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Covering the Oil and Gas Industries

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Taofik Adegbite, managing director and CEO of Marine Platforms Ltd.

See page 44

Crude oil:

Still the world's leading fuel

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Contents

Image: Expro

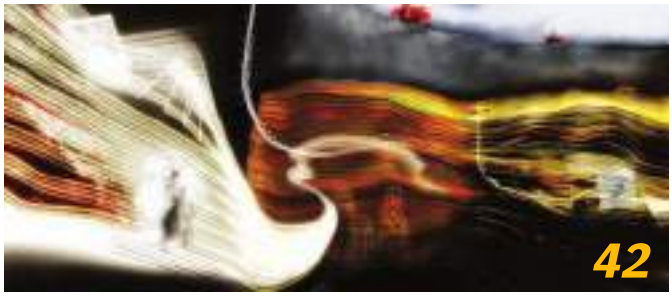
Expro has recently won contracts in excess of US$100mn over three years, across Tullow Oil's assets in Ghana. These contracts build on investments Expro has made over the past five years including the establishment of its world class operating facility in Takoradi.

Editor's note

OVERALL, ACTIVITY IN the oil and gas industry across the African continent has slowed in the wake of the declining oil price in late 2014. "While the oil price has caused activity to drop, it has also served as a wake-up call to many African governments, which are working hard to pass favourable oil and gas legislation in order to attract investment into the sector," commented Chris Bredenhann, PwC Africa oil and gas advisory leader. Countries such as Kenya, South Africa and Tanzania have been taking a serious look at legislation currently in place with a view to making it more investor-friendly.

In this issue, we look at how South Africa's shale gas deposits present significant transformative potential for the country's economy and could make it 'self-sufficient' in energy supply. We also look at Gabon, which is facing an uncertain future, although hopes are building that sub-salt discoveries could change restore the country to its former glory.

Close reservoir monitoring and analysis are integral to today's oil industry, maximising longevity, efficiency and ultimately, profitability. In this issue we look at the key elements and challenges behind reservoir modeling in Africa today and how they are contributing to extending field life.



The latest version of Roxar RMS also includes the further integration of fault uncertainty tools with structural modeling and 3D gridding.

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Executives' Calendar 2015

SEPTEMBER			
8-9	**Africa Expo: Oil & Gas 2015**	JOHANNESBURG	www.africaoilexpo.com
8-11	**Offshore Europe**	ABERDEEN	www.offshore-europe.co.uk
16-17	**Uganda International Oil & Gas Summit**	KAMPALA	www.uiogs.com
17-19	**Offshore Africa Conference 2015**	PORT HARCOURT	www.s-scg.com
21	**Mozambique Gas Summit 2015**	MAPUTO	www.thecwcgroup.com
22-24	**5th U&D Oil & Gas Expo 2015**	ABUJA	www.oilandgasexpos.com
OCTOBER			
5-6	**3rd Annual Subsea Integrity Conference**	HOUSTON	www. upstreamintel.com
6-8	**ECOWAS Mining and Petroleum Forum**	ACCRA	www.ecomof.com
7-9	**Gulf of Guinea Oil & Gas Exhibition.**	MALABO	www.cwcgog.com
7-9	**Oil & Gas Fundamentals**	LAGOS	www.cwcschool.com
7-9	**Gulf of Guinea Oil & Gas**	MALABO	www.cwcgog.com
8-9	**Africa Oil & Gas Expo 2015**	JOHANNESBURG	www.africaoilexpo.com
12-14	**Enterprise Mobility Nigeria Oil & Gas**	LAGOS	www.nog.cwcenterprisemobility.com
13-14	**West Africa Assembly**	LAGOS	www.oilcouncil.com
13-14	**Offshore Energy 2015**	AMSTERDAM	www.offshore-energy.biz
13-15	**Global Local Content Council's Annual Summit**	LONDON	www.glccsummit.com
19-30	**Oil & Gas Mini Management & Business Administration**	HOUSTON	www.cwcschool.com
24	**4th SITEI**	LAGOS	www.csr-in-action.org
27-29	**Practical Nigerian Content**	YENAGOA	www.cwcpnc.com
27-30	**22nd African Oil Week**	CAPE TOWN	www.globalpacificpartners.com
NOVEMBER			
3	**OSCC 2015**	ABU DHABI	www.opito-oscc.com
3-5	**Deepwater Operations**	GALVESTON	www.deepwateroperations.com
11-12	**Africa Energy, Oil & Gas Conference 2015**	NAIROBI	www.s-scg.com
16-18	**World Oil and Gas Week**	LONDON	www.oilandgascouncil.com
18-19	**PEFTEC 2015**	ANTWERP	www.peftec.com
23-24	**2nd Storage & Distribution Forum**	GABORONE	www.afrra.org
23-24	**Project Financing in Oil & Gas**	LONDON	www.smi-online.co.uk
23-25	**SAOGE 2015**	DAMMAM	www.saoge.or

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

Radical reform of NNPC to be launched

A WEEK AFTER President Muhammadu Buhari asked President Obama in Washington to help repatriate some of the US$15bn in oil and gas revenues stolen over the past decade, he is to split the state oil company Nigerian National Petroleum Corporation into two parts. One part will be an independent oil and gas regulatory authority with oversight over the entire sector, and the other would be restructured into what presidential spokesman Femi Adesina described as 'an investor vehicle'.

This suggests the government may revive the core ideas behind the much-delayed Petroleum Industry Bill – that the NNPC's joint ventures with international oil companies be incorporated, properly audited and managed with the capacity to raise investment on the international and local markets.

Dr Ibe Kachikwu, NNPC's new group managing director.

Since then, Dr Ibe Kachikwu, has been appointed the new group managing director of NNPC, which has received good levels of appreciation by industry stakeholders who described him as a 'round peg in a round hole' due majorly to his grasp of the workings of the global oil industry.

Tanzanian parliament passes petroleum bill

TANZANIAN LEGISLATORS HAVE passed a new petroleum bill that creates a regulatory and legal framework to manage discoveries and control of the East African nation's natural gas reserves and possible future oil finds, officials said.

Tanzania has an estimated 55.1 tcf of gas reserves, the second-largest in the region after Mozambique, and the new law is aimed at speeding up the development of the sector.

It was passed amid stiff opposition and days of debate. Some 40 opposition legislators were suspended from parliament after disrupting sessions the day before, complaining that the law was being rushed through after inadequate consultation.

"We are now through ... the parliament has finally passed the bill," Energy Minister George Simbachawene told state television from the country's administrative capital Dodoma.

More than 30 international gas and oil exploration firms are currently operating in Tanzania, and the bill sets out royalty production fees to be paid to the government.

Under the law, which needs to be signed by President Jakaya Kikwete, the government will take a 60 to 80 per cent share of profit from onshore gas production, and up to 85 per cent from offshore production. The government's share of profits from any future oil production will be between 50 and 70 per cent.

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Global alliance with OneSubsea and Subsea 7

ONESUBSEA, A CAMERON and Schlumberger company, has announced that they have signed an agreement establishing a worldwide non-incorporated alliance with Subsea 7 to jointly design, develop and deliver integrated subsea development solutions through the combination of subsurface expertise, subsea production systems (SPS), subsea processing systems, subsea umbilicals, risers and flowlines systems (SURF), and life-of-field services.

The alliance will bring together Subsea 7's experience and technology in seabed-to-surface engineering, construction and life-of-field services with OneSubsea's unique reservoir expertise and state-of-the-art subsea production and processing systems technologies.

The alliance will combine both companies' resources to collaborate on selected projects, engaging early to improve field development planning from the reservoir to the production facility.

By combining the complementary capabilities and market-leading technologies of Subsea 7 and OneSubsea, the alliance will work collaboratively with clients to design, develop and deliver integrated SPS and SURF solutions, which will enhance project delivery, improve the recovery, and optimise the cost and efficiency of deepwater subsea developments for the life of the field.

"The technology and expertise from Subsea 7 perfectly complements OneSubsea's Pore to Process business strategy to offer a holistic approach to subsea development solutions," Mike Garding, OneSubsea CEO, said. "Our established competencies in subsurface modelling and production systems engineering will be further strengthened by integrating the SURF expertise provided by Subsea 7. By integrating these key areas of expertise, we can further reduce risk and uncertainty to deliver the optimal solution for our clients to produce cost-effectively from subsea reservoirs."

Jean Cahuzac, Subsea 7 CEO, said: "This combination of subsurface, SPS, SURF and life-of-field expertise is unique in its breadth of integrated service offering and provides clients with the opportunity to significantly improve subsea field economics over the lifetime of the development. I am looking forward to developing further our relationship with OneSubsea as we will be able to capitalise on the synergies between our strong technology portfolios and develop joint technologies to improve our offering for our clients."

Ceona joins forces with Interoil Angola

CEONA, SURF CONTRACTOR with heavy subsea construction capabilities, has expanded its West African reach after entering into a strategic partnership with Interoil Angola Lda.

The partnership will see Interoil Angola, which is a key player in offshore support vessel management in West Africa, support Ceona's plans to expand into Angola.

Ceona is already active in West Africa through its Ceona-Seaweld joint venture in Ghana as well as the company's strategic partnership with Marine Platforms Ltd in Nigeria.

Bill Hickie, Ceona's VP Business Development, said: "Interoil Angola is a well-established company and an approved supplier by the major operators in the region. It is also one of the few Angolan organisations that has a licence for vessel management. Partnering with them enables Ceona to officially enter the Angolan market, where our flagship Ceona Amazon vessel is highly suited for work offshore, and at the same time continue to grow our strong footprint across West Africa."

Headquartered in Luanda and with a yard in Sonils, Interoil Angola's core business is managing support vessels in-country. The company, which is registered with Sonangol, offers oil and gas services in strategic alliance with reliable and proven technical partners.

Ceona is a SURF and heavy subsea construction contractor in the deepwater market, specialising in full-service engineering, pipelay and construction project management and execution. The company has already established an impressive track record which has seen it expand into West Africa, the Gulf of Mexico and Brazil.

Amec FW launches jv with Ghanaian partner

AMEC FOSTER WHEELER has announced the formation of a joint venture company working partnership with Ghanaian firm, BSS Engineering. The jv will operate as Amec Foster Wheeler & BSS Ltd, with a goal to provide the country's energy sector with technical services, drawing upon Amec's global capability and international standards, and BSS' local skills, knowledge and experience.

A particular aspiration for the jv will be to provide training and development to local Ghanaians looking to build a career in the country's oil and gas industry. Founded in 2003, Accra-based BSS Engineering offers support services to the oil field, industrial and construction engineering businesses, including storage tank construction, piping fabrication, marine engineering, general supply and oil and gas services.

Dr Cyril Titus-Glover, country manager for Amec FW's Ghanaian operations and managing director of the jv, said: "Our new joint venture is well positioned to support the growth of Ghana's hydrocarbon industry and provide training and development to its citizens. We look forward to a long and successful partnership with BBS Engineering, as we seek to enhance the already significant opportunities for Ghana's hydrocarbon industry."

Benedict Tandoh, CEO of BBS Engineering and deputy MD of the jv, added: "Amec Foster Wheeler & BBS Ltd is well positioned to contribute significantly to the country as it establishes itself as an oil and gas services hub in the West African sub-region and the African continent at large."

The launch of the jv coincides with the tenth anniversary of Amec FW's activity in Ghana. Its current projects there include work on three gold mining projects and involvement in several brownfield engineering projects linked to the Kwame Nkrumah FPSO in the Jubilee field off the Ghanaian coast.

Ghana aims to be port of call for west Africa's offshore industry

THE ATLANTIC WATERS off the west African coast teem with oil rigs and support vessels, most a very long way from home. Ghana, a new entrant to the energy game, wants to provide them with a closer port of call. It wants to grow its economy beyond raw material exports – and hopes a new port and rig repair depot will help it to do just that.

This year groundbreaking begins on the Atuabo Free Port, a US$1bn facility on the western side of Ghana's coastline. Here, oil rigs will be towed to be serviced, saving the almost 18,500 km journey to the Far East where the work is usually carried out. Atuabo will also serve as a free trade port for energy-related industry. The project is being driven by Lonrho, a UK-based corporation that has invested in African projects for more than a century. Lonrho and its investment partners will hold 55 per cent of the venture, with another 35 per cent taken up by Ghanaian investors. The government will have a stake of 10 per cent.

In April, the China Harbour Engineering Company was awarded a US$600mn contract for the project, which is sited 326 km west of Accra, and just 100 km west of Takoradi, the centre of the country's emerging oil industry.

