike – in a continuous layer with better adhesion – for better performance.
- **Flexibility:** Increasing an FBE coating's Tg often requires sacrificing other properties such as flexibility. FBE flexibility is critical to enabling installation efficiencies and cost savings. Despite their higher Tg values, newer HOT FBE coatings maintain a high



Dr Jeffrey David Rogozinski, global product director – Fusion-Bonded Epoxy/Pipe, Sherwin-Williams Protective & Marine.

degree of flexibility, ensuring pipes can be “reel-laid.” Installers can therefore prepare a kilometre of pipeline onshore, spool it and then reel-lay the pipe offshore. They can then connect another kilometre-long section to that pipe from a barge, coat the field joint and continue pipe laying. These activities are significantly more streamlined and less

“Older coatings cannot handle the additional heat exposure and are prone to failure.”

costly compared to welding and coating field joints every 12 metres from the barge.

- **Barrier properties:** Newer, HOT FBE technologies with higher Tg values are able to maintain tightly linked structures within the coating matrix. Therefore, a molecule will have a harder time working its way into and through the coating to reach the steel pipe substrate. The tighter the links, the better the barrier against water, electrolytes, oxygen and other moieties that contribute to corrosion.
- **Damage resistance:** Increasing the Tg of an FBE can also alter the coating's damage resistance properties, as the more heat-resistant molecules can either provide better or worse resistance to impacts, gouges and abrasions. Newer HOT FBE coatings with higher Tg values ensure better damage resistance as the coatings remain somewhat flexible, while retaining a highly crosslinked structure due to molecular level composites. This flexibility allows the force of an impact to dissipate within the HOT FBE matrix instead of being relieved by forming a crack in the coating.

By balancing higher Tg values with better barrier properties and damage resistance, newer HOT FBEs are enabling offshore exploration into untapped areas, deeper well drilling and hotter material extractions. Their flexibility for reel-lay applications is also providing welcome efficiencies and cost reductions for operators. ■

With more than 30 years' experience in coatings and academia, Dr. Jeffrey David Rogozinski is responsible for developing protective coatings, powder coatings, resins and additives for the oil and gas, pipeline, and bridge and highway markets. His coatings science emphasis is on researching and testing polymer synthesis and structure-property characterisation. He can be reached at Jeffrey.Rogozinski@sherwin.com.

Image Credit: Sherwin-Williams

Designing the perfect sensor solution

When a pressure sensor is called for, a standard KELLER product may be sufficient. However, there are often great benefits to be had from a customised solution.

SINCE 1974, KELLER has been harnessing the potential of piezoresistive sensor technology to see numerous challenging projects through to completion. In all of these projects, the mutual exchange of expertise was essential to their success. Our customers are specialists in their field: they know the requirements and operating conditions best.

By taking the actual usage conditions of the sensor into consideration right from the outset, we can achieve major improvements in effectiveness and durability whatever the application – from fill level sensors in rainwater tanks to ultra-precise laboratory instruments, and even rocket science.

Expert advice from our sales engineers and developers is a vital piece of the puzzle. Together, we look at the requirements to determine the properties needed for flawless measurement, taking a close look at all the factors involved and their various interdependencies.

“Thanks to our technological expertise, longstanding experience and mastery of the many processes involved in manufacturing pressure sensors, coupled with a high level of vertical integration, we can make even the impossible possible,” says Bernhard Vetterli, technical director at KELLER AG.

First, we define the basic sensor specifications such as overall measuring range, accuracy, calibration to specific measuring points and units of pressure, or scaling of the output signal. Products with a digital signal output have additional factors that also need to be determined, such as sampling rate or signal resolution. The values defined at this stage form the starting point for selecting components.

Another crucial requirement is taking the ambient conditions into consideration. Not only does this increase the service life of the sensor, it is also an essential prerequisite for correct measurements. If the pressurised system operates with a large overpressure or with dynamic loads, the sensor design must be optimised for these particular demands. With some applications or neighbouring system parts, there is a risk of signal distortion or component failure due to vibration or shock. Temperature also has a major impact on all materials and their resistance. Complications can be caused not just by extreme temperature values but also by rapid changes in temperature. Another equally important factor is chemical resistance. The materials used for housings and seals must be carefully selected, otherwise they risk being damaged by aggressive measuring media. External factors such as petrol fumes, UV radiation, salt water or even microorganisms can also cause problems. It is therefore essential that all relevant factors be considered. Of course, even finely tuned designs still have limits, and additional protective measures may be needed.

A device's performance is heavily influenced by the sensor design, from the choice of sensor chip and coupling medium through to the materials and production techniques used. In addition, customers may have particular requests concerning shape and size, pressure connections and so on. And of course, any specific requirements pertaining to the area of application must be complied with, along with



Image Credit: KELLER AG

Keller AG is a leader in piezoresistive sensor technology.

all the applicable legal regulations and standards.

The main function of the electronics is to prepare the measurement signal, as well as possibly to save it and output it via a suitable interface. Customers can also request that application-specific calculations be integrated in the firmware, or ask for special device and software configurations. There are other requirements that depend on the environment, such as extended lightning protection, EMC or explosion protection. Intrinsically safe products can also be specially configured to match the parameters of the customer's overall system.

Digital interfaces can be configured for specific communication protocols, or modified to suit the customer's needs. Meanwhile, analog interfaces also continue to play a vital role in sensor technology. KELLER is highly experienced in developing application-specific solutions based on both of these principles, including devices with light wave and frequency outputs. For electrical connections, the necessary plugs can be integrated into the design, while cable outlets can be specified by the customer.

In addition to customer logos, it is also possible to have functional markings applied to the product. Customers can also specify a colour-coding scheme for the connecting wires. For consumer products such as manometers, a personalised design that includes the customer's logo can be applied to the front panel. ■



Image Credit : Adobe Stock

Cyber threats to the oil and gas industry have increased over the last year.

Digitalisation demands stronger cyber security

Cyber experts explain why, in the digital age, the oil and gas industry must maintain rigorous cyber security to prevent harmful cyber threats. Robert Daniels reports.

WITH THE RAPID advancements of AI, data analytics, big data management, cloud computing and more, the lure of digitalisation, offering tangible benefits in areas such as productivity, safety, cost and sustainability has become so great that there are now few companies within the energy industry who have not taken the first steps along this path. However, the abundance of data and its accessibility on virtual platforms has opened the door for cyber crime, which can cause serious financial problems as well as threatening physical infrastructure and even employee safety.

As Tim Grieveson, chief information security officer at AVEVA, commented, "The exponential development of computing devices has expanded access capabilities for cyber criminals to detect and exploit vulnerabilities in innovative ways. With a medium-grade smartphone now more

powerful than the most advanced computers were only a few years ago, cybercriminals can launch powerful and sophisticated attacks at a relatively low cost from a mobile unit while also working from home.

