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Oil Review Middle East

Oil · Gas · Petrochemicals

VOLUME 22 | ISSUE 2 2019

High hopes for Bahrain's E&P sector

- Confidence on the up in Iraq
- Improving energy efficiency in compressors
- Digital twins for subsea operations
- Effective corrosion protection
- The latest advances in pipeline technology
- Intelligent artificial lift for the digital oilfield

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Printed by: Buxton Press

Printed in: March 2019

 ISSN: 1464-9314

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Editor's note

BAHRAIN HIT THE headlines last year when it announced a major offshore oil discovery, its biggest since 1932, with more than 80bn bbl of tight oil in place. This has the potential to significantly revitalise the country's E&P sector and positively impact its economy. In an exclusive interview, Bahrain's Tatweer Petroleum outlines how it is looking to increase production by exploiting the new discovery as well as by boosting output at the Bahrain Field with the help of enhanced recovery techniques (see p16).

Zaher Ibrahim, BHGE's president and CEO, Saudi Arabia, North Gulf & East Mediterranean, discusses the company's localisation strategy on p36, and we look at Iraq's resurgent oil sector (p12). Our technology section covers the latest advances in compressors (p22), corrosion protection (p26), pipeline technology (p28) and digital twins for subsea operations (P32).

We hope to see you at MEOS (see p18), where all the latest industry trends and technologies will be discussed and showcased.

Contents

Front cover image: Tatweer Petroleum

➔ Executives' Calendar 2019

MARCH			
5-6	**Saudi Downstream Forum**	YANBU	www.saudidownstream.com
5-7	**Middle East Electricity (MEE) 2019**	DUBAI	www.middleeastelectricity.com
11-15	**CERA Week**	HOUSTON	www.ceraweek.com
18-21	**MEOS**	MANAMA	www.meos19.com
18-21	**Pipeline Technology Conference**	BERLIN	www.pipeline-conference.com
25-26	**Gulf Safety Forum**	MANAMA	www.gulfsafetyforum.com
27-28	**OpEx MENA 2019**	MANAMA	www.opex.biz
27-29	**OMC**	RAVENNA	www.omc2019.it
APRIL			
2-4	**Lebanon Int'l Oil & Gas Summit**	BEIRUT	www.liog-summit.com
8-9	**Annual Middle East Petroleum & Gas Conference**	DUBAI	www.mpgc.cc
14-15	**Health, Safety & Environment Forum**	MANAMA	wwwq.hse-forum.com
15-17	**Oman Downstream**	MUSCAT	www.downstream-oman.com
28-2 May	**SOGAT**	ABU DHABI	www.sogat.org
MAY			
1-4	**Iran Oil Show**	TEHRAN	www.iran-oilshow.ir/en
6-9	**OTC**	HOUSTON	2019.otcnet.org
JUNE			
25-26	**East Med Gas 2019**	LONDON	www.newsbaseeastmed.com

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

Expanding the Mediterranean energy sector: fuelling regional growth

THE DEEP WATER discoveries in the East and South Mediterranean have opened up a whole new frontier, offering exciting opportunities to oil and gas companies to assess and develop the energy potential of this highly prospective region.

The combined existing and potential resources represent the opportunity to expand regional markets, revitalise domestic consumption and produce wealth. The Mediterranean is turning into an important gas hub for export to Europe as well as to other Mediterranean markets, maximising the usage of existing infrastructure in the region.

Natural gas, LNG and a range of new technologies will play an important role as regards the increasing and changing demand for transport.

As the world seeks to reduce emissions, the utilisation of renewables in the North African countries has begun to make a significant contribution to the energy mix.

Research and innovation will act as a catalyst for the development of the entire region. The digital "revolution" and the rapid implementation of energy efficiency technologies promise to enhance productivity and increase competitiveness while ensuring higher quality standards, security and environmental protection.

These and other issues will be explored across plenary, panel and technical sessions at the Offshore Mediterranean Conference (OMC 2019) to be held from 27-29 March in Ravenna.

Image Credit : J. Stephen Conn / Flickr

Deep water discoveries in the Eastern Mediterranean have opened up new opportunities.

OMC 2019 will encourage technical and business knowledge sharing among ministers, CEOs, experts and trade professionals worldwide. The event is expected to attract more than 20,000 industry experts and some 650 companies from 33 countries.

For further information see the website at www.omc2019.it.

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A full stream of insights and opportunities at Lebanon International Oil & Gas Summit

THE LEBANON INTERNATIONAL Oil & Gas Summit (LIOG) has firmly established itself as the leading international and annual oil and gas event for Lebanon, providing a meeting place for industry executives and experts to gain invaluable insight to the opportunities, the challenges and the road ahead for companies and investors.

With the new formation of the Lebanese government, everything is in place for companies to establish a presence in one of the most exciting nascent oil and gas markets. Held under the patronage of Lebanon's Ministry of Energy and Water, the Summit will be at the centre of the expected developments, including the start of exploration drilling in two maritime blocks, the launch of the second licensing round offshore Lebanon, and the introduction of Liquefied Natural Gas (LNG) for the first time to the Lebanese market through FSRUs.

Organised with the strapline 'A full stream of insights and opportunities', LIOG 2019 will take place from 2-4 April 2019 at the Hilton Beirut Habtoor Grand Hotel. It will include a two-day strategic conference, along with a technical day, covering the whole value chain of the country's petroleum industry.

With more than 600 participants from around the world expected to attend, including top public and private sector officials, the 5th LIOG Summit comes at a crucial time to provide participants with the best possible platform for insightful information and debate, and dedicated networking opportunities to facilitate meeting and partnerships.

For further information see the website at www.liog-summit.com.

Boosting Oman's downstream industry

THE REFINING AND petrochemical industry in Oman is evolving fast as the country seeks to maximise the value of its crude and exploit its full downstream potential. Major projects are underway such as the Duqm Refinery & Petrochemical Complex.

The Oman Downstream Exhibition & Conference (ODEC), to be held from 15-17 April at the Oman Convention & Exhibition Centre, Muscat, will provide a forum for Oman's refiners and petrochemical producers to discuss solutions to support the industry's growth and technical challenges.

Expected to attract more than 3,000 trade professionals, the event will provide an opportunity to connect with the key stakeholders amd buyers in Oman's downstream industry, who are actively seeking the latest technologies and services.

Image Credit : Zhu Difeng/Adobe Stock

Oman's downstream industry is expanding fast.

The conference will cover subjects including the rise of the East, threat from EVs, changing bunker fuel specifications and the differentiator of digital.

For further information see the website at www.downstream-oman.com.

Driving operational excellence

WITH THE RAPID increase in global energy demand, the oil and gas industry faces serious challenges. Oil and gas companies urgently need to implement the latest technologies and management processes to reduce costs and ensure safe operations.

Image Credit : ryzhi/Adobe Stock

The event will explore the latest technology trends.

The sixth edition of OPEX MENA 2019, to be held from 27-28 March in Manama, will gather major operators from the region to share case studies that outline their challenges, successes and key learnings. Industry leaders, solutions providers and consultants will discuss the newest tools and techniques that will drive the industry to even greater levels of operational excellence improvements, allowing companies to innovate in the areas of 'people', 'process', 'assets' and 'technology'.

Latest trends including cyber security, artificial intelligence (AI), virtual reality (VR), digitalisation, visualisation, Big Data and Industrial Internet of Things (IIoT) will be discussed at the event.

For further information see the website at www.opex.biz.

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Oman signs upstream agreement with Total, Shell

Image credit: Derek Gavey/Flickr

The agreement is set to explore and develop in 2019 the gas resources of the Greater Barik area.

TOTAL, THE MINISTRY of Oil and Gas of the Sultanate of Oman (MOG), Oman Oil Company (OOC), Shell and Petroleum Development Oman (PDO) have signed an interim upstream agreement to further explore and develop gas resources of the Greater Barik area, northern part of Block 6 located onshore in the central west region of Oman.

This agreement is the first step towards the implementation of the MoU signed between Total and MOG in May 2018 related to the development of an integrated gas project.

This integrated project includes an upstream development, in partnership with Shell and OOC, to produce the gas resources of the Greater Barik area and a downstream development by which Total and OOC will supply build and operate a one million tonnes per annum (Mtpa) LNG plant and develop an LNG bunkering hub in the port of Sohar.

Parties will continue to work diligently to finalise the definitive agreements which will guarantee the success of those integrated developments.

Rockwell Automation and Schlumberger form JV for digital oilfield

ROCKWELL AUTOMATION HAS partnered with Schlumberger, one of the leading providers of technology for reservoir characterisation, drilling, production and processing to the oil and gas industry, to create a new joint venture, Sensia.

The Sensia joint venture will be the first fully integrated provider of measurement solutions, domain expertise and automation to the oil and gas industry.

Under the terms of the agreement, Sensia will operate as an independent entity, with Rockwell Automation owning 53 per cent and Schlumberger owning 47 per cent of the joint venture.

"Oilfield operators strive to maximise the value of their investments by safely reducing the time from drilling to production, optimising the output of conventional and unconventional wells and extending well life," said Blake Moret, chairman and CEO at Rockwell Automation.

"As oil and gas producers strive to improve productivity, we will bring the value of the Connected Enterprise to life for them. Sensia will provide complete lifecycle and process automation solutions from well to terminal, including industry-leading oilfield technology and expertise," added Moret.

Mubadala Petroleum signs production sharing contract in Thailand

Image credit: Mubadala Petroleum

The long-term producing gas asset will contribute to the company's overall growth strategy

ABU DHABI'S MUBADALA Petroleum has signed a production sharing contract (PSC) with its partner PTTEP Energy Development Company Limited (PTTEP ED) for offshore Block G1/61 containing the Erawan gas field in Thailand.

The current Block G1/61 concession will expire in April 2022 and PTTEP ED, a subsidiary of PTT Exploration and Production PCL, will then take over the operations.

PTTEP ED will hold a 60 per cent stake and Mubadala Petroleum will hold a 40 per cent stake in the PSC.

Commenting on the agreement, Bakheet Al Katheeri, CEO of Mubadala Petroleum, said, "We look forward to working closely together with PTTEP ED to efficiently and safely produce gas and further develop the Erawan field to safeguard Thailand's long-term domestic gas supply."

"The Erawan field is Mubadala Petroleum's first gas project in Thailand, where we are currently one of the largest crude oil operators with three producing fields," he added.

"This large-scale, long-term producing gas asset will contribute to our overall growth strategy by increasing the proportion of gas in our producing portfolio while also building on our recent gas-focused acquisitions in Egypt and development of the Pegaga gas field in Malaysia," he concluded.

Saudi Aramco expands China business

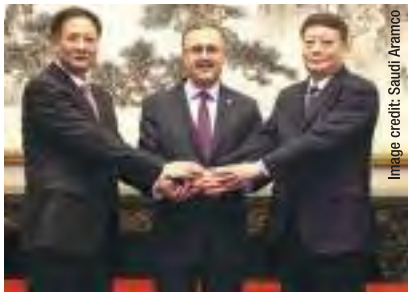

Image credit: Saudi Aramco

Aramco stated that there are additional plans to establish a fuels retail business.

SAUDI ARAMCO HAS signed an agreement to form a joint venture (JV) with the Chinese conglomerate NORINCO Group and Panjin Sincen to develop a refining and petrochemical complex in Panjin city of Liaoning province.

The partners will establish a new company, Huajin Aramco Petrochemical Co, as part of a project that will include a 300,000 bpd refinery with a 1.5 mmtpa ethylene cracker and a 1.3 mmtpa PX unit.

Aramco will supply up to 70 per cent of the crude feedstock for the complex, which is expected to start operations in 2024.

Amin Nasser, CEO of Saudi Aramco, said, "Our agreement with NORINCO and the Liaoning province is a clear demonstration of Saudi Aramco's strategy to move from beyond a buyer-seller relationship, to one where we can make significant investments to contribute to China's economic growth and development."

"Our participation in the integrated refining and petrochemical project in Panjin will strengthen our collaborative efforts to enhance energy security, revitalise key growth sectors and industries in Liaoning and also meet rising demand for products and goods in China's Northeast region," he added.

Aramco stated that there are additional plans to establish a fuels retail business.

Saudi Aramco, North Huajin and Liaoning Transportation Construction Investment Group Co are expected to form a three-party marketing JV to develop a retail fuel station network in the target markets by the end of 2019.

Saudi Aramco has also signed three Memoranda of Understanding (MoUs) aimed at expanding its downstream presence in the Zhejiang province, one of the most developed regions in China. The company aims to acquire a nine per cent stake in Zhejiang Petrochemical's 800,000 bpd integrated refinery and petrochemical complex, located in the city of Zhoushan. It involves investing in a retail fuel network.

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Honeywell opens manufacturing and testing centre in Kuwait

HONEYWELL HAS OPENED Kuwait's first certified in-country manufacturing, integration and testing centre for advanced automation technologies.

The Honeywell Customer Solutions Centre, located in Mina Abdullah in southern Kuwait, was officially inaugurated by Darius Adamczyk, chairman and CEO of Honeywell, and Hashem Hashem, deputy chairman and CEO of Kuwait Petroleum Corporation (KPC).

The centre aims to enable product assembly, customer testing and acceptance to be consolidated under one roof, making it easier for customers to deploy new technologies.

Image Credit : Honeywell

The new Honeywell facility aims to assemble distributed control system (DCS) platforms and operator consoles for small to medium-sized automation projects.

According to Honeywell, the centre is set to transform the country into a world leader in the downstream oil and gas industry.

Hashem added, "KPC is focused on maximising the country's energy resources and leveraging the latest technology and know-how to optimise operations and achieve greater cost efficiencies in line with our KPC Vision 2040."

Halliburton breaks ground on chemical plant in Saudi Arabia

HALLIBURTON HAS ANNOUNCED that it will build the first oilfield chemical manufacturing reaction plant in Saudi Arabia.

The company held a groundbreaking ceremony on 18 February at the PlasChem Park plant location in Jubail.