Atuabo intends to eventually become a regional hub for oil and gas companies operating in the area, with corporate, logistical and manufacturing facilities. Most rigs now must travel 20 days to South Africa for repairs, increasing costs and delays for upstream operators in the Gulf of Guinea, according to Steven Gray, Atuabo development manager.

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Oil price drop a wake-up call for Africa

WHILE THE OIL price drop has caused activity in Africa's oil and gas industry to decline, it has also served as a wake-up call to many African governments, according to a report released by PwC.

This wake-up call has spurred many African governments to start passing favourable oil and gas legislation designed to attract investment into the sector, according to PwC Africa oil and gas advisory leader Chris Bredenhann.

The PwC report analyses what has happened in the last 12 months in the oil and gas industry within Africa's major and emerging markets.

As oil prices declined in 2014, the industry response was far-reaching with a significant reduction in headcount and other cost-cutting measures. Capital budgets have also been cut, and frontier exploration activity has decreased.

An example of this is Mozambique, which has passed a law in this regard, while other countries such as Kenya, South Africa and Tanzania have been taking a serious look at current legislation with a view to making it more investor-friendly.

"While response to such a drastic decline is necessary, we have seen that the most successful organisations are taking time to re-set, re-strategise and plan for the upturn in prices, which will inevitably come. Africa should be no exception as many of the frontier exploration plays lie on the continent," said Bredenhann.

In the current economic climate, oil and gas companies are looking to increase production potential through improving efficiencies and operational excellence. In addition, they are also looking towards exploration and finding new resources as an alternative to sustainability.

World Bank to provide finance for Sankofa

The Sankofa-1A well was drilled by the Blackford Dolphin Semi-Submersible drilling rig.

THE WORLD BANK has approved US$700mn in guarantees for Ghana's Sankofa gas project, which is designed to alleviate the country's serious energy shortages by developing new sources of natural gas for domestic power generation.

The approval is in the form of an IDA Payment guarantee of US$500mn that supports timely payments for gas purchases by Ghana National Petroleum Corp, and an IBRD Enclave Loan guarantee of US$200mn that allows the project to secure financing from its private sponsors.

These payments should lead to US$7.9bn in new private investment being mobilised for offshore natural gas, the largest foreign direct investment in Ghana's history.

Sankofa, 60 km offshore, comprises five oil and gas fields in the Offshore Cape Three Points block in water depths of 600-1,000 metres. Eni operates in partnership with VITOL.

Development will be via subsea production systems connected to an FPSO, with the gas sent through a pipeline to reception facilities on the coast of western Ghana.

Production is due to start up in early 2018.

General Electric reaches 10-year safety milestone in Nigeria

GENERAL ELECTRIC HAS recorded another milestone in its oil and gas facility in Onne, Rivers State, exhibiting an exceptional safety record. In the last 10 years of operations, GE has not had any incidents at its Onne facility resulting in lost work time for any of the technicians, engineers or other personnel working in the facility.

President and CEO of GE Nigeria, Dr Lazarus Angbazo, said: "This achievement was due to GE's outstanding environmental health and safety standards and all the employees in Onne that make quality and safety an integral part of how they operate on a daily basis".

Dr Angbazo said the safety record at the Onne facility underscores GE's commitment to localisation, continued investment in the Nigerian economy and the creation of jobs for Nigerians. He said GE will continue to improve service capabilities in Onne through constant training and retraining of the engineers and technicians.

In recognition of this achievement, GE received a "Meritorious Safety Performance Award", which is an award that Shell Nigeria Exploration and Production Company (SNEPCO) awards to its partners that prioritise safety in their operations. SNEPCO's head of subsea intervention, Awwal Abubakar, commended GE's remarkable safety standards which, he said, aligns with Shell's corporate policy of "Safety First". "In Bonga field today we have 40 GE trees producing oil safely and successfully and it all started from the GE Onne facility," said Abubakar. He also commented on GE's high quality standards and the growth in Nigerian personnel at the Onne facility over the past few years.

Operating since 2002, GE's purpose-built facility in Onne is the first quayside facility of its calibre in Nigeria. It is the cornerstone of its commitment to Nigeria's oil and gas industry. With continually expanding capabilities, the site provides complete assembly, testing and life cycle service for subsea tree systems, subsea control modules, specialty connectors and pipe. It also includes a dedicated on-site training centre and offers broad business development opportunities for local suppliers.

DOF Subsea Angola secures contract wins

DOF SUBSEA, A leading provider of integrated subsea services, has marked the relocation of its Angolan office by signing two contracts with a major operator.

The Luanda-based team of 12 has just moved from the centre to new 200 sq m premises 20 km away in Belas Business Park in the Talatona area.

As well as the move, DOF Subsea are celebrating the news that the company recently increased survey and positioning (S&P) services to a key operator in West Africa by signing two contracts for rig positioning services in two additional blocks.

The scope of work will range from pre-mobilisation and mobilisation work to vessel positioning and survey support and the provision of final well location positioning, according to the client's specified accuracy requirements.

Commenting on the office move, DOF Subsea general manager for Angola, Colin Ferguson, said: "In spite of the difficult global market, it is important that we position ourselves for future growth in markets such as West Africa.

"This important relocation plays a central role in enhancing our presence in Angola, positioning us alongside other key operators and placing us at the heart of a thriving and vibrant business community which benefits from good infrastructure, hotels and conference facilities."

Executive vice president for DOF Subsea's Atlantic region, Jan Kristian Haukeland, added: "We are very happy to have secured these additional contracts, which will build on the good relationship that we have with this operator in Angola, and enhance DOF Subsea Angola's position as a leading provider of S&P services."

Africa Oil Week set for October

GLOBAL PACIFIC AND Partners will host the 22nd Africa Oil Week/Africa Upstream Conference 2015, in a joint venture with ITE Group, from 26 - 30 October, at the Cape Town International Convention Centre where around 1600 delegates assembled in 2014.

Africa Oil Week is the landmark corporate occasion for the continent, a meeting with global reputation, and one of few top world-class events held annually at a continental-level in the world's E&P industry Calendar. The 22nd Africa Upstream Conference 2015 will run from Tuesday-to-Friday, with a full three-and-half day programme, with 120 speakers from Governments, leading private/public companies, African National Oil Companies, licensing agencies, and key players inside Africa's oil/gas-LNG industry value chain.

Meanwhile the 13th Africa Independents Forum will take place alongside the 17th Scramble for Africa Strategy Briefing, on 26 October, followed by the 71st PetroAfricanus Dinner in Africa and the traditional Icebreaker Cocktail Reception for Africa Oil Week held.

Expro secures US$100mn Tullow Oil contract win

INTERNATIONAL OILFIELD SERVICES company, Expro, has been awarded new contracts from Tullow Oil, Africa's leading independent oil company.

Worth in excess of US$100mn over three years, the contracts will see Expro work across Tullow Oil's assets in Ghana, including the Jubilee Field and the Tweneboa-Enyenra-Ntomme (TEN) field project.

Following on from Expro's phase one contract for Jubilee, involving more than 10 completions, the company has been awarded continued services for phase 1a. This covers completions on new wells for Jubilee, as well as interventions and remedial work.

A number of Expro's product lines and services will be utilised, including large bore subsea completion landing strings, subsea exploration and appraisal landing strings, high flow rate surface well testing and sampling services. The TEN project will also see Expro provide subsea completion work in all planned wells.

The company has invested over US$32mn in Ghana since entering the market in 2008 to support key clients such as Tullow.

Riccardo Muttoni, Expro's sub-Saharan Africa regional director, commented: "We are delighted to work with Tullow in delivering a range of world class projects, strengthening our existing partnership and delivering value to their Ghanaian business.

"These contracts build on investments Expro has made over the past five years including the establishment of our world class operating facility in Takoradi. We are proud that 70 per cent of our workforce in-country, including 20 graduate engineers, is Ghanaian, which we are looking to increase to 85 per cent by 2017."

Charles Darku, Tullow Ghana's general manager, said: "We look forward to utilising Expro's expertise in the offshore environment to deliver our key projects in Ghana. Major investments have been undertaken to date by both Tullow and Expro, with emphasis on local content development plans to further create opportunities for local businesses and people."

Expro's sub-Saharan Africa operational headquarters are in the Ghanaian capital, Accra.

Few words are used to describe the African oil situation in the latest energy roundup. However the national output figures reveal an encouraging story. We conclude that the region continued to make a major contribution to global energy security in 2014.

Crude oil: still the world's leading fuel

DESPITE THE TUMBLING price of oil, all forms of worldwide energy demand was weak last year, says BP's latest Statistical Review *. China remained the largest single growth market.

Global primary consumption increased by just 0.9 per cent in 2014, well below the 10-year average of 2.1 per cent annually. Unusually, growth in emerging countries was below par, too. However demand for nuclear power and renewables countered the trend – in the first case despite a complete shut-down of the industry in Japan. Sub-Saharan Africa is seen as one of the most promising renewables markets of the future.

Despite its declining edge, crude oil remained the world's leading fuel, accounting for just under one-third of total energy consumption. "The most significant development on the supply side in 2014 was undoubtedly the continuing revolution in US shale" said group chief executive Bob Dudley in the introduction to this year's Review, the 64th in the series. "The US replaced Saudi Arabia as the world's largest oil producer – a prospect unthinkable a decade ago."

The BP monitoring team believe the weakness in oil prices – which has significantly worsened in 2015, even before the UN Security Council's rapprochement with Iran on 14 July – has been "largely driven by the strength of supply as non-OPEC production grew by a record amount and OPEC maintained its production levels in order to protect its market share."

So, in the wake of one of the biggest turnarounds in the history of energy tracking, where does all this leave the crude-dependent nations of North and sub-Saharan Africa? Producers in both envy the much firmer price trends enjoyed by suppliers of natural gas, the sector which spawned the revolutionary practice of hydraulic fracturing in the first place.

> The stark fact [remains] that investment in prospecting globally continue to be deterred.

Demand remains weak

First, demand remains weak, and it is cost consciousness that sets the ceiling in OECD countries most of all. Second, prices have been heavily deflated by production increases in many non-OPEC countries, especially the USA, Canada and Brazil. These have been matched by the Organisation's landmark decision to defend market share. As a result of the US raising output by 1.6mn bpd (the largest single-nation increase of all, BP says) the global production rise was two times – plus that of consumption.

Nigeria is finding itself much better positioned in terms of formally registered (ie, unbunkered) sales.

So there is no way that any African producers, traditional or new, whether OPEC-controlled or not, can be accused of exacerbating this unfortunate situation. Indeed output in Libya and Angola fell sharply in 2014, by 490,000 and 90,000 bpd, respectively, and for quite different reasons.

Africa's total oil output last year was just 8.26mn bpd, a full five percentage points down on 2013. A record regional 10.2mn bpd was reached in 2008 even though Nigeria's production was already on the way down (for different reasons again) by then. National performances varied, but in no other region as a whole was such a downturn recorded last year.

Paying the price of the US' rise in output

So it can reasonably be claimed, and complained, that many of today's African producers (including the brand new ones such as Ghana's offshore operators) are now paying the price of North America's astonishing 10.5-point rise in output in 2014. Unlike the situation underlying North America's unconventional boom, it is traditional wells and production techniques that are accounting for nearly every barrel so expensively pumped out here.

Producers in Chad and Tunisia are all caught up painfully in this situation; Sudan is a special case as the industry in the newly independent south is going from strength to strength. Nigeria is finding itself much better positioned in terms of formally registered (ie, unbunkered) sales too.

Nigeria winning plaudits

Indeed, the west coast's number-one producer is winning plaudits all round. The smooth change of government was widely welcomed. Industrial diversification is chipping away at the energy industries' unhealthy monopoly on GDP make-up. The critical shortage of power is being tackled as are security and smuggling.

"Opportunity knocks" concluded the influential weekly Economist in a lengthy upbeat review on 20 June.

Nevertheless, among the consequences of all the above remains the stark fact that investment in prospecting globally continues to be deterred, more so here in Africa than almost anywhere else. Kenya's arid north apart, little of the gloss of today's exciting gas developments in the East are rubbing off elsewhere. Total all-African proved reserves of crude as at 1 January 2015 were marginally down on the year before; in many other OPEC countries they were significantly up. And only in the USA are the real fruits of the unconventional fracking revolution now being seen. ■

BP Statistical Review of World Energy June 2015, www.bp.com/statisticalreview

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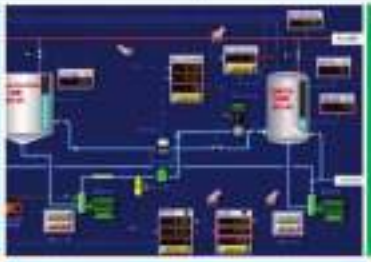

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Despite the chaos and conflict that is today's Libya, the country's National Oil Company attended the Mediterranean Offshore Conference & Exhibition in Ravenna, Italy, where Stephen Williams was able to speak to various industry figures.

