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The UAE and Africa: Closer ties?

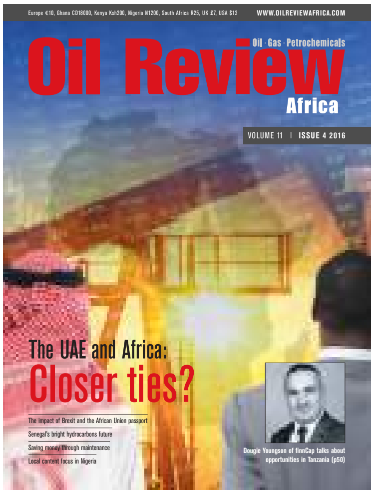
The impact of Brexit and the African Union passport

Senegal's bright hydrocarbons future

Saving money through maintenance

Local content focus in Nigeria

Dougie Youngson of finnCap talks about opportunities in Tanzania (p50)



UAE interest in African oil and gas investment is analysed on page 23.

EDITOR'S NOTE

The United Arab Emirates has a long history of trade with Africa and, along with many of its neighbours in the Arabian Gulf, its leaders are keen to diversify the economy. Could investment opportunities in the African oil and gas industry prove to be mutually beneficial? Turn to our cover story on page 23 to find out more about the opportunities that may lie ahead.

Senegal and Egypt are in the spotlight in this issue. Senegal stands to experience massive economic transformation thanks to massive hydrocarbon discoveries (page 16). Egypt, meanwhile, is looking to move closer to gas self-sufficiency with BP and Eni joining forces to exploit a significant offshore discovery (page 20).

There is also a focus on cost-effective operations with features on how to plan for efficient shutdown turnarounds (page 28), the importance of regular maintenance to save money in the long term (page 32) and gas leak detection (page 36).

Georgia Lewis
Managing Editor

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Executives Calendar 2016

AUGUST

14-18 **EnerCom's The Oil & Gas Conference 2016**
Denver
www.theoilandgasconference.com

SEPTEMBER

4-5 **2nd Middle East Health & Safety Forum**
Dubai
www.hse-forum.com

6-8 **NACE Egypt Corrosion Conference**
Cairo
www.egyptcorrosion.nace.org

OCTOBER

4-6 **SPE African Health, Safety, Security, Environment and Social Responsibility Conference & Exhibition**
Accra
www.spe.org/events

9-13 **23rd World Energy Conference**
Istanbul
www.wec2016istanbul.org.tr

17-19 **The 8th Saudi Arabian Oil & Gas Exhibition**
Dammam
www.saoge.org

18-19 **The 37th Oil & Money Conference**
London
www.oilandmoney.com

23-26 **OTL Africa Downstream**
Lagos
www.otlafrica.com

26-27 **Bottom of the Barrel Technology Conference (BBTC) Middle East & Africa**
Manama
www.bbtc-mena.biz

31- 1 Nov **23rd Africa Oil Week**
Cape Town
www.africa-oilweek.com

NOVEMBER

7-10 **Abu Dhabi International Petroleum Exhibition & Conference (ADIPEC)**
Abu Dhabi
www.adipec.com

8-10 **Deepwater Operations**
Galveston, Texas
www.deepwateroperations.com

15-17 **East Africa Oil & Gas Summit & Exhibition**
Nairobi
www.eaogs.com

DECEMBER

5-7 **Africa Energy and Technology Conference**
Nairobi
www.spe.org/events

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

Nigerian conference to tackle big issues surrounding content

THE SIXTH PRACTICAL Nigerian Content Forum (PNC) aims to deal with the big questions raised by major players in the country's hydrocarbons industry in relation to meeting regulated content requirements.

Taking place for the first time in Abuja from 22-24 November 2016, the event has a number of issues on the agenda. Local content requirements are not always met by operators and the conference will seek to re-energise the drive to ensure these standards are upheld throughout the entire industry.

The Nigerian Content Development and Monitoring Board (NCDMB) will be asked how it plans to revise the Nigerian Content Development Fund to better cater for the financing needs of local operators and service companies along the value chain.

The role of indigenous producers in growing reserves and boosting production will also be discussed at the conference.

The contracting process is frequently onerous for operators. To this end, the NCDMB, as well as National Petroleum Investment Management Services and IOCs, will explain their plans to reduce long contracting cycles. Representatives from the government will be called upon to discuss how oversubscription of bids to tenders by non-qualifying companies can be identified and eliminated.

Looking towards the bigger picture, the conference will also feature government speakers who will address the delegates on how to strengthen links between the oil and gas industry and infrastructure development.

www.cwcpnc.com

Economic diversification urged to achieve stability for Africa's big oil nations


Image Credit: Africa Property Investment Summit

The Africa Property Investment Summit focused on economic diversification.

AFRICA'S LARGER, OIL-DRIVEN, commodity-exporting countries have sharply felt the effects of currency and liquidity crises. Speakers at the Africa Property Investment Summit, held in Johannesburg in July, told delegates that in these countries, there has been a shift towards economic diversification and that the East African region is providing more stability than other parts of the continent.

Foreign direct investment (FDI), particularly in oil and gas projects, will remain essential for ongoing economic growth and stability across Africa.

These views were also reflected in EY's 2016 Africa attractiveness programme entitled "Staying the Course". In 2015, East Africa recorded its highest share of FDI across Africa, achieving a total of 26.3 per cent of total project. The souther part of the continent remains the largest FDI region, although 2015 projects were down 11.6 per cent from 2014 levels. In West Africa, FDI was up by 16.2 per cent and in North Africa, FDI increased by 8.5 per cent. However, Nigeria in particular has been affected heavily by the oil price decline.

While oil and gas remain important, in 2015, consumer products, retail, financial services, technology, media and telecommunications accounted for 44.7 per cent of FDI projects.

Tullow announces half-year profits and solid progress in Ghana and Kenya

TULLOW OIL HAS announced an after-tax profit of US$30mn for the first half of 2016 and a pre-tax operating cash flow of US$256mn.

The TEN project in Ghana and operations in Kenya and Uganda all played leading roles in Tullow's ongoing success in Africa, a company statement announced at the end of July.

With first oil expected in August 2016, the TEN project is on schedule and on budget.


Image Credit: Ben Sutherland/Flickr

Offshore oil development in Ghana has been a boon for the Tullow Oil bottom line.

When it reaches facility capacity at the end of 2016, TEN will increase Tullow's group net production by around 60 per cent.

Additionally, the Jubilee field's new operating procedures are working well, according to a company statement, with gross production in the second half of 2016 expected to average 85,000 bopd.

East African upstream and pipeline projects in Kenya (see news story, right) and Uganda are moving towards FEED.

Other parts of Africa are also looking promising for Tullow. The statement announces that a new licence in Zambia was signed by Tullow in the first half of 2016, and pre-drilling and scoping activities are under evaluation in Namibia.

Drilling to recommence in South Lokichar

DRILLING WILL RECOMMENCE in Kenya's South Lokichar oil basin in the fourth quarter of 2016. Blocks 10BB and 13T, operated by Tullow Oil, Maersk Oil and Africa Oil in a joint venture, already have four wells and there is potential to expand this by a further four wells.

The first two wells will be in the Etete and Erut prospects in the northern part of the basin. Other potential prospects include further appraisal of the Ngamia and Amosing fields. The plan by the joint venture is to target un-drilled flanks with the aim of extending these discoveries.

Additionally, the operators are planning an extensive water injection test programme in Q4 to collect data to optimise field development plans.

A three-year extension on the two blocks has been granted to the joint venture, which expires in September 2020.

The Kenyan government is assisting with infrastructure development, announcing its intention to run a crude oil pipeline from South Lokichar to the port of Lamu, on the northern part of the Kenyan coastline. A memorandum of understanding in regard to this project has been signed between the government and the joint venture partners. A pipeline joint development agreement is expected to be signed in the third quarter of 2016.

As well as the pipeline, an early oil pilot scheme for road and rail oil transport is being assessed. FEED studies, initiated by the joint venture, on technical, environmental and social issues are due to start in early 2017.

Angola and the US discuss oil and gas in top-level dialogue

A DELEGATION FROM Angola visited the US Department of State's Energy Resource Bureau in early August for the third installment of the US-Angola Strategic Energy Dialogue, with a focus on the African country's petroleum and power sectors.

Jose Maria Botelho de Vasconcelos, minister of petroleum, and Joao Baptista Borges, minister if energy and water, led the Angolan delegation. The discussion, held in Washington DC, was co-hosted by the US Department of State's special envoy and coordinator for international affairs, Amos J. Hochstein, and the US Department of Energy's assistant secretary for fossil energy, Christopher Smith.

Oil and gas sector security and the environmental impacts of oil and gas installations were on the agenda. It is a largely positive time for the Angolan oil sector. The 2016 OPEC Annual Statistical Bulletin reported that the largest additions to the world's proven oil reserves have come from Angola, as well as Venezuela and Iran. According to the report, in 2015 Angola's proven crude oil reserves were at 9,524mn barrels. Crude oil production for Angola in 2015 was 1,767,000 bpd. Additionally, natural gas reserves were at 308.1 bcm and natural gas marketed production was 772.5 mcm.

However, the OPEC report also revealed that the value of Angola's petroleum exports has been steadily declining since 2011, when exports were valued at US$51.409mn. In 2015, the value had dropped to US$21.751mn. Meanwhile, refinery capacity for Angola has remained constant since 2011 at 65,000 bpd at the Fina-Petroleo de-Angola facility in Luanda.

Image Credit: US Department of State

The UIS Department of State's Energy Resource Bureau hosted an Angolan delegation in August.

The last strategic energy dialogue between the two countries was held in August 2011. At this session, the US and Angolan delegations reviewed progress made in the bilateral relationship in the energy sector over the past five years. Participants discussed the need for regulatory changes in the energy sector as well as the need to create a favourable business climate to attract more private investment to Angola.

The dialogue concluded with both parties reaffirming their joint commitment to continued cooperation and mutual interest in the petroleum and power sectors.

Large-scale gas processing plant for Tanzania's Lindi Region and Mtwara

PROFESSOR SOSPETER MUHONGO. Tanzania's minister for energy and minerals, has announced the government will invest at least US$30bn towards the construction of a gas processing plant in the Lindi Region, located in the country's south.

Professor Muhongo urged calm as the project is "likely to take many years" to be completed. When he made the announcement, he said the project is likely to take 40 months, and that it will require significant expertise and supervision as well as funding.


Image Credit: Muhummad Tariq Nazir/Flickr

The coastal city of Mtwara is expected to benefit from gas sector development.

As well as the slated gas processing plant, Professor Muhongo also announced the planned development of supporting gas infrastructure. He said the Tanzanian government will have to build around 200 km of gas pipelines from the sea to the new plant.

"This is not an easy job, it will take some years," said Professor Muhongo. "We are suposed to bring the gas from the sea, it is between 100 and 200km."

He said that the Lindi Region and the nearby city of Mtwara will become Tanzania's "economic hub".

"All investors are eyeing at Lindi and Mtwara because of gas and other resources," said Professor Muhongo. He said Lindi residents should be ready for significant investment in their area in the coming years.

Metocean data acquisition in Ghana for Hess Corporation completed by Fugro

FUGRO HAS COMPLETED a 33-month period of metocean data acquisition for Hess Ghana Exploration. Measurements were taken in three locations off the Ghanaian coast in the Deepwater Tano/Cape Three Points block in depths of around 2,400 metres. The information gleaned from this project will be used by Hess in support of its ongoing operations in Ghana.


Image Credit: Fugro

Fugro used vessels from its own fleer and the spot market for the nine site visits.

Fugro's Wavescan buoy was used to measure waves, currents, and meteorological and seawater parameters. Real-time data was displayed on a webpage designed especially for the project, which Hess could access.

"The final report will include data from each of the three stations over the complete duration of the project and will form part of the wider FEED study being carried out by Hess," said Jonathan Ainley, commercial manager at Fugro GEOS. "The information will be utilised for a number of engineering activities including riser and facilities design, fatigue calculations, as well as assisting decisions for physical construction at the field."

Global valve makers to descend on Düsseldorf

INTERNATIONAL EXPERTS FROM the valves and fittings industry will descend on Düsseldorf at the end of November. Valve World Expo Düssseldorf is the 10th biennial conference and exhibition for leaders in the industry. The event will run from 29 November until 1 December, 2016.

For the oil and gas industry, valves and fittings are important for ensuring safety.