Upon the plant's completion inin 2020, Halliburton will begin local manufacturing of specialty chemicals to help customers achieve production and reliability goals in applications from the reservoir to the refinery.

The plant will be able to produce a wide range of chemicals for stimulation, production, midstream and downstream engineered treatment programmes.

Jeff Miller, chairman, president and CEO of Halliburton, said, "This is a strategic, targeted expansion to accelerate our fast-growing specialty chemicals business. We are excited to house this premiere facility in Saudi Arabia while continuing to strengthen our commitment to the In Kingdom Total Value Add programme."

"We chose Saudi Arabia for this plant because it provides an advantaged location for us to deliver our value proposition of superior service and chemical applications expertise to eastern Hemisphere customers, and because of our strong 80-year history of success in the Kingdom of Saudi Arabia," he added.

Halliburton's global laboratory and team in Dhahran Techno Valley and local manufacturing enable the company to accelerate the production of next generation chemical solutions while developing local employees and capabilities.

One of the largest oilfield services companies in the world, Halliburton celebrates its centenary in 2019. With 60,000 employees in more than 80 countries, the company helps its customers maximise value throughout the lifecycle of the reservoir — from locating hydrocarbons and managing geological data, to drilling and formation evaluation, well construction and completion, and optimising production throughout the life of the asset.

ADNOC enters into US$4bn pipeline infrastructure investment agreement

The signing ceremony.

Image Credit : ADNOC

THE ABU DHABI National Oil Company (ADNOC) has entered into a multi-billion-dollar midstream pipeline infrastructure partnership with KKR and BlackRock, two of the world's leading institutional investors.

As part of the transaction, a newly formed entity, ADNOC Oil Pipelines, will lease ADNOC's interest in 18 pipelines, transporting stabilised crude oil and condensate across ADNOC's offshore and onshore upstream concessions, for a 23-year period. The entity will, in turn, receive a tariff payable by ADNOC, for its share of volume of crude and condensate that flows through the pipelines, backed by minimum volume commitments. Funds managed by BlackRock and KKR will form a consortium to collectively hold a 40 per cent interest in the entity, while ADNOC will hold the remaining 60 per cent majority stake. Sovereignty over the pipelines and management of pipeline operations remain with ADNOC. The transaction will result in upfront proceeds of approximately US$4bn to ADNOC and is expected to close in Q3 2019, subject to customary closing conditions and all regulatory approvals.

This transaction marks the first time that leading global institutional investors have deployed capital into key midstream infrastructure assets of a national oil company in the Middle East, says ADNOC, which is seeking additional infrastructure-related investment opportunities with institutional investors.

NESR bags KOC contract

NATIONAL ENERGY SERVICES Reunited Corporation (NESR), a leading national integrated energy services provider in the Middle East and North Africa region, has won a major contract from the Kuwait Oil Company (KOC)

The contract, valued at up to US$100mn, includes cementing and associated services for drilling and workover operations for conventional resources, according to NESR.

The company added that the contract is for five years and marks the entry of NESR in the completions sphere in Kuwait.

Sherif Foda, chairman of the Board and CEO of NESR, said, "The award of this contract positions NESR as a multi-segment provider in Kuwait and allows us to build our position in Kuwait to the next level.

"I would also like to take this opportunity to thank KOC for the trust they have placed in us to be a part of their extensive growth plans."

Founded in 2017, NESR provides Production services such as cementing, coiled tubing, filtration, completions, stimulation and fracturing, and nitrogen services, as well as Drilling & Evaluation services.

SENAAT enters into partnership with TUBACEX

SENAAT, ONE OF the largest industrial investment holding companies in the UAE, has entered into a joint venture with Spain's TUBACEX, a global leader in the manufacture of stainless steel and high-alloyed tubular products (tubes and accessories). The new partnership has signed an agreement to jointly acquire NOBU Group, a Dubai-based specialised provider of precision manufacturing and repair services catering to premium tubular solutions needs.

H.E. Eng. Jamal Salem Al Dhaheri, CEO of SENAAT, said, "SENAAT's new partnership with TUBACEX is consistent with the company's strategy of seeking to partner with global organisations to grow the UAE's manufacturing base. As the country's leading industrial holding company, we have a big responsibility to promote our chosen knowledge-based industrial sectors in line with Abu Dhabi Economic Vision 2030. Our new partnership also fits closely with our existing focus on the oil and gas industry and will add further impetus to our efforts to drive shareholder value, as can already be demonstrated by the acquisition of NOBU."

SENAAT is invested in the sector through NPCC, a leading EPC services provider to upstream oil and gas companies and more recently through Al Gharbia, a line pipe manufacturing company developed in partnership with Japanese partners JFE and MISI. Within the oil and gas sector, Oil Country Tubular Goods (OCTG) is a particular focus area for SENAAT, as it is a key component of the industry.

H.E. Eng. Jamal Salem Al Dhaheri explained: "We are keen to expand our oil and gas product portfolio to take advantage of the massive sector development programmes recently outlined by ADNOC and several other NOCs in the region. These programmes offer significant opportunities to UAE manufacturers, especially in OCTG, where the ability for oil companies to have ready and reliable access to such products is so key to the programmes' successful implementation."

Confidence on the up in Iraq's oil sector

Iraq's oil sector looks set for a period of expansion once again, OPEC commitments notwithstanding, reports Martin Clark.

WITH OIL PRODUCTION and exports both on the rise, 2019 looks a bright year for Iraq's energy sector. In the final month of last year, oil exports averaged 3.726mn bpd, continuing a gradual increase from previous months. Total production is now estimated at more than 4.5mn bpd – and rising. Moreover, the destruction of the final pockets of IS resistance in parts of Iraq perhaps paves the way for a more peaceful nation in the year ahead.

While the vast bulk of exports are flowing out of Iraq's southern Basra oil terminal – where export flows are nearing all-time monthly highs – there is a fresh impetus in the north too. Shipments out of the northern Kirkuk oilfields to the Turkish port of Ceyhan increased to 99,000 bpd in December from just 8,716 bpd the month before.

It follows a re-start to exports at Kirkuk following a year-long hiatus due to a standoff between the central government and the semi-autonomous Kurdistan region. The suspension of exports in October 2017 cut off almost 300,000 bpd flowing out of northern Iraq toward Turkey and on to international markets.

Although the south still accounts for the bulk of Iraq's oil production and exports, Kirkuk is one of the nation's biggest fields, with an estimated nine billion barrels of recoverable reserves.

> "The country has been steadily building out capacity and could go beyond five million bpd in 2019."

OPEC balancing act

While Iraq is still producing some way below its maximum capacity of nearly five million bpd permitted under an agreement between OPEC and other exporters, its trajectory seems to be gathering strong upward momentum. Indeed, while OPEC will continue its balancing act this year to manage supply and demand and hold up crude prices, Iraq remains something of a wildcard, say analysts.

"The country has been steadily building oil capacity and could go beyond five million bpd in 2019," said Wood Mackenzie in a January research paper.

Of the OPEC members in the Middle East and North Africa region, it states that Iraq has been the least compliant with output cuts – even though it is the second largest producer behind only Saudi Arabia. Still, there are signs that compliance could influence output, with officials suggesting that Iraq plans to adhere to OPEC rules. At the beginning of February, a senior oil ministry official said production had been lowered at the Majnoon field to 104,000 bpd from 220,000 bpd in January, in line with the agreement. New Oil Minister Thamir Al Ghadhban declared on 4 January that Iraq would keep output at the level of its OPEC target, certainly during the first half of 2019.

Iraqi upstream growth - selected oil projects (kb/d)

Field	Operator	Plateau target	Output Sept 18
Nassiriya	Dhi Qar	-	90
Gharraf	Petronas	230	87
Halfaya	CNPC	400	250
Missan Group	CNOOC	450	220
Zubair	ENI	850	454
Rumaila	BP	2,100	1,475
West Qurna-1	Exxon	1,600	455

Source: APICORP

Source: APICORP Research

Iraq's upstream growth - selected oil projects (thousand bpd)

Later in the month, Baghdad approved a 2019 budget of 133 trillion dinars (US$112bn), based on projected oil exports of 3.88mn bpd at a price of US$56 per barrel.

New E&P initiatives

Nonetheless, when Ghadhban assumed office in the latter half of 2018, he also made it clear that Iraq plans to aggressively expand its oil industry, to increase output and export capacity, as well as diversify export terminals and modernise infrastructure.

Oil production has already doubled since 2007 and could rise to 6mn bpd by 2025 – though some question whether it will fall short. According to Rystad Energy, Iraq's production is expected to increase by 860,000 bpd over the next four years to hit 5.3mn bpd by 2022. That's some way off earlier, lofty projections of 10 million-plus bpd, but hugely impressive given the chaos that has engulfed the country in recent decades. Not only does it mean careful ongoing management of super-giant fields like Majnoon and Kirkuk, but also getting to grips with the rest of the nation's vast oil potential.

According to an APICORP report, the Halfaya and Gharraf oilfields are expected to reach contract plateau output in 2019, with production gains also being recorded at the giant Rumaila field, the Missan area fields, Zubair and West Qurna 1. LUKOIL has commenced drilling of new production wells at West Qurna-2 field as part of the second development phase, which will ramp up production from the current level of 400,000 bpd to 480,000 bpd in 2020, according to a company statement. LUKOIL uses an approach to cluster drilling which envisages erection of two drilling rigs at one well pad. This approach is new for Iraq and will provide for significant field development speed up and production growth within the shortest time, LUKOIL says.

While the well-known fields remain the workhorses of Iraq's oil industry, the government is keen to unlock and understand the entirety of its upstream geology too, given that it sits on the world's fifth largest reserves, estimated at around 140bn bbl. China's CNOOC recently signed up to conduct a seismic survey for two oil exploration blocks, including

one offshore block in the Gulf and another near the border with Iran.

Natural gas could also come into focus, with Iraq boasting 135 trillion cubic feet of proved reserves, the 12th largest in the world. Basrah Gas Company (BCG), which captures and processes flared gas from the Rumaila, West Qurna 1 and Zubair oilfields, is reported to be looking to increase capacity by 40 per cent through its growth programme.

Yet future expansion could hinge more on other infrastructural improvements, rather than the drilling of wells, including the upgrade and diversification of export facilities. This all takes time in the highly charged political landscape of the Middle East Gulf.

> “The government is keen to unlock and understand the entirety of its upstream geology.”

Kurdistan region

Further north, there is likewise fresh momentum for Iraqi Kurdistan’s oil and gas sector. The deal to re-start Kirkuk exports signals that Iraqi Prime Minister Adel Abdul-Mahdi and his new oil minister are prepared to work with Erbil despite previous tensions and a failed independence referendum in September 2017.

Iraq’s northern exports appear to have held steady in January at around 400,000 bpd, according to various data compiled by Reuters. Although that is still far below levels of more than 500,000 bpd in some months of 2017, it reflects a return to healthier levels after the tumult of recent years.

The emphasis is not just on oil exports, but on gas supply for development too. Within Iraq’s Kurdistan region, the Khor Mor gas project is targeting a 500 million cfd expansion this year, mainly to deliver gas to the local market. More significantly, the project will open up for gas exports beyond 2019.

If Iraq and its semi-autonomous northern Kurdistan region can enjoy a prolonged period of peace and stability – and that’s a big if in this corner of the world – then the platform and the resources are there to make a genuine impact on long-term development. ■

Eni looks to strengthen its Iraq presence

THAMIR A. AL Ghadhban, the deputy prime minister of Iraq, and Eni CEO Claudio Descalzi met in Baghdad in February to discuss future opportunities and development investments that will further strengthen Eni’s relationship with the country.

Eni has been present in Iraq since 2009 through its subsidiary Eni Iraq B.V., and with the ramp up of the Zubair Field Development Project, which it operates with Basra Oil Company (BOC) the company has become one of Iraq’s main operators in the oil sector.

The project has marked the fast-track development of one of the largest producing oil fields in the southern Iraq region of Basra. At Zubair, oil production has grown more than 100 per cent since 2015 and a new 380 MW plant that will generate power for domestic consumption is in the final stages of construction.

The continuing demand for oil to 2040

Significant levels of continued investment in new oil will be required to meet energy demand in 2040, according to BP's *Energy Outlook 2019*, which explores the forces shaping the global energy transition out to 2040 and the main uncertainties surrounding it.

IN ITS 'EVOVLING Transition' scenario, the Outlook report forecasts that rising prosperity and improving living standards, particularly in India, China and across Asia, will cause global energy demand to rise by a third by 2040, and shows how that demand will be met over the coming decades through a diverse mix of supplies including oil, gas, coal and renewables.

The Middle East maintains its role as a key source of energy, supported by the growth of OPEC oil production in the second half of the Outlook, together with an expansion in gas production in Qatar and Iran. The Middle East remains the largest net energy exporter, increasing both its oil and gas exports over the Outlook period. It remains the largest oil producing region and the second largest gas producer, representing 36 per cent of global liquids production and 20 per cent of global gas production. The share of non-fossil fuels in the Middle East's primary energy demand mix increases from one per cent in 2017 to 13 per cent in 2040, still only half of the world's average (27 per cent).

The global transition to a lower-carbon energy system continues, with renewable energy and natural gas gaining in importance relative to oil and coal. 85 per cent of the growth in energy supply is generated through renewable energy and natural gas, with renewables becoming the largest source of global power generation by 2040, the report predicts.