Dawn versus dignity: the struggle for Libya's resources

HELD IN LATE March 2015, the 12th Mediterranean Offshore Conference & Exhibition had the theme: Planning the next 20 years, Diversifying Choices, Increasing Opportunities. But given the chaos and conflict that has descended on Libya, a key country of the Mediterranean oil and gas market, that seemed a very ambitious objective.

Since Muammar Ghaddafi fell from power, oil production has fallen from 1.7mn bpd to barely 500,000, and many of the country's main oil ports and terminals have closed or are non-operational. Intensified fighting between rival groups of militias is even threatening that output.

Libya possesses Africa's largest proven reserves of oil and once exported most of its production to Europe, in particular to Italy but France and Spain were also major markets.

According to the International Monetary Fund, oil and natural gas accounted for over 95 per cent of total government revenue and 98 per cent of export revenue in 2012, the first year of the post-Ghaddafi era.

But from mid-2013, when the call to declare the eastern region an autonomous territory became more vociferous, four out of the five terminals in the east where the country's most prolific oil fields are found – Es Sidra, Ras Lanuf, Zueitina, and Marsa al-Hariga – were closed.

Some sort of compromise agreement was reached between the central government in Tripoli and the separatists in the east, with millions of dollars in compensation being paid to the separatists to allow oil exports to resume. But the following year, the fragile balance of power collapsed, and two major rival factions, (and governments) emerged.

> Only Italy's Eni has continued to lift and export oil.

Eni's Bouri DP4 is the biggest platform in the Mediterranean sea.

After militias fought over the capital Tripoli, in the process destroying the international airport, the newly elected and internationally recognised government that had been blocked from taking power from the outgoing General National Congress moved to Al Baida near Tobruk in the east of the country, close to the Egyptian border.

Prime Minister Abdullah al-Thinni's government, based in the east, has announced plans to both create a new payment system for the oil sector and an 'alternative' National Oil Corporation.

However, the established National Oil Corporation stayed put in Tripoli. A gentleman in Ravenna insisted to Oil Review Africa, "the NOC is non-political". But their overseas partners, the oil companies working in Libya, began mothballing their operations and pulling their staff out of the country.

Total of France, Repsol of Spain and Marathon Oil of the US, have all suspended production. Only Italy's Eni has continued to lift and export oil.

Super-major Eni is Italy's largest company by market value, and the largest western producer in Africa. It produced 240,000 bpd of oil equivalent, which includes gas production, in Libya last year and 300,000 a day in early 2015. It is still operating a pipeline from Melita, northwest Libya, to Sicily that carries about 10 per cent of Italy's natural gas supplies, but NOC has warned that force majeure could close the western Wafa gas field that supplies the natural gas.

Eni's production up

Eni has announced that 2015's first quarter world-wide production was up on the same period last year, with Libya accounting for part of the rise. Yet Eni's chief executive, Claudio Descalzi, has cautioned that the situation in the war-torn country is worsening, and a strike has also hit the El Feel oilfield operated by Eni and the NOC.

Libya has proven natural gas reserves of almost 55 tcf, making it the fifth-largest natural gas reserve holder in Africa.

In February, Italy warned that Libya was a 'ticking time bomb' and associated the rise of Islamic State terrorism to the power vacuum in the country, indirectly creating the criminal enterprises that are organising shiploads of would-be immigrants to make the perilous Mediterranean crossing in rickety boats. Frequently, these crossings end in tragedy with hundreds drowning in Mediterranean waters.

The UN-sponsored national dialogue peace attempt, that took place in Rabat, Morocco, failed to reach an agreement between the two major adversaries, the Baida government (Dignity) and Tripoli's GNC (Dawn).

Meanwhile attacks, against oil and gas installations and foreign oil workers are increasing – with the pipeline that carries crude from Libya's largest oil field Sarir to the Marsa Hariga terminal being bombed, causing the field to be shut down.

The rival governments battling one another for control of the hydrocarbons sector need the sector to be successful for the future viability of whoever wins, and the country itself will depend on it.

But now there are not only competing political groups in Libya fighting for control of Libya's hydrocarbons sector, but the ISIS jihadis bent on destroying it. These are brutal extremists, guilty of numerous human-rights abuses, who view the industry as evidence of a foreign and corrupt alien presence.

Libya's agony of conflict and increasing chaos appears to be increasing, and no end appears in sight. However, the work of the NOC and its presence at the Mediterranean Offshore Conference and Exhibition signals a brave non-political resolve to confront the challenges, and seek a peaceful resolution to the tragic situation that has befallen the country. ■

Because He founded the earth upon the waters...
And four fifths of the earth is under water

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South Africa's shale gas deposits are ranked the largest in sub-Saharan Africa – but future extraction, as in other jurisdictions, is subject to environmental, infrastructure and water constraints. However, it presents significant transformative potential for the South African economy and could make South Africa 'self-sufficient' in energy supply. Moin Siddiqi reports.

Shale gas ambitions

SOUTH AFRICA'S MODEST conventional hydrocarbons reserves are more than compensated for its potential in shale gas deposits – ranked largest in sub-Saharan Africa – but future extraction, as in other jurisdictions, is subject to environmental, infrastructure and water constraints. Huge upstream investment and the latest technologies are required to unlock unconventional energy sources in the country.

South Africa has a major sedimentary basin that contains thick organic-rich shales. The Karoo Basin is vast, covering two-thirds of land-area, with the southern portion judged prospective for shale resources. In geological terms, the Karoo refers to a period dating back some 120mn years and the rocks laid down during those ancient times. The Karoo desert is estimated to have between 390 and 485 trillion cubic feet (tcf) of technically recoverable shale gas resources, according to US Energy Information Administration (EIA), located in the Whitehill, Prince Albert, and Collingham formations.

An evaluation report by the Petroleum Agency of South Africa (PASA) concluded that, "owing to the limited amount of available data in the area, it is impossible to quantify the resource accurately, other than to say that it is potentially very large. It is essential that additional, modern sub-surface information be obtained through drilling or a geophysical survey to constrain these estimates." However, the basin contains significant areas of igneous sill intrusions that could impact (reduce) the quality of shale gas deposits, limit the use of seismic imaging, and increase overall risks for explorers.

High level pledges to shale gas exploration

The government has made high-level pledges to shale gas exploration. The task team's report on investigations into fracking in the Karoo Basin, published by the Department of Mineral Resources (DMR) in September 2012, recommended the use of fracking "under strict supervision" by a monitoring committee. However, it warned the process could be halted "in the event of any unacceptable outcomes".

The DMR recommended some preliminary steps before actual fracking takes place, including "normal exploration... such as geological field mapping and other data gathering activities" under the existing regulatory framework. In October 2013, the authorities proposed new technical regulations to govern standards for shale gas exploration and hydraulic fracturing. Proposed regulations also required drillers to meet US best practice on the type of equipment used and the disclosure of chemicals – based on the American Petroleum Institute (API) standards.

The Karoo desert is estimated to have between 390 and 485 tcf of technically recoverable shale gas resources. Image: IHS

The DMR recommended some preliminary steps before actual fracking takes place.

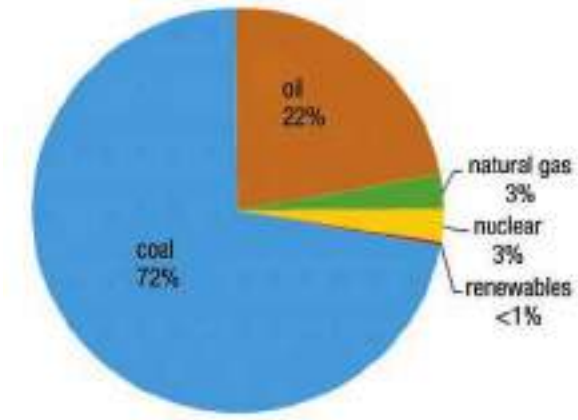
Bountiful resources

To date, the PASA has issued companies Technical Co-operation Permits (TCPs), for carrying out geological, seismic and desktop studies of the relevant areas – with the option of then applying for 'Reconnaissance' Permits, which would allow surveying, but no drilling. Falcon Oil-Gas in partnership with Chevron was an early explorer, obtaining an (30,327-sq km) TCP along the southern edge of the Karoo region. Shell obtained a larger (185,000-sq km) permit surrounding the Falcon area. The Sasol/Chesapeake/Statoil joint-venture area of (88,000-sq km) and the Anglo Coal TCP application area of (50,000-sq km), respectively, is towards the north and east of the basin. To mitigate concerns over water usage, developers must obtain permits for sourcing and discharging water from the Department of Water Affairs.

The energy groups are awaiting the publication of 'final' regulations and approval to convert their TCPs into shale exploration licences, which are expected to include requirements for local content in procurement, manufacturing and shareholding. Recently, the government finalised the Infrastructure Development Bill, which would reduce project approval times.

Econometrix, South Africa's leading independent economic consultancy, estimates even if five per cent (550bcm) of total shale deposits are

Figure1. Total primary energy consumption in South Africa, 2013



Traditional solid biomass and waste is not included in the total. Source BP Statistical Review of World Energy 2014

economically recoverable, this adds over US$6bn (R80bn), or 3.3 per cent a year, to gross domestic product (GDP) for 25 years. This, it notes, is nearly double the total present contribution of coal mining to GDP. Government tax revenue rises by US$2.8bn (R35bn)/year and new job creation could be about 300,000. Therefore, should 10 per cent or 20 per cent of the reserves be turned into production, the longer-term benefits would be enormous.

Shale exploration activities are at fledgling stages with some years away from potentially producing any commercial reserves.

Diversifying energy mix

Investing in shale gas has many positive spillovers; the Strategic Environmental Assessment of Shale Gas Development notes: "Not only could the exploitation of deposits of lower carbon shale gas – if found – result in the provision of affordable and safe energy, [but] it is also a potential source of job creation, foreign exchange and investment. It would also contribute towards energy security."

The Science and Technology Minister, Naledi Pandor echoed this assessment: "If indeed viable deposits are found in South Africa, shale gas, as a relatively lower carbon energy source, presents significant transformative potential for the economy."

If ultimate recoverable [shale] reserves are substantial, South Africa could turn the gas into synthetic fuels or use more localised gas to meet swelling electricity needs for many decades. This is important because of the need to replace old power stations whose coal reserves may soon be exhausted. Recurrent power shortages combined with environmental concerns at over-reliant on coal (which fuels whopping 93 per cent of electricity) have given a new impetus to gas exploration. The PASA has also issued 30 exploration rights for coal-bed methane gas, whose reserves are estimated at 20-30 tcf.

Fracking the Karoo. Image: Wikipedia.

According to the Department of Energy's Integrated Resource Plan 2010-2030, South Africa needs more than 50 gigawatts (GW) of new generating capacity, whilst committing itself to cut greenhouse gas emissions by one-third by 2020. The DOE envisages falling gas prices thanks to large-scale exploitation of shale deposits – leading to a switch in power generation from coal and costly nuclear towards increased construction of gas-fired plants. Thus, expanding new generating capacity is critical to sustainable growth.

Practical challenges

The EIA cautions that turning technically recoverable resources into commercially viable production depends on variations in their geological structure. Economic recoverability also depends upon extraction costs and market prices of gas. A shale-gas well costs twice as much to develop. South Africa's onshore energy services sector is relatively underdeveloped. There are reportedly no rigs capable of drilling the types of boreholes necessary for hydraulic fracturing (fracking). An additional drawback is the scarcity of water reservoirs in the arid Karoo Basin.

Even if authorisation to drill exploratory wells is granted now, it could take explorers about 2-3 years to determine how much gas deposits can be commercially extracted; at what cost; and how best it can be monetised? Also, further environmental impact assessments are needed before the start of any large-scale projects in the Karoo region. Hence, actual production (assuming positive results) can occur in the medium-term at best.

Shale exploration activities are at fledgling stages with some years away from potentially producing any commercial reserves. Estimates by the PASA and the Council of Geosciences appraise recoverable gas resources at 36 Tcf.