In particular, the trend towards stainless steel in valve manufacturing is continuing unabated because of their corrosion resistance and hygiene.

Running parallel to Valve World Expo will be Pump Summit 2016. This event will give manufacturers, distributors, and users of pumps, compressors, and seals the opportunity to present their products to an international audience as well as share knowledge.

Valves are an integral part of oil and gas operations and efficiency is vital.

For maximum efficiency in the oil and gas industry, pumps need to be reliable, cost-effective and conserve energy. Additionally, issues with corrosion, abrasion, and aggressive media among the major challenges pump manufacturers face. Oil and gas industry clients in particular are very demanding because of the changing operating conditions, high temperatures and pressures which reduce their lifespan.

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Woodside buys ConocoPhillips' Senegal assets

AUSTRALIAN ENERGY COMPANY, Woodside Petroleum has entered into a $US430mn purchase and sale agreement (PSA) to buy ConocoPhillips deepwater stakes in Senegal, including one of the world's most promising recent oil finds.

Under the purchase and sale agreement, Woodside will acquire 100 per cent of the shares in ConocoPhillips Senegal BV, which holds a 35 per cent working interest in a production sharing contract with the Senegal government covering three blocks, Rufisque Offshore, Sangomar Offshore and Sangomar Deep Offshore.

The production sharing contract includes the 560 mmbbl SNE deep water oil discovery, one of the largest global deep water oil discoveries since 2014 and the FAN deep water oil discovery.

According to the agreement, Woodside will pay a further US$80mn as completion adjustment for the deal.

Image Credit: Cpkmistic/Fotolia

"We are taking advantage of our balance sheet to acquire a world-class asset that fits well with our capabilities, offers significant future upside in exploration and line-of-sight to near term oil production," Woodside CEO Peter Coleman said in a statement.

The agreement will give Woodside the option to take over as operator of the development and production of the oil fields. The current operator is Britain's Cairn Energy Plc, which owns 40 per cent and is looking to sell down its stake, the Reuters reported. Australian FAR Ltd owns 15 per cent of the fields and Senegal's state-owned Petrosen holds 10 per cent.

Completion of the PSA is subject to fulfilment of customary conditions, including Government of Senegal's approval and pre-emption and is targeting close by year-end 2016.

Helium production in Tanzania to commence in five years

COMMERCIAL PRODUCTION FROM the recently discovered vast helium field in Lake Rukwa may start in five years, the CEO of the Norway-based company spearheading the project has stated.

Lake Rukwa is estimated to contain around 54 bcf of helium reserves.

Image Credit: terex/Fotolia

"If all goes according to plan, we could be in production by 2020 or 2021," Helium One chief Thomas Abraham-James said. He added that next year additional testing will be carried out as part of a feasibility analysis focused on the Lake Rukwa find.

"With all these projects, we need to drill and confirm that the gas exists beyond any doubt," he added.

Helium One, the startup firm licensed by the Tanzanian government to explore for helium at three sites in the country, is also looking to raise US$40mn in investments before it begins extracting the gas, the CEO said.

British and Norwegian researchers' discovery of the Rukwa reservoir that could contain 54 bcf of helium could ultimately generate "hundreds of millions of dollars" in revenues, Abraham-James pointed out.

While the global market for Helium is small, the worldwide supply of the gas is not abundant, with the United States controlling the largest-single helium reserve of 24.2 bcf. The Tanzania discovery could prove more than twice that size, which would be sufficient to meet global demand for nearly seven years. Independent analysts have estimated the total resources to be worth US$3.5bn.

The company has explored for the gas in other East Africa countries along the Rift Valley but has not met with positive results, Abraham-James added.

IMF predicts challenging times for Equatorial Guinea

A MISSION FROM the International Monetary Fund (IMF) that visited Malabo to conduct the 2016 Article IV consultation discussions has warned that Equatorial Guinea's short term economic outlook remains depressed following a dip in global oil prices.

The mission found that the oil price shock since 2014 is having a major impact on Equatorial Guinea. Despite efforts to foster economic diversification in recent years, the economy remains heavily resource dependent. GDP declined by 7.4 per cent during 2015, as lower hydrocarbons prices induced oil companies to reduce production.

The end-of-mission press release said that non-hydrocarbon activity had slumped by 5.2 per cent, due to sharp slowdown in public investment and private sector construction.

The report pointed out that Equatorial Guinea's near-term outlook is very challenging, given that energy prices remain depressed, and hydrocarbon production will continue to decline. In 2016, weak oil revenues and limited buffers will require further cuts to public investment. As such, overall economic activity is expected to decline 9.7 per cent.

In view of the challenge confronting Equatorial Guinea, the over-arching message of the consultation was to accelerate an economic reset driven by the non-resource economy. The mission stressed the need to step up the pace of fiscal consolidation to avoid a disorderly adjustment and macroeconomic instability.

Marathon Oil begins gas production offshore Equitorial Guinea

MARATHON OIL HAS produced first gas through its new Alba B3 compression platform off Equatorial Guinea.

Production from the B3 platform allows Marathon Oil to convert about 130mn boe of proved undeveloped reserves, more than doubling the company's remaining proved developed reserve base in the country,

"The Alba B3 compression project will allow us to maintain plateau production for the next two years, mitigating base decline, while extending the Alba Field's life by up to eight years," said Mitch Little, vice-president–conventional.

He added, "I want to highlight that the platform was completed on time and within budget, reflecting strong project management and a close collaboration with the operations team in Equatorial Guinea.

Execution of the Alba B3 compression project involved engineering and construction in four countries with Heerema Fabrication Group (HFG) serving as the general contractor. A local construction firm fabricated both the platform flare and bridge structures.

Marathon Oil's wholly-owned subsidiary Marathon E.G. Production holds 65 per cent working interest in the Alba Field and is the operator, while Noble Energy owns the remaining 35 per cent stake.

Image Credit: Bryan Burke/Flickr

The Alba B3 platform is connected by bridge to the existing Alba B2 platform, where gas and condensate are currently sent to an onshore gas plant at Punta Europa for processing into various products, including propane and butane.

ExxonMobil and Qatar Petroleum to team up for Mozambican gas assets

EXXONMOBIL AND QATAR Petroleum are in talks for possible acquisitions of energy assets in Mozambique, where huge natural gas deposits have been discovered, Bloomberg reported.

Citing sources close to the deal, the report said that the two oil groups are examining the possible purchase of stakes in the Area 1 and Area 4 Blocks of the Rovuma Basin in northern Mozambique, operated by USA's Anadarko Petroleum and Italy's ENI, respectively.

Last May, ENI CEO Claudio Descalzi revealed that he was in talks to sell part of its stake in the Area 4 Block and added he expected a final investment decision by the end of the year.

In October 2015, the ExxonMobil group obtained three licenses for oil exploration in offshore blocks south of the two blocks. The company also has a working interest in Statoil ASA's Block 2 in Tanzania, north of the Rovuma Basin.

ExxonMobil's ties with Qatar, the world's largest exporter of LNG, include the RasGas partnership, which produces and liquefies gas from Qatar's North field, and the Golden Pass LNG terminal in Texas.

Mozambique holds some of the largest natural gas discoveries, located off its northern coast.

Image Credit: QR9iudjz0/sxc.hu

Private equity companies gear up for O&G spend

GLOBAL PRIVATE EQUITY (PE) firms plan to acquire stakes in the oil and gas sectors by 2017, a new survey by Ernst & Young (EY) global survey has revealed.

According to the survey, the firms plan to deploy capital into the global oil and gas investment with 25 per cent planning acquisitions before 2016-end, while the number would rise to 43 per cent during half of 2016.

Claire Lawrie, EY Africa Energy Lead, said that with US$971.4bn of PE funds from June 2016 yet to be deployed, PE firms are now preparing to increase investment into the sector, adding that PE firms are capitalising on opportunities in the oil and gas. She further noted that there was anticipation that deal-making will grow in Africa, with 80 per cent of survey respondents believing activity will increase.

"Investors are being drawn by the promise of new infrastructure initiatives across the continent, opening up new trade routes and enhancing regional integration, such as rail and port developments in Mozambique and Angola, as well as stronger regulatory systems in countries such as Kenya and Ethiopia.

"Access to financing is the biggest challenge facing the O&G firms. While many expected PE funds to swoop in during lower oil price over the last 18 months, investment has fallen short," Lawrie revealed.

She, however, said that despite the tide turning, great consensus over the oil price future and more favourable asset-valuations are improving the conditions for private equity firms and creative capital structures are on the rise.

Under the Patronage of
His Royal Highness Prince Saud Bin Naif Bin Abdulaziz
Governor of the Eastern Province
Kingdom of Saudi Arabia

THE STATE OF TWO UNIONS

There are mixed views on the impact of Britain leaving the European Union after the June referendum and the new African Union passport. Amalia Ilgner sought the views of industry experts as one union loses a member and another becomes ever-closer.

WHAT BRITAIN'S VOTE to leave the European Union will mean for the African oil and gas industry still remains speculative. Meanwhile, the African Union passport could affect the hydrocarbons sector.

Yann Alix, a partner for global law firm Ashurst, said that while currencies and stocks tumbled in a number of African jurisdictions immediately after the referendum, "Brexit is unlikely to have a significant impact on the African oil and gas industry".

Stuart Carter, partner and head of oil and gas at European law firm Fieldfisher says that in the longer term some effects may be felt, "The UK could be subject to some tariffs on oil and gas from the EU, so may be more likely to import petroleum from Africa". However, Carter stresses that this is still highly unlikely.

A possible second Scottish independence referendum might have an impact. Carter believes that projects could be delayed in the Scottish area of UKCS (United Kingdom Continental Shelf) and Africa could potentially benefit from a slowdown in the UKCS as teams become available.

Leaving the EU has implications of fewer trade restrictions for UK business from the EU, and this could make working with African partners "more attractive", says Andrew Spears, CEO of Petroplan recruitment.

Image Credit: GovernmentZA/Flickr

Dr Nkosazana Dlamini Zuma opens this year's African Union summit, where the AU passport was officially launched.

The African Union (AU) passport will grant free movement to citizens of all 54 member states. Launched in July at the AU summit in Rwanda, the passports will be initially issued to senior officials, with the aim to distribute them to all African citizens by 2018. Spears believes this step towards "pan-Africanism" will encourage the mobility of talent and encourage expansion into new territories.

> **"The UK could be subject to some tariffs on EU oil and gas so may be more likely to import petroleum from Africa"**

Alix says the passport "sends a positive message to investors" and will be helpful for cross-border projects. But the high number of expatriates employed in the sector will make the impact "limited", he says.

Additionally, Carter warns it could "potentially impoverish" countries that cannot offer competitive financial rewards to its educated workforce, causing many to move away. He wants to see mutual support across Africa to ensure that all nations prosper from the increased mobility.

David Mpanga, a Uganda-based partner at Bowman Gilfillan, is skeptical about the passport project. "While the idea is a good one, implementation across the 50-plus states will be fraught with practical difficulties."

Mpanga points to the "slow and sporadic" lifting of travel barriers between states and functional regional blocs such as the East Africa Community and the Economic Community of West African States.

He told *Oil Review Africa,* "I do not expect that the far less cohesive AU will be able to pull off a passport project in a way that has a measurably positive effect on the oil and gas sector in the short or even medium term".

PROMISING TIMES AHEAD WITH DISCOVERIES IN SENEGAL

Impressive discoveries in Senegal could signal the next African oil and gas boom. *Oil Review Africa* editor Georgia Lewis reports on the next stages – and the challenges – for the emerging Senegalese hydrocarbons industry.

Image Credit: Cairn Energy

The Athena Rig is an important part of the offshore operations that are well underway off the coast of Senegal.

SINCE THE 1950s, more than 140 offshore wells have been drilled off the coast of Senegal but it was only in October 2014 that a real breakthrough was made when Cairn Energy found the first of two significant deposits about 100km offshore.

In August 2015, Cairn announced that evaluation, multi-well exploration and appraisal would commence and since then, promising results have been reported by the companies which have stakes in Senegal, including national oil company Petrosen, FAR and Kosmos Energy.

In July this year, Woodside bought out the 35 per cent stake that ConocoPhillips held in partnership with Cairn (40 per cent), FAR (15 per cent) and Petrosen (10 per cent) over three blocks covering 7,490 km2. Miles Warner, general manager of Cairn Energy, said the Woodside deal will not have a massive impact on their Senegalese operations. “It is just a change of partner,” he said.