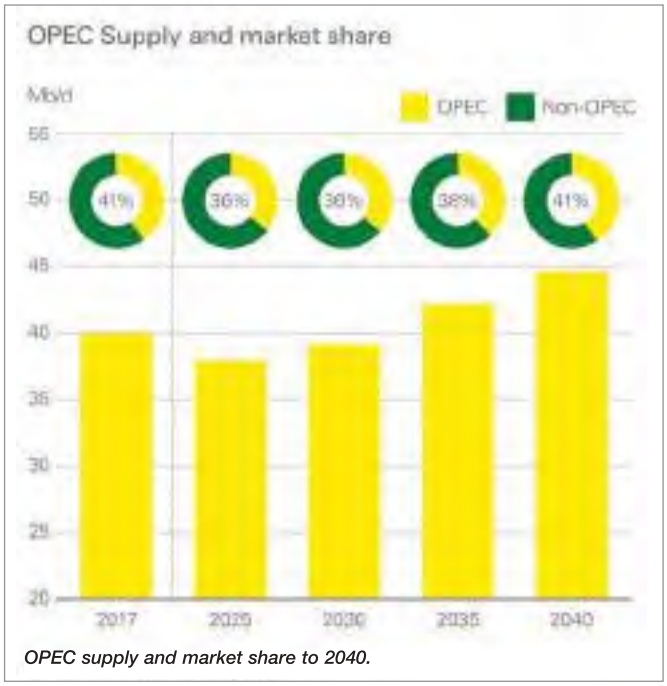
Oil will continue to play a significant role in the global energy system in 2040. Oil increases during the first half of the Outlook by around 0.3 per cent per annum, although much slower than in the past, before plateauing in the 2030s, as efficiency improvements in the transport sector accelerate. The increase in liquids production is initially dominated by US tight oil, but OPEC production subsequently increases as US tight oil declines.

OPEC output increases by four million bpd over the Outlook, with all of this growth concentrated in the 2030s. The increase in OPEC production is aided by OPEC members responding to the increasing abundance of global oil resources by reforming their economies and reducing their dependency on oil, allowing them gradually to adopt a more competitive strategy of increasing their market share. Non-OPEC supply grows by six million bpd, led by the USA, Brazil and Russia.

The world looks set to consume significant amounts of oil (crude plus NGLs) for several decades, with the level of oil demand in 2040 ranging from around 80mn bpd to 130 mn bpd, requiring substantial investment.

Strong growth in gas

Natural gas grows strongly, at an average rate of 1.7 per cent per annum, supported by broad-based demand, plentiful low-cost supplies, and the increasing availability of gas globally, aided by the growing supplies of LNG. Gas demand grows in almost every country and region, driven in broadly equal amounts by use in power and industry. Global gas production is led by the USA and Middle East (Qatar and Iran) – who together account for almost 50 per cent of the growth in gas production over the Outlook – supported by strong increases in output in both China and Russia.



OPEC supply and market share to 2040.

Image Credit : BP

The importance of gas trade continues to grow, driven by robust expansion of LNG supplies which overtake inter-regional pipeline shipments in the late 2020s. LNG exports increase significantly, led by USA and Qatar, fostering a more competitive and globally integrated market. These two countries will account for around 40 per cent of all LNG exports by 2040. The increase in LNG supplies leads to greater competition between LNG and pipeline gas, especially in Europe and China – two of the largest importers of gas.

Dual challenge

The report highlights the dual challenge that the world is facing in satisfying growing energy demand while accelerating the transition to a lower-carbon future. Global carbon emissions continue to rise, signalling the need for a comprehensive set of policy measures to achieve a substantial reduction.

"The Outlook once again brings into sharp focus just how fast the world's energy systems are changing, and how the dual challenge of more energy with fewer emissions is framing the future," said Bob Dudley, BP's chief executive. "Meeting this challenge will undoubtedly require many forms of energy to play a role." ■

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High hopes for oil & gas resurgence in Bahrain

In an exclusive interview with *Oil Review Middle East*, Bahrain's Tatweer Petroleum outlines how it is looking to exploit its major new discovery, announced last year.

What is the potential impact of the new find on Bahrain's economy?

Despite the low oil prices, Tatweer has endeavored to maintain oil and gas production levels. Efforts in this direction are now significantly more optimistic with the discovery of the Khalij Al-Bahrain Basin (KAB), our large-scale offshore carbonate resource, which is the biggest discovery since 1932 with over 80 billion barrels of tight oil in place. In addition, the discovery of 10 to 20 trillion cubic feet of natural gas in the Pre-Unayzah reservoir, underlying the Bahrain Field, is a welcome development which aims to meet the increasing gas demands of the Kingdom of Bahrain.

Can you update us on the current status of the new discovery and plans for development?

Following the discovery of the reserves in the KAB in 2018, a new objective has been introduced to put the field on production as early as possible. A decision was taken to drill and test two wells on Um Al Naasan Island. The drilling of the first well commenced in December 2018 with results expected from the two wells by the end of 2019.

Due to the current decline rates of Khuff production and in order to meet the increased local gas demand, the Jubah and Jauf formations will be tested and put on production late in 2019. In 2018, extensive planning was done to evaluate different drilling plans for both the Jubah and the Jauf formations which underly the Unayzah. Workover re-entry and testing of Jubah was conducted in BD-1 and existing wells, and preparations for intervention to test the Jauf formation is on-going. The current programme includes drilling of up to eight wells by end of 2020.

Tatweer has been preparing for a new regional 2D seismic acquisition campaign, targeting various areas of interest in order to obtain a better understanding of deeper geological structures. The project was launched in 2018 by communicating with different government agencies to obtain the necessary permits. Actual acquisition operations are expected to start in February 2019 and last until April 2019. The results of this survey, which are to be received by August 2019, will add value to the offshore exploration Blocks and help identify new hydrocarbon prospects.

> "A new objective has been introduced to put the field on production as early as possible."

Do you face any significant technical challenges in developing the new discovery?

The main challenge for the KAB project is the offshore logistical issues mainly caused by variable water depths ranging from land to offshore, which include transport requirements and storage space for fracking equipment. In addition, the limited availability of hydraulic fracturing services and materials in the region is considered another challenge which will be taken into consideration for the Pre-Unayzah gas development project. Other challenges for the deep gas project include the lack of geological and geophysical data for deeper zones, limited land areas (especially in the crestal part of the anticline), and potential production issues such as sanding.

Notwithstanding these challenges, Tatweer Petroleum has one of the strongest technical teams in the industry that is ready and prepared for any challenges our projects may face.

The location of the Khalij Al-Bahrain Basin (KAB), offshore Bahrain.

Image Credit : Tatweer Petroleum

Tatweer has succeeded in boosting production by harnessing new technologies.

Image Credit : Tatweer Petroleum

What about the Bahrain Field - how are you boosting output there?

In relation to the Bahrain Field, Tatweer Petroleum has maintained a steady production rate through the drilling of an additional 69 new wells, targeting the Ahmadi, Mauddud, and Kharaib reservoirs, resulting in a total number of 1,021 new wells drilled since Tatweer Petroleum's inception in 2009. The production capacity of Non-Associated Gas (NAG) was successfully maintained at 1.4bn cubic feet per day, meeting the Kingdom of Bahrain's average and peak demands for energy.

Tatweer Petroleum continued further technical assessment and development in each reservoir. In the Ostracod/Magwa reservoirs, 37 wells were completed with high pressure high rate acid fracturing, adding 600 BOPD incremental oil gain. The Rubble Thermal Pilot Phase-6 project was expanded with the commissioning of 10 wells, injecting its first steam. Crestal gas injection continued in the Ahmadi reservoir, adding an incremental 100 BOPD, flattening the reserve decline. The commissioning of Zero Operating Pressure skids (ZeroP) at Tank Batteries 01 and 02 achieved a total gain of 700 BOPD. In relation to gas operations, the new 500 MMSCFD Central Gas Dehydration Facility (CGDF) was commissioned.

Tatweer Petroleum plans to continue its focus on optimising the ongoing improved oil recovery schemes such as increased Mauddud gas injection, Ostracod/Magwa horizontal wells with multistage fracking, debottlenecking process facilities, steam injection, and artificial lifting techniques, which have all shown good potential to extract more difficult oil from the Bahrain Field.

> “Tatweer Petroleum plans to continue its focus on optimising the ongoing improved oil recovery schemes”

How important is technology in maximising value from existing reserves?

When Tatweer Petroleum assumed stewardship of the Bahrain Field, the kingdom's oil production was at approximately 26,000 bpd. Since then, Tatweer Petroleum has managed to increase production by more than 60 per cent. This is mainly due to the dedication and efforts of our employees, using the knowledge and expertise of our previous partners, implementing new technologies, and focusing on generating innovative ideas. We hope to continue to maintain, if not increase, production despite the monumental challenges we face, which include the dip in global oil prices.

Our multidisciplinary team approach, which was formed in 2016, continues to combine the efforts of Field Operations, Maintenance, Facilities Engineering, Reservoir Engineering, Production Engineering, and Supply Chain to improve oil production. The team has carried out significant surface and subsurface improvements, including operations enhancement, identifying physical bottlenecks, review of underperforming wells, exploring new ways to identify opportunities and continuously strive in accelerating other project works.

The GIS team at Tatweer Petroleum developed its recent real-time GIS application, which was designed to highlight operational awareness of critical operational events using real-time streaming of data imposed on the spatial map under the title of SCOPE (Surveillance and Control of Operation Production Environment). This application has been developed as a pilot project covering specific traits related to Tatweer Petroleum's producing wells that are focused on seven traits such as alarms for events, including high flow line pressure, dead wells, shut-ins, transmitter errors, etc.

Tatweer Petroleum received the 2018 Excellence in GIS Implementation (EGI) Award during the GISWORX Conference held in Dubai, UAE, under the title of “GIS in Critical Oil Operations”. The award was given to Tatweer Petroleum for its advanced usage of GIS technology such as geographical and spatial data gathering, management and analytics to aid its various daily operations and also as a part of Tatweer Petroleum's drive to improve efficiency and effectiveness of its operation processes.

What role do you see for foreign investment and expertise in the development of Bahrain's upstream sector?

Extensive promotion for KAB, Pre-Unayzah gas, and Offshore Exploration Blocks was conducted in 2018. Many data-room visits were conducted throughout the year welcoming International Oil Companies (IOCs) from the USA, Europe and Asia. In addition, a promotional project was launched with Citi Group to attract foreign interest, particularly for the two discoveries of oil in KAB and gas in Pre-Unayzah, which is expected to yield results by mid-2019. During 2018, two Joint Study Agreements (JSAs) with Total were completed and one Technical Evaluation Agreement (TEA) was completed. High level discussions were conducted with ENI regarding the direct assignment of Block-1, which materialised in the signing of the Memorandum of Understanding (MoU) in January 2019.

The company aims to start a KAB promotional tour in the coming months of this year in the USA. The enormous success of shale resources there is the result of advanced technology developed by several IOCs and service suppliers. The USA's experience in the production of shale oil will minimise the amount of time for us to learn and implement this technology. We are currently collecting information with regards to these wells in a complete package in order to present the information to international companies. ■

The shape of resilience in the oil and gas industry

In the run-up to MEOS 2019 Sultan S. Al Shidhani, MEOS 2019 co-chair and petroleum engineering manager at Petroleum Development Oman, gives a sneak preview of what we can expect from the show.

What is the thinking behind the conference theme 'Resilience through Talent and Technology Transformation?'
One of the strengths of the oil and gas industry is its ability to adapt and respond to major changes and threats. This ability is in the form of resilience firmly based on its talents and transformational technologies. With the lasting low oil price environment, the conference is providing a forum and platform for strengthening this ability by sharing and discussing the industry's experiences and advancements that have enabled it to stay the course and confront such major challenges.

> "Technology is one of the major pillars that the industry is relying on for its resilience in facing the challenges"

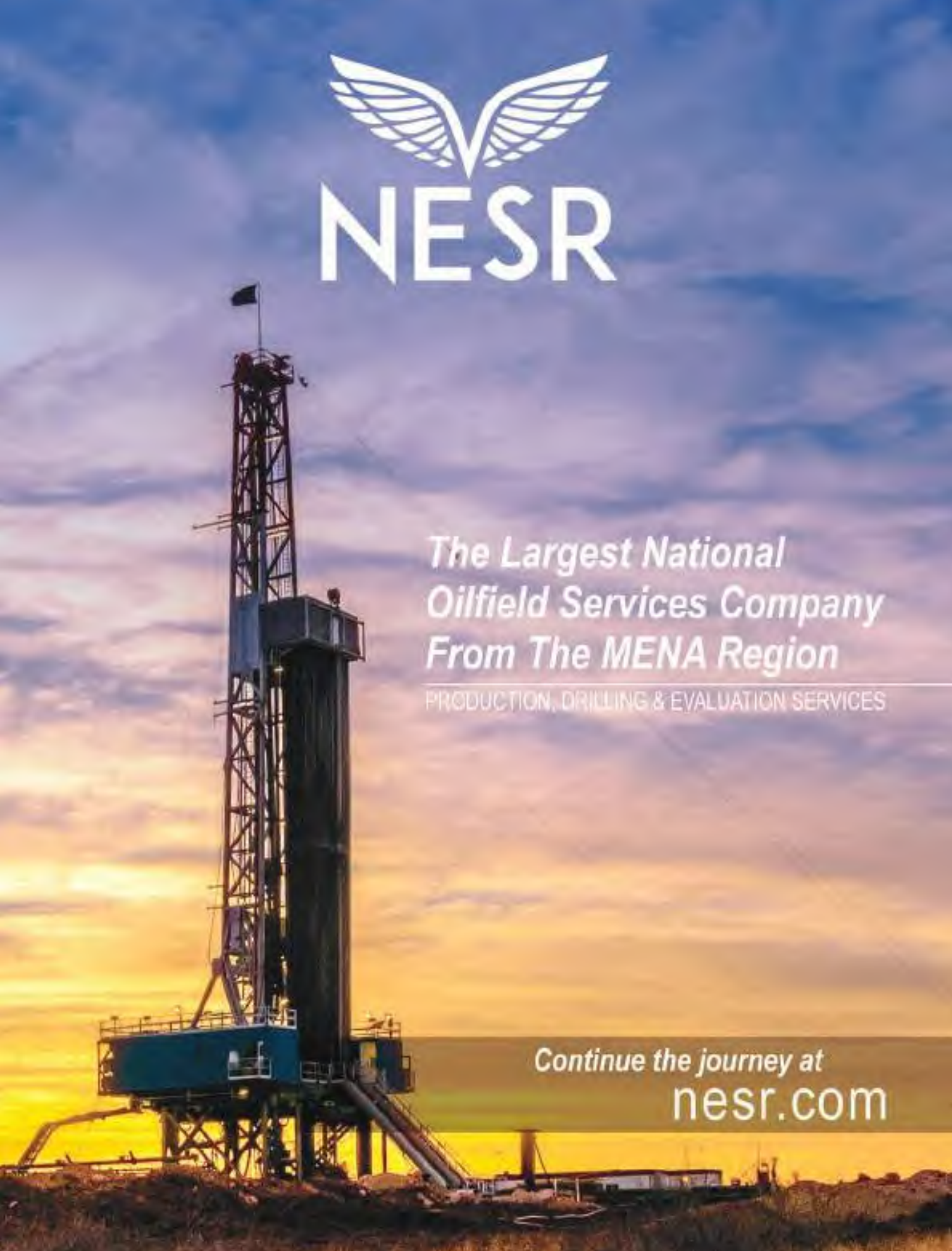
Image Credit UBM AEM

MEOS is firmly established as a leading international oil and gas conference and exhibition.