Monetisation of shale gas could reduce over-reliance on imported oil and coal for power, thus making South Africa 'self-sufficient' in energy supply. ■

**Footnote: Technically recoverable resources represent the volumes of oil/natural gas that could be produced with current technology, regardless of fuel prices and production costs.*

THE ENERGY PROFILE

- **Oil and gas were first discovered offshore South Africa during the 1960s. The bulk of proved crude oil reserves (15mn barrels) are located in the Bredasdorp Basin off the west coast. The offshore Orange Basin near Namibia is believed to hold substantial hydrocarbons resources, but so far there has been limited exploration activity in the area. The country has very limited proven natural gas reserves of 27,160,000 cubic metres.**
- **The state-owned Petroleum Oil and Gas Corporation of South Africa (PetroSA) operate all upstream hydrocarbons producing assets.**
- **South Africa has sophisticated synthetic fuels capacities, producing gasoline and diesel fuels from the Secunda coal-to-liquids (CTL) and Mossel Bay gas-to-liquids (GTL) plants – operated by SASOL and PetroSA, respectively.**
- **At the CTL plant, more than 37mn short tons of coal annually are converted into liquid fuels and a range of chemical feedstock. The plant has a total capacity of 160,000 bpd of oil equivalent. Whilst GTL facility at Mossel Bay produces 45,000 bpd of synthetic fuels such as kerosene (paraffin), diesel, propane, liquid oxygen/ nitrogen, distillates, eco-fuels and process oils.**
- **Petroleum and other liquids (total oil) production was around 191,000 bpd in 2014. However, synthetic fuels, derived from coal and natural gas, accounted for 172,000 bpd, or almost 90 per cent of the country's domestic petroleum supply. The US Energy Information Administration (IEA) estimated that South Africa's total oil consumption was 655,000 bpd in 2014.**
- **South Africa's proved coal reserves of 33bn short tons at end-2013 constituted 95 per cent of total African coal reserves and three per cent of global reserves, according to BP's database. The electricity sector accounts for over half of the coal consumed. About one-third of gasoline and diesel consumption is produced from coal, according to the World Coal Association.**
- **Currently, about 90 per cent of generation capacity is from coal-fired power stations, about five per cent from one nuclear power plant, and five per cent from hydroelectric plants, with a small amount from a wind station, according to the DOE. Nameplate installed power capacity is about 46,000 MW. The state-run Eskom supplies 95 per cent of the nation's electricity.**
- **The country has the highest energy consumption on the continent, accounting for about one-third of total primary energy consumption.**
- **South Africa has the second-largest crude oil distillation capacity in Africa at 503,000 bpd, after Egypt. PetroSA and China's Sinopec have commissioned a feasibility study into building a 400,000 bpd refinery near Port Elizabeth.**

Container World expands into Angola

CONTAINER WORLD IS a South Africa-based company that has been providing specialised container conversions to the African onshore market since 1983. With growing demand from its long-term onshore customers, the company recently expanded its product range and is now able to offer a wide variety of offshore containers, baskets, skips, reefers and accommodation modules, all certified to DNV 2.7-1 and EN 12079.

Strategically located in Cape Town and with most units available ex stock, Container World is well placed to be able to service demand from both East and West Africa, with short lead times and at competitive prices. The company's onshore division remains a leading supplier of converted containers to the African market, including accommodation, dining, kitchen, ablution and office units. With more than 25 years of experience servicing the African market, and with 10 strategically located branches, Container World is ideally positioned and experienced to handle any onshore or offshore container enquiry.

In response to a consistent demand for its quality products and service offering in Angola, Container World has recently announced its JV partnership with ES-KO in this strategic market, with the formation of ES-KO Habitat. This joint venture aligns Container World with a company that has over 30 years experience in the diverse Angolan market, and its cross-border knowledge will round off a more complete and satisfying experience for its extensive customer base.

A large custom-built storage and distribution facility in the Viana district of Luanda will ensure a readily available supply of units in-country, both onshore and offshore, with plans in place to more than double the size of the existing facility in the next 18 months.

CWOS workshop.

The team has a long established reputation in Angola, and is confident that the local office will be in a position to provide a more hands-on service to the ever increasing demand for off-shore and on-shore equipment.

For more information, visit: containerworld.co.za

Hopes are building that sub-salt discoveries could change the landscape of Gabon's oil industry and restore its former glory. That could take time, however, with Gabon, in the meantime, having limited its short- and medium-term options by not following through on reforms in the years of high oil prices. Sam Ciszuk reports.

Gabon - at eve, or daybreak?

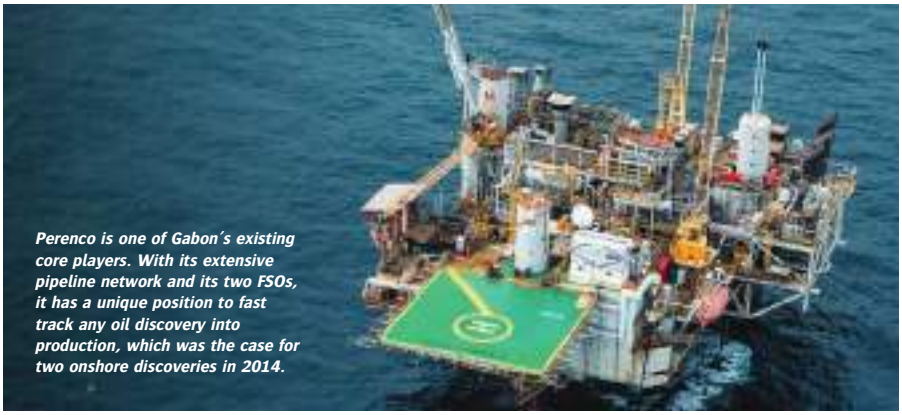
GABON, WITH ITS internationally modest crude production rate of around 210,000 bpd, is often overlooked when the perils of West African oil exporters in the face of the US shale oil boom, are discussed. Yet, the country appears to have been caught up by these larger events, as well as by the global oil price crash of 2014 and now, as badly as any other.

Indeed, Gabon has for some years been struggling to find a way out of a twilight zone, caught as it is between falling mature production rates, a lack of diversification, a relatively narrow set of upstream actors, an eroding market share in a key market and internal, as well as external resistance to reforms. Recent subsalt deepwater discoveries promise a way out, although a low oil price and slashed IOC capex budgets could prove an insurmountable obstacle, at least in the medium term.

Falling oil revenue has, not surprisingly, fuelled political discontent, with strikes and protests – some turning violent – flaring up temporarily, particularly in the capital Libreville. For a government deriving around 80 per cent of its exports and 50 per cent of its income from the oil industry, the fluctuations in global crude prices can be a problem.

The current President, Ali Bongo Ondimba, took over from his father, long-time President Omar Bongo, in 2009, following the 2008 oil price crash and immediately launched an ambitious reform programme. Key concepts were diversification not only of the economy, but also of the upstream actors involved in Gabon's oil sector, as well as contract liberalisation and increased transparency.

A return to high crude prices in the intervening years, together with institutional resistance to change and the natural tendency among existing actors to guard their foothold, seems to have taken the force out of the reform drive, however.



Perenco is one of Gabon's existing core players. With its extensive pipeline network and its two FSOs, it has a unique position to fast track any oil discovery into production, which was the case for two onshore discoveries in 2014.

Gabon's mature oil fields could benefit from the entry of smaller and nimbler EOR specialists.

French companies dominate

French companies continue to dominate the country's oil sector and enjoy traditional strong political backing from their home country. Luring new IOCs to Gabon has not been impossible, but lately the attractiveness of the country has taken a hit following several rounds of contract and tax problems suffered by newer actors in the country, where disputes perhaps too often seem to have been resolved in favour of more well-connected long-time players.

A case in point is UK-based Africa champion Tullow, which has seemed about to be kicked out of a minority stake in the producing onshore Onal licence, operated by Maurel & Prom. The licence was re-opened for term renegotiation prematurely last year on the operator's request, but seemed then to lead to Tullow being shut out. This year in April the Financial Times reported that the issue had escalated, causing an intervention by UK Prime Minister David Cameron on behalf of Tullow, as well as Shell, which was faced with back taxes of up to US$100mn, a decision it contests.

Unlike Tullow, Shell is a veteran player in Gabon, although only deriving around 12,000 bpd of production from the country. A more dominating veteran, France's Total has also had its share of problems. Last year, the Wall Street Journal reported the company had settled a government claim of tax arrears totalling US$805mn, although there was no official confirmation as to the size of the final agreement.

Such events hit hard against investor attractiveness of any country looking for investment and bode particularly ill for Gabon's mature oil fields, which could otherwise benefit from the entry of smaller and nimbler EOR specialists. At the same time, government desperation to raise or reclaim quick funds is understandable, all the more so since marketing problems have only increased recently. Gabon used to see most of its crude being exported to the US and has, like its Gulf of Guinea neighbours, had no choice but to see its market share there be eroded in favour of domestically produced light tight oil. Such a changing environment favours established large players, that have experience marketing Gabonese crude – or at least it would look the safer option in an insecure situation.

Nevertheless, reforms to rein in corruption, diversify the number of upstream actors and increase transparency seem to have hit an impasse, which will particularly undermine efforts to reinvigorate Gabon's mature onshore and shallow water production. Doubts over contract sanctity, however small, have a large impact on investment decisions of marginal projects.

Still, decline rates have levelled off in recent years, compared with the sharp fall from peak production of around 370,000 bpd in 1997 to around 240,000 bpd by the middle of the last decade, thanks mainly to efforts by Gabon's existing core players, Total, Shell and Eni, as well as Swiss-based, Sinopec-owned Addax, and France's Perenco and Maurel & Prom.

Some work by more recent arrivals is, however, getting done. Most recently, US junior VAALCO has announced production start-up at its South East Etame/North Tchibala (SEENT) platform offshore Gabon, at a rate of 3,400 bpd. This brings gross production from the mature SEENT Fields Project to 21,400 bpd, according to a company statement, which is a significant amount for Gabon.

Hopes on subsalt deepwater discoveries

Hopes for the future are, however, placed on the sub-salt deepwater discoveries, being mostly by Eni and Shell/CNOOC in the past few years.

There are good reasons to think that exploration could double the combined reserve base of Gabon

and neighbouring Congo (Brazzaville) to four billion barrels of crude and raise gas reserves very considerably, at least according to Eni's calculations. Shell and CNOOC in October last year reported hitting a 200 feet gas pay zone in pre-salt formations in Gabon's Block BCD10. Earlier in 2014 Eni reported a 500mn barrel find, the Nyonie Deep, in Block DV. Further south in the same geological basin, off Congo, Eni in October last year hit a 1,380 foot light crude pay zone. Deepwater acreage off Gabon found many takers in the country's 2013 licensing round and currently ExxonMobil, Repsol, Ophir Energy, Petrobras and Marathon are among the companies pursuing an exploration programme at some stage in Gabonese waters.

With sub-salt potential being so large, compared to the country's current production, economy and population, it is not surprising that tough reforms get stranded and abandoned. These could reinvigorate the mature assets more efficiently but have faced some resistance from within as well as outside the country.

Gabon's application to sign up to the Extractive Industries Transparency Initiative (EITI) some years ago is a case in point. A lack of follow-through on transparency and statistics reform resulted in the application being rejected in 2012.

That does not make Gabon stand out particularly from a crowd of crude exporting nations – but for a country seeking investments to achieve a turnaround in its fortunes, that could actually be the problem. A bolder path in this regard would have put it on a better footing to lure new players and to diversify its own options in the oil and gas sector.

Total is one of Gabon's existing core players.

As things currently stand, Gabon has all its eggs in the sub-salt basket, at a time of deep capex slashing in the oil industry and when West African crude increasingly has to find new markets in faraway Asia and often is being marketed at a marginal disadvantage. Indications of commerciality for the sub-salt discoveries, which to date have been made in the region, are good although these are very early days, but, given the oil price movements of just the recent month, developments might be further away than Gabon's government had hoped.

In the meantime, this situation leaves the leadership with few options. The economy could take a further dive, with strikes and riots further destabilising the industry and cutting into export revenue. The government would have even less opportunities to sweeten terms and attract investment, particularly for marginal projects which could have been fast-tracked and yielded short-term benefit, in such a scenario. Things are looking up for Gabon's oil industry, but it might find itself being very much at the mercy of global oil price movements in the coming years, before any large-scale sub-salt FIDs are signed. ■

Strategies for identifying and recruiting talent is critical as oil and gas companies cope with "great crew change".

Challenges in identifying and recruiting talent

TODAY THE OIL and gas industry is facing a significant talent and knowledge gap, that actually began in the 1980s, resulting in many potential engineers and geophysicists looking elsewhere for careers. The ones who remained are spread throughout the world and are in high demand as the oil and gas sector rebounds at an astonishing rate.

As you may remember, the price of a barrel went from US$35 to US$10 in the 1980s, resulting in massive layoffs throughout segments of the energy industry. It resulted in one of the largest downsizings of a highly capitalised labour-intensive industry every known. Once concentrated in western countries, the talent has now been spread thin as major companies throughout the world are competing for talent that can deliver oil and gas products.