Woodside CEO Peter Coleman said the acquisition “aligned with the company’s growth strategy by providing a significant position in an under-explored and highly prospective emerging oil province”.

“Woodside will bring to the joint venture expertise in deepwater drilling, development and operation of subsea infrastructure and floating production storage and offloading vessels,” said Mr Woodside. “We are taking advantage of our balance sheet to acquire a word class asset that fits well with our capabilities, offers signifiant future upside in exploration and line-of-sight to near-term oil production.”

> **“Senegal is a strong democracy, there is a legal and jury system, there is confidence in our country and people are willing to invest”**

In May 2016, Cairn announced promising results from the appraisal of the SNE-4 well, located 85km off the coast of Senegal in the Sangomar Offshore block. It is located at a depth of 942m and reached the planned total depth of 2,944m below sea level.

Cairn’s analysis of the data from the appraisal confirmed the extension of reservoirs in the eastern extent of the SNE fields and the existence of oil-bearing sands of similar quality to those encountered as being gas-bearing elsewhere in the field. Initial indications confirm 32° API oil quality as seen across the field.

At the time of the announcement, Cairn Energy CEO Simon Thomson was upbeat about the appraisal’s

Image Credit: Cairn Energy

Balancing act: if managed properly, the development of Senegalese hydrocarbons will provide long-term benefits.

findings: “Operations in Senegal have been safely conducted and are ahead of schedule and substantially under budget.”

“We have now drilled four successful appraisal wells in Senegal and we are delighted with the results to date of the multi-well evaluation programme, which has confirmed the scale and potential of this world class asset,” said Mr Thomson.

Additionally, in May this year, Kosmos announced a significant offshore gas discovery around 65km north-west of Dakar at a depth of 1,800m, drilled to a depth of 4,485m. While the discoveries are promising, there are also challenges to overcome with some of the gas deposits crossing the border to the north with Mauritania as well as technical issues surrounding the sometimes-complex geology of some of the finds.

Andrew G. Inglis, chairman and CEO of Kosmos Energy, echoed the positive sentiments of Cairn Energy’s Mr Thomson, saying the find has “opened a super-major scale basin” off the coastlines of Senegal and Mauritania with “world class resource potential”.

“Given the scale and quality of the gas resource discovered along the inboard trend, our focus is to move this resource through to development,” said Mr Inglis. “Our forward exploration plan is to mature the two independent tests with oil potential in northern Mauritania and in the outboard of Mauritania and Senegal for drilling in 2017.”

“Extensive evaluation is underway. The potential for oil production in Senegal is enormous but connectivity is still the uncertainty”

Oil Review Africa attended a briefing hosted by the Energy Industries Council (EIC) that coincided with the Woodside announcement. Thierno Alassane Sall, Senegal’s minister for energy and development of renewable energy, spoke about the benefits of investing in the country.

“Senegal is a democracy, a strong democracy since independence,” said Mr Sall. “Our institutions are working quite well, there is a legal and jury system, there is confidence in our country, the system is working and people are willing to invest.”

Mr Sall went on to say that since 1988, the Senegalese energy sector has been assisted by a strong administrative framework for foreign investors and private investors working in conjunction with a national operator.

He praised companies “from around the world” that provide legal and technical assistance for Senegal as they develop the oil and gas industry.

The gas discoveries that straddle the Senegal-Mauritania border present additional challenges but Mr Sall told the briefing that an agreement has been signed between the two countries and Kosmos.

Mr Warner reiterated Mr Sall’s positive comments about the stable political and investment climate of Senegal.

“It is a very straightforward place to work, people are willing to learn, the industry is very new and they are in a period of terrific success,” said Mr Warner.

He stressed the importance of local content and said it is important to “help the Senegalese benefit fully”.

“We are working with stakeholders [and] the process is very, very open,” said Mr Warner. “We are building relationships with local businesses [and] we are looking to employ as many people as possible in Senegal.”

Local content laws were hailed by Mr Warner as being “very straightforward” and “not restrictive” as Senegal is “full of capable local people”.

The timeline for moving ahead on making Senegalese oil viable is for development and study to take place between now and 2017, commerciality to be declared in 2018 and the government to receive the exploitation plan, and 2021-2023 is the target for first oil. An extensive evaluation plan is underway to examine the full block potential. The appraisal programme, including seismic surveys, is looking at the complex geology of the SNE-1 block, while exploration drilling continues at Bellatrix.

“The appraisal programme is to see if it’s all connected,” Mr Warner told the briefing. “The potential for production is enormous [but] connectivity is still the uncertainty.”

Mamadou Faye, CEO of Petrosen, addressed the briefing on the production sharing contract (PSC) with Kosmos (60 per cent), Timis (30 per cent) and Petrosen (10 per cent). In particular, he spoke about Block C8, the significant gas discovery

Image Credit: Cairn Energy

Senegal is strongly encouraging foreign investment in its energy sector and Britain is keen to play a leading role.

on the border with Mauritania. He said there is a "proposed unitised zone" between Senegal and Mauritania.

"The document [for the unitised zone] has been proposed to both governments but it's a long process," said Mr Faye.

It is expected that an intergovernmental agreement between the two countries will use the Frigg Treaty as a model. This is a 1978 United Nations-led treaty between the governments of Norway and Great Britain in relation to the exploitation of the Frigg Field reservoir on the continental shelf in the North Sea. The agreement covered the manner in which the field would be exploited and how the proceeds from gas production would be apportioned.

Looking ahead, Mr Faye said that at this early stage any "upstream development concept is just an idea". He added that in regard to the gas discovery on the Senegal-Mauritania border, the local market is not big enough to make it commercially successful and developing LNG facilities, such as a FLNG treatment unit, for export would be a more viable option.

The Mauritanian oil and gas industry is, like Senegal, in its nascent stages. According to the website of the Mauritanian Ministry of Petroleum, Energy and Mines, there are "numerous discoveries to be made offshore" and there has been "very little exploration so far in the onshore areas of Mauritania".

The Chinguetti oil field, the Banda gas field with an oil deposit and the Tevet field are all promising offshore plays for Senegal's neighbour. Additionally, promising results have been reported from Mauritania's Tanit-1 field, which is being drilled by Total, reflecting the potential of the Taoudenni Basin.

As well as cooperating with Mauritania in regard to the hydrocarbon deposits that straddle the two country's borders, there is cooperation in regard to the gas-fired electricity sector. Mauritania has agreed to supply Senegal with electricity produced from the promising Banda field.

In regard to developing FLNG facilities, Mr Sall said that this is new to Senegal and they are currently looking at "training and support" and are "open to discussion" with any company willing to form a partnership with Petrosen. In terms of developing other downstream facilities, Mr Sall said there is an existing refinery in Senegal but it is more than 50 years old and can only process 2mn tonnes per year. A new refinery is being built with the ability to process 5mn tonnes.

"It will use the best modern technology," he said.

George Hodgson, the British ambassador to Senegal, addressed the attendees on how to do business in Senegal and emphasised the assistance the British government can offer.

"The UK and Senegal relationship was not traditionally strong but it is now growing," said Ambassador Hodgson.

The work being done by UK Trade & Investment (UKTI) in Senegal in terms of growing trade relations is part of a wider project across multiple African countries for the UK to support the investment climate. As well as operating in Dakar, UKTI has a presence in other African cities, including Abijan, Accra, Lagos and Abuja. Ambassador Hodgson stressed the importance of integrating trade and prosperity for African countries.

> **"Energy is important for Senegal. Hydrocarbons are potentially a game-changer for the country and the discoveries are a massive boost"**

He praised Senegal's international cooperation with the United Nations Security Council, in particular the involvement with peacekeeping, and added that the country is aiming for emerging economy status by 2035.

A double taxation agreement between Britain and Senegal came into effect for Britain in April this year and it will come into effect for Senegal from January 2017.

"In terms of trade and investment, energy is the most important for Senegal," said Ambassador Hodgson, before adding that mining, agriculture and services will also be important as the economy continues to grow and develop. "Hydrocarbons are potentially a game-changer for Senegal [and the hydrocarbon discoveries] are a massive boost."

BOOSTING OFFSHORE GAS FOR THE EGYPTIAN MARKET

Exciting new gas discoveries have the potential to help Egypt get closer to its goal of energy self-sufficiency, paving the way to reduced dependence on imported gas, says Louise Waters.

Image Credit: pichitstocker/Fotolia

THE LATEST IMPORTANT offshore discovery by BP and Eni, located in the Baltim South Development Lease in the East Nile Delta, offshore Egypt, follows the discovery of the Nooros and Zohr fields in 2015. The Baltim SW-1 exploration well, drilled in a water depth of 25 metres by operator IEOC (Eni), reached a total depth of 3,750m and penetrated approximately 62 metres of net gas pay in high quality Messinian sandstone.

Located 12km from the shoreline, the discovery is a new accumulation along the same trend of the Nooros field. Further appraisal activities will be required to underpin the full resource potential.

Future potential and plans

Eni said that the Baltim South West discovery further confirms the significant potential of the so-called “Great Nooros Area”, which is now estimated to hold 70-80bn cubic metres of gas in place.

Hesham Mekawi, regional president of BP North Africa, commented, “Our plan is to utilise existing infrastructure, which will accelerate the development of the discovery, expediting early start-up.”

BP holds a 50 per cent stake in the Baltim South Development lease, and Eni, through its subsidiary IEOC, holds the remaining 50 per cent.

BP is one of the largest foreign investors in Egypt with investments of approximately US$30bn, and has made a series of discoveries in Egypt in recent years. Through joint ventures with EGPC/EGAS and IEOC, the Pharaonic Petroleum Company and Petrobel, BP currently produces almost 30 per cent of Egypt’s total gas. Its main strategic investment, the West Nile Delta project, involves the development of five trillion cf of gas resources and 55mn barrels of condensates. Production is expected to be around 1.2bn cf/d, starting in 2017.

> **“Our plan is to utilise existing infrastructure, which will accelerate the development of the discovery, and expedite early production start-up”**

Eni has been present in Egypt since 1954, where it operates through IEOC Production BV. The equity production in the country for 2015 was 200,000 boe/d.

Meeting growing energy needs

The Baltim South discovery is the latest in a number of finds off the Egyptian coastline. The most significant discovery was the Zohr “supergiant” oilfield discovered by Eni in August 2015. The largest known gas field in Egypt and the Mediterranean, it is estimated to hold 849.5bn cu/m of gas, covering an area of around 100 sq km.

According to Adam Pollard, analyst at energy consultancy Wood Mackenzie, the Zohr development is being fast-tracked in phases, with the first phase due to come onstream in late 2017. Production is set to ramp up to around 2.7 bcf/d by 2019, equivalent to around 60 per cent of Egypt’s current production. It is hoped that the exploitation of recent discoveries will play a significant role in meeting Egypt’s growing gas demand, which currently outpaces its levels of production. This has led to the import of LNG since April 2015.

“This will have a huge, positive impact on the economy, as it will offset the more expensive gas Egypt is buying in,” said Pollard. It is reported that the Egyptian Natural Gas Holding Company (EGAS) is contracted to import 80 LNG shipments to the value of US$2.3-3bn in 2016.

Sectors such as power generation, cement and fertilisers, which have all suffered due to gas shortages in the past, are all likely to benefit, added Pollard.

Seeking further foreign investment

The new discoveries, along with the pragmatic approach of the Egyptian government and relatively high cash margins, have served to further whet the appetite of foreign investors. BP announced earlier this year that it is looking to double gas production in Egypt before the end of the decade.

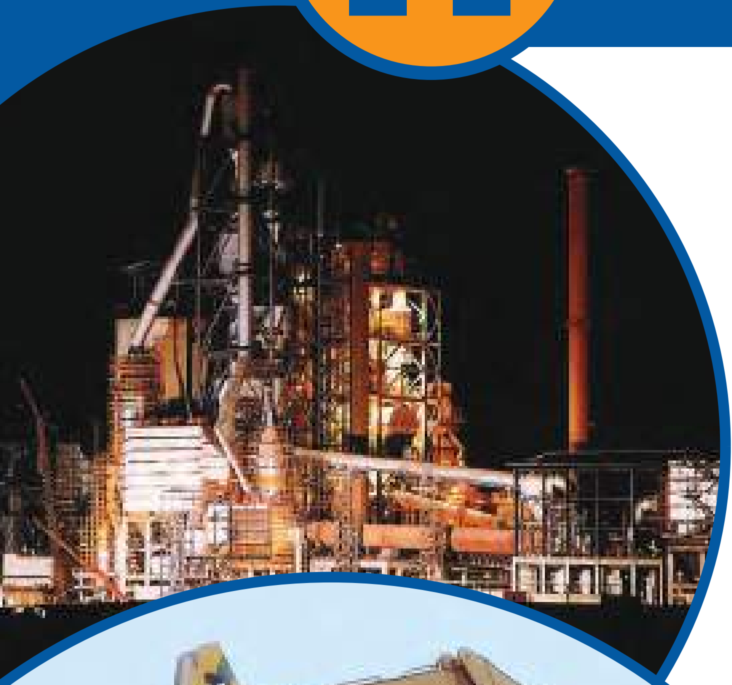
> **"New discoveries will have a huge, positive impact on the Egyptian economy as gas demand is currently outpacing production, necessitating the import of expensive LNG since 2015"**

The Egyptian government is making strenuous efforts to encourage further foreign investment, with measures such as the reduction of historic debts to IOCs and energy sector reform.