What role does technology play in building a resilient industry, and how important is it for oil and gas companies to harness the benefits of the 4th Industrial Revolution?
As I said, technology is one of the major pillars that the industry is relying on for its resilience in facing the challenges and threats and staying the course. Along with continually optimising and improving oil and gas development and management, technology has enabled the achievement of more cost-effective and efficient operations and value delivery. The 4th Industrial Revolution (4IR) with its elements is highly relevant and is a major enabler for the oil and gas industry to achieve its business goals. As a technology leader, the oil and gas industry is clearly set to harness its benefits and even shape the 4IR implementation and further advancements. The conference and exhibition will showcase the uptake and plans of the oil and gas industry to strongly foster the 4IR as a key enabler for it in the future.

What do you think are the main talent challenges facing the industry, and how can oil and gas companies build a resilient workforce?
While the oil and gas industry is facing fierce competition from other industries such as IT and the financial industry in attracting talent, it is adopting strategies to deal with this situation. One of these strategies is moving more towards 4IR elements such as the use of analytics and mechanised/robotic operations. Additionally, the oil and gas industry is improving the career development of its talent in ways that recognise innovation and collaboration and reward great achievements. This year we are introducing for the first time the MEOS Energy Awards as a way of recognising and showcasing major technological advances and excellent deliveries.

What do you think are the reasons for the longstanding success of MEOS, and what are your hopes for MEOS 19?
MEOS is indeed a long-standing success that is seeing continuous growth in the number of technical papers and levels of participation. There are several reasons behind these successes. It has established itself as the main international Oil and Gas conference held in the Middle East. Factors include the high level of international participation in its organising committees, the support it gets from the major oil and gas companies and organisations, and its ability to foresee the challenges and opportunities lending themselves to the industry, and hence select relevant and critical themes to discuss and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My hopes for MEOS 2019 are for it to continue thriving, to take the industry to new horizons and allow it to harness the benefits and lead in the 4IR.

Which new features have you added this year, and why?

New features include new topics and senior level panels that will have distinguished presenters and speakers, not just from the oil and gas industry but from other industries such as IT and global business development. This will enhance learning from and build on advances achieved in these industries, and enable benchmarking with oil and gas approaches and practices. Another new feature is the prestigious MEOS Energy Awards. The Awards provide valuable recognition and enable the sharing of best practices and advances. Along with the Conference, there are number of forums and seminars that are key to the success of the conference and advancing the industry. A new forum that is organised this year along with MEOS is the Energy Summit, addressing the futuristic outlook of energy mix and the role the oil and gas industry is playing in the overall energy sector.

> “The Energy Summit will address the futuristic outlook of the energy mix and the role of the oil and gas industry in the overall energy sector.”

Image Credit : Society of Petroleum Engineers

Sultan Al Shidhani, MEOS 2019 co-chair.

Are there any other aspects of the show you would like to highlight?

The Exhibition is an important aspect of this international gathering of oil and gas experts and developers. It goes hand in hand with the conference to enforce the message of resilience and continued development in the industry. ■

The SPE Middle East Oil & Gas Show (MEOS) takes place from 18-21 March at the Bahrain International Exhibition and Convention Centre. For further information see the website at www.meos19.com.

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Improving your compressor's energy efficiency

A consistent supply of clean, dry compressed air is essential to many sectors, but it can require a considerable amount of energy to produce. James Cutting, sales manager at Gardner Denver details some simple steps that operators can take to improve energy efficiency and bottom-line profitability.

OPTIMISING COMPRESSOR PERFORMANCE and identifying inefficiencies can lead to sizeable financial and productivity benefits. By contrast, not remedying these issues could have a marked effect on site operations.

Total cost of ownership

One of the first steps to improving efficiency is to analyse the total cost of ownership of the compressed air system. This incorporates a number of variables, including the initial purchase price and maintenance regime, but the largest proportion – 80 per cent in fact – is the energy cost.

It is therefore vital that a compressor is correctly sized and specified to the site's demands. Installing a data-logging device to monitor and audit relevant performance metrics, such as maximum and minimum air pressure, and compressed air flow demand can help operators specify a more efficient compressor with reduced energy consumption.

The unit's initial purchase price should also be factored into its whole life costs. While purchasing a less expensive compressor can seem like a shrewd business decision, a lesser-quality unit may require more maintenance across its working lifetime.

This ongoing maintenance can be more expensive, with rising service costs negating any initial savings over time. By considering the purchase price alongside the longer-term service and maintenance required, total cost of ownership can be improved.

> "An audit can prove vital to improving compressor efficiency and reducing otherwise avoidable costs."

Audits and leakages

Alongside energy costs, compressor efficiency should be taken into account when considering a unit's total cost of ownership. An energy audit will identify key factors affecting overall efficiency and highlight simple methods to reduce site downtime, increase productivity and safeguard product quality. Consequently, an audit can prove vital to improving compressor efficiency and reducing otherwise avoidable costs.

One such example is the identification of pipework leakages. A single three millimetre hole could cost as much as US$700 a year in wasted energy and account for 35 per cent of total air consumption, making it clear that audits could prove vital to improving system performance.

An audit can also identify the compressor's possible heat potential. 94 per cent of compressor-generated heat can be recovered and reused for other site processes, resulting in pronounced efficiency gains.

Image Credit : Gardner Denver

Industry 4.0 and the Internet of Things offer opportunities to improve compressor efficiency.

iConn and analytics

Industry 4.0 and the Internet of Things offer further opportunities to improve compressor efficiency. By taking advantage of data-driven opportunities, operators can make more informed decisions about compressor maintenance and performance. Taking this into account, Gardner Denver has introduced iConn, a cloud-based, air management platform that provides historic, real-time, predictive and cognitive analytics, allowing operators to rectify potential issues before they arise.

Using iConn, operators can monitor data in real time and view in-depth reports and trends concerning potential energy wastage, including how, why and when it occurs. Access to this detailed level of information enables plant managers to make more informed decisions regarding unit performance, optimising overall efficiency.

In conclusion, remedying inefficiencies and optimising performance can lead to pronounced benefits. By carrying out energy audits, using platforms like iConn and correctly specifying compressors, operators can ensure maximum energy efficiency and minimal wastage. ■

For more information on Gardner Denver, please visit www.gardnerdenver.com/industrials.

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Tailored solutions in compressed air

Leading compressed air specialist Kaeser Kompressoren celebrates its 100th anniversary this year and is going from strength to strength in the Middle East. Carl Briden, managing director of Kaeser Kompressoren FZE, spoke to *Oil Review Middle East* about the company's regional activity.

A STRONG DEALER NETWORK, tailored solutions and a focus on keeping lifecycle costs to a minimum are core factors in Kaeser's success.

"Our dealer network is as strong as it has ever been, thanks in part to the local support we have been able to provide over the years from our regional head office and training facility in JAFZ," says Briden. "Here we have recently strengthened our numbers to further improve the support to our dealership network which is necessary to drive forward our goals and targets for the years ahead.

"Our strategy is to continue to support our dealer network to further enable them to increase market share and provide even greater support to our existing and expanding customer base."

Kaeser is well represented across the entire Middle East region, and Saudi Arabia is a particularly important market.

"Saudi Arabia will always be a very important market and we are continually looking at ways to increase business. This starts with continued support to our local partner as well as making regular visits to key customer accounts to ensure the best possible service is being provided. The prospects for future growth are encouraging when we consider the Kingdom's long term Vision 2030 plan, and we hope to take full advantage as this develops."

Growing oil and gas market

The oil and gas sector is an important market for Kaeser in the region, says Briden, and the company is experiencing an increasing demand for its products.

"Every year the oil and gas sector provides a greater percentage of our overall turnover. This is part due to an upturn and increase in confidence, and also due to the fact our customised packages have gained an enviable reputation for reliability and quality. We are seeing an increased number of end users and EPCs approaching Kaeser with new projects.

Image Credit : Kaeser Kompressoren

KAESER nitrogen generation package installed in central Oman.

> "Every year the oil and gas sector provides a greater percentage of our overall turnover."

"Due to the varied nature of the business, practically any compressor we manufacture could ultimately be used to satisfy a customer's requirement, although in each case the compressor is just one of a number of components that is packaged together and delivered to the customer on single or multiple base frames.

"The product we supply is designed as always in accordance with the client's high standards and expectations, which in turn are constantly becoming more demanding. We welcome this development, which is being handled very well between our regional head office in Dubai and our purpose-built design, fabrication and testing facility in Austria."

Tailoring a system to specific customer requirements is at the heart of Kaeser's philosophy. The company prides itself on its specially developed analytical methods which enable its engineers to create future-proof solutions precisely tailored to meet customer needs and which not only save money, but are also kind to the environment.

"Our target is always to provide the best solution to meet a customer requirement, with a focus on life cycle costs, ensuring these are kept to industry-leading low levels," stresses Briden.

"We continue to innovate and look at ways Kaeser can reduce the cost of producing compressed air for its customers." ■

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Protective coatings for effective corrosion resistance

Darren Ward, technical manager, Oil & Gas, AkzoNobel gives a critical comparison of Epoxy Phenolic and Alkylated Amine Epoxy technology in uninsulated conditions.

FOR MANY YEARS, Epoxy Phenolic technology has been a common solution specified to protect pipework operating at high temperatures. These coatings evolved from linings used for the internals of storage tanks, where a highly crosslinked film was advantageous to resist the damaging effects of strong chemicals or high temperature service.

Over time, it was realised that the high crosslink density also provided an effective barrier to mitigate the damaging effects of Corrosion Under Insulation (CUI). Recent testing demonstrates that Alkylated Amine Epoxy technology is a next-generation alternative, with greatly enhanced application properties and improved UV resistance.

There are many generic specifications utilised in the protective coatings industry for the protection of piping which operates through a range of temperatures, and these are often driven by specific client requirements. Variables include:

- Operating conditions i.e. cyclic or static temperature
- Design parameters i.e. insulated or uninsulated
- Substrate material i.e. carbon or stainless steel
- Specification i.e. 2 x 100µm, 2 x 125µm, 3 x 90µm (2 x 4 mils, 2 x 5 mils, 3 x 3 mils).

Image Credit: AkzoNobel

HIgh temperature piping, valves and vessels are subject to aggresive CUI conditions.

> “Applying the ‘UPC Approach’ saves approximately 10 per cent on overall rework costs over the course of the project.”

Assuming application and surface preparation is carried out in accordance with the coating manufacturer’s recommendations, Epoxy Phenolic technology generally shows good ‘real world’ resistance to the aggressive CUI conditions found on high temperature piping, valves and vessels. UV radiation causes chalking and discoloration of Epoxy Phenolic coatings over time, which makes it important to consider the environmental conditions that the coated steel will experience, not only during operation, but also during transit and on-site storage prior to the installation of any insulation materials. Premature coating failure may result where environmental conditions are not fully known, understood and/or taken into account, in both the selection of the coating technology and during application/installation.

A next generation high temperature coating from AkzoNobel, based on novel Alkylated Amine Epoxy (AAE) technology and pigmented with aluminium flakes, has demonstrated significantly improved resistance to the erosive effects of UV and rainfall in both natural weathering and accelerated tests. Temperature resistant from -196°C (-321°F) to 230°C (446°F), Interbond 2340UPC is a combination of an alkylated epoxy resin with aluminium pigmentation, resulting in a coating with excellent CUI resistance alongside very low erosion rates when compared with typical Epoxy Phenolics found in the market. This significantly reduces DFT loss, even in high UV/high rainfall environments.

The challenge faced by many process piping and material design engineers is to understand the erosive/corrosive environment for the coating during:

- Storage and erection stage (up to two to three years on large projects)
- Designed operation
- Design changes later in asset lifecycle (such as removal of insulation).

Interbond 2340UPC provides a single effective coating solution, delivering long term protection during operation and project build, whilst ensuring operational flexibility if insulation is removed later in the asset lifetime.

Applying the ‘UPC Approach’ with Interbond 2340UPC to all pipes, valves and vessels saves approximately 10 per cent on overall rework costs over the course of the project, as well as greatly improving productivity and helping to ensure the maximum performance in operations. ■

Preventing corrosion in pipelines

CORROSION IS ONE of the most critical threats to pipeline integrity, particularly in the Middle East, with the use of corrosive chemicals for EOR and the prevalence of high levels of sour gas and H2S.

The first step in effective corrosion control, according to NACE, is to have a thorough knowledge of the various forms of corrosion, the mechanisms involved, how to detect them, and how and why they occur. There are various different types of corrosion, and a pipeline can suffer from more than one kind, depending on the combination of metals or materials used and the environment it is exposed to.