"That ease of access goes some way to explain why there is a cyber attack every 39 seconds. As industrial organisations embrace digitalisation, inadequate security protection can open up their systems to malicious actors."

To understand the damage that cyber criminals can cause and what preventative solutions are available to prevent this, *Oil*

Review Middle East spoke to representatives from Sophos, Mimecast, ThreatQuotient, Tenable and ManageEngine to find out more.

What are the biggest threats to cyber security for oil and gas companies?

Rajesh Ganesan, vice president, ManageEngine: The oil and gas industry is one of the most powerful financial sectors in the world. Its importance in both national and global economies has made the industry a high-value target for cyber crime. Threats like cryptojacking, nation-state attacks, attacks on smart devices, advanced phishing and ransomware attacks are currently some of the biggest threats the industry faces.

John Shier, senior research scientist at Sophos: The obvious global concern is ransomware, which is equally true for oil and gas companies. The reasons for ransomware's success are varied and speak

“Cyber criminals can launch powerful and sophisticated attacks at a relatively low cost.”

to a broader set of causes. We find ourselves in a world where many cybercriminals have specialised and offer their unique services to others. Some focus their efforts on initial access by breaching companies with weak security on their externally facing services. Others are skilled at phishing which nets them valuable network credentials. Both these groups can resell their ill-gotten information to other criminals who are skilled at hands-on attacks and data exfiltration.

Hany George, security specialist for Mimecast Middle East:

The oil and gas industry continues to face an array of sophisticated threats, and these have increased over the last year. Mimecast's newly released *State of Email Security 2021 Report* highlights how organisations in the energy, oil/gas and utilities sectors across the globe have seen an increase in threats over the last 12 months. 65% saw an increase in phishing attacks, 56% experienced a surge in impersonation fraud, and 47% were increasingly victims of threats or data leaks initiated by compromised, careless or negligent employees.

Michel Huffaker, director of Threat Intelligence at ThreatQuotient:

The COVID-19 pandemic seemingly appeared from nowhere, challenging the very idea of security. As workforces largely became distanced and remote, the challenges in the oil and gas sectors intensified. With so much of operations requiring air-gapped and hardened networks, organisations were forced to choose between putting personnel or networks at risk. Obviously, many organisations managed to protect both – at least publicly – but there was no doubt an increased exposure to risk on both the enterprise and operational networks.

Maher Jadallah, Middle East regional director, Tenable:

Attackers thrive during times of uncertainty, and 2020 has given them plenty to target. We've seen organisations, including those in the oil and gas sector, move to accommodate remote working, some overnight. The remote working "hybrid" model is likely to continue in 2021, and possibly beyond. This shift to a remote, distributed workforce has led to a higher volume of critical and confidential information being transmitted electronically.

“Attackers thrive during times of uncertainty and 2020 has given them plenty to target.”

What challenges does accelerating digitalisation pose to cyber security?

Ganesan: The acceleration of digitalisation in the lives of people, coupled with recent difficult situations including the pandemic, has resulted in the disappearance of the line between corporate and personal use of technology. People have to work from wherever they are, with whatever device they can find, and whichever network they can connect to. This is a completely new terrain to tread even for seasoned security leaders, and this calls for a complete transformation of operating models.

Shier: Digital transformation means that you are taking analog or manual processes and digitising and/or automating them. This naturally means that some or all the old processes will have a new digital dimension. These new processes may require additional technologies that are not already present in the organisation. As such, security needs will have to address these new processes and provide mitigations for a set of threats that may not have existed previously.

George: Employees have traded cubes, offices and conference rooms for email, instant messaging and Zoom meetings, which means sharing of sensitive business information has migrated from conference room white boards and face-to-face conversations to discussions via collaboration tools and extended email threads. This swell of digital activity has presented cybercriminals with numerous new openings for social engineering attacks. In fact, during 2020, the Mimecast Threat Centre detected a 64% rise in threat volume compared to 2019.

Huffaker: At the most simplistic level, there's just a ton of data to process and make sense of. But, more specifically, things are becoming harder to protect. It used to be that just the most sophisticated companies with the most sophisticated technologies were targeted by the most sophisticated actors. That's not necessarily the case, now that almost everything is internet-connected.

Jadallah: The challenge is that legacy security approaches weren't designed to handle an attack surface of this size and complexity. And the repercussions are evident. Analysis by Tenable's Security Response Team of publicly disclosed data breaches, from January to October 2020, found that there were 730 breach events resulting in more than 22 billion records exposed, not to mention the untold damage to reputation and trust. Furthermore, more than 35% of breaches were linked to ransomware attacks, resulting in an often tremendous financial cost.

Are companies in the Middle East taking their cyber security seriously?

Ganesan: The relatively high concentration of



Image Credit : Adobe Stock

Comprehensive cyber security can help prevent cyber attacks.

oil and gas companies in the GCC region make them an exclusive target for hackers like organised ransomware groups. Due to the enormity of the financial and operational impact they can make, such groups work with high levels of motivation to leverage the same type of attacks across multiple companies. As chief executives of organisations in the region become highly concerned about cyber security, we expect to see a further rise in the adoption of endpoint protection solutions, and security tools with data analytics will also remain important.

George: Mimecast's *State of Email Security 2021 Report* revealed that 23% of UAE respondents don't have a cyber resilience strategy in place, against a global average of 44%. And this is in spite of the fact that 75% expect an email-borne attack will damage their business in the next year and that 86% of companies were hurt by their lack of cyber preparedness in the previous year.

On the upside, the report revealed that 98% have either deployed, were in the process or looking to roll out various email security systems. So, while organisations might not have all the proper controls in place, they are at least working towards it.

However, other concerning findings were that while nearly all organisations at least have plans to deploy email security systems, only half currently have safeguards in place and 22% have no email security system at all (against a global average of 13%).

Huffaker: Absolutely. The Middle East, like all other regions, is playing catch-up, to some degree. Companies have policies and business goals and ethics to guide their decisions, but they move much slower than the cybercriminals and spies. In my opinion, the cyber security maturity trajectory in the region has enjoyed unmatched growth over the last decade.

Jadallah: Yes. And, at a time when organisations worldwide are facing a potentially lengthy period of economic uncertainty, it becomes more critical than ever to prioritise investments based on risk. There's also a clear operational benefit to be gained from performing risk management exercises which can serve as a bridge between the business and the infosec sides of the organisation.

How can companies improve their cyber security?

Ganesan: Solutions that harden IT security like our Desktop Central and Password Manager Pro can help manage and secure endpoints and passwords, respectively. With sophisticated phishing attacks on the rise, it is important that organisations monitor users who log on from multiple locations simultaneously or who access multiple resources in a short period of time. Therefore, our new-gen SIEM solutions like Log360, which includes user and entity behaviour analytics (UEBA) capabilities, and our privileged access management solution, PAM360, are very useful for enterprises.