The talent is there, but it is spread thin throughout the world, among countries which view oil and gas as the next gold rush that will lead them to prosperity and a position of leadership in a world in desperate need of energy.

The executive talent, albeit scarce, is available, but spread thin throughout the world.

What happened to the talent pool?

It actually began shrinking in the 1980s when roughly 25 per cent of engineers and geologists left the industry. At the same time in the 1980s, college enrolment for petroleum engineers and geology students dropped significantly, thereby starting a "perfect storm" that has resulted in the talent gap of today. During that decade, oil reserves were hard to find, there was the initial talk of running out of oil, and the notion of a world relying on alternative sources of power. The trend is likely to continue, according to a study by Schlumberger Business Consulting, indicating that approximately 22,000 engineers and geoscientists will retire from the industry by 2015.

The components of this perfect storm include:

- Colleges seeing a decrease in those pursuing these degrees
- A recognition that oil and gas is plentiful, as exploration techniques became more sophisticated
- A proliferation of national oil companies (NOCs) throughout the Middle East and Africa, increasing the demand and competition for qualified energy professionals
- A proliferation of independent oil and gas companies that are also expanding from their traditional regional operations into international exploration efforts
- China and India seeking out reserves for huge populations that have become increasingly consumer-based, requiring more and more energy

It is compounded by the retirement of those born between 1954 and 1964 from C-level positions, resulting in a glaring absence of talent available to move into these vacant and projected positions of leadership. Statistically there are few 40-50 year olds capable of running these companies. And while universities are pumping out engineers and geologists, it will be decades before they are ready to run these companies.

The scenario is really very similar to the technology boom in the 1990s which resulted in companies aggressively identifying, recruiting, and ultimately compensating these individuals. The executive talent, albeit scarce, is available. It's just a matter of locating, enticing, and securing these individuals.

Also, there is a growing awareness in the industry that these companies have a responsibility to run environmentally safe and efficient operations.

Present in Angola since 1985, Eni select young people to join the company every year.

Not all doom and gloom

So, it's not all doom and gloom but today's companies must develop a strategy that reaches out across borders while also grooming and retaining younger executives who can move into leadership positions in 15-20 years.

One of the first steps is to fill this gap for the near future. The bad news is that the investment portfolios of the recently retired C-level executives took a hit, but it is also good news.

From a personal level, it's not a good scenario, but from an industry perspective it comes at a good time. These former high-level executives are going back to work as high-priced consultants. They are supplementing in-house teams and mentoring the younger stars being groomed for future leadership positions.

This is a temporary and willing workforce, so oil and gas companies of all sizes must develop a strategy for bringing these valuable resources into the fold They must:

- Locate these individuals
- Develop an attractive package that will give these retirees flexibility along with appropriate compensation
- Allow flexi-time, involving activity on-site and from home

These industries are positioned for remarkable growth and there is no evidence that they will plateau any time in the near future. With Middle East volatility at its peak and the Russian/EU political tension growing, countries will be looking to the US for energy. The only thing conceivably holding these industries back is competent executive talent and leadership. ■

Rick Davis, Stanton Chase International Executive Search
This article was originally produced by Oil & Gas Monitor.

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IRATA Level 2	17th - 21st Aug. 2015 7th – 11th Sept. 2015
IRATA Level 3	24th - 28th Aug. 2015
Assessment days	29th - 30th - 31st Aug 2015 12th – 13th Sept 2015
Rescue at Height	Thurs – Fri [Weekly]
PPE Inspection	Mon - Tues [Weekly]

SCAFFOLDING [CITY & GUILDS APPROVED]	
Scaffold Part 1	3rd – 14th August 2015
Scaffold Part 2	17th - 28th August 2015
Scaffold Inspection	24th – 28th August 2015

NON-DESTRUCTIVE TESTING [ASNT APPROVED]	
Visual Testing [VT] Level I/II	3rd – 7th Aug. 2015 1st – 4th Sept. 2015
Penetrant Testing [PT] Level I/II	10th – 14th August 2015 14th – 18th Sept 2015
Magnetic Particle Testing [MT] Level I/II	17th – 21st Aug. 2015 7th – 11th Sept 2015
Ultrasonic Testing [UT] Level I/II	24th – 28th Aug. 2015 21st – 26th Sept. 2015
Radiographic Film Interpretation [RFI] Level I/II	26th – 30th Oct 2015

HEALTH, SAFETY & ENVIRONMENT	
Working at Height	Mondays [Weekly]
Confine Space Operations	Thurs – Fri [Weekly]
Manual Handling	Weds [Weekly]
Basic First Aid	Weds [Weekly]
Basic Fire Fighting	Tues [Weekly]

LIFTING OPERATIONS [LEEA APPROVED]	
Lifting & Slinging	Thurs – Fri [Weekly]
Rigging Loft Controller & Examiner	27th – 31st July 2015 24th – 28th August 2015
Offshore Crane Operations Stage 1 & 2	3rd – 14th August 2015
Offshore Crane Operations Stage 3	On Request
Appointed Person for Lifting Operations	3rd –7th August 2015 7th – 11th September 2015
LOLER & PUWER	Fri [Weekly]
Forklift Operations	Weds – Thurs [Weekly]
Mobile Crane Operations	Mon – Tues [Weekly]

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CGG nets Tanzania shoot

CGG HAS BEEN awarded a contract by the Tanzanian Petroleum Development Corporation (TPDC) to acquire high-resolution gravity gradiometry and aeromagnetic data over two onshore areas along the Southeastern Tanzanian Coastal Basin and the eastern arm of the East African Rift.

Acquisition over a total area of 30,000 sq km will commence in mid-August 2015 and is scheduled to last up to two months. Using the industry's lowest noise gravity gradiometry, Falcon, CGG will deliver high-resolution data and interpretation to help evaluate the hydrocarbon potential of these basins ahead of future licensing rounds.

Tanzania has already established itself as a highly prospective hydrocarbon province in East Africa with a series of significant discoveries offshore and CGG says it is excited to be part of this next phase of TPDC's exploration of the onshore basins. This survey will benefit from the experience gained through the completion of many projects throughout Africa, using the most advanced technologies available in the industry

Greg Paleolog senior vice president CGG Multi-Physics, said: "CGG is delighted to work with TPDC to improve understanding of the structure of these basins and to assist in the identification of suitable areas for future seismic acquisition. With the selection of our Falcon service, we can ensure that TPDC and potential operators will have the best quality data and interpretation products ahead of the proposed licensing round."

"We know that there have been significant discoveries in the Kenyan and Ugandan parts of the Rift Valley, and there may well be undiscovered oil or gas reserves on Tanzania's side," Dr. Mataragio, managing director of TPDC explained. "This survey is imperative, given the significant reserves discovered in similar geological settings in Kenya and Uganda. "

Alima starts Gambia 3D operation

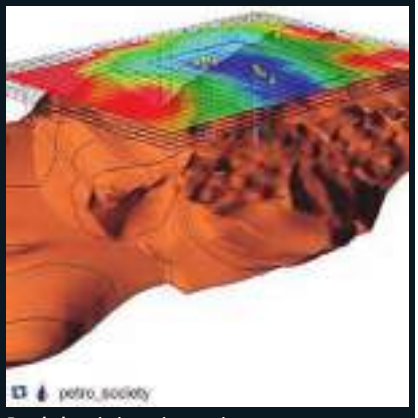
POLARCUS HAS BEGUN acquiring 3D seismic over two blocks operated by Camac Energy Gambia.

The 12-streamer 3D/4D vessel vessel Polarcus Alima should take around 50 days to cover 1,500 sq km over the A2 and A5 blocks, 45 km off the Gambian coast. Both are said to be on-trend with Cairn Energy's deepwater FAN-1 and SNE-1 discoveries offshore Senegal.

Kase Lawal, chairman and CEO of Camac parent company Erin Energy, said, "The acquisition of 3D seismic data in this emerging West Africa margin basin will provide valuable pre-drill information that is key to evaluating the exploration potential of these blocks, which are in close proximity to recent offshore Senegal oil discoveries."

Complex geology reliably illuminated

SCHLUMBERGER HAS ANNOUNCED the launch of the depth domain inversion services. Schlumberger petrotechnical experts use the services to improve the reliability and consistency of seismic structural and quantitative interpretation in complex environments. "Conventional seismic inversion in the time domain introduces inconsistency between the seismic images and the rock properties, especially where there's a significant overburden, such as subsalt," said Maurice Nessim, president, Schlumberger PetroTechnical Services. "With depth domain inversion services, customers receive more information derived from seismic data for reservoir characterisation. This helps reduce uncertainty in complex reservoir environments, improve the confidence in prospect delineation, reservoir properties and volumetric calculations."

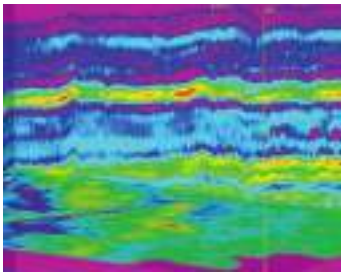


Depth domain inversion services.

Performing seismic inversion in the depth domain fully integrates the inversion with the imaging products to improve the reliability of estimating rock properties for reservoir characterisation. This is done by correcting for depth space and dip dependent illumination effects during seismic amplitude inversion directly in the depth domain. Depth domain inversion services have been successfully applied in complex geological environments in North and South America.

Greater seismic accuracy with PrecisION

ION GEOPHYSICAL CORPORATION has launched PrecisION, an innovative compressed seismic inversion process that builds earth reconstructions with improved accuracy and aids geoscientists in better quantifying exploration and development risk and uncertainty.



Unlike conventional inversion algorithms, PrecisION performs analytical processes in the Eigen domain, a province in which useable data is more readily separated from noise to produce highly stable inversion results.

Its unique, flexible approach is applicable to both land and marine environments, making it a more effective general solution for earth reconstruction especially in intricate areas that face either sharp boundary or subtle gradient changes.

"PrecisION addresses the industry's need for better subsurface images by taking an innovative approach to quantitative geophysics, " noted Paul Farmer, vice president of ION's Innovations group. "

PrecisION is uniquely engineered to exceed the inherent limitations of previous and current techniques, and delivers much improved accuracy when analysing complex geologic areas.

We designed PrecisION to specifically complement the growing industry movement toward broadband seismic, a movement that seeks to leverage advanced technological capabilities to further reduce uncertainty and improve understanding."

PrecisION enhances decision-making by quantifying the risk indicated in inversion results, with displays that provide visual verification of the reliability of those results.

A geophysicist can use this information, for example, to more accurately assess the uncertainty between well and seismic tie relationships, more fully understand lithology and fluid presence characteristics, and to determine a level of confidence in the data correlation.

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Mozambique liquefied natural gas, (LNG) stands to transform the country and entrench it as a leading player in the global LNG industry. Developing these reserves and scaling up the currently planned LNG facility to its potentially multi-train capacity, will establish Mozambique as one of the largest exporters of LNG, a commodity of increasing global prominence.

After LNG - what next?

MOZAMBIQUE LIQUEFIED GAS, (LNG) stands to transform the country and entrench it as a leading player in the global LNG industry. Developing these reserves, and scaling up the currently planned LNG facility to its potentially multi-train capacity, will establish Mozambique as one of the largest exporters of LNG, a commodity of increasing global prominence.

Standard Bank estimates that developing LNG in Palma will facilitate a real GDP increase of 800 per cent by 2035 with the Government of Mozambique receiving in excess of US$200bn in receipts over the life of a six-train facility. The opportunity scale, for developers, the Government and citizens of Mozambique, as well as private participants across all sectors, is therefore enormous.

Anadarko and ENI's, together with ENH and their respective partners, world-scale discoveries will need large volumes of contracted LNG sales to underpin the sizeable offshore and onshore development requirements associated with monetising the gas.

Scope to provide gas locally and regionally

"There is significant scope to provide gas to the local market to foster gas-based industrial development," said Simon Ashby-Rudd, global head oil & gas at Standard Bank. "This option has attracted interest from a number of players across power, fertiliser/petrochemicals and gas-to-liquids (GTL). As Mozambique develops into a global energy player, so too can it potentially become a regional energy hub providing petroleum products, chemicals and power to neighbouring countries. Regional LNG import options are developing at a rapid pace and Mozambique will also be well-positioned to serve these."

South Africa has recently announced the procurement of approximately 3,000 MW of gas-fired power, which, given the country currently has no material gas-producing assets capable of supporting such plants, will likely require LNG imports.