The government has launched two international bid rounds this year for oil and gas exploration; the latest, launched at the end of July, included 10 blocks in the southern Gulf of Suez and the Western Desert. Over the last two and a half years, Egypt is reported to have signed 66 agreements for new upstream oil and gas blocks, securing a minimum commitment of US$14bn. Speaking at OTC in Houston in May, Tarek El Molla, Egypt's Minister of Petroleum and Mineral Resources, highlighted investment opportunites worth around US$35bn in the oil and gas sector, with plans to add six bcf/d to the country's production within five years. In addition to the Zohr prospect, he cited the potential in the Nile Delta, as well as the underexplored Upper Egypt and Red Sea regions.

Recent developments have also served to further Egypt's ambitions to become a regional energy hub for gas re-export, linking up eastern mediterranean countries such as Cyprus, Turkey and Israel.

RELIABILITY IN OIL WELL CEMENTS



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THE UAE AND AFRICA
A SPECIAL RELATIONSHIP

The United Arab Emirates has a long history of trade and investment with African countries. Despite challenging economic conditions, canny UAE investors are spotting mutually beneficial African oil and gas investment opportunities. Kevin Hackett reports.

WHILE THE RAMIFICATIONS of the UK's decision to leave the European Union are yet to be felt by British real estate agents (with the expectation being that London will be seen as a less attractive proposition for investors from the UAE and other Arab nations), there's no shortage of smart Middle East money being poured into certain parts of Africa right now. And for good reason, for while property in the continent might not be the golden opportunity it is elsewhere, Africa's oil and gas sectors are proving to be more than sound, with potential for even greater growth than has been recently experienced.

A long history between the regions

The trading links between Arab nations and Africa go back millennia. Similarities between cultures no doubt help, with much shared in the way of religion and traditional values, but there's more to the UAE's interests than a sense of brotherhood. Leaders in the Emirates' oil and gas industries see global expansion as vital in securing the long-term futures of their companies, and Africa features high on their collective agenda, but the underlying reasons might not at first be quite so obvious.

Image Credit: flibrilu/Flickr

Headquarters of the Abu Dhabi Investment Authority, a sovereign wealth fund with international interests.

> **"Africa's oil and gas sectors are proving to be more than sound, with potential for even greater growth than has been recently experienced"**

"There is no doubt that the UAE is an important trading partner of Africa," remarked Dr Carlos Lopes, of the Economic Commission for Africa, in an interview with UAE newspaper, *Gulf News*, in April this year. "For instance, total merchandise trade between Africa and the UAE has increased from $5.6 billion in 2005 to $17.5 billion in 2014. That represents more than a threefold increase within a decade and shows a clear trend towards deepening economic relations between Africa and the UAE."

The long road ahead

While that total might at first appear impressive, when it comes to UAE investment in oil and gas, there's still a great deal to do in spreading that much needed wealth. Dolapo Oni is the Head of Energy Research at the Ecobank Group, Nigeria, and he says that, while money is heading to Africa from the Middle East, there's a lack of uniformity when it comes to regional investments. "We did a check last year to see the extent of trade and investment between the Gulf countries and Sub Saharan Africa and realised it was really low," he remarks.

"On a country-by-country basis, it's slightly higher for Saudi Arabia and the UAE, relative to Qatar and Kuwait. The UAE [accounts for] roughly two per cent of Africa's trade with the

Image Credit: Etihad Airways

In May 2015, Etihad started flying to Uganda's Entebbe International airport, marking the beginning of an important partnership between the two countries.

world now, but this is on the back of a steady increase in trade volumes since 2005. On the investment side of things, we've seen lots in power and renewable energy across SSA from the UAE. Companies such as TAQA have made several investments in power in Ghana. We have some UAE companies that have invested in oil and gas fields in Cote d'Ivoire, Angola, Tanzania."

He offers an explanation for this perceived lack of continuity: "I think there have been a few challenges to understanding the West African terrain and political economy. Thus, they've been very hesitant in making real investments but there's a considerable level of appetite for oil and gas investment opportunities in Africa from the UAE. Furthermore, the constraints in doing business across the continent – logistics, visas, political unrests, insecurity – have ensured that they have focused on specific countries only."

Interest from the UAE

Arab billionaire, Sheikh Abdullah Ahmed Al Ghurair, chairman of Mashreq Bank (the UAE's longest established financier) and Al Ghurair Investment, has made no secret of his interest in ploughing huge sums into African oil and gas sectors, particularly in Nigeria, and he is not alone. These investments are good news for all concerned, with significant funding being allocated to building roads, stimulating existing ports and the introduction of other essential infrastructure.

This, it is intended, will contribute to societal and political harmony, and bring employment as well as previously unseen prosperity to regions suffering from large swathes of poverty. These plans are already taking shape in some parts of Africa, as noted by Dr Theodore Karasik, a UAE-based geopolitical analyst, when writing in Abu Dhabi newspaper, The National, this time last year. "Minister of State [for the UAE] Reem Al Hashemy has a critical role when it comes to east Africa and also Uganda, which is a key focus in tourism, energy, infrastructure and oil, among other industries," he wrote.

"The UAE supports plans to build airports in Uganda and the construction of an oil pipeline from Uganda to Mombasa"

"Through the minister's efforts, Ugandan president Yoweri Museveni and his foreign minister, Henry Oryem Okello, signed a double tax avoidance agreement with Abu Dhabi that will improve trade.

The importance of infrastructure development for Africa

The UAE also supports plans to build airports or airstrips in the Ugandan districts of Arua, Pakuba, Hoima (Kabaale) and Kasese, develop tourism around Lake Victoria, the construction of an oil pipeline from Uganda to Mombasa, agriculture processing, infrastructure, minerals and investments in renewables.

Last year Abu Dhabi's national airline, Etihad, added Entebbe International (Uganda's principal airport) to its ever-growing list of destinations, enabling speedy and reliable transport between the two vital locations – as sure a sign as any that the UAE's government is putting its money where its mouth is.

Also DP World, the Dubai-based shipping, freight and logistics colossus, has invested heavily in plans to build and reinvigorate African ports, bringing what it sees as a fresh and new approach to corporate social responsibility, helping to develop small and medium-sized local enterprises. In turn, the UAE is hoping to drive out extremism by giving the local populace a better life with proper, long-term prospects.

Cooperation between the UAE and Africa also results in knowledge-sharing and leading by example. The UAE has been a leader in developing free zones to make trade, investment and the formation of companies easier, especially for foreign investors. Africa has followed this lead with a resurgence of special economic zones. The oil and gas industry in particular can benefit from the development of more of these free zones.

One such example is Nigeria's gigantic Lekki project. According to the International Energy Agency's (IEA) Medium Term Market Report for 2016, the project's owner, Aliko Dangote is "still insisting" it will come online in 2018. While the IEA forecasts a completion date closer to the end rather than the beginning of 2018, this large-scale, complex project has the potential to restore Nigeria's 450,000 bpd refining capacity.

While this has been largely assisted with Chinese investment, the project is still open to other backers and it could represent a great opportunity for a UAE-based investor seeking to capitalise when the Nigerian hydrocarbons sector recovers.

"Abu Dhabi sees its proximity to Africa as an opportunity to benefit from its growth while promoting security near its own borders"

Togo-headquartered Ecobank already has an office in Dubai.

Image Credit: Ecobank Group

A bright future with mutual benefits

"Overall, the UAE point of view is that Africa is experiencing rapid population growth and is fertile ground for foreign investment," said Dr Karasik. "Abu Dhabi sees its proximity to Africa as an opportunity to benefit from its growth, while promoting security in areas near its own borders."

For a country surrounded by political turmoil, the UAE keeping its borders secure has never been more important, and Africa's role in keeping safe this incredibly wealthy part of the world cannot be underestimated. The UAE's continued investment in Africa could, in fact, be viewed as essential to global security, which in the end really does benefit everyone.

Mixed news for African countries from IEA report into oil market trends for the medium term

THE INTERNATIONAL ENERGY Agency (IEA) has released a report on oil market trends. Oil: Medium term Market Report 2016 offers market analysis and forecasts to 2021. The good news for Africa is that overall the IEA forecasts improved prospects for much of the continent, along with Argentina and India.

Demand for oil continues to rise in Africa, largely owing to population growth. The medium term outlook for Africa is for growth at an average rate of 3.5 per cent to 2021.

Transportation fuel leads this drive for expansion as well as Africa's emerging industries. Greater use of oil in the power sector is also forecast with extra demand stemming from the use of diesel generators which are used as back-up in the event of breakdowns in the grid.

Geopolitical issues in Libya, Sudan and South Sudan will dampen growth in those countries. Oil demand in Egypt is contingent on political stability and fluctuating valuation of the Egyptian pound.

Image Credit: European Parliament/Flickr

President Buhari says he is determined to stamp out corruption and boost foreign investment in Nigeria.

Nigeria, meanwhile, is still considered by the IEA to be a volatile country, but the report does factor in President Buhari's stated determination to stamp out corruption and open up the economy to more foreign investment in the hydrocarbons sector.

The Nigerian economy is forecast to grow at an average of 4.3 per cent to 2021. This, coupled with a near-quadrupling in refinery runs and no concrete plans to further curb product subsidies after 2012's gasoline hike, means Nigeria's demand growth is set to average four per cent to 2021.

While total non-OPEC African oil production is forecast to decline by 260 kb/d up to 2021 but new projects, particularly in Ghana and Congo, are expected to be sources of new supplies. Ghana is also offering positive news for the continent with the TEN project on track to go online this year.

Uganda and Kenya were both cited in the report as markets to watch but their future success in oil development will depend on progress with infrastructure and logistics, as well as political stability.

In Niger, pipeline constraints could hinder ambitions to triple oil production from current levels.

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BETTER PLANNING FOR SHUTDOWN TURNAROUNDS

Nothing can prevent a shutdown turnaround outage from taking place. But as Andy Bartlett of Petrotechnics explains, there are ways to improve planning, execution and outcomes of mandatory shutdowns, and minimise the threat to operational excellence.

AS OIL PRICES remain low, tight margins are now tighter, increasing the focus on operational excellence and the drive for an efficient, productive, safe work environment. However, since operational excellence means many things to many people, it's worth considering the five basic premises on which it is based. These are:

- Achieving a workplace that is free from incidents and injuries;
- Mitigating all significant workplace healt h risks and promoting a healthy and safe workforce.
- Identifying and then mitigating environmental and process safety risks.
- Ensuring that asset integrity and reliability attains the highest standards.
- Ensuring that all natural resources and assets are used efficiently.

> **"The tension between managing risks and delivering on time is a constant challenge of the shutdown turnaround outage process"**

The Engen refinery in South Africa underwent a successful shutdown turnarouns outage last year.

Image Credit: Oxfam/Flickr

But can these standards be met during a shutdown turnaround outage (STO)?

Managing hazards and deadlines

Achieving operational excellence is no straightforward task – even during normal operational procedures. But achieving operational excellence during periods of change create a greater number of process hazards and high-risk activities. It's not surprising, therefore, that activities such as STO often severely test an organisation's ability to achieve operational excellence – even though such activity is mandated to be repeated on a regular, if not frequent, basis.

A behemoth of planning and seemingly endless paperwork, the STO looms large on any operator's calendar. It is not unknown for an STO to involve more than 40,000 separate jobs; the average duration ranges from 20 to 60 days, depending on the type of work that is required. A 200,000-barrel-per-day refinery can see its on-site staff numbers triple or even quadruple, from 500 to 2,000, during a turnaround project.