Remote Access Plus enables employees to initiate remote connections to Windows, Linux, or Mac computers regardless of the user's or device's location. Access Manager Plus lets administrators launch RDP, VNC, and SSH connections to critical infrastructure without the need for VPN or any special software in employee devices. Both products come with complete session monitoring, shadowing, and recording capabilities to augment the remote access convenience with high levels of security and compliance.

Shier: Doing security right is difficult. That's why we always say there's no 'silver bullet' in security. A good start, however, is building a

solid security foundation. This includes having the right people, processes and tools in place to give you a fighting chance. Sophos helps companies fight cyber crime by providing products that prevent threats and unwanted software from infecting devices and networks. We also provide a managed service like Sophos Managed Threat Response (MTR) that continuously monitors customer environments for those that don't have a security team, and a Rapid Response team to help companies who find themselves under active attack. Lastly, we provide insight into current threats and adversary tactics, and advice on how to best protect yourself through our various outreach channels.

George: Traditional approaches to security are no longer effective. That is why Mimecast takes a holistic approach to cyber security that has been designed to secure, preserve and continue the flow of information via email. Mimecast prepares you for every stage of an attack by providing the right security services in place before an attack happens; devising a durability plan to keep email – and your business operations – running during an attack or failure; the ability to recover data and other corporate IP after an incident or attack occurs; allowing organisations to educate employees with powerful engaging content and sharpen their skills to detect phishing with regular tests.

Huffaker: It's critical to implement systems with threat intelligence-based strategy in mind. To do this, you must understand three main things: what you're protecting, how you're protecting it, and who is after what you're protecting. This understanding can only come from the melding of internal data and information with external threat intelligence. The ThreatQ threat intelligence platform, backed by its professional services, can bring this all together for organisations of any scale without reinventing their workflows.

Jadallah: Tenable's research team analysed disclosed cyber breaches in 2020 and identified that, for the vast majority of incidents, it was known vulnerabilities that continue to be the favourite attack methodology for attackers. Tenable's cyber exposure management solutions enable organisations to take a holistic view of their infrastructure to identify those assets and systems that are critical to function, determine which vulnerabilities exist within these core areas that are being actively exploited and update these systems to fix those flaws first. In tandem, focus must also be placed on securing accounts for employees, service contractors, temporary workers, systems accounts and others and their access to and permissions across systems. ■

Promoting the development of non-metallic pipe systems

TWI LTD AND Saudi Aramco Technologies Company (SATC), leaders in the research field of the use of non-metallic materials in the oil and gas industry, have signed an agreement with Netherlands-based, flexible composite pipes solutions provider, SoluForce, to undertake collaborative research and development (R&D) aimed at expanding the operational capabilities of plastic pipe systems in service. The agreement is within the framework of the Non-metallic Innovation Centre (NIC) in which TWI and SATC are partners with Abu Dhabi National Oil Company (ADNOC).

R&D activities will focus on increasing the operating temperature and pressure that reinforced thermo-plastic (RTP) pipes are able to withstand when transporting hydrocarbons. The overall aim is to create a new, more affordable, spoolable composite pipe product which will combine high performance and cost competitiveness, thereby supporting much wider adoption of the use of non-metallic pipes across the oil and gas industry. The long-term strategy is to reduce manufacturing costs whilst optimising the cost benefit of developed products, in order to promote the adoption of sustainable, non-metallic solutions.

The application of plastic pipelines offers a number of benefits to operators over using metal pipes including:

- Resistance to corrosion
- Light weight and consequently much cheaper to transport and easier to install
- Flexibility and durability
- Reduced carbon footprint compared to metallic alternatives.

The NIC and SoluForce will combine their expertise on the project to develop an affordable RTP solution. R&D activities will take place at the NIC's Cambridge base in TWI's headquarters and the prototype product will be manufactured by SoluForce. The NIC will carry out materials selection processes, investigate the potential use of recently developed and commercially available options, and evaluate the new pipe.

Robert-Jan Berg, managing director, SoluForce said, "We are honoured to



The agreement being signed by, left to right, Robert-Jan Berg, managing director, SoluForce, Mihalis Kazilas, NIC programme director and Ihsan Al-Taie, chief technologist, Saudi Aramco.

have been selected to take part in this prestigious Non-metallic Innovation Centre Agreement. I believe that an important part of innovation is combining the right partners and their underlying knowledge, and I am confident that we will be able to do just that in this development."

Dr. Ihsan Taie, the chief technologist from Aramco's Non-Metallics R&D team, said, "Seeing how the NIC made significant progress since its establishment in late 2018, we've recorded 100% growth in terms of funding, members and project portfolio. This success is attributed to its unique effective model for technology development. The model is designed to create a practical, efficient and effective platform for innovation and business at the same time, and we have just put in place a new plan for expansion to include affiliate members."

New bunker planning solution

I4 INSIGHT, CREATORS of a platform that provides a single point of access for multiple data streams and applications offering a holistic view of fleet operations, has formed an alliance with BunkerEx to incorporate optimised bunker planning data into the i4 Insight platform.

The addition of BunkerEx to the i4 Insight platform will further help shipowners and operators realise greater voyage and operational efficiency and improved fleet performance.

With bunkers being one of the largest costs associated with a voyage, making the right choice about where to bunker is critical. The BunkerEx data provides the optimal recommendation using real-time, accurate price data, while identifying fuel availability and pricing for each location. The technology processes thousands of potential bunker options in seconds and combines that with distances and live pricing information to reveal the most cost-effective bunker option. In addition, BunkerEx data lists any surprise charges, such as barge fees, calling costs and port charges.



Image credit: Adobe Stock

The solution provides fast, transparent bunker information.

“Access to fast, transparent bunker information is vital for ship operators to make optimal decisions. By collaborating with other maritime platforms, we can greatly improve the customer experience and grow with our partners. This alliance with i4 Insight is further proof of that and demonstrates the benefits of collaboration,” said Ishaan Hemnani, co-founder of BunkerEx.

“We know fuel costs take up a large percentage of a ship’s operating costs,” said Joel Meltzner, i4 Insight chief executive officer. “We have formed an alliance with BunkerEx to obtain live pricing data and fuel availability from ports around the world to be incorporated into our platform. We’re excited to bring more new products to the market very soon.”

Awards for corrosion protection solutions

INNOVATIVE CORROSION PROTECTION solutions have been recognised with Materials Performance (MP)/Association for Materials Protection and Performance Corrosion Innovation of the Year Awards.

CorrosionRADAR won the award for its Predictive Corrosion Under Insulation (CUI) Monitoring System, which combines real-time field data and predictive analytics generated via wireless sensing wave guides embedded under the asset insulation, with quality, integrity and risk-based inspection methodologies to drive repair or rehabilitation schedules. For operators, this means a more sustainable future with informed decision making, optimised maintenance programmes, safer and more reliable operations with decreased risk, and more production uptime.