"A 2015 Final Investment Decision (FID) of Mozambique LNG would be a game-changing development for Mozambique and be key to unlocking future investment in the country and begin the geopolitical repositioning of Mozambique," he said. While moving gas from the Rovuma Basin to southern Mozambique is subject to its own economics and wider strategic consideration, there remains potential for gas-based development around Maputo through, for example, compressed natural gas, (CNG), in the short-term or a dedicated pipeline in the longer term. Such developments could facilitate industrial development around Maputo, as well as meeting South Africa's energy shortfall and generating additional revenue streams. These would of course be subject to other power/petrochemical/GTL developments further north and continued progress on the rolling out of further LNG trains over the next decade.

Ashby-Rudd noted that gas-based industrialisation leveraging multiple LNG train developments has underpinned the economic growth of Qatar, Oman, and Trinidad and Tobago. While there is large potential for this to be replicated in Mozambique, outstanding items still remain in realising such an opportunity. These include:

- Finalising the development of the LNG facility near Palma and extending this to further trains which underpin the scalability of domestic gas volumes;
- Concluding domestic gas sales agreements (including volumes and pricing structures) and fiscal terms surrounding the resultant projects, noting that multiple field developments are needed;
- Finalising the gas allocation mechanism to individual projects; and
- Addressing project-specific requirements and permitting (eg, IPP bid-round procedures; GTL facilities are underpinned by different dynamics relative to petrochemicals and each will require special considerations).

Anadarko has selected a consortium consisting of CB&I, Chiyoda and Saipem (CCS JV) for the initial development of the onshore LNG park in Mozambique.

The domestic gas possibilities are underpinned by LNG and the majority of the gas for such purposes will come from the Prosperidade and Mamba fields which are expected to be developed for trains three onwards. Therefore, completing the first trains and the associated infrastructure upon which more trains will be developed should be a priority and is seen as a first step for truly unlocking the potential domestic gas holds for Mozambique, in line with the Gas Master Plan.

In addition to the above, challenges specific to location (land, water, local market demand etc); global factors such as the oil price, downstream market developments as well as regional developments, (eg, South Africa resolving its energy crisis), will all impact decision points as domestic gas industries develop. Resolving these outstanding items in the next 18 months will place Mozambique in a leading position to entrench itself in the energy landscape regionally, and do so well ahead of the 2019 national elections.

"As the largest bank in Africa by assets, together with our strategic partner ICBC, we see energy and industry growth in Africa as a significant opportunity. Hence we play an active role in maintaining this growth momentum by helping clients, projects and governments raise capital and manage risk to advance projects and drive investment," said Ashby-Rudd. "Standard Bank is optimistic about Mozambique's large potential. Banks grow when economies grow."

Noting the growth potential of Mozambique, Standard Bank has supported Anadarko's progress, raising awareness and understanding of LNG and the benefits it offers the country.

Ashby Rudd believes that Mozambique LNG and the developments that are possible stemming from it can drive sustained growth and industrial development in Mozambique.

Standard Bank combines deep local expertise with global market access to assist all stages of project development to realise such opportunities. Standard Bank is actively engaged in this process in Mozambique and hopes to help investors, the Government of Mozambique and its citizens benefit from the significant potential on offer.

"While both the LNG and domestic gas opportunities are major drivers of these benefits, LNG corporate and associated contract completion is the first step and should be prioritised to fully finalise within the next 12 months," said Ashby-Rudd. "With LNG developments underway, this opens the opportunity to leverage LNG developments to significantly advance discussions with downstream project developers and implement industrialisation in line with the Gas Master Plan." ■

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Eni finds gas at Nooros in Nile Delta

ITALIAN MAJOR ENI has made a gas discovery in the Nidoco NW2 Dir NFW well, located in Nooros exploration prospect of the Abu Madi West license, in the Nile Delta, 120 km northeast of Alexandria, Egypt.

The company identified "a 60 metre-thick gas bearing sandstone interval of Messianian age with petrophysical properties, further of other gas layers in the overlying Pliocene section. The well was drilled to a depth of 3,600 metres", the company reported. "Preliminary estimates of the discovery account for a potential of 15bn cu metres of gas in place with upside, plus associated condensates".

The company said it will put the well into production in two months' time (September 2015) "through a tie-in to the existing Abu Madi gas treatment plant, located 25 km southeast."

"This discovery is the result of Eni's new strategy to re-focus its activity on near field and incremental exploration opportunities with high potential value, which allow in case of success their quick exploitation through the already existing and synergic nearby infrastructure".

Eni, through its subsidiary IEOC Production BV, holds a 75 per cent stake of working interest in the West Abu Madi development lease, with BP as a partner with 25 per cent. Petrobel, equally owned by Ieoc (50 per cent) and EGPC (50 per cent), is the operator of the concession.

World Bank propels Sankofa gas scheme

THE WORLD BANK has approved US$700mn in guarantees for Ghana's Sankofa gas project, which is designed to alleviate the country's serious energy shortages by developing new sources of natural gas for domestic power generation.

The approval is in the form of an IDA Payment guarantee of US$500mn that supports timely payments for gas purchases by Ghana National Petroleum Corp, and an IBRD Enclave Loan guarantee of US$200mn that allows the project to secure financing from its private sponsors.

These payments should lead to US$7.9bn in new private investment being mobilised for offshore natural gas, the largest foreign direct investment in Ghana's history.

Sankofa, 60 km offshore, comprises five oil and gas fields in the offshore Cape Three Points block in water depths of 600-1,000 metres. Development will be via subsea production systems connected to an FPSO, with the gas sent through a pipeline to reception facilities on the coast of western Ghana.

Eni operates in partnership with VITOL, with production due to start up in early 2018.

Ophir awards FEED contracts for Fortuna FLNG

OPHIR ENERGY HAS awarded upstream front-end engineering and design (FEED) contracts for the Fortuna floating LNG (FLNG) project in block R, offshore Equatorial Guinea to two contractor consortia.

One is McDermott Marine Construction and GE Oil & Gas UK. The other is Subsea 7 and Aker Solutions.

The scope of work includes subsea development design that will enable the two competing consortia to submit their engineer, procure, construct, install and commission (EPCIC) tenders at the end of FEED, on the basis of which one of them will be selected for final investment decision (FID).

Focus areas for the FEED process will be defining the number of wells required at first gas, the cost of development and delivery time of the long lead subsea items such as subsea trees. The process will be completed at the end of Q1 2016 so that the FID can be made in mid-2016 with first gas expected in 2019. Ophir had announced in May that Golar LNG will be the midstream partner for the project. Golar LNG will build, own and operate the FLNG vessel — the Gimi.

Ophir Energy CEO Nick Cooper said, "With the appointment of Golar LNG as midstream partner and the commencement of FEED, the project has strong momentum. Ophir Energy's focus will now switch to securing buyers for the LNG offtake and to bringing in an equity partner prior to our mid-2016 FID. Numerous potential counterparties have recently expressed interest in the offtake and partnering opportunities."

The company is also considering a second FLNG vessel to develop unallocated gas resources in block R. It would likely take an investment decision once the Fortuna field has started production, with a view to having the second vessel operational by the middle of the next decade.

CEO Nick Cooper said: "The selection of FLNG to monetise our block R resource base has drastically reduced gross development capex to first gas from the c.US$3bn estimates for a conventional LNG plant to c.US$800mn for FLNG, and has also reduced development lead time; thereby accelerating first gas by two to three years to 2019...

"The potential application of a second leased FLNG vessel...would accelerate the production of contracted resource and expand the total resources base to be commercialised. A second vessel would be synchronised with the cash flow from the initial trains, thereby minimizing capex exposure to Ophir and materially increasing the Fortuna FLNG project's overall value."

Gas flowing from Moroccan shale

IRISH EXPLORER CIRCLE Oil, which focuses on North African reserves, said gas was flowing from its first shale well drilled into a basin in Morocco.

The company said it reached a stabilised flow rate of 1.9 million cubic feet per day (cfd) in its LAM-1 well in the Lalla Mimouna permit area onshore Morocco.

"We are delighted that our first well on the Lalla Mimouna block has such positive results, flowing gas at significant rates," Circle CEO Mitch Flegg said in a statement. "The productivity of this first well is very encouraging for the expansion of Circle's portfolio of Morocco gas fields."

Gas flowing from Moroccan shale.

Morocco is one of the North African countries that have drawn interest from international energy companies eager to tap into unexploited reserves. Onshore, the country holds an estimated 20 trillion cubic feet of recoverable shale oil and natural gas reserves.

Rival company Gulfsands Petroleum in early 2015 said natural gas was flowing at a rate of 10mn cfd at a test well in northern Morocco.

Gulfsands, which has headquarters in London, said last year it planned to spend US$3.5mn to develop its acreage in northern Morocco.

Uganda to start building oil refinery

CONSTRUCTION OF AN oil refinery in Uganda's Hoima district is expected to start before December this year, the country's Ministry of Energy and Mineral Development has said.

"It is anticipated that construction will start in 2015 and the first phase of the refinery will be ready around 2018," said Catherine Bekunda, communications officer in the Ministry of Energy's directorate of petroleum.

She added that a feasibility study has been finalised and land acquisition for the refinery is ongoing, with construction to start after the government's negotiations with the appointed investor are complete and when land for the project is fully acquired.

The selection process for the lead investor is in the final stages, noted Bekunda. According to an announcement in February this year, a consortium led by Russia's RT Global Resources had been identified as the best bidder while a South Korean consortium led by SK Engineering & Construction Company had been named the alternate preferred bidder. The selected investor will have a 60 per cent stake in the refinery, with the remaining 40 per cent to be held by the Ugandan government.

The refinery will be developed in phases, with the initial phase producing 30,000 barrels per day (bpd) before gradually increasing to 60,000 bpd. The cost of the project is expected to be around US$2.5bn.

Bekunda also said that the ministry expects about 700 oilwells to be drilled in the region between 2016 and 2024.

Technip to upgrade Egypt refineries

TECHNIP ITALY HAS finalised two joint agreements valued at a total of US$2.9bn with Egypt-based companies for upgrades of two refineries in the North African country.

Technip and SACE announced the finalisation of a joint agreement with Midor (Middle East Oil Refinery) for a project to modernise and expand the Midor refinery near Alexandria. The investment has an estimated total value of US$1.4bn and aims at improving the production quality of the plant, considered the most advanced of the African continent, by increasing its refining capacity from 100,000 to 160,000 barrels per day (bpd) of crude oil.

SACE has committed to launch the evaluation process in order to ensure an export credit facility to support the project, the statement said, noting that Technip will in parallel start the activities on the project.

In due course, Technip will take responsibility for the EPC phase of both the projects, according to the statement.

In another development, the contract with Egyptian General Petroleum Corporation (EGPC) and Assiut Oil Refining Company (ASORC) for the modernisation project of the Assiut refinery, Upper Egypt, is designed to refine the "bottom of the barrel" in the frame of the long-standing co-operation between Italian and Egyptian Governments and companies, especially in the oil and gas sector.

The investment has an estimated total value of US$1.5bn, aims at maximising diesel production, and will introduce the most modern refinery technologies in Upper Egypt to meet the growing local demand for petroleum products. Technip will now start activities for the project, as well as providing support to ensure project financing, a statement said, adding that SACE is ready to evaluate a possible intervention to support the project.

BW Gas to provide Egypt with floating LNG terminal

NORWEGIAN GAS SHIPPING company BW Gas will provide Egypt with a liquefied natural gas (LNG) floating import terminal under a five-year contract, according to state company EGAS, as the government grapples with energy shortages.

The deal is worth about US$60mn per year, Oil Minister Sherif Ismail told Reuters.

Once an energy exporter, declining oil and gas production and increasing consumption has forced Egypt to divert energy supplies to the domestic market, turning it into a net energy importer.

The floating regasification and import terminal, which converts super-cooled LNG into gas, is Egypt's second. An import terminal from Norway's Hoegh LNG arrived in Egypt in April, allowing Egypt to begin LNG imports.

The new terminal will have a capacity of 750mn cfd, and will start pumping gas into the national grid in mid October, EGAS said in a recent statement.

"The terminal will arrive at the Ain al-Sokhna port in late September," the statement said.

EGAS put out a bid on 3 July to import LNG for the terminal and closed the bidding on Sunday, EGAS Chairman Khaled Abdel Badie said in the statement.

The company is evaluating the bids ahead of choosing which companies to import around 45 cargoes of LNG from, he added.

EGAS is also in talks over importing additional LNG cargoes with Russia's Gazprom and Algeria's state-owned oil and gas company Sonatrach, he said.

Egypt had agreed in April to import around US$3.55bn worth of LNG in the 2015-2016 financial year, including 35 LNG cargoes from Gazprom over five years and six from Sonatrach.

Ismail told Reuters in February that he expected Egypt to stop importing LNG by 2020 as energy deals signed with foreign companies and oil field development agreements come to fruition.