This tension between managing risks and delivering to time is a constant challenge of the STO process in particular, and operational efficiency in general.

Sub-optimal outcomes

A poll by Oil & Gas IQ into trends in the STO space showed just how much of a challenge it is to deliver a result in an efficient way. A quarter of shutdown professionals gave their shutdowns a ranking of less than five out of 10 (in this scale, one is terrible and 10 is flawless).

The same poll showed that the principal source of overruns for 45 per cent of survey participants was scope creep, while 36 per cent said that sub-sufficient planning was the main threat to efficient management of the project. Given that most scope creep involves hot work, deviating from the lean scope tends to increase risk.

Perfect STO planning

Delivering an STO that is closer to the 'flawless' end of the scale starts in the 18-month planning stage. Planning should aim to:

- Simplify the complexity within

Image Credit: Cairn Energy

Cairn Energy, which is operating in Senegal, recognises the importance of safety during all operations.

the turnaround environment.

- Provide risk-based prioritisation for planning and work execution.
- Improve standardised risk awareness and risk assessment practices.
- Ensure policies, roles and safe working practices are embedded and systematised across the turnaround.
- Improve collaboration between functions across the whole turnaround process.
- Ensure there are contingencies in place to handle the inevitable emergent work, which is often forgotten or overlooked.

Get this right and outcomes will improve. It is tempting to see planning as the creation of a detailed manual to follow. But regardless of how detailed the manual is, it is little more than a static to-do list that struggles to support good outcomes.

It doesn't take into account the multitude of interconnections involved when 40,000 separate and often hazardous tasks have to be scheduled. By definition, it cannot predict all the unexpected outcomes, the unanticipated events, the unplanned delays, and so cannot provide guidance on how best to address the knock-on effects that will ripple out through the schedule.

It also doesn't take into account the simple human desire to avoid memorising lengthy documents. In other words, it's not a planning tool that is designed for the dynamic, risky, multi-lingual environment of an STO. But when well co-ordinated procedures and policies interact with dangerous assets and flawed human beings, issues can arise.

The "follow-the-manual" approach to planning makes it harder for operators to adjust to change. It is often dependent on information that is stored in on- and offline formats that has to be gathered, updated and validated. Learnings from the previous shutdown process are hard to capture, as are changes to operational circumstances, new equipment and new risks. Even where this information gathering is fully computerised, it can be prone to stasis, reflecting the events of five years ago, not the current facts on the ground.

"Effective planning lies less in tick boxes and more in dynamic planning tools that support developing manageable, shareable procedures"

The language of risk

Effective planning lies less in lengthy, unconnected tick boxes, and more in dynamic planning tools that support the development of a manageable, sharable set of procedures. By taking into account the interrelated tasks, hazards and risks, they can detail not just the minutiae of how an individual task should be performed, but enable planners to consider how all work can be delivered safely.

The ability to visualise risk before an STO even begins gives operators the foresight to optimise plans both prior to and during the execution phase, by proactively adjusting schedules to reprioritise work as conditions and associated risks change.

The result? A dynamic to do list that reduces risk and minimises the possibility of schedule overruns.

These tools also help overcome one of the biggest challenges that any multi-disciplinary project planning faces: mediating between the loudest voices. During the 18-month lead-time there will inevitably be different departments coming together, all of whom feel that their area of maintenance is the priority.

Instead of giving precedence to the most insistent individual, all tasks can be ranked according to a common parameter – in this case, risk. By visualising and optimising workload, conflicts, and all risks in one place, and showing how activities and conditions combine to impact process safety in real-world conditions, information sharing is easier and more relevant.

With this type of planning model, everyone can see the bigger picture. Using a common language of risk, front-line engineers understand the causes and consequences of their particular tasks, while managers can make smart decisions about staffing and scheduling at a risk level that is acceptable.

Digital support won't transform STO overnight. It's not going to replace experienced people in the field. But it can make their jobs easier by putting the right procedures in place and enabling the right people. It's about regarding safety as an enabler of productivity, not a drag on operations and profits. With a positive connection between safety and productivity, operational excellence becomes more achievable.

NATIONAL CONTENT FOCUS AT MOZAMBIQUE GAS SUMMIT

With Mozambique emerging as an important player in the Africa hydrocarbons marketplace, the summit will cover a broad range of topics, including local content and developing the gas sector in conjunction with other countries in the East African region.

Image Credit: Edson Chilundo/ Flickr

Mozambique is hopeful that developing the gas industry will benefit future generations.

AS THE EAST African country emerges as a vital player in the African gas sector, there will a strong national content focus at the Mozambique Gas Summit.

Scheduled for Maputo from 30 November until 2 December, there will be a full day dedicated to national content. Delegates will hear from representatives from government and industry on new legislation, capacity-building and enhancing the role of SMEs as the country moves towards gas commerciality.

Partnerships between international and local companies, best practices, and boosting the role of local companies will be on the agenda.

Last year, Mozambique's government passed a petroleum law with the requirement that local people are trained and employed, preference be given to local companies and services, and local companies and citizens have the opportunity to hold equity stakes in Mozambican oil and gas projects when possible. The law also lets the government promote local entrepreneurship and guarantees a quota of no less than 25 per cent of Mozambican oil and gas be dedicated to the local market. The session on building capacity and enhancing knowledge for successful gas projects will also tie in well with the national content focus. The conference will cover topics with implications for the sector and neighbouring countries.

LNG will play an important role in the ongoing development of the Mozambican gas sector. Delegates will be updated on LNG projects and financing for gas and LNG.

The theme of the session on domestic gas will be "A Catalyst for Diversification", and there will be a session on social and environmental impacts.

There will also be an outward-looking session on regional collaboration in infrastructure development with Mozambique's neighbouring countries. Additionally, there will be discussion of global gas markets and the role of new upstream technologies.

> **"Mozambique's new petroleum law requires that local people are trained and employed, and local companies and services used wherever possible"**

Speakers will include Omar Mitha, chairman of ENH; Carlos Zacarias, President of INP, Estevao Pale, Chairman of CMH, HE Joanna Kuenssberg, British High Commissioner to Mozambique; Martin Hutchison, managing director of International Resources Consulting; Dr Vasco Nhabinde, director of the Ministry of Economy and Finance; Dr Claire Mateus Zimba, director general of the Institute for Promotion of SMEs; and Professor Doutour Francisco Noa, dean of Universidade Lurio.

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A NEW LEASE OF LIFE FOR EQUIPMENT IN STORMY TIMES

Andrew Courtney, operations director for Surface Technology, discusses how oil and gas companies should be looking to introduce new approaches to repair and refurbish their equipment to increase efficiencies throughout the current sector downturn.

Image Credit: Fernando Butcher/Flickr

Neglecting maintenance on oil and gas plants, which is inevitably a false economy, can put the site's future under a cloud and create further costs down the line.

SIX MONTHS AGO, the economic situation faced by multiple suppliers to the oil and gas sector was somewhat concerning, but few people anticipated the oil price per barrel to drop to US$28 at the start of this year.

The speed and depth of the impact on the supply chain within the sector has come as a surprise and many companies are now faced with a sink-or-swim financial dilemma.

It is important for any company that supplies the industry to always endeavour to work in partnership with oil and gas opertors. These important customers are always looking at ways in which they can significantly reduce costs, waste and environmental impact through effective repair and refurbishment of offshore equipment.

> **"There is a wide array of surface solutions available but many oil and gas companies do not utilise them to their full effect"**

Despite such a wide array of surface solutions available to repair and refurbish critical components, many oil and gas companies are not utilising these to their full affect and may be missing valuable cost saving opportunities.

Drilling down to what's possible

This article will outline a range of critical oilfield equipment that can be repaired and refurbished and how coatings can extend their operational life.

The range of processes available include thermal spray, selective plating processes such as the SIFCO Process® (a portable method of electroplating on localised areas), painting to marine specification from spot repairs to full asset re-coating, machining and grinding, non-destructive testing (NDT) inspection and pressure testing.

Valve applications

Typically, valve bodies and seats can suffer from corrosion and abrasive wear in use when particles are introduced between two moving surfaces.

Thermal spray can refurbish them to their original condition using high velocity oxy fuel (HVOF) coatings eliminating the need to purchase new parts.

Drilling equipment

Issues with the manufacturing process can also lead to a need for component salvage. For example, we received the sealing bore of an outer connector sleeve – a critical part of the drilling system – which had been scored during the manufacturing process.

A HVOF thermal coating was recommended due to its wear, corrosion and oxidation-resistant characteristics.

Once coated, the surface profile of the sealing bore was re-machined to meet the manufacturer's original specifications and then comprehensive inspection and non-destructive testing (NDT) to ensure the part had no microscopic cracks or inherent weaknesses.

Christmas trees and pipelines

Pipelines and Christmas trees, which are used in subsea oil drilling operations, are subject to harsh undersea conditions, but this equipment can be cost-effectively refurbished by working with an oil and gas coating specialist.

A bristle blasting method can be employed, for example, as it enables rapid spot repair to small and medium-sized areas.

Subsea/marine risers

Larger components with threaded connections such as risers and tethers for tension leg platforms present a coating challenge to the surface finishing industry due to their size and complex handling and resultant health and safety issues.

Blowout preventers

A blowout preventer (BOP) is a large high pressure valve used to prevent the uncontrolled flow of liquids and gases during drilling operations. A common industry problem is mechanical damage caused to the internal sealing diameter of the valve. The most common method of repair is to weld clad with Inconel. However, a more dynamic method of repair would be an HVOF thermal coating due to the moderate transfer of heat to the powder particles and to the work piece.

“Approaching the selection of an appropriate coating for a repair can be somewhat daunting and complex without the right advice”

In-situ repairs

Some repairs can also be carried out in-situ without significant disassembly using the SIFCO Process® and our oilfield equipment preservation service.

The SIFCO Process® is the leading method of electroplating localised areas on components without the use of an immersion tank. There are many benefits to choosing selective plating, including the ability to focus the plating onto specific areas of a component, enabling parts to be plated in-situ, helping to minimise downtime and production delays. This, in turn, makes it a more cost-effective option for operators.

In contrast to tank plating, the SIFCO Process® does not require extensive masking or special fixtures to plate the component. SIFCO Process® deposits can be plated at rates that are 30 to 60 times faster than conventional tank plating.

The effective impact of a one-stop-shop

The benefit of having a complete approach to coating solutions is that customers can be assured that the correct solution will be specified through dedicated technical expertise.

In summary, approaching and considering the selection of an appropriate coating for repair or refurbishment can be a somewhat daunting and complex task without the right advice.

However, if operators are vigilant in ensuring repairs and refurbishments are undertaken to the highest standard, this will result in many benefits including increasing asset service life, reducing capital costs and improving profitability.

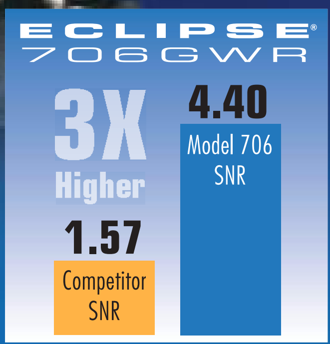
Image Credit: Science for Human Rights/Flickr

Poor pipeline maintenance is an example of poor economic management when cost-effective repairs can be made.

break through the NOISE

Better Signal-to-Noise Ratio Means Better Level Control Performance

While transmit pulse amplitude (signal size) has helped to make guided wave radar technology the standard for accurate, reliable level measurement, the fact is signal-to-noise ratio (SNR) represents a far more critical indicator of level control performance. For superior SNR in all process conditions, no other GWR device beats the Eclipse® Model 706 transmitter from Magnetrol®.



The ECLIPSE Model 706 transmitter has a signal-to-noise ratio nearly ***3 times higher*** than competitors.

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MEETING LOCAL CONTENT REQUIREMENTS IN NIGERIA

Meeting local content requirements and being a responsible operator are important to Marine Platforms. The company is showing that giving back to the country and running a successful business are not mutually exclusive.

Image Credit: Marine Platforms

Marine Platforms has committed to local content initiatives, including investing in young Nigerian professionals.

NIGERIA'S LOCAL CONTENT requirements are stringent but companies are leveraging the laws to help run a more effective business. Marine Platforms is one such example.

Last year, the company was awarded the brownfield deepwater construction contract for Chevron's Agbami Phase 3 project. The contract involves carrying out subsea tie-back for the Agbami field, one of Nigeria's largest deepwater developments. It is an eight-well drilling programme that commenced in early 2015.