There are several methods of corrosion protection. Cathodic protection controls natural corrosion of metal surfaces through an electrochemical process by using a direct electrical current which neutralises external corrosion. It is generally used for underground pipelines or in water.

Corrosion inhibitors can be used internally with carbon and low-alloy steel pipes as a cost-effective corrosion control alternative to stainless steels and alloys, coatings, or non-metallic composites. They can prevent or reduce internal corrosion.

Protective coatings such as epoxy resin can be applied to pipelines whether above or below ground and are often used in combination with cathodic protection. The correct selection, specification and application of such coatings is essential.

Materials selection is critical to preventing many types of failures. Stainless steels, plastics, and special corrosion resistant alloys can help to extend the lifecycle of a pipeline. Reinforced thermoplastic pipes (RTP) are becoming increasingly popular as a result of their corrosion resistant properties as well as other benefits such as strength, durability and cost effectiveness. Appropriate system design is also important for effective corrosion control.

Proper cleaning and maintenance of pipelines, for example using pigging, can also help to prevent corrosion build up.

Corrosion is one of the most serious threats to pipeline integrity.

Image Credit : Maureen/Flickr

Signalling the good times

New technology from pipeline services specialist Trans Asia Pipeline & Speciality Services will help solve transmission challenges in remote locations.

ABU DHABI-BASED TRANS Asia, in 2018, launched e-Signaller in association with the UK's iNPIPE to acquire data from pipelines.

Embedded with LoRa technology, the signaller runs on alkaline battery, helping it to last for a year. LoRa (short for long range) is a patented wireless communication technology that enables smart IoT applications to solve some of the biggest challenges such as energy management, infrastructure efficiency etc., at low capital and operational costs.

Speaking to *Oil Review Middle East*, Surendranath Dhanekula, managing director, said that the technology helps transmitting data from the pipeline where Internet accessibility is limited, such as jungles or deserts.

"The LoRa technology can transmit radio waves up to 20km. This is ideal for pipelines in the deserts or jungles where the availability of Internet connection/SCADA system/satellite connectivity is scarce. Our device on the pig signaller is able to transmit the data to a range up to 20km with a single receiver station. To transmit further, a repeater can be added at the desired location and ultimately to available Internet gateway after which the gateway will be uploaded into our Cloud. Thereupon we can monitor the remote infrastructure real-time from the Control Room."

"The e-Signaller can also be configured to record the critical pipeline parameters such as pressure, temperature, etc., as well as give accurate real-time pig run status."

Since the LoRa network is independent of satellite GSM or fibre optic, using this communication technology Trans Asia and iNPIPE also plan to develop further a range of devices for remote operations of pipeline operators' infrastructure.

Image Credit: Trans Asia

Surendranath Dhanekula, managing director of Trans Asia Pipeline & Speciality Services, is aggressively looking to pursue new markets.

Now, the pipeline specialist is in talks to do a pilot study in the Middle East.

"The technology is not power hungry; it is very power efficient. What we are trying to solve here is that an operator doesn't have to send staff every now and then to change the battery or power the device. With no complicated power generation system, this is the easiest way to get your job done reliably," Dhanekula explained.

Apart from being providers of technology and pipeline services, Trans Asia Pipeline is looking to manufacture pipeline pigs within UAE to cater to the local market as well as the wider Middle East. The company is also in talks to provide niche industrial services such as hydro jetting, hydro milling and catalyst loading/unloading.

"We are committed to invest in assets and personnel in this segment and have secured our very first major project providing a wide spectrum of industrial services in the UAE."

Africa is another major market that the company has set its eyes on, and is now bidding for West African projects. "With a solid track record and having successfully completed some very challenging projects we are now also expanding our operations geographically beyond the Middle East and Asia, with a focus on West Africa and CIS countries in 2019. We are bidding aggressively in these regions and we hope very soon we will be able to replicate the Trans Asia Philosophy of 'Experience Excellence' in those regions as well." ■

"With a solid track record and having successfully completed some very challenging projects we are now also expanding our operations geographically beyond the Middle East and Asia with a focus on West Africa and CIS countries in 2019."

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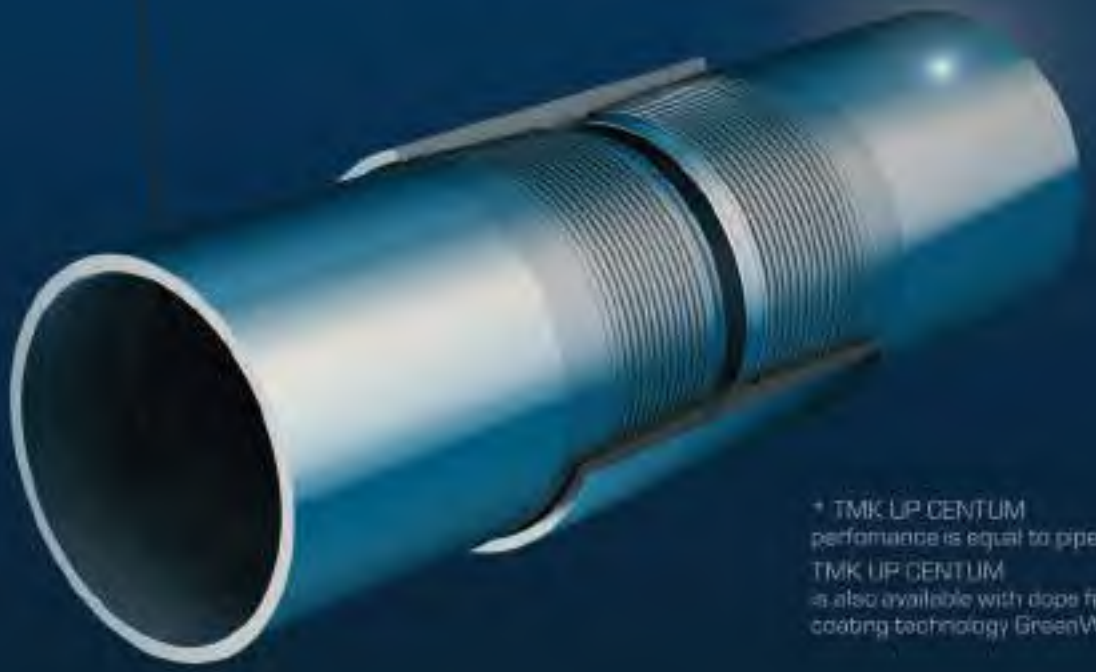

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Intelligent artificial lift brings improved process insight and control.

Image Credit: Adobe Stock

Intelligent artificial lift systems for the digital oilfield

Ari Huttunen, product manager for Drives at ABB, explains why modern motor control technology is a vital element in building the digital oilfield.

INTELLIGENT ARTIFICIAL LIFT systems use real-time data provided by variable speed drives (VSDs) and sensors combined with tailored algorithms to make proactive process adjustments. This approach is a key step in implementing the digital oilfield concept that will eventually use digital devices and communications networks to optimise a wide variety of oil production tasks.

Artificial lift (AL) methods, such as rod pumps, progressing cavity pumps (PCP) and electric submersible pumps (ESP) driven by electric motors are used in approximately 95 per cent of the world's nearly one million oil and gas producing wells. When these motors and pumps are managed and controlled by new generation VSDs, with built-in oil industry specific programmes, intelligent artificial lift becomes possible. The result is improved process insight and control.

Intelligent artificial lift can address the three main areas of waste found in the oilfield.

Firstly, the oil that is left in the ground; secondly, inefficient use of electrical energy to run the pumps; and thirdly, damage to equipment that is not being run correctly. Optimised process management can, for example, achieve a major reduction in the number of oil pump strokes and on-off cycles, saving on both component wear and energy usage.

> "Intelligent artificial lift can address the three main areas of waste found in the oilfield."

ABB has obtained real-life data from nine oil wells to build a picture of the potential economic benefits of intelligent artificial lift. We found that oil inflow could be increased by up to 50 per cent, with a 30 per cent reduction in energy consumption. In some cases, downtime due to maintenance and breakdowns has been reduced by 70 per cent. While these results may not apply to every oil well, it is clear that significant improvements are feasible with relatively little effort and investment.

The detailed real-time data generated and managed by drives is now becoming an important element in the digital oilfield concept. Among the benefits for operators are improved oil pumping based on the well conditions, optimised energy use and the safeguarding of critical equipment against wear and breakage. There is even the capability for remote monitoring and troubleshooting services by experts from the other side of the world.

Essentially, the digital oilfield will enable operators to improve their decision-making with proactive trend spotting. In many cases, potential problems will be identified before they become serious and costly disturbances, even in very remote and difficult-to-access locations. ■

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The evolution of digital twins in subsea operations

Alan Whooley, subsea manager, Wood, assesses the potential for the use of digital twins in subsea applications.

Digitalisation is increasingly taking hold in the oil and gas industry.

Image Credit: Wood

AS DIGITALISATION TAKES hold in the oil and gas industry, digital twinning is becoming a widely discussed topic. But for a technology that is the subject of so many conversations, there is still some confusion about what it actually is. Indeed, the definition of a digital twin often depends on who you are talking to.

As such, discussions around digital twinning tend to reflect the siloed thinking and operations that can still characterise some of the sector. Speak to a structural engineering company, and it is a structural engineering model. Discuss digital twinning with a data management company, however, and you're talking about a data management system. This is ironic, given that breaking down these silos is one of the many advantages that digital twins can offer.

What is a digital twin?

To understand digital twins, it helps to take a step back and view it in a broader context. Rather than thinking of it as a specific function or a portfolio of technologies, digital twinning can be considered more as an approach that can take a number of specific forms.

> "Subsea is an obvious next step for the application of digital twinning."

One of the most widely deployed definitions is that digital twinning is a multi-faceted engineering model that enables design collaboration across all disciplines. Certainly, this is the accepted definition within the construction sector, where 3D building information models have evolved to become 4D and even 5D models that incorporate time and cost dimensions respectively.

This has enabled construction firms to develop central project models that, in effect, are digital representations of all of the systems, processes and information that form each project. With the central model in place, structural, electrical, and mechanical engineers can collaborate far more effectively when designing and constructing a building. Rather than a workflow that relies on completed documents and reports being exchanged, the digital twin transmits data to where it needs to be.

Since the construction and hydrocarbons sectors interact most frequently in the building of onshore facilities, the application of these principles has already crossed over. From there it has journeyed to the offshore sector in the past 18-24 months.

In practice, at a basic level, a digital twin is a computer simulation that represents a physical or statistical model of a given asset, system or facility. This virtual replica allows companies to manage the operation or integrity of the modelled asset from inception to decommissioning. Nonetheless, the definition

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gives room to incorporate a number of different approaches that are still grounded in the familiar. For example, smaller independent firms without robust data management systems could deploy a cloud-hosted geographic information system and a document management system that would allow all users – from engineers to procurement teams – to access and use live information to make joined up, effective decisions.

Digital twins and subsea operations

We have already seen digital twinning transition from onshore to offshore, so subsea is an obvious next step for its application. As elsewhere, subsea is experiencing a drive to commoditise and automate engineering processes, and digital twins fit perfectly into this agenda.

More specifically, there are two main use cases for digital twins in subsea operations:

- Simulation: digital twins can be used to plan, investigate, and train individuals using 'what if' scenarios. For example, the integrated processes of an entire subsea, pipeline and facility can be simulated to train operators or to understand the system response to a planned change in operating conditions.
- Asset performance and integrity monitoring: digital twins can be used in real time (or near real time) to determine an asset's physical response to current operating conditions and the output of decision-ready monitoring and advisory information. For example, a digital twin of a subsea spool that is subject to vibration caused by unstable flow can calculate the rate of fatigue based on real-time production data.

Eventually, a very large and sophisticated digital twin could combine all these and more, with the aim of allowing operators to manage every facet of their system through a remote digital replica.

As these use cases indicate, subsea's unique challenges, particularly in deepwater, lend themselves to a digital twin solution. When even an infield flow line can have 30 miles of pipeline tied back to a facility, linear assets are spread over vast distances, and control systems represent an underwater version of spaghetti junction, even the slightest improvements to inspection regimes can deliver significant safety, efficiency and cost benefits.

With an established, robust, and proven digital twin of the asset in place, the traditional method of inspections can be transformed. Rather than sending an inspector offshore to operate an ROV, tag information on videos, communicate with the operations team on the asset or on the beach, an inspector can pilot the ROV from the safety and security of an onshore office building, using a digital model of the field.

Not only does this reduce the cost of sending an inspector offshore, the ROV pilot can be more efficient because flight paths can be included in the twin that make it easier to inspect the asset. Early estimates show that a digital twin can be used to improve inspector efficiency by up to 30 per cent.

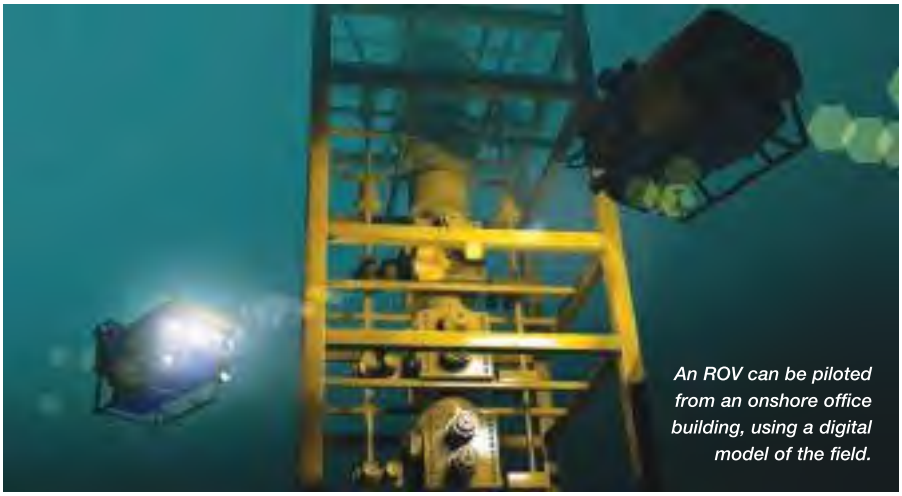


Image Credit: pixone 3d/Adobe Stock

An ROV can be piloted from an onshore office building, using a digital model of the field.