New oil pipeline for Kenya

THE KENYA PIPELINE Company (KPC) has signed a US$350mn loan with a consortium of local and international banks for the construction of a new 20-inch, 450 km ultra-modern petroleum products pipeline from Mombasa to Nairobi.

The loan will constitute 70 per cent of the estimated total cost of US$484mn, with KPC funding the remainder, with construction to be undertaken by Zakhem International Company. Among the banks in the consortium are CfC Stanbic, Commercial Bank of Africa, Co-operative Bank, Standard Chartered Bank and Rand Merchant Bank.

It is expected that the new pipeline will replace the existing 35 year-old pipeline whose use has been extended by over 10 years. The new pipeline is expected to enhance product flow from 730,000 litres per hour on the existing pipeline to one million litres per hour, thereby eliminating stocks-outs. "With the new pipeline, product flow will meet the current and future demand in the rapidly growing region served by KPC," observed John Ngumi, KPC's chairman.

The project will include the installation of new pumps in Changamwe, Maungu, Mtito Andei and Sultan Hamud. Two booster pumps will be constructed at Kipevu, on the Port of Mombasa.

Firefighting systems at Moi International Airport, Jomo Kenyatta International Airport, Nairobi Terminal and Kipevu will also be upgraded in tandem with modern pipeline facilities to handle larger volumes in critical locations.

"A bigger pipeline diameter and four new pump stations will boost oil supply in East and Central Africa. It will also act as an important stimulus to growth in the region," said Flora Okoth, acting managing director of KPC.

The new pipeline is part of the on-going expansion programme by KPC which includes the construction of a modern bottom truck-loading facility in Eldoret. Additional storage tanks in the Nairobi Terminal are expected to double the capacity from the current 100mn litres to 230mn litres. The JKIA Greenfields depot is also expected to increase storage capacity from 54mn litres to 126mn litres of jet fuel.

Mwangi Mumero

Savannah signs PSC with Niger

SAVANNAH PETROLEUM HAS signed a Production Sharing Contract (PSC) with the government of Niger for the country's R3/R4 license area.

As part of the deal, a signature bonus payment of US$28mn will soon be made to the state of Niger. Savannah has already mapped 29 leads across the R3/R4 PSC area with a range of closure sizes similar to existing discoveries in the basin, according to a company statement. Under the PSC for the R3/R4 license area, the state of Niger's public participating interest in the region will be set at 15 per cent.

The minimum work programme for the area requires the acquisition of 748 sq km of 3D seismic data and the drilling of two wells during the initial period of the exclusive exploration authorisation (EEA), 500 sq km of 3D seismic and two wells during the first renewal period of the EAA and 249 sq km of 3D seismic and two wells during the second renewal period of the EAA.

Andrew Knott, CEO of Savannah Petroleum, commented in a company release: "The signing of the R3/R4 PSC is another landmark transaction for Savannah. We have now licensed circa 50 per cent of the Agadem Rift Basin, which the board believes places the company in a very strong position for the future given our assessment of the scale, risk profile and cost structure of our assets.

I would again like to thank the government of Niger for awarding the PSC to us, and for their support over the past three years. Savannah will now move to commence what we expect to be an aggressive exploration programme over our licenses which we hope will deliver material benefits for all of our stakeholders over the coming years."

TEN on target for mid-2016 start-up

TULLOW SAYS ITS three-field TEN development project offshore Ghana is around 65 per cent complete and on schedule for first oil in mid-2016. Highlights during the first half of this year include running two well completions and starting work on a third; installing four subsea christmas trees; completing fabrication in Ghana of anchor piles for the FPSO, ahead of the offshore installation campaign which started earlier this month; and transportation of specialist subsea manifolds and umbilicals, now in transit from the US.

Conversion work on the TEN FPSO continues at the Jurong Shipyard in Singapore. All major modules are installed and integration works are under way. A naming ceremony is due to be held in September with the vessel set to sail for Ghana around year-end.

Tullow and its partners continue incremental development of the nearby Jubilee field with two additional wells. The J-37 oil producer was drilled in early July and should come online in September, while the J-36 water injector is due to be drilled during Q4.

The company remains in discussions with the government of Guinea on the resumption of petroleum operations in its offshore exploration blocks. Force majeure was lifted on the block after a US regulatory investigation of partner Hyperdynamics was dropped. Drilling of the Fatala exploration well depends on the outcome of these discussions and the status of the Ebola situation in Guinea.

The FPSO has been named after Professor John Evans Atta Mills.

Otakikpo project scheduled for Q3 start-up

LEKOIL HAS ISSUED an update regarding operational activity at the Otakikpo marginal field.

Courtesy: Lekoil.

Re-entry activities on Otakikpo-002 started with the successful drilling-out of the cement plugs in the 9-inch casing. While attempting to drill-out the cement plugs in the 7-inch liner, the rig crew noticed a potential critical safety issue around the crown block of the rig which has forced temporary suspension of re-entry activities, for safety reasons, pending repairs and replacement of equipment. No injuries were incurred due to the proactive actions of the trained rig crew.

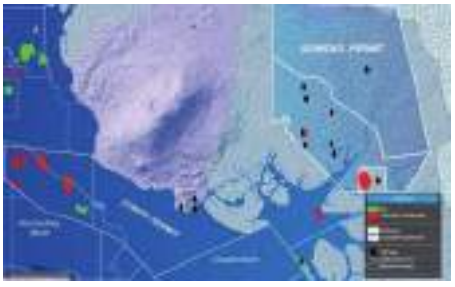
Due to the interruption, first oil is now expected to flow from the Otakikpo-002 to the early production facility (EPF) by the end of Q3. Otakikpo-002 and Otakikpo-003 are planned to be recompleted for Phase 1 of the development, which also includes the installation of the 6,000 bpd capacity-EPF facility.

Otakikpo is located in oil mining lease 11, about 60 km southeast offshore Port Harcourt, in a coastal swamp location. According to Lekoil, the field holds 2C recoverable resource estimates of 56.75mn bbl.

The field development plan consists of two phases. Following Phase 1, Phase 2 covers the subsequent incremental development of the rest of the field with a new central processing facility and seven new wells coming onstream during 2017.

Bowleven discovers hydrocarbons onshore Cameroon

BOWLEVEN HAS ANNOUNCED that Zingana, the first in a two well exploration programme on the Bomono Permit onshore Cameroon, has discovered hydrocarbons.



The well, which has been drilled to its planned total depth and logged, encountered hydrocarbons in the Paleocene (Tertiary) aged reservoir intervals and detailed log evaluation is currently being undertaken. The rig used to drill Zingana will now be moved to the second planned well in the company's 2015 exploration programme, Moambe, which is located just over one mile east of Zingana in the previously undrilled Paleocene (Tertiary) aged robust three-way dip closed fault block.

Bowleven announced that the Zingana well had spud 1 June and revealed that the well would be drilled to an estimated target depth of 1,829 metres. In its most recent press release, the company stated that both the Zingana and Moambe wells would be drilled, logged and evaluated prior to determining any testing plan.

Bowleven is the operator in the Bomono Permit, which is located in the onshore extension of the Douala Basin, and holds a 100 per cent interest in the site.

Commenting on the progress of the company's 2015 exploration programme, Bowleven chief executive Kevin Hart said in a company statement: "We are encouraged by the well results to date at Zingana. The evaluation of log and well data acquired at Zingana is continuing and we are now looking forward to drilling the second exploration well in the programme, Moambe."

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MX Oil spuds Aje 5 well

MX OIL HAS started drilling on the Aje 5 production well, located in the Aje Field on the OML 113 license offshore Nigeria.

Once drilling operations at Aje 5 are completed, which is expected to be early in October, according to a company press release, the Scarabeo 3 (mid-water semisub) used to drill the well will complete the Aje 4 well. These two wells represent the first of a three-phase development programme for Aje. Phase one is targeting first oil in December 2015 and peak gross production from these two wells is expected to reach 11,000 bpd of oil, as stated in the June 2015 Competent Persons Report. The CPR also states that Phase two is targeting an increase in gross production to 19,000 bopd from an additional two-well development.

MX Oil CEO Stefan Olivier commented in a company statement: "This is a major milestone for MX Oil. Having only very recently invested in the Aje field via Jacka Resources and with Aje 5 now being spudded, MX Oil is now progressing quickly towards significant near term production. This is the first of two planned wells in Phase one from which our CPR states a target peak gross production of 11,000 bpd. These production figures are expected to increase to 19,000 bpd gross in Phase two."

Gulf, Pacific win block

EGYPT'S MINISTRY OF Petroleum division Ganope has awarded Gulf Hibiscus and Pacific Oil an offshore exploration block in the southern Gulf of Suez.

The South East Ras El Ush concession (Block 2) covers 68 sq km in water depths up to 75 metres, and is surrounded by development leases. It contains the West Ashrafi discovery, which was included in the award and may be developed via a tie-in to nearby onshore infrastructure.

Two wells drilled in the West Ashrafi field tested commercial oil and gas.

Seychelles-based Pacific Oil will operate the concession, using its management team's experience in Egypt.

AFRICAN RIG COUNT

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

JULY 2015 - OFFSHORE

	JULY 15	JUNE 15	VARIANCE	JULY 14	JUNE 14	VARIANCE
Country	Offshore	Offshore	From Last Month	Offshore	Offshore	From Last Month
ANGOLA	18	20	-2	23	23	0
NIGERIA	13	13	0	13	14	-1
GABON	5	5	0	5	7	-2
CONGO (BRAZZAVILLE)	3	3	0	3	3	0
MOZAMBIQUE	0	1	-1	2	2	0
GHANA	3	1	2	3	2	1
CAMEROON	2	1	1	3	2	1
EGYPT	17	17	0	16	16	0
TUNISIA	1	2	-1	2	2	0
SOUTH AFRICA	2	1	1	3	3	0
TANZANIA	0	0	0	2	1	1
EQUATORIAL GUINEA	0	1	-1	2	1	1
NAMIBIA	1	0	1	1	0	1
LIBERIA	0	0	0	2	2	0
LIBYA	1	1	0	1	1	0
SENEGAL	0	0	0	1	1	0
COTE D'IVOIRE	1	1	0	0	0	0
BENIN	0	1	-1	1	1	0
MOROCCO	1	1	0	2	2	0
TOTAL	68	69	-1	85	83	2

Source: Infield Systems Ltd.

Angola pre-qualifies 84 companies to bid for 10 onshore blocks

SONANGOL, THE ANGOLAN state hydrocarbon company cum industry regulator has invited 84 companies from over 12 countries to submit their proposals for 10 onshore acreages in the country. 47 of those companies are invited to bid as non-operators, while 37 are prequalified as operators.

Italian giant Eni, US major Chevron and London-listed Tullow Oil, are among those pre-qualified as operators. The list also includes Colombia's EcoPetrol, Portuguese firm Galp Energy, Austrian independent OMV and the Anglo Swiss conglomerate Glencore, the prominent oil trader now vigorously paddling upstream.

The acreages include

Onshore Baixo Congo .....three blocks (CON 1, CON 5 and CON 6)

Onshore Kwanza .....seven blocks (KON3, KON 5, KON 6, KON 7, KON 8, KON 9 and KON 17)

Although there is a significant number of Angolan indigenous firms, the prominent presence of key international companies seems to counter the narrative that this lease sale was largely meant for fast-tracking the indigenisation of the Angolan E&P space.

Still the preponderance of Angolan companies among the companies pre qualified as non operators make it seem right to argue that this bid is largely meant to help local independents gain a foothold in the industry. Operatorship is not exclusive to international oil companies though. The Brazillian behemoth Petrobras is pre-qualified as a non operator while Somoil, the Angolan minnow, has been invited as an operator

The bid terms for all the blocks however clearly state that 20 per cent block participation will be awarded to the competing Angolan companies.

Africa's energy sector remains fertile ground for EPC contractors, which offer convenient turnkey solutions for the major operators, but it's a tricky business to be in.

EPC contractors - One stop shop

NO PROJECT IS simple when it comes to the oil and gas industry. The technical complexity of extracting hydrocarbons from the ground, potentially located miles offshore, deep beneath the seabed, is only part of the equation.

This work has to be done safely, of course, and typically to a strict budget and timescale.

Developing large-scale plant and infrastructure to accommodate and process any oil and gas again throws up a whole bunch of additional challenges.

So, if there's any chance of layering in a degree of simplicity then it makes perfect sense for operators, especially on super-sized developments where costs might stretch into billions of dollars.

Indeed, oil majors in Africa are closely aligned with all the key engineering, procurement and construction (EPC) contractors that offer turnkey solutions for such major projects.