While Novosound, a leading ultrasonic company based in Scotland, received the award for its Belenus ultrasound sensor, which provides corrosion monitoring across a variety of structures and environments in a range of industries.

Manufactured using Novosound’s patented, thin-film technology, the Belenus is the world’s first corrosion monitoring sensor that can operate completely soaked in high-temperature atmospheres up to 400°C (752°F) for extended periods of time.

By providing highly accurate and real-time corrosion data from remote and inaccessible locations, the Belenus enables corrosion in metal pipework and structures to be detected early and reliably. This facilitates improved maintenance planning and increases operational efficiency, as corrosion issues can be actioned and mitigated before unexpected failures occur.

Dräger releases new acoustic gas leak detector

DRÄGER HAS LAUNCHED the Polytron 8900 ultrasonic gas leak detector (UGLD) transmitter, an early warning area monitor for detecting high-pressure gas leaks in outdoor industrial process environments. Thanks to an ultrasonic acoustic sensor, it responds earlier than conventional gas detectors because it registers the sound of leaking gas instead of measuring the concentration of accumulated gas clouds. As gas escapes, leaks are immediately detected in the surrounding area, regardless of the wind direction.

The Polytron 8900 measures in the inaudible ultrasonic range and can therefore detect methane gas leaks of 3.5 ounces per second within a radius of approximately 49ft (14.9m), even in loud industrial environments.

“The Polytron 8900 UGLD is not affected by environmental influences such as wind or by background noise and detects a gas leak on a compressed gas line as soon as the gas escapes,” explained John Wilson, Dräger’s senior vice president of marketing and sales for safety solutions in North America. “An early warning system for leaking gas can prevent a plant from having to be shut down unnecessarily, thus saving time and money.”

Sandvik launches Sanicro 825

SANDVIK HAS LAUNCHED Sanicro 825, Sandvik’s first-ever nickel-iron-chromium alloy in bar and hollow bar, for improved performance in corrosive, high-temperature environments.

A high-strength alloy with minimum 40% nickel content, Sanicro 825 has excellent corrosion resistance to acids and alkalis, superior resistance to stress corrosion cracking (SCC) and good corrosion resistance to phosphoric, nitric, sulfuric, and organic acids, seawater, caustic chloride alkalis and ammoniac media.

Stable, easy to machine and weld, the new alloy is ideal for use in a wide range of components and installations including heat exchangers, evaporators, offshore piping systems, seawater coolant, valves and flanges.

Available in three- to seven-metre lengths with an outside diameter (OD) ranging from 20mm-260mm, Sanicro 825 offers a cost-effective alternative to superalloys such as Alloy 625 and Alloy 718. Its chemical formulation has been tailored within EN, UNS and ASTM standards.

“Sanicro 825 opens new high-performance possibilities for our customers. At elevated temperatures and in corrosive conditions, this new grade offers clear advantages to standard stainless steel or duplex grades and is more cost-efficient than some superalloys,” said Martin Holmquist, business development manager, Sandvik Materials Technology.



Image credit: Sandvik

Sanicro 825 is suitable for a wide range of components and installations.

EGS invests in the ultimate production efficiency

Euro Gas Systems (EGS) has maintained its record of incorporating the latest technologies to deliver top quality equipment to its customers with the acquisition of MicroStep DRM.

THROUGH CONTINUOUS INVESTMENT EGS has strategically positioned itself at the forefront of the natural gas value chain, providing on-going support to the global gas demand market.

Every product built within EGS's multiple manufacturing plants is tailor-made to customer specifications with the company able to promote full flexibility due to its impressive in-house design and engineering capabilities. One of the core strengths of EGS is the continuous investment, not only in its employees, but also in equipment and new technologies.

Recently, EGS installed its newest investment in the new vessel and skid manufacturing plant which was commissioned in early 2020; a MicroStep DRM 12001 Gb S Ppk, a CNC controlled 5-axis robotic plasma and oxyfuel cutting center, customised to suit EGS business needs.

"This investment allows EGS to not only support our ever-growing international market demand but also allows our team to streamline production time with increased accuracy throughout all stages of the manufacturing process. Improvements in efficiency will result in product cost reduction and improve delivery time of our gas compression equipment for our customers," said Roger Wachter, general manager for EGS.

The new MicroStep DRM is a robust gantry based machine designed for long-lasting industrial use and to meet the highest requirements of precision, performance and efficiency. This sizable machine is approximately 13m x 6.8m x 1.6m and is equipped with a durable scanner device that is specifically designed for scanning of 3D shapes. This can be used with any beveling tool station and includes a camera which allows the operator to position it correctly with ease.

The scanner's applications also include:

- Additional beveling process (ABP) capability of the machine is used for creating Y or K bevel cuts. The machine is able to cut the bevels in the full range thicknesses of the plasma source's capability.



Image Credit : Euro Gas Systems

The MicroStep DRM 12001 Gb S Ppk.

- Scanning of beams ensures precise cuts by compensating the cutting path for dimensional differences due to beam mill tolerances.
- Scanning of domes for accurate dome cutting. Plasma technology used together with the scanner results in precise cuts by compensating for manufacturing tolerances of the domes.

The MicroStep DRM 12001 Gb S Ppk:

- Gb denotes the oxyfuel rotator tool station, (Y, Z, A, B infinite; ITH), its multifunction includes cutting plates, pipes and domes.
- Pp represents a plasma beveling head, 3D rotator, a pantograph with a tilt up to 120° for cutting with both plasma and oxyfuel technologies. It can be used for plates, pipes, shells, beams and domes.
- k denotes the ACTG station (automatic calibration of torch geometry). This special station for both rotators improves geometry and precision after collision with materials during the cutting.
- Plasma Source: Hypertherm HPR400XD, high definition, with automatic gas console. The HPR400XD is the fastest, thickest and

most versatile HyPerformance Plasma system available on the market. HyPerformance Plasma cuts fine-feature parts with superior quality and consistency, eliminating the cost of secondary operations prior to welding.

When using plasma cutting technology the maximum cutting thickness of the machine is conditioned by the plasma piercing capacity, respectively 50 mm for the perpendicular piercing on the product surface, 35 mm for piercing at an angle of 45° and, during edge starting, it is possible to cut 80mm effective thickness. When using oxyfuel cutting technology the maximum cutting thickness is 330mm.