Next steps for digital twins

Looking further ahead, digital twins could enable autonomous inspection. Autonomous vehicles are already being trialled in offshore settings as part of the industry-wide drive to reduce costs.

But with a digital twin, we will soon be at the point where an autonomous vehicle that is either resident at the facility or deployed from a vessel will be able to navigate a pre-defined inspection path. Deep machine learning techniques and artificial intelligence will take us to the point where the vehicle will be able to identify structural changes and detect leaks or anomalies automatically, eliminating wastage associated with video review and manual anomaly annotation.

> "Subsea's unique challenges, particularly in deep water, lend themselves to a digital twin solution."

There's also the issue of life extension of assets that are either approaching or technically past their expected decommissioning date. Whereas levels of fatigue, corrosion and erosion may have been accurately anticipated during the planned lifecycle, many assets, notably those in the North Sea, are now far less predictable.

The time dimension in a robust digital twin, combined with the advanced analytics that are a critical component of any digital model, give operators a more accurate predictive capability. Operators can therefore look at leading indicators and accurately predict where a riser, pipeline or jumper may become overstressed or a flow might become choked – and put remedial measures in place proactively.

Digital twins as a totex solution

As these few examples indicate the digital twin concept fits into two broad trends: one technological, the other operational.

Looking at the operational first, firms around the world are looking at ways to overcome the historical disconnect between opex and capex and the transition from the design and construction phase to operations. Totex, the total project expenditure, may sound like the latest buzzword of the month, but it reflects the broader reality, in which operational staff are involved much earlier in projects.

Digital twins provide technological support to this process, and can reduce the traditional headache that accompanies the handover of a capital project to operations. In the traditional IT estate, systems used to design a field or facility are typically entirely separate from those used to manage integrity, maintenance or operations. In the world of digital twins, these systems can be joined together across the whole lifecycle – with obvious financial advantages and operational benefits.

With regards to technology, digital twins bring together all of the major IT trends of the past few years: data and advanced analytics; sensors and connectivity; the Industrial Internet of Things; robotics, AI and deep machine learning; cloud and utility computing. Even augmented and virtual reality have a role to play.

To date, the major specialist software houses have not focused on subsea operations: there has been more to gain from general applications that can be replicated across an onshore refinery, a process plant, or a process production facility. But as we have seen, digital twins are not an obscure branch of technology with limited business potential.

As new models of digital twin become established, with a combination of replicable and bespoke components, we should see some of the most entrenched challenges in safe subsea operations being broken down. ■

Supporting localisation and technology development

BHGE continues to strengthen its presence in Saudi Arabia from the technology, people and portfolio perspectives, building on its eighty-year heritage of involvement with the Kingdom. *Oil Review Middle East* spoke to Zaher Ibrahim, the company's president & CEO, Saudi Arabia, North Gulf & East Mediterranean.

"SAUDI ARABIA IS the hub of our region, we've had a presence in the Kingdom for more than 80 years, across the whole industry," says Ibrahim. "Baker Hughes drilled the first well in Saudi Arabia in 1938, we provided Frame 3 gas turbines in 1940, and we have been growing throughout the years to get to where we are today.

"Today, we have more than 2,700 employees in Saudi Arabia, of which around 1,500 are Saudi nationals, whom we've developed, employed and trained through various programmes in partnership with academia and vocational institutes."

The company works closely with its customers, partners and suppliers to play a key role in supporting the Kingdom's IKTVA and Vision 2030 localisation and economic diversification objectives.

"We firmly believe that in-Kingdom value creation is about empowering Saudi suppliers – working with them and helping them become partners of the energy supply chain. Today, we have over 1,350 Saudi suppliers in our supply chain and have helped create over 5,300 indirect jobs. This was built through our deep presence in the Kingdom," says Ibrahim.

BHGE has also signed a Memorandum of Understanding with Saudi Aramco to expand its physical and human capital to secure reliable local supply. "As per the MoU, we will support the IKTVA Action Plan to develop a broad-based local contractor and supplier community in Saud Aramco's area of operation," he adds.

"We are pursuing new initiatives big time and growing our manufacturing capabilities. Our Pressure Control facility has increased capacity by a factor of three in the last five years, supporting not only Saudi Aramco but the whole region." The largest and one of the most advanced facilities by BHGE in the region with manufacturing done entirely in-Kingdom, it has a 60 per cent Saudi workforce.

In December 2018 BHGE announced plans to build a state-of-the-art Oilfield Services facility in King Salman Energy Park (SPARK), which will support ongoing customer activities for three product lines – drilling services, wireline services and pressure pumping, ultimately acting as a regional hub for these services, positioning BHGE for future growth in the region and boosting the Kingdom's exports of maintenance equipment.

Image Credit : BHGE

BHGE has a strong focus on hiring and developing female engineers.

BHGE's new Multi-Modal facility is another example of localisation; is the first of its kind outside the company's Turbomachinery and Process Solutions headquarters in Florence, Italy which will support the manufacturing, assembly, packaging and testing of turbomachinery equipment and components.

"So we continue to take it to the next level," Ibrahim says. "We have ten facilities today in the Eastern Province alone, supporting Saudi Arabia and the region."

Localisation is not just about hiring people, Ibrahim points out. "If you don't have the right framework and structure in place, the right development gameplan, you will lose talent, especially in Saudi where there is strong competition for it. So we partner with a number of institutions such as KFUPM, hiring engineers, developing them, sending them abroad, then bringing them back and promoting them to leadership positions." The company partnered with the Technical and Vocational Training Corporation (TVTC) to devise a tailored programme to train and develop technicians for the Pressure Control facility. It also partners with SADA, the Saudi Arabian Drilling Academy and Saudi Petroleum Services Polytechnic (SPSP) to develop vocational technicians who are then employed by the company, adding value and receiving opportunities for further career development.

Promoting diversity

BHGE has a strong focus on promoting diversity and has an increasingly diverse workforce. "The kingdom is transforming, and we're playing a very solid role in transforming the kingdom to a diverse workforce and focusing on females," says Ibrahim. "Thirty-six per cent of our female employees are involved in engineering or STEM, which is very important for us."

BHGE works with the National Institute

of Technology (NIT) to put female engineering graduates through a six-month programme, following which they are employed by the company. It has also committed to hire and develop 50 female vocational technicians through an academy for females which it part-owns.

"Today we have female engineers working and being trained on rigs in the region," he adds.

Ibrahim stresses that a lot of care and sensitivity is required in bringing females into the workforce. "We are taking it in steady steps, we make sure we bring the right content, the right development, the right set-up and ecosystem."

Localisation goes hand in hand with technology development, says Ibrahim – and here its Dhahran Technology Center plays a central role. This has over 15 R&D projects and has filed more than 30 patents, partnering with customers in Saudi and the region to develop and bring together solutions that cater to customer challenges, and connecting with the company's worldwide research. The center also works with Saudi Aramco and King Fahd University of Petroleum and Minerals (KFUPM) to develop solutions for the Kingdom and the rest of the world.

Zaher Ibrahim, BHGE's president and CEO, Saudi Arabia, North Gulf and East Mediterranean

Highlighting the tangible accomplishment in localisation, BHGE also invested in a state-of-the-art, PDC (polycrystalline diamond compact) drill bit plant in Dhahran, the first facility in the Middle East to completely manufacture the drill bits in the Kingdom and export them worldwide.

"For us, localisation means more than simply operating and supporting our customers through locally provided services," says Ibrahim. "Instead, we work to create links across the local economy to build the right ecosystem across the energy sector."

Digitalisation is a strong focus. "We are working with all our customers to bring value added into the supply chain through strengthened digital capabilities. We have just added 3D printing capabilities to additive manufacturing in our Dhahran Technology Center, which will be our regional hub for 3D printing.

"So there are many areas of involvement from the technology, people and portfolio perspectives," Ibrahim concludes. "As the only company that brings the upstream, midstream and downstream together, we have the portfolio, the technology and the people to provide what the customers want. We work in the toughest conditions – high pressure, high temperature and with high H2S – bringing solutions across the spectrum from drilling services to completion and artificial lift.

"Throughout our heritage we've always worked closely with customers to look at opportunities where we can add value, bring technology and solutions and take it to the next level." ■

The Internet of Things
starts with a sensor

The sensor is the main component of the IoT process, says KELLER AG für Druckmesstechnik, Europe's leading manufacturer of pressure sensors. The company is a key partner when it comes to implementing IoT solutions.

THE INTERNET OF Things (IoT) always starts with a sensor. After all, things cannot capture states or carry out actions unless they are fitted with sensors. These two activities and a connection to the web are what make these objects "intelligent" without the help of humans.

The Internet of Things is all around us every day, whether we realise it or not. If, for example, you can control TV recordings or your lights at home using your smartphone, this falls under the category of the smart home. If a company uses automatic, independent processes in its organisational measures, we call this a smart factory or Industry 4.0. Other related terms include smart energy, smart mobility and smart health. No matter the sector, the sensor is ultimately the most important supplier of data and thus the key component of the IoT process. When fitted to an object, different sensors can be connected to local and global communication networks. The final step in the process is to analyse the data on networked computers or in a cloud.

IoT processes are highly customised and are undergoing continuous development. KELLER has already worked with international companies to develop numerous smart, customer-specific total solutions in various sectors. The technologies for those IoT-projects include GSM, LoRa, RFID and Bluetooth (SMART) and were selected to ideally suit the individual application. The following is just one example that illustrates how KELLER sensors fuel IoT progress.

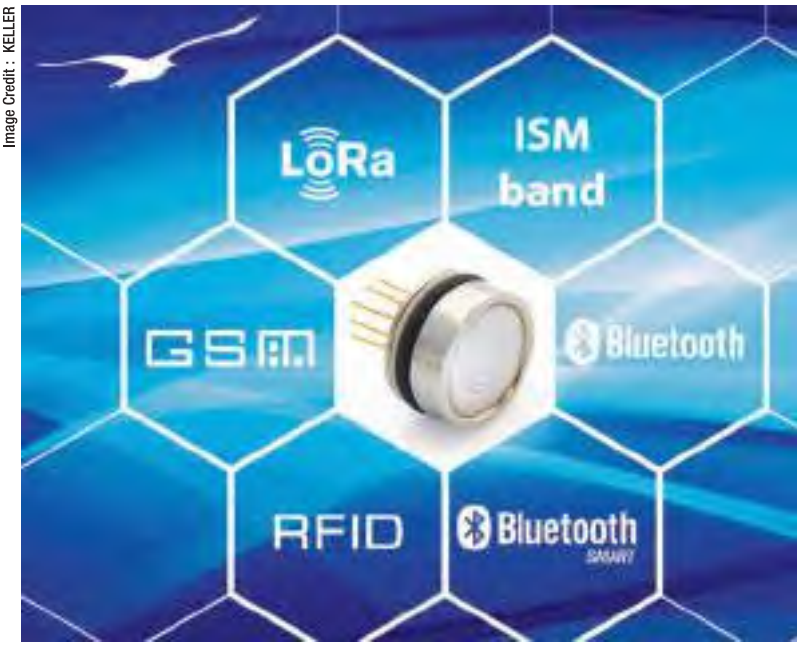
> "No matter the sector, the sensor is ultimately the most important supplier of data."

Smart fuel tank management with fuel prices updated daily

Alongside water and drinks, fuels are another liquid ideally suited to being managed by means of automated, "smart" processes. The remote monitoring of fuel levels in heating oil, diesel, and petrol tanks is a great support to mineral oil companies, petrol station owners, and property managers alike.

KELLER developed the EasyOil® remote monitoring system in partnership with a Swiss mineral oil supplier. This system has really found its place in the market and is the key selling point for customers in 80 per cent of the contracts concluded for heating oil deliveries.The pressure and level of oil are measured at the lowest point in the tank, the current content in litres is calculated according to the shape of the tank and the data is transmitted via GSM. A special feature of this application is the customer-specific software. In addition to the current data such as fill level, consumption and order history, it also contains oil prices, which are updated twice a day. This combined information optimises the order process, allowing customers to stockpile when the price of oil is low or the tanker is close by.

Image Credit : KELLER



Various technologies are used for IoT projects, to suit the individual application.

Because there is a risk at petrol stations that an electric spark could cause the gaseous atmosphere to explode, any pressure transmitter taking measurements in this type of environment must be intrinsically safe. For this application, the GSM-3 remote transmitter has been extended to include a box with built-in safety barriers that limit the electric output of the measurement system within the zone at risk of explosion (the ex zone), thus preventing sparks.

The Internet of Things offers smart solutions that help make life easier and more convenient, improve and streamline processes, and receive information in good time that was previously unavailable or difficult to acquire. Smart solutions are highly personalised but always begin with an object and a sensor.

Whether you need a competent partner to provide you with accurate and reliable OEM pressure sensors or a smart solution ready for use, contact KELLER for advice on your own customised IoT requirements. info@keller-druck.com. ■

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BP invests in AI technology

BP VENTURES, A venture capital firm that identifies and invests in private and high-growth technology companies, has invested US$5mn in Belmont Technology's Series A financing to boost BP's artificial intelligence (AI) and digital capabilities in its Upstream business.

The investment supports BP's ongoing work exploring opportunities to apply machine learning and cognitive computing in its global oil and gas business.

The Houston technology start-up has developed a cloud-based geoscience platform using AI, which can intuitively link geology, geophysics, reservoir and historic project information together, identifying new connections and workflows, and creating a robust knowledge-graph of BP's subsurface assets. BP experts can then interrogate the data. The technology then uses AI neural networks to interpret results and perform rapid simulations.

Aimed at accelerating project lifecycles, from exploration through to reservoir modelling, the technology is targeting a 90 per cent time reduction in data collection, interpretation and simulation.