Describing it as a "major feat for local content", Taofik Adegbite, Marine Platform's chief executive officer, said, "This is a major achievement for Nigerian content development, especially at this current time in the oil and gas industry.

It further cements Chevron as a major player supporting indigenous capacity-building in Nigeria by having confidence in Marine Platforms to be able to execute this job."

Since 2010, Marine Platforms has been promoting the Nigerian content initiative through capacity-building, employment and training of high quality Nigerian graduates both at home and abroad.

"Marine Platforms has recruited Nigerians to gain experience on this project," said Mr Adegbite. Ten Nigerian subsea engineers and 20 marine cadets have been able to benefit from working on such an important project. As well as offering young professionals experience in Nigeria, Marine Platforms has sent cadets to Norway for training. In 2014, 11 engine cadets from Nigeria were sent to Marine Platforms' subsea vessel build in the Havyard Shipyard, located in the Norwegian coastal town of Leirvik. The cadets were handpicked from the Nigerian Maritime Academy Oron after a rigorous selection and examination process.

> **"Marine Platforms promotes Nigerian content through capacity-building, employment and training, asset ownership and local investment"**

The cadets took part in the familiarisation process of vessel technology and worked with the vessel build up to completion stage. Such training helps to demystify the complexities of such vessels and ensure Nigerians are exposed to vessels of this capacity.

As well as their heavy involvement in training promising young Nigerian professionals, Marine Platforms has brought about the reality of asset ownership and local investment in the economy via the purchase of multi-million dollar subsea equipment and vessels. This is a means of reducing capital flight, which has long been an issue for the sustainability of the Nigerian economy.

MAINTAINING THE RIGHT GAS LEAK DETECTION STRATEGY

Lars Larsson, from Schneider Electric, discusses the challenges faced by gas operators in detecting leaks and the importance of regular maintenance to prevent serious economic and environmental loss and reduce the risk of fires.

Image Credit: Transportation Safety Board/Flickr

Failure to detect leaks can ultimately result in rupture or explosion. This is the Cabri pipeline in Sasketchewan, Canada.

WHILE LEAK DETECTION guidelines have been established for liquid transmission pipelines for a long time, the guidelines or standards for leak detection on gas pipelines are few and typically company specific. The methodologies and tools that can be implemented on liquid pipelines with a high degree of success do not work nearly as well for gas transmission pipelines because of the physical state of gas and the operational philosophy of the gas pipeline.

Leak detection is vital to prevent disasters, both human and environmental, from occurring, as well as preventing loss. When gas leaks from a pipeline, the natural gas either dissipates directly into the atmosphere or ignites.

Natural gas is compressible, and hydraulics in the gas pipeline might make the leak close to invisible for the pipeline controller in the control room. These conditions make it much more difficult to detect a leak because the most typical indicators – visual detection, pipeline pressure fluctuation and volume differential – are extremely difficult to perceive on a gas pipeline, and the strategies to do so are different from a liquid pipeline.

> **"Natural gas leaks can be close to invisible for the pipeline operator in the control room and this makes detection more difficult than on liquid pipelines"**

To prevent a leak in a gas pipeline, the physical pipeline, its equipment and instrumentation needs an integrity management programme (IMP) to ensure the infrastructure is maintained and in good working order. Systems and industry guidelines for liquid leak detection and prevention are advancing more every day. Similar guidelines for gas pipelines are currently missing, but it is expected that guidelines for prevention and detection of leaks on gas pipelines will materialise sooner rather than later.

The foundation of strong gas transmission leak detection is an accurate hydraulic model of the pipeline. To sustain an accurate hydraulic model that can support advanced leak detection systems, sufficient maintenance of the pipeline and the model is needed. Operators may have the capital to install leak detection systems as part of a CAPEX investment, but may not have the OPEX budget to keep the leak detection system working successfully after installation. This means the company feels the technology or leak detection system has failed, and replace it with a new system covered by another CAPEX investment.

It can be significantly more effective and cost-efficient to focus on maintenance rather than a system overhaul. It is important to recognise that even state-of-the-art equipment requires maintenance, or it loses value. Lack of maintenance is a huge potential problem to an industry that is in great need of better leak detection.

The real time transient model provides an accurate picture of the hydraulics appearing in the gas transmission pipeline. A good hydraulic model is necessary for leak detection systems to work well, but as it is based on the virtual pipeline design and telemetry data, it becomes less accurate as the nature of the pipeline changes.

Gas pipelines are affected by normal wear and tear, deposits building up inside, equipment degrading and possibly even changing operating conditions. If these changes are not introduced on the real-time transient model as well, then any applications building on the output of the hydraulic model would suffer, including leak detection.

“Gas pipeline operators have more flexibility than liquid pipeline operators to balance their risk tolerance against the cost of detection”

The hydraulic model uses software to create a virtual model of what is happening inside the pipelines, as opposed to a system that only reports information such as pressure readings at specific mile markers.

Failing to keep the physical pipeline maintained, as well as not re-calibrating the hydraulic model to reflect changes, makes the model all but useless in the accurate depiction of pipeline flow conditions. This is critical, as the hydraulic model feeds critical add-on modules such as leak detection that provide controllers with advanced tools to prevent and detect leaks.

Image Credit: Malcolm/Flickr

Safety is imperative to any gas pipeline installation, including leak monitoring, prevention and maintenance.

Gas pipelines respond in fundamentally different ways to integrity breaches than liquid pipelines, because gas is a highly compressible, diffuse substance. This means that short of a major disaster, a gas leak could go undetected indefinitely.

Even with no leak detection methods, someone will eventually realise there is an integrity issue on a liquid pipeline. At some point there will be a realisation that less product is getting delivered than was shipped. Even if that isn't picked up, a leak will eventually be seen.

Gas is compacted in a pipeline, so when the receiver draws product from the pipe they receive it instantaneously, with no easy volume-in/volume-out calculation to make. Additionally, because gas is diffused, gas packed into one point of the pipeline may likely not be affected by an integrity breach at another point. Finally, except for specific conditions, leaking gas dissipates into the atmosphere and, unless identified by special optical monitors, is difficult to visibly catch unless it ignites.

Detecting a gas leak requires more complex flow monitoring solutions to observe and identify anomalies. The hydraulic model uses existing telemetry and determines what's working, what is not working, and the amount of gas being packed into the pipeline. If there is a leak, the hydraulic model helps the operator distinguish when, where and how big it is, or if that leak is just a broken piece of equipment that requires maintenance.

Because the environmental and regulatory implications of a minor gas leak are less than a liquid leak, gas pipeline operators have greater flexibility to balance their risk tolerance for an undetected leak against the cost of detection strategies. An operator's risk tolerance should determine not only the complexity of the leak detection solutions but also the maintenance plan. For example, if an operator is willing to tolerate a small amount of throughput loss in a remote area where the risk of impact to the environment or people is low, they can consider implementing a less sophisticated leak detection system that require less maintenance. The operator can then focus their resources on high consequence areas such as under rivers or populated areas. This focuses a company's resources at the highest risk areas where the most loss could be incurred while still keeping an eye on the big picture. It is important for pipeline operators to note that if they choose a lower maintenance strategy, they have to accept the fact that they will be less able to identify leaks that occur.

High maintenance is the necessary strategy for pipelines with a low risk tolerance. Proper maintenance allows a business to detect leaks and act on them to prevent loss, as well as create a detection plan. When anomalies show up they should be promptly investigated using the hydraulic model, a pipeline controller is able to better understand if the abnormal pressure reading is caused by a deposit build up, equipment failures, or if the pipeline in fact has a pipeline integrity issue.

Maintenance requires manpower. For the pipeline to run smoothly, workers dedicated to leak detection are vital. They get to know the software and the individual pipelines, so when something goes wrong they take immediate action.

A company could lose tens to hundreds of thousands of US dollars in lost product if there is a minor or even moderate leak. It may have little environmental impact, but it will be costly if it goes undetected for a few days before a pipeline controller notices they are not getting the expected amount of gas from the pipeline.

While gas pipeline leak detection seems daunting, it is not something to be feared if proper maintenance is performed. Implementing a hydraulic model improves the chances of detecting leaks. This, paired with maintenance, provides companies with peace of mind.

The main goal of pipeline maintenance, modelling, and detection is to avoid large leaks down the road. The effort put into balancing these factors from a pipeline integrity point of view from the beginning, will continue to pay off long into the future.

MAKING THE MOST OF ONSHORE FACILITIES

Global engineering and construction group Fluor argues that South Africa could consider both onshore and offshore storage and regasification options for importing LNG, but onshore facilities could offer a number of advantages. Terence Creamer reports.

THE SOUTH AFRICAN government is showing a preference for a floating storage and regasification plant, or FSRU, as part of a broader initative to develop the gas importation infrastructure required to support a gas-to-power (GTP) procurement programme.

The Department of Energy is aiming to procure 3,126 MW of gas-fired power generation from independent power producers (IPPs) and a further 600 MW from a public-private partnership involving state-owned companies.

The government's IPP Office, which has overseen a successful renewable-energy procurement programme, is expected to release a request for proposals in the coming months for a "bundled" infrastructure and power-generation development, which could be built at the ports of Saldanha Bay, Ngqura or Richards Bay.

Fluor sub-Saharan Africa GM Alejandro Escalona said that the FSRU is an understandable option, but an onshore LNG terminal could offer greater operational flexibility and localisation potential.

He points to the experience of a number of European countries, where the decision to locate terminals onshore has made expansions easier to pursue. He cited the example of one- or two-tank facilities that have expanded significantly: "That ability to scale up is a big advantage that South Africa should consider."

Image Credit: Fluor

Onshore facilities can be leveraged by operators to great effect, saving on costs in some cases and allowing localisation opportunities.

Localisation opportunities associated with LNG ships are limited, whereas they could be significant in the case of onshore facilities. "We see the programme as a strategic opportunity and are ready to participate regardless of the model chosen," Escalona stresses. Fluor is able to participate in "everything from the ship to the grid".

"We feel that we are in a unique position to deliver because we work in infrastructure, we have done quite a number of regasification terminals around the world, we are able to build pipelines and combined-cycle power plants and we even have a joint venture with Eskom, called Trans-Africa Projects, that does grid connection," he adds.

The GTP opportunity also arises as Fluor moves to diversify and grow its African portfolio to include more power- and infrastructure-related projects, having traditionally concentrated primarily on the oil and gas and mining markets in the region.

Escalona says Fluor is considering to actively pursue African nuclear prospects, with momentum from the 2015 appointment by Westinghouse Electric Company to build two nuclear power reactors in the US states of Georgia and South Carolina. In addition, Fluor is a majority investor in NuScale Power, a small modular reactor technology company.

Besides sectoral diversification and engineering services, Fluor will offer more integrated project solutions, including construction and fabrication.

The group attributes the rise in its order backlog to a record US$45bn in 2015 partly to focusing on lump-sum engineering, procurement, fabrication and construction. Fluor's recent US$755mn acquisition of Stork, has increased its capacity in delivery of maintenance, modification and asset integrity services. Escalona says the integrated solutions model is finding favour with African clients by spanning the entire capital project life-cycle to reduce costs and schedules, improve certainty of delivery and increase safety. Under the model, the company uses its five fabrication mega-yards in China, Canada, Mexico, the Philippines and Russia to produce 'plug and play' modular components for capital projects, to lower costs, compress schedule and improve project safety. However, Escalona says the group is tailoring the fabrication solution to the strong demand in Africa for local content.

This is an edited version of an article first published in Creamer Media's Engineering News.

KEEPING WORKERS AND THE PUBLIC SAFE WITH NETWORK CAMERAS

Andrea Sorri, director business development, Government, City Surveillance and Critical Infrastructure, at Axis Communications, discusses how network video can play a valuable role in securing critical infrastructure facilities as well as supporting HSE processes.

EVERY CRITICAL INFRASTRUCTURE facility has a duty to protect the health and safety of workers and the public, as well as tthe environment. Typically, there are strict processes and policies in place to ensure employees work in a safe way, use the right tools and equipment, and know the emergency procedures – for example during a plant evacuation. But, beyond the main focus of keeping people and the environment safe and complying with legal requirements and industry standards, health, safety and environment (HSE) considerations are increasingly evolving, with plant operators seeking – and gaining – a better understanding of the actual risks and effects of production processes within their plant, and how best to mitigate those risks.