EGS also operates production equipment, incorporating the latest technologies, including CNC drilling/milling machines, semi-automated welding machines, and a CNC plate rolling machine, which support EGS in delivering top quality equipment to customers in the market place. The commitment for investments in developing the company's product range, engineering and service capabilities remain the main focus of the company. ■

Project Databank

Compiled by Data Media Systems

OIL, GAS AND PETROCHEMICAL PROJECTS, SAUDI ARABIA

Project	City	Facility	Budget (US\$)	Status
Advanced Polyolefins Company - PDH and PP Complex	Jubail	Polypropylene	1,800,000,000	EPC ITB
AGIC - Petrochemical Complex	Jubail Industrial City	Propylene		Project Announced
Al-Khafji Joint Operations (KJO) - Dorra Gas Field Development - Overview	Eastern Region	Gas Field Development	3,000,000,000	Feasibility Study
Basic Chemical Industries Company (BCI) - Chlorine Derivatives Plant	Jubail	Chlor Alkali	138,662,077	Construction
Daelim - Amiral Petrochemical Complex - Polyisobutylene (PIB) Plant	Jubail	Synthetic Rubber	300,000,000	Feasibility Study
Dow - Polymers Production Facility	Jubail	Polymers	100,000,000	Feasibility Study
INOCHEM - Soda Ash and Calcium Chloride Complex	Ras Al Khair	Detergents	300,000,000	Construction
NIGC - Jubail GAS Phase 9 - Air Separation Unit	Jubail	Industrial Gas Production	900,000,000	Construction
Pan Asia - Jizan City for Basic & Downstream Industries - Petrochemical & Chemical Fiber Integrated Project	Jizan	Purified Teraphtalic Acid (PTA)	3,800,000,000	Construction
Pan Asia - Jizan City for Basic & Downstream Industries - Petrochemical & Chemical Fiber Integrated Project - Phase 1	Jizan	Purified Teraphtalic Acid (PTA)	1,300,000,000	Construction
Pan Asia - Jizan City for Basic & Downstream Industries - Petrochemical & Chemical Fiber Integrated Project - Phase 2	Jizan	Purified Teraphtalic Acid (PTA)	500,000,000	Feasibility Study
Pan Asia - Jizan City for Basic & Downstream Industries - Petrochemical & Chemical Fiber Integrated Project - Phase 3	Jizan	Polybutylene Terephthalate (PBT)	800,000,000	Feasibility Study
Petrokemya - Jubail Nexlene Project	Jubail Industrial City	Polyethylene	350,000,000	FEED
Royal Commission for Jubail & Yanbu - KeroTech Industries - Kerosene Plant	Jubail	Kerosene	166,000,000	Project Announced
Sabic - PK Cluster	Jubail Industrial City	Petrochemical Plant	500,000,000	EPC ITB
Sabic - Saudi Aramco - Yanbu Crude Oil To Chemicals (COTC) Complex	Yanbu	Polyethylene	20,000,000,000	Feasibility Study
Saudi Aramco - Juaymah NGL Fractionation Plant Refrigeration Units and Storage Tanks	Juaymah	Storage Tanks	300,000,000	FEED
Saudi Aramco - Yanbu to North Jeddah NGL Pipeline	Yanbu	Gas	600,000,000	Construction
Saudi Aramco - Abqaiq Oil Plant Revamp	Abqaiq	Oil Production	1,000,000,000	FEED
Saudi Aramco - Annual Onshore Maintain Potential Programme - (Program)	Eastern Region	Maintenance	5,000,000,000	Construction
Saudi Aramco - Berri Oilfield Expansion - Downstream Pipeline LTA 43	Berri	Operation & Maintenance	350,000,000	Engineering & Procurement
Saudi Aramco - Berri Oilfield Expansion -	Berri	GOSP Expansion	1,700,000,000	Construction
Saudi Aramco - Berri Oilfield Expansion - Offshore Pipeline Replacement	Berri	Offshore Pipeline	400,000,000	Construction
Saudi Aramco - Berri Oilfield Expansion -	Berri	Oil Field Development	6,000,000,000	Construction
Saudi Aramco - Berri Oilfield Expansion - Two Drilling Islands Project	Berri	Dredging/ Reclamation	150,000,000	Construction
Saudi Aramco - Berri Oilfield Expansion -	Berri	Water Injection	200,000,000	Construction
Saudi Aramco - Dammam Oilfield Redevelopment	Dammam	Oil Production	1,000,000,000	Engineering & Procurement
Saudi Aramco - Gas Storage Facilities	Various	Storage Tanks	1,000,000,000	Project Announced
Saudi Aramco - Haradh Gas Increment Program - Freeflow Pipelines	Haradh	Flowlines	470,000,000	Construction
Saudi Aramco - Haradh Gas Increment Program - North Haradh Field Gas Compression Facilities	Haradh	Gas Compression	1,200,000,000	Construction
Saudi Aramco - Haradh Gas Increment Program - Satellite Gas Compression Facilities	Haradh	Gas Compression	1,200,000,000	Construction
Saudi Aramco - Hawiyah Gas Plant Expansion	Hawiyah	Gas Processing	1,200,000,000	Construction
Saudi Aramco - Hawiyah Unayzah Gas Reservoir Storage	Hawiyah	Storage Tanks	1,700,000,000	Construction
Saudi Aramco - Hawiyah Unayzah Gas Storage Pipeline	Hawiyah	Gas Pipeline	300,000,000	Engineering & Procurement