David Eyton, BP's group head of technology, said, "This AI-based platform, which we've nicknamed Sandy, is expected to unlock critical data for our subsurface engineers at a much accelerated pace. Sandy will then interpret our data, including mapping out many more scenarios than are currently constructed, helping us make faster, better informed Upstream decisions."

New cut and lift product

Image Credit : James Fisher Offshore

The new product will help to streamline decommissioning projects worldwide.

SPECIALIST SUBSEA PROJECT delivery firms James Fisher Offshore (JFO) and First Subsea have joined forces to launch a revolutionary cut and lift product that promises to streamline decommissioning projects worldwide, simplifying operations whilst reducing costs and risk.

The collaboration has led to the development of a one-component system, Internal Cut and Lift Technology (ICLT), which merges market-leading cutting and lifting tooling, optimised with Ballgrab gripping technology, to provide a simple, flexible and quick mechanism to remove retired subsea assets and tubulars.

Designed with the oil and gas industry's decommissioning projects in mind, ICLT offers a simple solution that streamlines the number of contractors, operations and personnel required on offshore platform operations.

When fully commercialised early in 2019, it will offer significant HSE, time, operational and cost benefits to customers ready to decommission late-life assets.

Enhanced production optimisation platform

WEATHERFORD INTERNATIONAL HAS enhanced its ForeSite production optimisation platform, expanding predictive failure analytics to electric submersible pumping systems (ESPs) and adding complete optimisation capabilities for plunger-lifted wells.

The platform expands on industry-exclusive capabilities in reciprocating rod lift by adding predictive failure analytics for ESP systems. By predicting an ESP failure before it happens, this capability not only reduces failure frequency, it also reduces total downtime and lost production by enabling proactive failure management and planning.

Adding plunger-lift optimisation builds on previous optimisation capabilities in rod lift, gas lift, natural drive, and ESP-lifted wells. ForeSite enables real-time optimisation and surveillance along with intelligent alerts, well modelling, plunger-cycle design and more.

ForeSite is now also edge-computing ready. Combined with advanced IoT-enabled hardware and CygNet SCADA software, placing ForeSite modelling capabilities at the wellsite can increase asset profitability, productivity, and uptime, paving the way for the next-generation automation system, ForeSite Edge.

Finally, the ForeSite enhancement includes automated well testing and the ability to execute well-work activities in the field via ForeSite Mobile.

Weatherford introduced the ForeSite platform, which combines physics-based models with advanced data analytics to improve performance across wells, reservoirs, and surface facilities on a single, secure platform in 2017.

"Since its launch, ForeSite has been deployed around the world with unmatched success, enabling operators to identify and prioritise their production opportunities," said Kyle Chapman, president of Production for Weatherford. "Simply put, the new ForeSite release gives operators the field-wide intelligence that they need to monetise their data. The new capabilities added to ForeSite combine an unprecedented ability to monitor performance and recognise current and future improvement opportunities across all reservoirs, wells, surface equipment and pipelines. This is the field of the future."

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BHGE introduces digital platform for methane monitoring

BHGE HAS LAUNCHED a new digital integrated platform, LUMEN, which provides continuous methane monitoring for oil and gas operators using both wireless ground-based and aerial drone-based technology

"Methane leak detection is one of the most pressing needs in the oil and gas industry, and we believe LUMEN is a game-changer for highly-effective methane emission monitoring," said Diarmaid Mulholland, CEO of BHGE's Measurement & Sensing business.

Image credit: BHGE

LUMEN uses both wireless ground-based and aerial drone-based technology.

"Using advanced sensors and industrial software, LUMEN helps operators to protect the environment by detecting harmful methane leaks, and by using advanced data analysis, this technology helps to identify and reduce emissions while also increasing safety for operators."

The platform includes a full-suite of methane monitoring and inspection solutions capable of streaming live data from sensors to a cloud-based software dashboard for real-time results. The platform consists of two seamlessly connected formats – a ground-based solar-powered wireless sensor network, and a drone-based system for aerial monitoring – ensuring methane emissions are monitored as efficiently and accurately as possible.

Innovative monitoring strategies like LUMEN go beyond meeting safety and regulatory requirements and can also help increase operational efficiencies, reduce costs and minimise pollutants for customers globally. The technology can also be used to help operators quantify any actions they have taken to reduce their carbon footprint.

Speaking to *Oil Review Middle East* Glen Parkes, the company's general manager, Sensor Solutions commented that while the initial drive behind the development of the platform was conformity with US emissions regulations, it is now the industry and corporate governance rather than regulation that is driving it.

"This is a really interesting turn of events in the last 12 months or so," he remarked, adding that it has been three years in development and has attracted interest from operators worldwide.

Using proprietary algorithms and machine learning, LUMEN provides methane concentration data (PPM), as well as the location and rate of the leak, and trend analysis. The data is available in real-time at the touch of a button via a computer or smartphone, giving operators the ability to make quicker, more reliable decisions for their operations. Customers can set their own emissions thresholds which can be configured for each site and have full visibility of their sites, being able to see instantly when a problem occurs.

CGG announces new geosoftware releases

GEOSOFTWARE, PART OF CGG's Geoscience Division, has launched a new generation of cloud-ready reservoir characterisation solutions. Jason 10.0, HampsonRussell 10.4 and PowerLog 10.0 also feature advanced machine learning capabilities and greater cross-product integration, improving E&P project performance and providing a better understanding of reservoir properties.

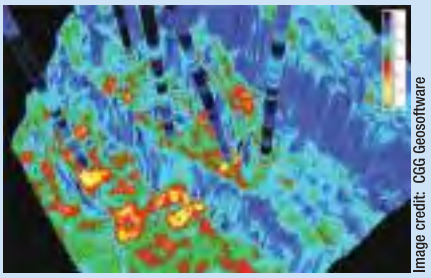

Image credit: CGG Geosoftware

Vp/Vs from Jason's RockTrace inversion highlights productive sandstones in the Gulf of Mexico.

The three new releases already run seamlessly on Microsoft Azure's Cloud Environment and will soon be available on other major Cloud platforms. Geoscientists can now implement compute-intensive workflows and run very large projects, to process thousands of wells, faster than ever before.

HampsonRussell Emerge now delivers deep learning in the form of Deep Feed Forward Neural Networks for better prediction of reservoir properties. An open Python ecosystem in PowerLog enables the routine use of machine and deep learning in workflows to increase automation and achieve more accurate facies predictions.

The new releases feature integration advancements, such as the ability to "load once, use everywhere" to streamline cross-product workflows, as well as other user-driven improvements.

Kamal al-Yahya, senior vice president, GeoSoftware & Smart Data Solutions, said, "Greater product integration is key for inter-disciplinary workflows as links between geophysics, geology and petrophysics grow ever stronger. This new set of releases is also the first to deliver real benefits from our digitalisation roadmap, offering a high-quality experience with the integration of machine learning and Cloud-ready applications."

Photoelectric sensor for demanding applications

ROCKWELL HAS INTRODUCED the new Allen-Bradley 42AF RightSight M30 photoelectric sensor, the latest addition to its smart sensing portfolio. Built with improved environmental resistance and long-distance detection in a mid-sized, right-angle housing, the RightSight M30 smart sensor offers the flexibility and performance required for a wide range of high-demand applications.

Image credit: Rockwell Automation

The new photoelectric sensor.

"Our new photoelectric sensor was developed to help increase reliability in harsh environments where dirt or undesired particles could accumulate on the sensor lens," said Adonis Evangelista, product manager, Rockwell Automation.

Built with IO-Link capability, the sensor easily integrates into The Connected Enterprise by delivering data and diagnostics from the sensor directly into a control system to help minimise downtime and increase productivity. With this capability, the sensor provides information such as signal strength, location, proximity alarms and timing functions that help create operational efficiencies and streamline troubleshooting. The 360-degree high visibility LED power and status indicators further assist in setup, monitoring and troubleshooting.

The durable, right-angle housing offers a universal 30 mm nose and 18 mm base mount for fast, flexible installation and replacement. The IP67/IP69k/1200 psi rated housing is fully sealed, enabling the RightSight M30 to withstand tough industrial environments, including those involving high-pressure and high-temperature wash-downs. Featuring multiple sensing modes, the sensor is also available in easy-to-apply, adjustment-free models and teachable versions that adjust sensitivity and output configuration at the push of a button.

The Allen-Bradley 42AF RightSight M30 photoelectric sensor is available worldwide.


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SIL 3 certified flame detector by 3M Gas & Flame Detection

AMONG 3M GAS & Flame Detection's wide range of gas and flame detection equipment is the MultiFlame series DF-TV7-T. The first triple IR flame detector on the market certified up to safety integrity level SIL3, the device is in compliance with IEC 61508:1-7 and abides by stringent functional safety assessments.

The MultiFlame DF-TV7-T series flame detector provides fast and accurate detection of hydrocarbon fires while ensuring reliable false alarm immunity. Based on a multi-infrared spectrum (3IR) technology, the detector provides one of the longest distance-to-detection ranges on the market (260 ft for n-Heptane). In addition, the 3IR detectors are highly sensitive to fire, and ideal for use in dirty environments and for smoky fires.

Also available in the MultiFlame product line is the DF-TV7-V, a UV/2IR version certified for use in SIL2 applications. The MultiFlame DF-TV7-V uses combined ultraviolet/infrared optical technology that provides industry-leading immunity to false alarms based on the two IR channel design. Both solutions lead to a very efficient false alarm rejection while keeping optimum sensitivity to fire.

The MultiFlame DF-TV7-T series flame detector provides fast and accurate detection of hydrocarbon fires.

All MultiFlame detectors are equipped with a continuous optical lens auto-check to ensure that the optical path is clear and that the detector functions properly. Sensors can be replaced easily in the field without removing any cable glands.

Each detector is constructed as follows:

- A stainless steel (316L) explosion-proof housing contains a set of tropicalised electronic cards as well as a display and infrared communication electronic card allowing communication with the remote control (TLU600).
- The sensor cartridge contains the flame detection circuitry, so it is possible to change the cartridge easily. The multispectrum IR detector is also available in a high sensitivity version.
- An IR communication head is located below the detector housing. It is used for communication with the maintenance hand-held terminal (TLU).
- A metallic support cable (optional) connects the wall mounting support and the housing, making maintenance easier.

For more information on the company's range of products and services, email the experts at gasandflamedetection@mmm.com or check the website at http://gasdetection.3M.com.

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Project Databank

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Project Summary

Project Name	Bapco - Bapco Modernization Program (BMP)
Name of Client	BAPCO - Bahrain Petroleum Company
Estimated Budget (US$)	6,000,000,000
Facility Type	Petroleum Oil Refinery
Status	Construction
Location	Sitra
Project Start	Q1-2009
End Date	Q1-2022
FEED	Technip
PMC	WorleyParsons
Main Contractor	Tecnicas Reunidas, Samsung Engineering Company, TechnipFMC
Contract Value (US$)	4,200,000,000
Award Date	Q1-2018

Background

Bapco plans to boost the processing capacity of the Bapco refinery, the country's only oil refinery, to 360,000 bpd from its current 267,000 bpd by updating ageing facilities. Approximately 220,000 bpd of oil is currently provided by Saudi Aramco, while 40,000 bpd is coming from Bahrain's own reserves. The company will look to develop the residue conversion unit (RCU) first as it will process heavier crude types into lighter-grade products. Bapco will then use the money generated by the RCU to fund the remaining work. A huge bulk of the additional capacity will be middle distillates or diesel fuel. The residue conversion unit will open access to cheaper feedstock of heavy crude oil and thus, a larger diversity in the sources of supply. The new hydrocracking unit and associated facilities will expand the mild hydrocracking unit from 54,000 bpd to 70,000 bpd in capacity and install a new fluid catalytic cracker. The dehydrosulphurisation unit will aid in the production of diesel according to the international standards of sulphur content, having fewer than 10 parts per million.
Bapco is the project client. Nogaholding, the investment and business development arm of Bahrain's National Oil and Gas Authority (NOGA) is investing in the project. Bapco has reached an agreement with UK Export Finance (UKEF) for an ECA agreement. Export-Import Bank of Korea (Korea Eximbank) and Korea Trade Insurance Corp. (K-sure) have agreed to provide US$734mn of financing to the project.