While HSE processes are often still managed manually, some operators are now turning to network video technology to help them automatically monitor process adherence, evaluate risks in real time, and improve health and safety practices.

Network video cameras may already be in place to protect against unauthorised access, sabotage and theft. The same technology can also be used to ensure the safety of the workers within the facility. For example, with the help of network cameras that are integrated with the access control system, operators can have an overview of how many workers are present in each area of the facility, at any given time. In an emergency, this information can be crucial to ensure the safe evacuation of the plant and its surrounding area.

Integrated with access control and using advanced image processing techniques for license plate or facial recognition, the network cameras can identify, inspect and track vehicles, drivers and passengers from the moment they pass through the gates, and ensure that safety procedures are followed and no worker or visitor enters a zone that they are not authorised to or that is not safe to access.

Similarly, the same cameras can be used to make sure employees are working in a secure and clean environment and in a safe manner at all times. With add-on video analytics applications such as cross-line detection, the cameras can, for instance, automatically alert individuals if they are getting too close to a dangerous zone or to the machinery. Thermal network cameras can track whether safety helmets, high-visibility vests or safety glasses are worn, while at the same time protecting the employees' privacy as they don't record facial features. And finally, to detect dangerous and hazardous situations, network cameras can be used to check for any leakages, smoke, or gas flares, and raise automatic alarms so operators can act quickly and minimise any risk of injuries, or damage to the plant or to the environment.

While safety procedures help minimise the number of incidents, emergencies do occur. In case of an incident such as a fire, a fast response is crucial. Intelligent network cameras installed throughout the facility enable operators to identify the type, scope and severity of the incident so that proper action can be taken. They can assist the safe and rapid evacuation of the plant by detecting smoke and how it develops, tracking the flow of evacuation through the building, and tracking and supporting the rescue team as they enter the facility. Advanced camera technologies that enhance image quality help provide a clear picture of the situation, even in situations where visibility is poor due to smoke, dust or darkness.

Andrea Sorri, Axis Communications.

While it is easy to see how network cameras can aid an operator to safely run a plant in day-to-day operation, identify hazards and mitigate risks, and to deal with emergencies, long-term reviews and improvement of HSE practices are also an area worth considering.

The key to continuously evaluating risks, and improving equipment, processes and services for maximum safety is to know exactly how people move inside a plant. Who is doing what, when and where?

Network cameras let the operator not only follow a situation in real-time, but also collect statistical data over a period of time to gain a better understanding of what happens inside the facility day to day – helping the security and the safety manager to adjust and update safety and environment policies and procedures as needed, and serving as a training tool when instructing employees on safe practices.

Due to their superior image quality, connectivity, scalability, and scope for adding video analytics applications, network video cameras are increasingly replacing analogue CCTV cameras to secure critical infrastructure facilities. With the added benefit of being able to support HSE processes, the transition to network video is a more obvious choice.

Image Credit:

THE ROLE OF WELLHEAD INSTRUMENTATION FOR EFFICIENCY AND SAFETY

There are multiple opportunities along the wellhead production stream to save money, improve performance and boost safety using level and flow measurement. Magnetrol is one company leading the way with the latest technologies.

RELIABLE WELLHEAD INSTRUMENTATION for level and flow control is critical to the efficient processing and safety shutdown systems required of demanding production applications.

The following steps in the wellhead production stream offer opportunities for better performance from wellhead equipment, using level and flow measurement.

Wellstream separators

Separators are large drums that separate wellstreams into individual components. They are commonly designed to separate two-phase (gas/liquid) or three-phase (gas/crude/water) wellstreams. Separators are classified according to horizontal or vertical configuration, operating pressure, turbulent or laminar flow, and test or production separation.

Challenges

Interface level measurement will actuate a valve to adjust vessel level in the oil separation process. An emulsion layer along the oil/water interface can contaminate the oil with water or the water with oil. Foaming along the gas/liquid interface, if entrained, can cause liquid carryover or gas blow-by.

Level technologies

- Continuous and interface level provides effective measurement of gas/liquid interface that is insensitive to foam. This prevents liquid carryover or gas blow-by. The Eclipse® Model 706 guided wave radar transmitter is recommended.
- Visual indication delivers technology redundancy and diversity, especially in remote, power-challenged sites where non-powered visual indication is preferred. The Orion Instruments® AtlasTM or Aurora® magnetic level indicator, or Jupiter® magnetostrictive transmitter are recommended. This will also work on water tanks.
- Flow indication detects water level to activate shut-off. The Thermatel® Model TD2 flow/level/interface switch is recommended.

Using the best technology saves time and money for operators.

Image Credit: Magnetrol

Process and storage tanks

Crude oil and water are stored at the wellhead. Unlike midstream tank farms at terminals and refineries, field storage consists of smaller vessels associated with oil and water processing. Diesel generator fuel, potable water and fire water are also stored.

Overflow control

Wellhead instrumentation that monitors level can provide overflow control and alarm systems or shut down pumps when level drops too low. Interface controls will sense the beginning of an oil/water interface during tank dewatering and control the water draw-off.

For oil and water tanks

- Continuous interface level provides effective level measurement of gas/liquid interface that is insensitive to foam, to prevent liquid carryover or gas blow-by. The Eclipse Model 706 guided wave radar transmitter is recommended. The Model R82 non-contact radar is recommended for water tanks.
- For an effective "high alarm" device for overfill prevention at point level, the Echotel® Model 961 ultrasonic level switch is a good choice. This is also recommended for water tanks.
- Like level technologies, visual indication is important. The Orion Instruments Atlas, the Aurora magnetic level indicator, or the Jupiter magnetostrictive transmitter are recommended.

Vapour recovery unit (VRU)

If allowed to escape into the atmosphere, hydrocarbon vapours diminish income through loss of hydrocarbon volume and create fire hazards and pollution problems. A VRU collects vapours from storage and loading facilities, reliquifies the vapours and returns the liquid hydrocarbons back to storage. Methods to recover vapours include absorption, condensation, adsorption and simple cooling.

A VRU is a simple, economical process unit that provides EPA compliance and improves operating economies by capturing up to 95 per cent of fugitive emissions. Continuous flow indication provides precise monitoring of hydrocarbon vapours and flared gases. A Thermatel TA2 thermal dispersion mass flow meter is recommended.

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'EFFICIENCY AND SAFETY CRITICAL TO OFFSHORE SECTOR'

Premier oil and gas gathering – ADIPEC 2016 – will host world-class conferences and seminars to share best practices and opportunities.

MAXIMISING EFFICIENCY WITHOUT compromising on safety and quality is crucial to creating a sustainable offshore sector in today's economic environment, experts urged ahead of the Abu Dhabi International Petroleum Exhibition and Conference (ADIPEC) 2016 from 7-10 November 2016 at ADNEC.

According to a recent study by research firm Markets and Markets, the global offshore drilling rigs industry is expected to grow from an estimated US$65.77bn in 2014 to US$102.47bn by 2019, at a CAGR of 9.27 per cent, representing a sizeable investment in a sector that continues to play an instrumental role in the growth of emerging energy markets.

The report indicated that the progress of the offshore rigs market largely depends on growing exploration activities across the globe. Recent discoveries of oil and gas reserves in remote areas, along with increasing technological

Image Credit: ADIPEC

ADIPEC 2016 will be hosting the second edition of its highly anticipated Offshore, Marine and Heavy Equipment Exhibition and Conference in Abu Dhabi.

advancements for equipment, have made drilling operations more feasible and cost effective.

In line with ongoing global and regional investments in offshore production, ADIPEC 2016 will be hosting the second edition of its highly anticipated Offshore, Marine and Heavy Equipment Exhibition and Conference. The purpose-built quayside exhibition and conference theatre makes ADIPEC 2016 host to one of the world's most exclusive waterfront offshore and marine showcases.

> **"The forum will bring together government ministers, CEOs of the world's oil and gas giants, and industry experts to address the current state and future opportunities for the energy sector"**

Following its launch last year, the dedicated zone is set to attract more than 100 exhibiting companies as global industry professionals come together with the common goal of bringing best practice to what has been traditionally recognised as a complex sector.

Ali Khalifa Al Shamsi, CEO of Al Yasat Petroleum Operations Company and ADIPEC 2016 chairman, said, "Significant developments in technology have allowed us to safely and efficiently tap into deepwater reserves which were previously considered inaccessible. However, today's market presents new challenges, and we must continue to enhance efficiencies without compromising on health, safety, or the environment. By combining global expertise with a unique showcase of offshore products and services, ADIPEC provides an ideal platform for stakeholders to collaborate towards creating a sustainable, more resilient offshore sector."

Christopher Hudson, president – Global Energy at dmg events, organisers of ADIPEC, added, "With about one-third of the world's oil supplies coming from offshore wells, technology and innovation will continue to play a pivotal role in driving efficiency and best practice in the offshore sector. The mooring and quayside exhibition space at ADIPEC allows visitors to witness a host of offshore equipment, technologies and tools in their native setting."

ADIPEC has the track record of bringing together experts and key decision makers to discuss challenges and opportunities in the global energy sector.

CELEBRATING AFRICAN UPSTREAM

The 23rd Annual Africa Oil Week-2016 to be held on 31 October-4 November 2016 in South Africa will focus on Africa's upstream industry with insights, debates and discourses from Africa's governments, national oil companies, licensing agencies and corporate players who are shaping the continent's vast hydrocarbon future.

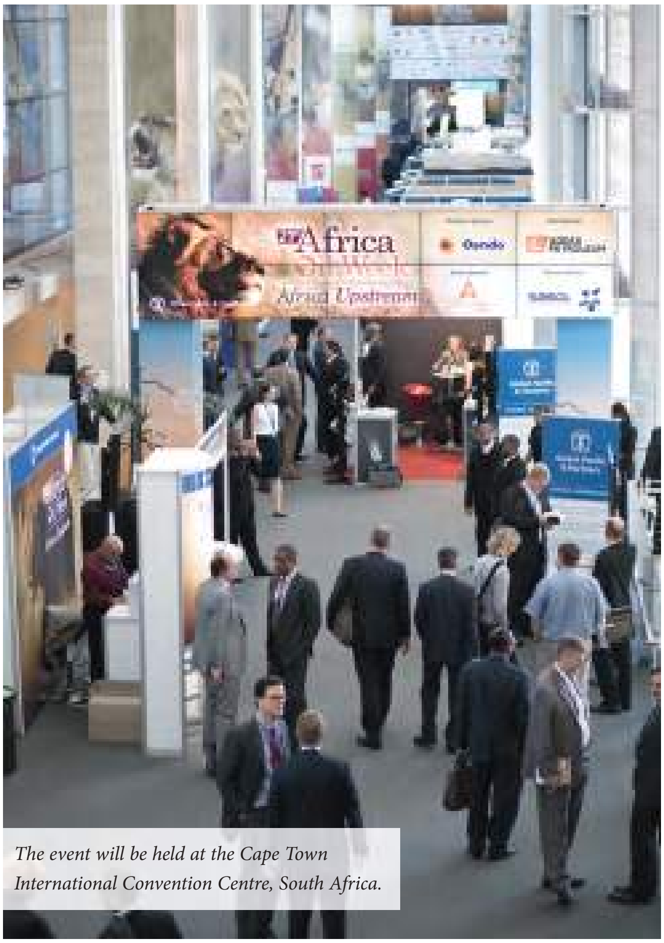
WHILE THE AFRICAN continent continues to attract a steady stream of oil and gas commitments in its fast-growing oil, gas and energy industry, the Africa Oil Week-2016 event will showcase key players shaping the continent's future in exploration and production/development, across new frontiers and established basins, onshore in the rifts and offshore in the shelf and deep-water.

Established in 1994, Africa Oil Week is one of the most widely recognised oil and gas events in the region. The event aims at forging corporate/state relationships in Africa and worldwide, as well as drive direct and foreign investment into and inside Africa's multiple upstream landscapes.

The organisers have confirmed that the 2016 conference will highlight Africa's expanding gas and energy game.

There will be a strong focus on emerging unconventional ventures in shale and diverse hydrocarbons, the fast-growing class of 'Born in Africa' companies, Africa's state oil firms and foreign national oil companies.

There will also be a large technical component to the conference with leading exploration technologies and geoscience/technical ideas being showcased. Additionally, local content policies and players and young professionals in Africa, and debate on the continent's oil and gas future will feature.



The event will be held at the Cape Town International Convention Centre, South Africa.