Project Databank

Compiled by Data Media Systems

OIL, GAS AND PETROCHEMICAL PROJECTS, SAUDI ARABIA

Project	City	Facility	Budget	Status
Saudi Aramco - Jazan Refinery to Abha Product Pipeline	Southern Region	Oil Pipeline	150,000,000	Construction
Saudi Aramco - King Salman Energy Park	Abqaiq	City	4,400,000,000	Construction
Saudi Aramco - LNG Terminal	Jeddah	Liquefied Natural Gas (LNG)	200,000,000	Feasibility Study
Saudi Aramco - Marjan Field Expansion - Interlinked Pipeline Installation	Marjan	Pipeline	600,000,000	Construction
Saudi Aramco - Marjan Field Expansion	Marjan	Oil & Gas Field	16,000,000,000	Construction
Saudi Aramco - Marjan Field Expansion -	Marjan	GOSP	5,000,000,000	Construction
Saudi Aramco - Marjan Field Expansion -	Marjan	Gas Treatment Plant	1,200,000,000	Engineering & Procurement
Saudi Aramco - Marjan Field Expansion - NGL Recovery & Fractionation	Marjan	Natural Gas Liquefaction (NGL)	1,000,000,000	Engineering & Procurement
Saudi Aramco - Marjan Field Expansion - Sulphur Handling and Propane Loading	Marjan	Sulphur Recovery	100,000,000	Engineering & Procurement
Saudi Aramco - Marjan Field Expansion - Pipeline Tanajib GOSP to Concession Areas	Marjan	Oil Pipeline	130,000,000	Engineering & Procurement
Saudi Aramco - Marjan Field Expansion - Pipeline Tanajib to Ras Tanura	Marjan	Oil Pipeline	100,000,000	Engineering & Procurement
Saudi Aramco - Marjan Field Expansion - Pipeline Tanajib to Jubail Concession Areas	Marjan	Oil Pipeline	200,000,000	Construction
Saudi Aramco - Marjan Field Expansion - Offshore Utilities and Associated Facilities	Marjan	Oil Field Development	400,000,000	Engineering & Procurement
Saudi Aramco - Marjan Field Expansion -	Marjan	Offshore Water Injection	5,000,000,000	Construction
Saudi Aramco - Marjan Field Expansion - Offshore Gas Facilities and Pipelines	Marjan	Gas Field Development	1,500,000,000	Construction
Saudi Aramco - Marjan Field Expansion -	Marjan	Onshore Water Injection	400,000,000	Engineering & Procurement
Saudi Aramco - Marjan Field Expansion - Tanajib Onshore Facilities	Marjan	Gas Compression	1,500,000,000	Construction
Saudi Aramco - Marjan Field Expansion - Inlet Storage and Compression	Marjan	Gas Compression	1,000,000,000	Engineering & Procurement
Saudi Aramco - Marjan, Berri, Zuluf and Safaniyah	Eastern Region	Oil & Gas Field Expansion	7,000,000,000	Construction
Saudi Aramco - Master Gas System Expansion	Various	Non Associated Gas	4,050,000,000	Construction
Saudi Aramco - Multiple Pipelines Revamp	Eastern Region	Gas Pipeline	250,000,000	Construction
Saudi Aramco - North Jeddah Bulk Plant Expansion	Jeddah	Storage Tanks	270,000,000	Construction
Saudi Aramco - Offshore Maintain Programme	Eastern Region	Oil & Gas Field	7,000,000,000	Construction
Saudi Aramco - Ras Tanura Refinery	Ras Tanura	Hydrocracker	500,000,000	FEED ITB
Saudi Aramco - Ras Tanura Refinery	Ras Tanura	Sulphur Recovery	200,000,000	EPC ITB
Saudi Aramco - Safaniya Debottleneck Plant	Safaniyah	Oil Production	800,000,000	Construction
Saudi Aramco - Safaniya Oil Field Expansion	Safaniyah	Operation & Maintenance	500,000,000	Engineering & Procurement
Saudi Aramco - Safaniyah Oil Field Expansion	Safaniyah	Offshore Platform	1,500,000,000	Construction
Saudi Aramco - Shaybah NGL Plant Upgrade	Shaybah	NGL	300,000,000	Engineering & Procurement
Saudi Aramco - Storage Tanks	Various	Storage Tanks	250,000,000	Engineering & Procurement
Saudi Aramco - Storage Tanks & Equipment	Yanbu	Storage Tanks	400,000,000	Construction
Saudi Aramco/Total Amiral Petrochems Complex	Jubail	Synthetic Rubber-ENB Plant	150,000,000	Feasibility Study
Saudi Aramco/Total Amiral Petrochems Complex	Jubail	Petrochemical Plant	9,000,000,000	FEED
Saudi Aramco Jafurah Gas Plant - Export Pipelines	Al Jafurah	Gas Pipeline	500,000,000	EPC ITB
Saudi Aramco - Jafurah Gas Plant	Al Jafurah	Gas Processing	2,500,000,000	EPC ITB
Saudi Aramco - Jafurah Gas Plant	Al Jafurah	Storage Tanks	100,000,000	FEED
Saudi Aramco - South Ghawar Field Development	South Ghawar	Gas Treatment Plant	700,000,000	Engineering & Procurement
Saudi Aramco - South Ghawar Field Development	South Ghawar	Gas Field Development	2,200,000,000	Engineering & Procurement
Saudi Aramco - South Ghawar Field Development	South Ghawar	Gas Pipeline	500,000,000	Engineering & Procurement
Saudi Aramco - South Ghawar Field Development	South Ghawar	Tie-In Installation	500,000,000	Engineering & Procurement
Saudi Aramco - Tight Gas Production Systems A&B	Turaif	Gas Field Development	3,500,000,000	Construction
Saudi Aramco - Tight Gas Production Systems B	Turaif	Gas Field Development	1,000,000,000	Construction
Saudi Aramco - Uthmaniya & Shedgum Gas	Uthmaniyah	Gas Compression Plants	2,500,000,000	EPC ITB
Saudi Aramco - Uthmaniya & Shedgum Gas Field	Shedgum	Gas Pipeline	100,000,000	EPC ITB
Saudi Aramco - Uthmaniya & Shedgum Gas Field	Uthmaniyah	Gas Pipeline	100,000,000	EPC ITB
Saudi Aramco - Zuluf Oilfield Expansion	Zuluf	Field Processing Facility	1,300,000,000	EPC ITB
Saudi Aramco - Zuluf Oilfield Expansion	Zuluf	Offsites & Utilities	1,300,000,000	EPC ITB
Saudi Aramco - Zuluf Oilfield Expansion	Zuluf	Water Injection	1,300,000,000	Project Announced
Saudi Aramco - Zuluf Oilfield Expansion	Zuluf	Oil Field Development	1,700,000,000	Engineering & Procurement
Saudi Aramco - Zuluf Oilfield Expansion	Zuluf	Water Injection/Oil Trunklines	1,000,000,000	Project Announced
Saudi Aramco - Zuluf Oilfield Expansion	Zuluf	Water Injection Wellheads & Tie-In Platforms	1,000,000,000	Project Announced
Saudi Aramco - Zuluf Oilfield Expansion	Zuluf	Water Injection Wellheads & Tie-In Platforms	1,000,000,000	Project Announced
Saudi Aramco - Zuluf Oilfield Expansion	Zuluf	Wellhead Topsides & Oil Tie-In Platforms	1,000,000,000	Project Announced

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Project Databank

Compiled by Data Media Systems

Project Focus

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Project Summary - Marjan Field Expansion - Package 6 - Tanajib Onshore Facilities

Name of Client & Project	SAUDI ARAMCO - Saudi Arabian Oil Company
Revised Budget (US\$)	1,500,000,000
Facility Type	Gas Compression, Oil Train, Gas Treatment Plant
Status	Construction
Location	Various
Project Start	Q1-2018
End Date	Q4-2023
FEED/PMC	Wood
Main Contractor	Hyundai Engineering & Construction
Contract Value (US\$)	1,400,000,000
Award Date	Q2-2019

Background

Saudi Aramco plans on expanding Tanajib's processing capacity by an additional 300,000 bpd of crude from its offshore fields as well as debottleneck the existing GOSP. A modification to the current process and utility facilities are in the pipeline to handle future increased water cuts.

Project Status

Date	Status
Mar 2021	Despite several delays due to COVID-19, Hyundai E&C's EPC works on the package are ongoing, but moving at a slow pace.
Nov 2020	Kamco's design and provision of construction equipment is ongoing.
Apr 2020	Early construction works on Package 6 are ongoing. Subcontractors involved in the project are Kamco, Hanwa, Gosan, Libert and Alfa.
Jun 2019	Hyundai Engineering & Construction has won the EPC contract.