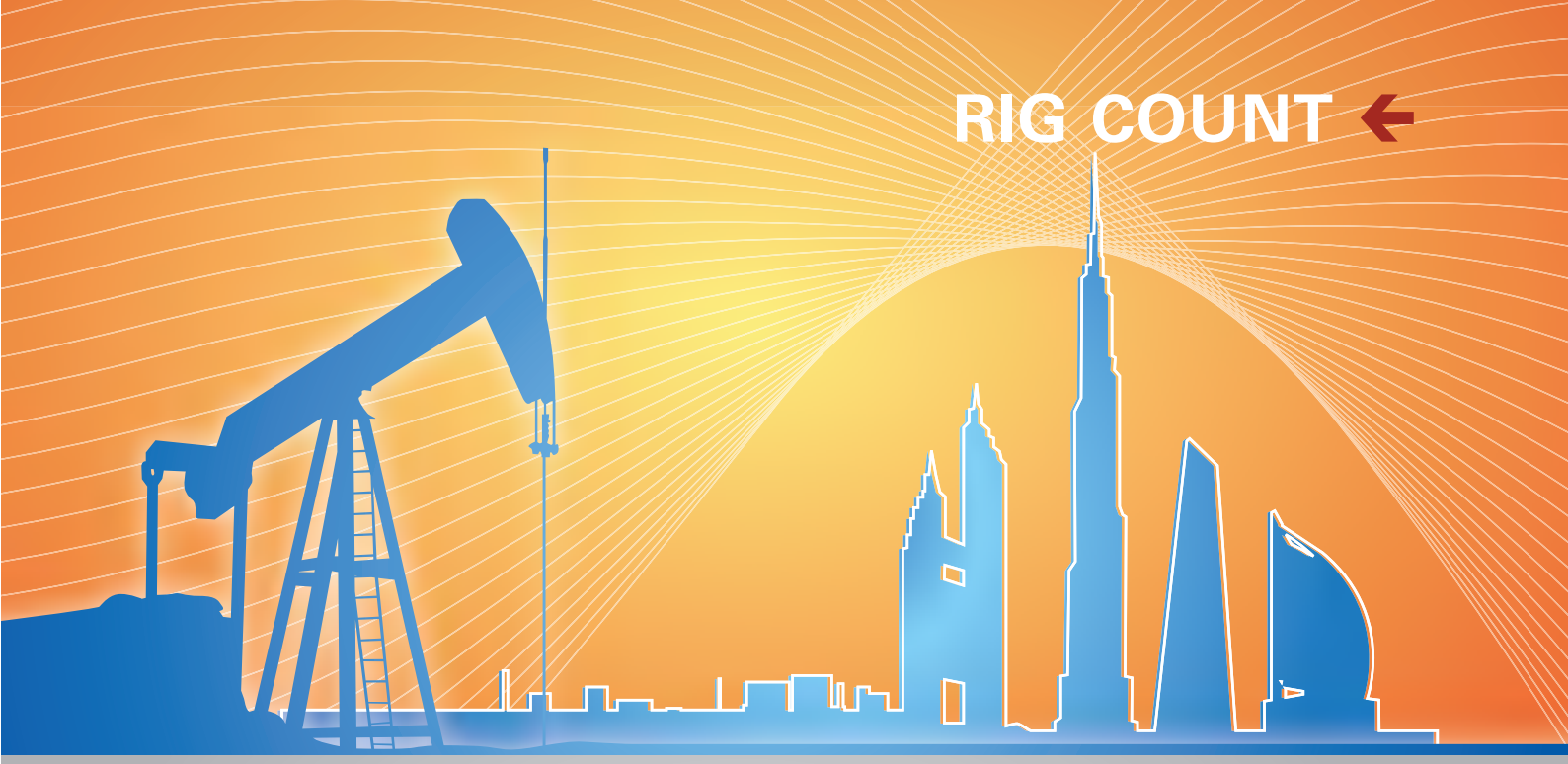
Project Status

Date	Status
Jan 2019	Construction works have commenced after an official groundbreaking ceremony.
Oct 2018	The Downtown group has completed work on the site preparation Package A sub-contract.
Jun 2018	Bapco has entered into advanced talks with ECAs to secure US$3-4bn of financial backing.

Project Scope

The scope of work includes:

- Residue conversion units
- Hydrocracker units
- Waste treatment facility
- ARU (Amine Recovery Unit); 60,000 barrels per hour (BPH)
- Hydrogen Production Unit (HPU); 295,000 normal meter cube per hour (nm3/h)
- Splitter
- Naptha hydrotreater
- Distillate hydrotreater
- Sulphur recovery unit; 750 tonnes per day (TPD)
- Tail Gas Treatment Unit (TGTU); 1,000 TPD
- Sour water stripper; 1,000 gallons per minute (GPM)
- Handling facilities
- Offsites & utilities



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.

	THIS MONTH			VARIANCE	LAST MONTH		
Country	Land	OffShore	Total	From Last Month	Land	OffShore	Total
Middle East							
ABU DHABI	37	20	57	2	36	19	55
DUBAI	0	2	2	0	0	2	2
IRAQ	62	0	62	0	62	0	62
JORDAN	0	0	0	0	0	0	0
KUWAIT	46	0	46	5	41	0	41
OMAN	51	0	51	0	51	0	51
PAKISTAN	20	0	20	1	19	0	19
QATAR	3	10	13	4	3	6	9
SAUDI ARABIA	98	25	123	-2	104	21	125
SUDAN	0	0	0	0	0	0	0
SYRIA	0	0	0	0	0	0	0
YEMEN	0	0	0	0	0	0	0
TOTAL	317	57	374	10	316	48	364
North Africa							
ALGERIA	44	0	44	-6	50	0	50
EGYPT	21	5	26	-1	21	6	27
LIBYA	7	2	9	0	7	2	9
TUNISIA	2	0	2	0	2	0	2
TOTAL	74	7	81	-7	80	8	88

Source: Baker Hughes

وأسرع بشأن مكان الحفر والكيفية، وما إذا كان كان الحفر سيتم على الإطلاق.

ويضيف إيتكين: «ومن خلال الوصول لقدرات حاسوبية فعالة وغير محدودة من خلال السحابة، صارت كيرن إنرجي، التي بدأت في التحول الرقمي منذ ٢٠١٥، تتمتع بالقدرة على توفير الشهور في عمليات معالجة الهزات الأرضية ثلاثية الأبعاد. ومع شركة معنية بالتنقيب مثل كيرن، يمثل تحسين سرعة اتخاذ قرار الحفر أو الإسقاط أمرا ثوريا».

ومنذ ٢٠١٤، أنفق مشغلو عمليات التنقيب ٥٠ مليار دولار أمريكي سنويا في المتوسط على التنقيب. وباستخدام متوسط الأنشطة ومستويات الإنفاق في الفترة من ٢٠١٤-٢٠١٧ كأساس، يظهر تحليل وود ماكنزي أنه خلال السنوات الخمس المقبلة، يمكن تحقيق وفورات محتملة في التكلفة تتراوح بين ٥ - ٧ مليارات دولار أمريكي (١٠-١٥ في المائة) سنويا في عمليات التنقيب.

مكاسب التنقيب المحتملة من خلال رقمنة العمليات

يمكن تحقيق وفورات مماثلة في الحفر والاستكمال، غير إن امتيازات الرقمنة المحتملة تبرز في تطوير الحقل. ومن جانبها، تشير ماريد إيفانز، المحلل الرئيسي بشأن سلسلة توريد عمليات التنقيب من النفط: «يتمثل التأثير المالي الرئيسي في خفض التكاليف الرأسمالية. وتعتقد شركة إكوينور أن مفهوم «حقل المستقبل» الخاص بها سيقلل من النفقات الرأسمالية للمنشأة البحرية بنحو ٣٠ في المائة».

«قد يؤدي هذا الانخفاض الهائل إلى تأثير جوهري، حيث يتيح التسييل النقدي للاحتياطات الحالية التي لم تصل للحدود التجارية. وتعتقد إكوينور أن أغلب التخفيضات في التكلفة نتيجة المنصات المؤتمتة، مثل أوسبرغ إتش، أول منصة ذاتية التشغيل في النرويج».

وتضيف: «تعني البيئات ذاتية التشغيل أسطحا علوية أصغر دون وحدات لإقامة العمال، ودون سفن توريد. وبطبيعة الحال، يمكن تحقيق ذلك إن أمكن أتمتة كل عملية أو إدارتها عن بعد، وهي نقطة تؤكد التأثير التحويلي المحتمل للاستنساخ الرقمي».

ويعتبر الاستنساخ الرقمي نسخة افتراضية من الأصل المادي. فهو يتبع ديناميكيات كل صمام وأنبوب وكابل، بالإضافة إلى التكامل الهيكلي للمرافق. ويسمح ذلك بمحاكاة النتائج على مستوى غير مسبوق. ويمكن رؤية الامتيازات طوال دورة التنقيب والإنتاج، من التخطيط والتطوير إلى الإنتاج وإيقاف التشغيل. وهذا الأمر ليس بالخيال العلمي، فبريتش بتروليوم تعد إحدى شركات النفط والغاز التي نفذت بالفعل هذه التقنية، مع تطبيق برنامج أبيكس الخاص بها.

كما تضيف إيفانز: «حتى دون المنصات المؤتمتة، ستؤدي الرقمنة إلى وفورات في التكلفة في مراحل التصميم الهندسي الكامل وما قبلها لعمليات التطوير التقليدية. إذ يمكن للنماذج المؤتمتة تحقيق نتائج اقتصادية بالحقل في ظل مجموعة من مفاهيم التطوير وسلسلة متواصلة من المتغيرات، وهذا الأمر ليس بالجديد. غير أن تحليلات البيانات الضخمة تدمج هذه النماذج مع خبرات العالم الفعلي، مما يسمح باتخاذ قرارات محورها البيانات على نحو أسرع وبثقة أكبر».

ولطالما كانت سابقة الأعمال في صناعة التنقيب عن النفط في مجال تنفيذ المشروعات مصدرا للشكوك لدى المستثمرين. وكشف بحث وود ماكنزي أنه على مدار العقد الماضي، كان متوسط تسليم المشروعات يتأخر لستة أشهر، مع ارتفاع التكلفة بنحو ١٤ في المائة مقابل توقعات قرار الاستثمار النهائي. وسيصير تطبيق الرقمنة أثناء مرحلة التطوير عاملا مهما في المحافظة على إنجاز المشروع بشكل جيد. وتشكل المرحلة التشغيلية العمود الفقري لإنفاق الصناعة التقليدي، حيث يتم إنفاق أكثر من ٢٤٠ مليار دولار أمريكي على النفقات التشغيلية كل عام. وفي حين أن التطورات الجديدة تقف إلى جانب المزايا العائدة من الرقمنة، يمكن تنفيذها كذلك في الحقول الموجودة مع تحقيق نتائج بارزة. ويعتمد التحليل أدناه على انخفاض تكاليف الحقل التشغيلية السنوية بنسبة خمسة في المائة، وزيادة إنتاج الحقل السنوي بنسبة واحد في المائة. وبالنسبة للعديد من الأصول، يعد ذلك افتراضا متحفظا. فعلى سبيل المثال، تتوقع توتال انخفاض النفقات التشغيلية بنحو ١٠ في المائة في حقل كوازين قيد التطوير في بحر الشمال بالمملكة المتحدة من خلال استخدام حزمة رقمية.

أما الجانب الآخر من المعادلة، وربما الأكثر قيمة، فيتمثل في أرباح الإنتاج من خلال زيادة زمن التشغيل. فعلى سبيل المثال، سيترتب على زيادة كل أصل إنتاجي تقليدي بنسبة واحد في المائة في مرحلة الإنشاءات على المستوى العالمي في ٢٠١٨ إنتاج ١.٣ مليون برميل نفط إضافي يوميا في السوق، وهو ما يساوي تقريبا إجمالي إنتاج ليبيا. ويضيف إيتكين: «تعجل الصدمات الكبيرة التي تلحق بالنظام من اتخاذ الإجراءات. وقد تسارعت جهود الأتمتة المجمعة في آخر ثلاث سنوات عقب تدهور أسعار النفط والتعافي الذي تلا ذلك. وتزعم بريتش بتروليوم أنها أضافت ٣٠،٠٠٠ برميل من الإنتاج العام الماضي نتيجة لاستخدام نظام أبيكس وقدمت نموذجا وقع في خليج المكسيك حيث تم تحسين النظام والخفض الوقت من ٢٤-٣٠ ساعة إلى ٢٠ دقيقة فحسب». ويظهر بحث وود ماكنزي أن الرقمنة ليست بدعة كما أنها ليست «مجرد مشروع لتقنية المعلومات». فالشركات التي لن تواكب التطور ستتخلف عن الركب. وبينما لدى الشركات الرئيسة المزيد من الأدوات تحت تصرفها، تتاح الامتيازات التحويلية التي تقدمها الرقمنة للجميع، حتى لأصغر المشغلين.

تبني تقنيات التحليلية والذكاء الاصطناعي قد يأتي بفوائد هائلة لصناعة النفط

وفورات هائلة في عمليات التنقيب نتيجة الرقمنة

طبقا لتقرير صدر حديثا عن مؤسسة وود ماكنزي، من الممكن أن تشهد عمليات التنقيب عن النفط تحقيق وفورات في التكلفة تصل إلى ٧٥ مليار دولار أمريكي سنويا نتيجة لرقمنة هذه العمليات، وذلك بحلول ٢٠٢٣. فقطاع النفط والغاز يعتبر رائدا في الابتكار التقني. فالعمليات المعقدة، والمتعلقة باستخراج الهيدروكربون من أعماق القشرة الأرضية، تجبر هذا القطاع، وبشكل مذهل، على تطوير أحدث التقنيات وتنفيذها وتطبيقها. غير أن قطاع التنقيب والإنتاج بدا متقاعسا في استخدام البيانات الضخمة. ومن الممكن أن يحقق تطبيق التطورات في التحليلات والتعلم الآلي والذكاء الاصطناعي عائدا كبيرا للصناعة.

رقمنة عمليات التنقيب: «أرقي المال» هو تقرير صدر حديثا من شركة استشارات الموارد الطبيعية وود ماكنزي يشير إلى إمكانية تحقيق قطاع التنقيب عن النفط وفورات تصل إلى ٧٥ مليار دولار أمريكي سنويا من رقمنة العمليات، وذلك بحلول ٢٠٢٣. ويمكن تحقيق هذه الوفورات في كل مرحلة من مراحل عمليات التنقيب.

وفي هذا الشأن، يقول كريج إينكين، كبير محللي فريق التحليل في وود ماكنزي: «تقدم الرقمنة منافع عديدة في عمليات التنقيب، ويتمثل أكبرها في الكشف عن موارد جديدة.

وقد يتم ذلك من خلال المعالجة الأفضل للهزات الأرضية، أو فهم حديث لسجلات الآبار والتحليل الكيميائي. ولن يقدم ذلك لشركات التنقيب والإنتاج رفاهية اكتشاف موارد جديدة في منطقة الامتياز الموجودة، ولكن سيتمتع أي شخص ذو ميزة تنافسية في التنقيب بميزة مادية في الترخيص أو القياس والتحليل». وفي حين أن الهدف الأسمى للتعلم الآلي والذكاء الاصطناعي يكمن في معالجة البيانات ورصد الخزانات التي تحمل الهيدروكربون بمعدل نجاح مثالي تقريبا، تتضمن الامتيازات الثانوية اتخاذ قرارات أفضل

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