Image Credit: Global Pacific & Partners

According to organisers, the event will present a programme with 130 top-line speakers, including corporate/state decision-makers, leading thinkers and policy-makers, and will see participation from 160 exhibitors and more than 1,000 executive delegates. Around 40 governments are expected to take part in the event, as well as banks institutions, institutional investors and financiers.

> **"Around 160 exhibitor companies and more than 1,000 senior executive delegates are expected to participate in the event"**

The African Oil Week includes the Africa Independents Forum, Africa Upstream Conference, PetroAfricanus Dinner in Africa, the Global Women Petroleum and Energy Club Luncheon, Africa Local Content Forum, African Institute of Petroleum Luncheon and Young Professionals in Africa, among other events.

Leaders in the industry will be honoured during the week at the annual "Big Five" board awards, to be held for the 20th time at the conference.

Some of the confirmed speakers at the event are SacOil Holdings CEO Thabo Kgogo, United Hydrocarbon International president and CEO Gabriel Ollivier, Sound Energy Plc CEO James Parsons, Lekoil CEO Olalekan Akinyanmi and Ambit Energy president and CEO Tunde Agbi.

AFRICAN RIG COUNT - 2016

COUNTRY	01/06/2015	01/07/2015	01/06/2016	01/07/2016
ANGOLA	20	16	10	10
EGYPT	15	17	10	9
NIGERIA	13	14	6	6
GABON	5	5	1	1
CONGO (BRAZZAVILLE)	3	3	3	3
GHANA	1	3	2	2
CAMEROON	1	2	1	1
TUNISIA	2	1	1	1
SOUTH AFRICA	1	2	1	1
CÔTE D'IVORE	1	1	1	1
LIBYA	1	1	1	1
SENEGAL	0	0	1	1
MOROCCO	1	1	0	0
BENIN	1	0	0	0
EQUATORIAL GUINEA	1	0	0	0
MOZAMBIQUE	1	0	0	0
Grand Total	**67**	**66**	**38**	**37**

Source: Luke Davis, Infield Systems

GE opens innovation centre for Africa in Johannesburg

GE HAS INVESTED in US$33mn in its first African Innovation Centre.

Based in Johannesburg, the centre will be a hub for research, development, SME growth and skill-building across the company's multiple business sectors, including oil and gas, as well as power generation.

The centre will help support existing GE projects, such as power generation technology for nine gas-fired power stations located across South Africa.

Additionally, the centre will support other projects across the African continent, such as the agreement with the Nigerian government, which includes oil and gas projects in its remit.

Job creation will be an important part of the centre's role with a project to develop the careers of more than 100 engineers from disadvantaged backgrounds, working across the entire GE product portfolio and learning from the company's leading members of staff.

Facilities will include a learning and development centre, and a prototyping laboratory for new product development.

GE has a long history in South Africa, with its first office outside the USA opening in Johannesburg in 1898. The company left the country in the 1970s in support of sanctions which were imposed against the apartheid system of governance. GE then reinvested in the 1990s when democracy was restored.

Among GE's African projects is the purpose-built facility in Onne, Nigeria. The site provides testing, assembly and service of multiple subsea systems, such as Christmas trees and connectors. Also in Nigeria, GE is investing up to US$250mn in a manufacturing and assembly facility in Calabar as a regional hub for the company's power generation services.

Image Credit: GE

This gas engine by GE is being used on a Tanzanian project. The new centre, which has opened in South Africa. could pioneer similar products for the oil and gas industry.

Half-mask respirators designed to prevent the spread of silicosis

THE RISK OF TB infection is dramatically increased for those suffering from silicosis – a form of occupational lung disease caused by inhaling crystalline silica dust. It is characterised by shortness of breath, coughing and fever, and is widespread in South African mining communities. In an effort to overcome this occupational hazard, MSA Africa developed half-mask respirators, which are more effective than traditional dust masks, to platinum-mining end users. It also has oil and gas industry applications.

MSA Africa respiratory and fire helmets product manager Suraksha Mohun explains that a reliable face mask can mean the difference between life and death for those exposed to fumes, mists and hazardous gases daily.

Image Credit: MSA

The 'MSA 'Advantage' half mask features reusable cartridges.

"Currently, a large number of mines use dust masks that only last for an eight-hour shift, and which present the opportunity for contaminants to sneak in.

"The MSA 'Advantage' half mask is cost-effective as its cartridges can be replaced, and which can last anything from a week to a month-and-a-half," Mohun adds.

It provides flexibility in usage, and has a filter programme to protect against harmful particles. Due to the humid conditions underground, the Advantage range of masks feature moisture-holes to release any water.

Analysing umbilicals and flexible pipes

SUBSEA ENGINEERS CALCULATE stresses in umbilicals and flexible pipes using software to ensure that individual components will not fail. Such failures could lead to costly production shut-downs or hydrocarbon leaks. DNV GL's Helica software, which calculates stresses in umbilical and flexible pipe components, has now been proven to deliver highly accurate results according to a release by the company. This was achieved through a joint industry project (JIP). The JIP compared stresses calculated using Helica with measured stresses in a full-scale umbilical sample subjected to tension and bending, and the analysis results correlated with the test data.

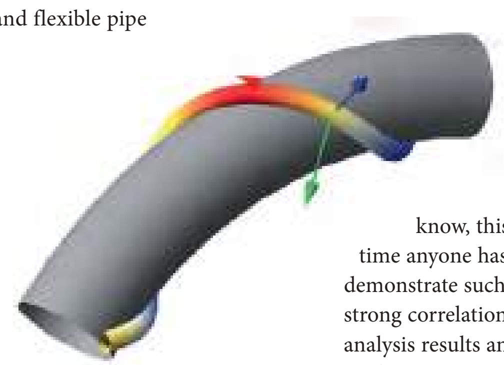
"As far as we know, this is the first time anyone has been able to demonstrate such a remarkably strong correlation between analysis results and such high quality stress measurements in full-scale subsea umbilicals," notes Nils Sødahl, vice president, Riser Technology, DNV GL – Oil & Gas.

Helica is a cross-section analysis tool that calculates mechanical properties, capacities, and fatigue of umbilicals and flexible pipes. Based on these analyses, engineers can optimise design and save cost throughout the lifecycle of the subsea system.

The JIP, which included Ultra Deep LCC, ExxonMobil, Oceaneering, Shell, Technip and ABB, based its research on data provided by ExxonMobil.

"We are very grateful to ExxonMobil for contributing stress measurements to the JIP and giving us this opportunity," says Sødahl.

Image Credit: DNV GL



Helica is a tool that has been developed for calculations on flexible pipes.

New virtual pipeline trailer announced

QUANTUM FUEL SYSTEMS Technologies Worldwide (QTWW), a specialist in natural gas storage systems, integration and vehicle system technologies, recently announced its offering of the new VP-650TM virtual pipeline trailer which will supposedly have the highest capacity available in the industry at approximately 650,000 SCF.

The VP-650TM virtual pipeline trailer is expected to be capable of moving very large quantities of CNG to support industrial users of energy who are not connected to a natural gas pipeline. The VP-650TM utilises Quantum's Q-Lite CNG storage cylinders.

The tanks in the VP-650TM are also capable of storing gas at up to 5,000 psi service pressure enabling additional fuel capacity compared to standard 3600 psi systems. This combination of lighter weight technologies and higher fuel density design has enabled Quantum to provide the new VP-650TM virtual pipeline trailer with the commendable capacity of 650,000 SCF.

Additionally, the trailer design and integration will house other features including push button shut-offs, independent lock-off features, and other technology to ensure a full fill is achieved every time.

Quantum president and CEO Brian Olson said, "We believe that offering 20 per cent more gas capacity than competing systems will allow virtual pipeline companies to save substantial operating cost by making 20 per cent fewer trips to service high volume industrial CNG users."

www.qtww.com

Combustion system installation improves gas turbine efficiency

GLOBAL SPECIALTY CHEMICAL company, Eastman Chemical Company declared Power Systems Mfg's (PSM) FlameSheet combustion system conversion project a 'remarkable technical success' at the global 7F Users conference. The system is in use on the two 7F gas turbines at the company's Longview, Texas-based cogeneration facility.

FlameSheet is an innovative retrofittable combustion system, with operational flexibility characteristics aligned to dynamic and challenging power generation market needs. The FlameSheet combustor employs a 2-in-1 can-annular combustor concept.

According to PSM, which is part of the Ansaldo Energia Group, FlameSheet provides up to a 30 per cent gas turbine operating load range increase while maintaining single digit NOx and CO emissions by innovative leveraging fuel/air mixing concepts. Designed to operate up to 32,000 factored hours between inspections, FlameSheet is ideally suited for the operationally challenges associated with shale gas, liquefied natural gas, alternate fuel operation such as ethane, propane and hydrogen.

Speaking about the company's experience in using the technology, Eastman Chemical Company area manager of utilities-cogeneration operations Jim Stark said, "FlameSheet's extended turndown capability allows us to increase market participation with the full capability of the plant available while minimising exposure to unfavourable market conditions."

PSM president Alex Hoffs pointed out that power generation market dynamics require gas turbine power plants to operate in increasingly flexible operating windows.

By delivering extended turndown capability, as well as lower maintenance costs, reduced emissions, and significantly increased fuel flexibility, FlameSheet technology can enable customers to implement strategic operational changes to increase profitability in their respective markets, he added.

Image Credit: PSM

According to the company, FlameSheet can help to increase gas turbine operating load range by up to 30 per cent.

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INFRASTRUCTURE DEVELOPMENT DRIVING TANZANIAN TRANSFORMATION

finnCap's oil and gas analyst Dougie Youngson spoke to Vani Venugopal about Tanzania's hydrocarbons prospects, including the implications of the new Uganda-Tanzania pipeline, infrastructure development and the effects of the downturn in gas prices.

Tell us about the Uganda-Tanzania oil export pipeline.
It was recently announced that the pipeline is going to pass through Tanzania as opposed to Kenya. The key driver for that was concern over security in Kenya across the Somalian border. Ensuring security along the length of the pipeline would have been an expensive thing to do. So they have gone for the easier option of running it through Tanzania, which is a bit more stable. Also the topography of the land is a bit better; Tanzania is flatter than Kenya.

What are the implications of the pipeline for Tanzania?
In theory, we should see some more exploration going on in Tanzania. Obviously, if you make a discovery next to a pipeline, you can commercialise your oil more easily. Hopefully, that would provide quite a big stimulus for companies to start looking for more exploration onshore.

How is the downturn in the gas price affecting the LNG sector?
The LNG sector is massively oversupplied at the minute. There is too much capacity already in place and in the next five years there is even more coming on line. So, really, there is a large quantity of LNG that the market needs to absorb before any new projects will be built. Along the whole of the East African coast, all the way to Mozambique, there are large capsules that are ideal for LNG development, but there is no market and the prices of building these plants are very high. So it is probably not going to happen for some time.


Image Credit: finnCap

Dougie Youngson is broadly optimistic about the development of the Tanzanian hydrocarbons sector, despite ongoing challenges.

> "The pipeline is driving the modernisation of the LNG sector, which will be of benefit to the whole nation"

Will the market pick up again?
Hopefully. Ultimately the market has got to go through a rebalancing process like we have seen for oil. It will happen in time, I'm sure. However, I don't think anyone really knows how long.

In terms of development, where do you see Tanzania's oil and gas sector? Do you see potential?
Yes, I think so. The building of the gas pipeline has really been crucial to kickstarting this whole process. That pipeline is driving the modernisation of the LNG sector, which will be of benefit to the whole nation. The modernisation process, including development of roads, railways and ports, will the market more attractive for foreign investment and one part of that investment will be the oil and gas sector.

Has global interest in the emerging Tanzanian oil and gas industry increased?
Yes. I've seen quite a few Chinese companies coming in and building roads, railways and gas pipelines and clearly the expansion of the ports will see more imports coming into the country and more exports of various products that Tanzania produces. Certainly, it is still quite an early stage. There is still quite a lot to be done, but as this infrastructure becomes more established and people become more aware of it, you can certainly expect to see a pick up in the nation's economy.

What are your views on the long-term outlooks for oil and gas in Tanzania and East Africa?
There is huge amount of opportunity in East Africa generally but Tanzania is leading the way. The new president has clearly got a vision for the country. These big infrastructure projects are part of that vision.


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"L-R: David Doig (OPITO Group Chief Executive), Emmanuel Onyekwena (MD,Tolmann) & Graham Gall (OPITO MD); during OPITO Engagement and share workshop with relevant stakeholders in Lagos recently".

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