Project Scope

The project scope involves the following:

- A new oil processing train
- Compression train
- A gas processing and dehydration train
- Crude storage & associated infrastructure

The package will possibly include additional water disposal pumps, fire pumps, flare stacks, new fuel gas supply pipeline and associated flare systems.

Middle East & North Africa

The Baker Hughes Rig Count tracks industry-wide rigs engaged in drilling and related operations, which include drilling, logging, cementing, coring, well testing, waiting on weather, running casing and blowout preventer (BOP) testing.

Country	MARCH 2021			VARIANCE		FEBRUARY 2021		
	Land	Offshore	Total	From Mar. 2020	From Feb. 2021	Land	Offshore	Total
Middle East								
ABU DHABI	29	15	44	-22	0	29	15	44
DUBAI	0	0	0	-2	0	0	0	0
IRAQ	34	0	34	-40	+3	31	0	31
KUWAIT	27	0	27	-23	-1	28	0	28
OMAN	43	1	44	-11	-3	46	1	47
PAKISTAN	14	0	14	-5	+2	12	0	12
QATAR	2	8	10	-3	0	2	8	10
SAUDI ARABIA	51	9	60	-54	-3	53	10	63
YEMEN	2	0	2	+1	0	2	0	2
TOTAL	202	33	235	-159	-2	203	34	237

North Africa

ALGERIA	25	0	25	-9	+3	22	0	22
EGYPT	22	1	23	-6	+2	19	2	21
LIBYA	12	0	12	+1	0	12	0	12
TUNISIA	0	0	0	-3	0	0	0	0
TOTAL	59	1	60	-17	+5	53	2	55

Source: Baker Hughes

من أجل تبسيط الاتصال والتزويد وإدارة الجهاز من خلال وحدة تحكم واحدة. وهذا يعني أنه يمكن للمستخدمين في الخارج إدارة جميع احتياجات إنترنت الأشياء الصناعية عبر الخدمة الجديدة. ويمكن للعملاء الاختيار من بين الخيارات اللاسلكية الخلوية والأقمار الصناعية والخيارات اللاسلكية منخفضة الطاقة، وإدارة كل شيء من واجهة واحدة.

ومجرد نشر الأجهزة، يقوم مركز إنترنت الأشياء بشركة «سيد كاست» - المنتشر على موقع أمازون للخدمات لزيادة قوة الحوسبة وقابلية التشغيل البيئي - بمراقبة صحة وحالة جميع العناصر الرئيسية داخل النظام البيئي لإنترنت الأشياء، بما في ذلك الأجهزة وشبكة الاتصالات ومنصة إنترنت الأشياء وتطبيقات المستخدم النهائي. ويتم الآن نشر خدمات إنترنت الأشياء من «سيد كاست» عبر قطاعات الطاقة والصناعات البحرية والقطاعات الأخرى.

وهو - من الناحية العملية - يوفر الشبكة التي تنقل بيانات المستشعرات لإحدى كبرى شركات النفط والغاز لتصنيع الضواغط الصناعية في الحقل إلى المقر الرئيسي لشركة العميل، حيث تتنبأ تحليلات البيانات بجدولة الصيانة لتقليل وقت التوقف عن العمل والتكاليف. وعندما يمكن أن يكلف عطل مضخة واحدة في موقع بعيد ما يصل تكلفته إلى 300,000 دولار أمريكي في اليوم من الخسائر في الإنتاج، فإن استردادها يأتي بسرعة، وتتنطبق اقتصاديات مماثلة في مجالات صناعات النفط البحرية. ولكن نطاق التطبيق يعتبر واسع الأثر. إذ يستفيد العملاء الآخرون من خدمات إنترنت الأشياء لشركة «سيد كاست» لمراقبة الأفراد وسلامتهم وتتبع البضائع وحمايتها وتوفير صيانة أكثر كفاءة لعشرات الآلاف من الأصول. لم تكن الصناعات البحرية أكثر ارتباطاً من قبل، ولكن هناك المزيد في المستقبل.

فنتحات صغيرة «VSAT» ميسورة التكلفة على الأجهزة المدمجة.

ومع تقدم التكنولوجيا بوتيرة سريعة، فإن الخبر السار هو أن الرقمنة - التي كانت مخصصة في السابق للسفن الكبيرة فقط - أصبحت متاحة الآن للمراكب الصغيرة أيضاً، والتي تُستخدم عادة في خدمات مساعدة أو داعمة داخل صناعة النفط والغاز البحرية.

وقد علق نبيل بن سوسة، الرئيس التنفيذي في شركة «أي إي سي تيليكوم» لآسيا والشرق الأوسط ورابطة الدول المستقلة قائلاً: «نشهد اليوم ارتفاعاً ملحوظاً في الطلب على الحلول الرقمية، والذي تصاعد بسبب الوباء. وقد تم إطلاق Orion Edge V في البداية لسوق الإمارات العربية المتحدة، حيث سلط الضوء على فوائد الرقمنة التي تتوفر الآن حتى للسفن الصغيرة عبر أحدث المنصات الافتراضية».

وأفادت حوالي 60 في المائة من الشركات في الشرق الأوسط بأنها تستثمر الآن في نشاطات التقنيات الرقمية، وتتمتع السفن الرقمية بميزة تنافسية عندما يتعلق الأمر بالتكيف مع التحديات وتحسين فرص العمل. ويتيح دمج نظام OneGate الخاص بشركة «أي إي سي تيليكوم» الموجود في حل Orion Edge المتوفر مسبقاً لمديري تكنولوجيا المعلومات والاتصالات، مراقبة شبكتهم والتحكم فيها عبر جميع سفن الأسطول عن بُعد عبر مجموعة من لوحات المعلومات سهلة الاستخدام. ويمكن أيضاً، عند الطلب، إضافة خدمات جديدة، بما في ذلك التطبيق عن بُعد ومؤتمرات الفيديو وأيضاً الصيانة عن بُعد.

إنترنت الأشياء

تعتبر هذه التطورات عالية التقنية ذات تأثير مادي في أماكن تواجدها. وقد أطلقت شركة «سيد كاست» - مؤخرًا - نظاماً أساسياً من الجيل التالي لإنترنت الأشياء

في نهاية العام الماضي دخول «جي إكس 5» الخدمة، وهو أقوى قمر صناعي لها حتى الآن، مما سيفيد المستخدمين على وجه التحديد في جميع أنحاء أوروبا والشرق الأوسط. وهي توفر خدمات النطاق العريض عبر الأقمار الصناعية المحسنة والرائدة في الصناعة (جي إكس) من طراز Ka-band المصممة للصناعات البحرية، مما يوفر ضعف السعة المجمعة لأسطول (جي إكس) الحالي بأكمله (جي إكس 1 - جي إكس 2). وذلك إلى جانب شبكة المحطات الأرضية الموسعة بشكل كبير والمعالجة المستندة إلى السحابة المحسنة. وصرحت «إنمار سات» بأن «جي إكس 5» يكمل الآن التغطية العالمية لـ «جي إكس» ويدعم النمو السريع في طلب العملاء على خدمات «جي إكس»، لا سيما ما يتعلق بالصناعات البحرية؛ مثل قطاعات الترفيه والتجارة والقطاعات البحرية الأخرى.

وتخطط الشركة لإطلاق سبعة أقمار صناعية أخرى على مدى السنوات الأربع المقبلة، وذلك لزيادة تحديث بنيتها التحتية، وكذلك إضافة السرعة والسعة والمرونة لشبكات الاتصالات البحرية في جميع أنحاء العالم. ويعتمد - بالفعل - عشرات الآلاف من المستخدمين النشطين في مجالات الطيران والبحرية والشركات والحكومة وغيرها من المجالات على جي إكس يومياً.

الحلول الرقمية

يجري طرح العديد من المنتجات والحلول الرقمية الأخرى في السوق لتحسين أو تسريع الاتصالات في القطاع البحري. فقد أطلقت مجموعة «أي إي سي تيليكوم» و «الثرثيا» حلاً رقمياً جديداً يغير قواعد اللعبة لجميع أنواع السفن في معرض «سيتريد ماريتايم الشرق الأوسط الافتراضي» في عام 2020. ويعتبر نظام «Orion Edge V» (V) الافتراضي هو نظام ساتكوم متطور يوفر تجربة شبيهة بتجربة «المحطات ذات

← مفكرة الفعاليات 2021

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نظام ساتكوم الرقمي الجديد Orion Edge V أصبح متاحاً أيضاً للمراكب الصغيرة

ثورة الاتصالات

في هذا المقال، يقول مارتن كلارك إن التطورات الجديدة في تكنولوجيا الاتصالات الرقمية والأقمار الصناعية تعود بالفائدة على الصناعات البحرية في الشرق الأوسط. فالاتصالات البحرية توفر رابطاً حيوياً بين منشآت مرافق النفط والغاز بدءاً من حفارات التنقيب ومنصات الحفر وكذلك سيارات النقل وناقلات النفط، وربطها بالعالم الخارجي.

وقد سجلت الشركة - قبل جائحة كوفيد-19 - نمواً ملحوظاً على أساس سنوي بنسبة 11 في المائة خلال النصف الأول من عام 2019 لمنطقة الشرق الأوسط. وصرحت بأن «الطلب والنشاط المتزايد يأتي من عملاء متنوعين، بما في ذلك شركات النفط الوطنية وشركات النفط الكبرى، وكذلك مشغلو الحفارات والشركات التي تقدم خدمات التنقيب والإنتاج». وكان عملاؤها يبحثون عن اتصالات هجينة متطورة بشكل متزايد، وحلول تكنولوجيا المعلومات للعمليات البرية والبحرية، وذلك من أجل دفع التحول الرقمي لمنصات النفط والحفر وسفن الإمداد البحرية ومنصات الإنتاج وسفن الإنتاج والتخزين والتفريغ العائم «FPSO».

التعزيز البحري «جي إكس 5»

مرت خدمات الأقمار الصناعية أيضاً بتحول خلال الثلاثين عاماً الماضية. وقد أعلنت شركة «إمغار سات»

مسؤولية ما يقرب من نصف حركة المرور العالمية على «إمغار سات (ج)»، والتي تشكل أساس السلامة البحرية الحيوية وأنظمة تتبع السفن وتحديد المواقع.

توسيع البنية التحتية

في الوقت نفسه، تتجه كذلك البنية التحتية، اللازمة للتعامل مع ما يعد فعالاً فيما يتعلق بسبل الاتصال ونقل المعلومات الضخمة، نحو النمو بشكل كبير. وتعتبر «مارلينك» واحدة من أكبر الشركات التي تعمل على توسع تواجدتها في الشرق الأوسط، استجابة لطلب الأعمال القوي لتوفير مزيد من النطاق الترددي والتركيبات الجديدة من قطاع الطاقة والعملاء الآخرين في البحر والبر. وهي تتوسع في مجالات عدد المحطات النشطة والاتصال عبر الأقمار الصناعية والشبكات المدارة وحلول تكنولوجيا المعلومات. هذا بالإضافة إلى الموارد في الموقعة؛ مثل المبيعات أو فرق الخدمة في مواقع الحقول بالدولة.

ربما يعتبر ذلك على بعد أميال عديدة من الشاطئ، في البيئات البحرية المعزولة، رابطاً مطمئناً ولحظياً بمجموعة عالمية من الخبرات، وأيضاً بالنسبة لأساطيل السفن التي تجوب البحار كل يوم حاملة نفط الخليج حول العالم، فهي كذلك جزء لا يتجزأ من بانوراما السلامة والملاحة. ومثلها مثل باقي قطاعات المجتمع الأخرى، هي مجال يشهد تطوراً سريعاً ومستمرًا مدفوعاً بالتقدم التكنولوجي الذي لا هوادة فيه. فلقد تجاوزت البيانات الضخمة والتكنولوجيا الرقمية والاتصال عبر الأقمار الصناعية، أيام المكالمات الهاتفية وأجهزة الفاكس، وتتحرك الأشياء الآن بشكل أسرع من أي وقت مضى. لقد مضى الآن 30 عاماً على إطلاق خدمة النظام العالمي للاستغاثة والسلامة البحرية (GMDSS)، عبر خدمة القمر الصناعي «إمغار سات (ج)».

يوفر القمر الصناعي «إمغار سات (ج)» موثوقية بنسبة 99,9 في المائة للبحارة، وتتولى شركة «مارلينك»

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فريق التحرير والتصميم: براشانت إيه بي، هيرتي بايرو، ميريام بروتكوف، رانجانا جاي إس، رونيكا باتناك، سامنثا بين، راؤول بوتنفيدو، نكي فالساماكس، فاني فينوجوبال، دويلينا روي.

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London SW1W 0EX UK
هاتف: +٤٤ (٠) ٧٨٣٤ ٧٦٧٦
فاكس: +٤٤ (٠) ٧٩٧٣ ٠٠٧٦

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صندوق بريد: ٥٠٣٢٠٧
مدينة دبي للإعلام
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تحليلات

ثورة الاتصالات ٤

ملخص محتويات القسم الإنجليزي:

تقارير خاصة: المملكة العربية السعودية.

استطلاعات: التكرير والبتروكيماويات، التنوع والاحتواء، التخزين والإيداع.

تقنيات: طلاء الأسطح، المضخات والصمامات، الأمن السيبراني.

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