An aerial view of the recently completed Azito complex thermal power plant in the Côte d'Ivoire by Hyundai E&C.

Critically, among the larger players, this EPC expertise can even stretch into the financial realm as well, an integral part of any major energy project.

It's easy to see why too

These providers offer a wealth of experience and a wide range of expertise across the industry, both upstream and downstream.

Tried and tested, they can lift some of the pressure from the shoulders of the project sponsors - though usually at a price.

Angola LNG is not expected to resume commercial operations until early 2016.

On the largest developments, EPC contracts themselves can easily push the billion dollar mark.

Sounds familiar

As well as offloading the work and responsibility to a third party, among the key advantages for oil majors in awarding EPC contracts are better management of risks and overall reduction and visibility of costs.

In some cases, the contractor carries the project risk for both schedule and budget in return for a fixed price, a so-called lump sum turnkey contract.

There are plenty of familiar industry names that have a helped build Africa's oil and gas industry into what it is today, hand in hand with the major operators like Shell and BP.

South Korea leads the pack with a glut of EPC heavyweights: Samsung Engineering, SK Engineering & Construction, Daelim, Hyundai Engineering & Construction and GS Engineering & Construction.

US players include CB&I, Fluor Corporation and McDermott, while familiar European names include Technip (France) and Saipem (Italy).

Other notable EPC contractors active in Africa's energy sector include JGC Corporation (Japan), Larsen & Toubro (India), Tecnicas Reunidas (Spain), Petrofac (UK) and Consolidated Contractors (Greece), among numerous others.

Financial gains

Critically, among the larger players, this EPC expertise can even stretch into the financial realm

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as well, an integral part - and often a difficult stumbling block - of any major energy project.

Most recently, Technip Italy SpA - a part of the Technip family - worked closely with Italian export credit agency SACE to enable it to proceed with the modernisation and expansion of two of Egypt's flagship refineries.

Collectively, it entails co-ordinating almost US$3bn dollars worth of investment.

At the Middle East Oil Refinery (MIDOR), near Alexandria, the US$1.4bn project will boost capacity from 100,000 bpd to 160,000 bpd.

SACE is to explore an export credit facility to help support the project in parallel with Technip, which will take responsibility for the EPC phase of the project.

In the second development, worth US$1.5bn, Technip will also modernise Egypt's Assiut refinery, again with the financial clout of SACE underpinning the deal.

Busy market

Other recent project activity includes Australia's WorleyParsons signing up the Fortuna project from operator Ophir Equatorial Guinea (Block R) Limited to provide engineering and project management services.

Block R is a gas development off 140 km southwest of Equatorial Guinea's Bioko Island in water depths ranging from 1,400 to 1,900 metres.

Ophir wants to develop the area's gas reserves through the phased installation of a 20-well subsea production system supplying dry gas to a locally moored floating liquefied natural gas (FLNG) facility with a capacity of three million tonnes per annum (mtpa).

The outlook for all EPC contractors is being shaped by other developments too.

The scope of the engineering and project management services includes overseeing the front-end engineering and design, tendering and evaluation of related engineering, procurement, construction, installation and commissioning packages.

The work will be done by WorleyParsons and its deepwater division, INTECSEA.

Indeed, Africa's LNG sector has proved an especially fruitful market for leading EPC providers in recent times.

CB&I, Saipem and Japan's Chiyoda Corporation were selected in May by Anadarko Petroleum as joint contractors for the development of the onshore LNG park in Mozambique, one of Africa's emerging gas frontiers.

This land-based venture includes two LNG trains, each with a capacity of six mtpa, two storage tanks plus condensate storage, a multi-berth marine jetty and associated utilities and infrastructure.

Anadarko boss Al Walker said the selection of the contracting team marks "a significant step toward reaching final investment decision" on the project.

Other FLNG projects, import and export, are taking shape elsewhere, in Cameroon and Ghana.

Angola LNG

Things do not always go to plan, however.

Angola LNG, built by US contractor Bechtel - which has been involved in multiple LNG plants around the world - has been closed since last year for repairs following fires, gas leaks and other problems.

Chevron, the operator, acknowledges design flaws in the facility but refuses to assign any blame.

Last year, its chief executive John Watson said that he would not "point fingers".

"This is our responsibility; it's a partnership consortium. The partnership consortium chose the contractor. We've run into some design issues. We're working to correct them," he told Reuters in an interview.

Still, it means overall costs have ballooned through the years.

From an original estimate of US$4bn to US$5bn eight years ago, Chevron put the figure closer to US$10bn back in 2009.

That is now likely to be closer to US$12bn to US$14bn according to unofficial estimates.

In terms of performance too it has been hugely underwhelming.

After launching in 2013, Angola LNG only exported a fraction of the cargoes a project of its size would typically produce before closing for repairs.

It is not expected to resume commercial operations until early 2016, once again, way behind a scheduled re-start date of mid-2015.

Local know-how

The outlook for all EPC contractors is being shaped by other developments too.

In line with current industry trends, there is also a shift to accommodate more local expertise and companies in this lucrative, but demanding, side of the business.

Kentz of South Africa has long been an important solutions provider to the regional energy sector, but the trend is likely to be mirrored elsewhere.

Nigeria seems keen on cutting its teeth in this area, with leading private sector conglomerate Dangote Group forging a partnership this year to exploit the EPC niche alongside established player Saipem.

The joint venture, Saipem Dangote E&C, will target the Nigerian and Central and West African engineering and construction markets, offering both technical expertise and financial capabilities.

It brings together Dangote's financial strength and knowledge of the sub-Saharan African energy market, and Saipem's own established EPC capabilities.

Over many years, Saipem's Nigerian unit has delivered turnkey projects including oil, gas and water pipelines, industrial plants, infrastructure, and offshore developments.

For many of Africa's top oil producing states, raising local content is a hot topic so it seems a natural progression that this should encompass the EPC market as well.

Indeed, one of the few positives those involved in the Angolan LNG scheme can point to is the fact that a large slice of the ballooning costs have ended up benefiting local businesses. ■

Egypt's state-owned Middle East Oil Refinery (Midor) seeks to raise US$400mn with an initial public offering (IPO) in the last quarter of 2015. This US1.4bn project, near Alexandria, will boost capacity from 100,000 bpd to 160,000 bpd.

All pipelines and pipework incorporate flanges and welded joints of varying sizes, designs and materials. Piping systems, including flanges and valves, collectively continue to be a major source of hydrocarbon releases, with piping being the single largest contributor. Belzona Polymerics reviews the options.

Flange corrosion protection: isolating the sealing face

TRANSMISSION OF HYDROCARBON products in the pipeline exposes flanges to corrosive action of sour gases hydrogen sulphide (H2S), sulphur dioxide (SO2) and chemically aggressive fluids at elevated temperatures, causing pitting to the pipeline internals and flanges. Thousands of flanges are affected annually on offshore platforms, process chemical facilities and water treatment plants posing serious and costly problems.

Corrosion mechanisms

Corrosion may propagate from localised areas to the whole of the flange face through different corrosion mechanisms and therefore a lot of effort has been put into non-destructive methods of flange face corrosion identification. Traditional non-destructive inspection techniques do not identify the rate and type of corrosion whilst phased array flange inspection is a new and relatively expensive method. Vessel and pipe spool flange face damage becomes apparent only when adjacent pipe spools are removed or if a flange starts leaking either in service or during a leak test. In both cases the equipment's integrity has been lost.

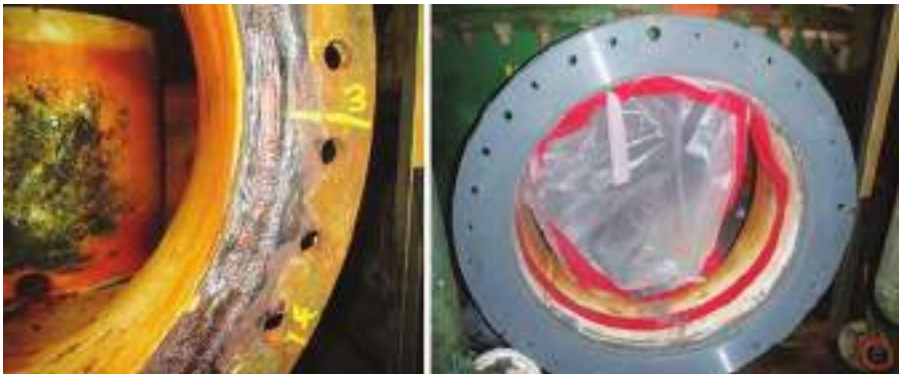
Crevice corrosion has long been the 'Achilles heel' of stainless steel in sea water service, where corrosive materials concentrate between the crevice of the sealing surface and gasket material. This type of corrosion is accelerated by the presence of hydrocarbons with a high percentage of H2S and Cl^-. Flange corrosion will at some point cause subsequent leakage.

Prevention and repair methods

Considering today's economic and environmental climate where leaks are not only costly but can be hazardous to the environment, it is more important than ever to implement a sufficient corrosion prevention plan.

Gaskets under compression are a known and trusted method for corrosion prevention but have been known to fail when exposed to harsh chemicals and thermal deformation of the substrate. Once the flange face is damaged, the flange is no longer sealable by a gasket and requires a replacement or repair. There are four basic types of repair that can be considered:

- Removing the corroded flange and welding a new one
- Site machining of the seal face/ring groove within the flange tolerance
- Weld buttering runs and site machining of the seal face/ring groove



24" flange face before and after composite repair.

- Use of polymer composite repair materials to rebuild the flange face

Repeated cutting and welding may introduce more galvanic problems to the pipe joint and the use of heat can distort the substrate, leading to further stress cracking propagation that could cause accelerated flange corrosion. Site machining and weld buttering requires specialist equipment and hot work, necessitating a hot work permit for welding and cutting. In addition, when flammable materials are present, a plant shutdown may be required. Where possible it is advised to avoid hot work, thus eliminating health and fire risks and speeding up the turnaround.

Complete isolation of the flange faces from the operating environment with the use of epoxy composites that bond strongly to the sealing face can be a viable alternative. The 100 per cent solids composite technology has been on the market for over 50 years, but is only now gaining acceptance for flange face repair applications. The material illustrated in this article is Belzona 1111 (Super Metal) manufactured and supplied by Belzona. The system is cold applied and does not require hot work or specialist equipment. Risk of sparks is furthermore eliminated by minimal requirements for surface preparation. Once mixed and applied, the epoxy paste grade composite acts as a permanent gasket, having excellent compressive strength as per ASTM testing. Tab 1 and Tab 2 illustrate typical values for Belzona 1111 when determined in accordance with ASTM D695 and its modified version, which was adapted to be more representative of in service operation by reducing the thickness of the Belzona material. Epoxy composites will also adhere strongly to a variety of metallic substrates, eliminating galvanic corrosion. Epoxy systems however do not add mechanical strength and would not be suitable in situations where the flange has corroded beyond the corrosion allowance.

Cure Temperature	Compressive Strength (Maximum)	Compressive Strength (Yield)	Compressive Modulus
68°F (20°C)	12525 psi (86.4 MPa)	9620 psi (66.3 MPa)	1.77 x 105 psi (1217 MPa)
212°F (100°C)	16645 psi (114.8 MPa)	10955 psi (75.6 MPa)	1.75 x 105 psi (1205 MPa)

Table 1. Typical values of Belzona 1111 (Super Metal) when determined in accordance with ASTM D695 (1.0 in/25.4mm thick test pieces)

Cure Temperature	Thickness	Compressive Strength (Yield)
68°F (20°C)	0.24 in (6.0 mm)	13095 psi (90.3 MPa)
212°F (100°C)	0.24 in (6.0 mm)	16450 psi (113.4 MPa)
68°F (20°C)	0.12 in (3.0 mm)	19910 psi (137.3 MPa)
212°F (100°C)	0.12 in (3.0 mm)	23840 psi (164.4 MPa)

Table 2. Typical values of Belzona 1111 (Super Metal) when determined in accordance with the modified version of ASTM D695 more representative of in service application.

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Put it to the test

Vigorous laboratory and field testing was performed over the last decade. Results to date show that epoxy materials may be recommended for the protection or repair of weld neck flanges and ring type joint flanges. Testing carried out by Wood Group in 2003 showed that epoxy materials can be used for the repair of flanges for #150, #300, #600 and #900 pressure rating systems with temperatures up to 120°C (248°F) (Tab 3).

The largest independent crude oil and natural gas producers in the world have standardised the use of polymer materials for the repair of flange faces by forming technique. The use of polymer repairs, when undertaken following manufacturer's guidelines, is effective in creating a suitable sealing face and preventing crevice and galvanic corrosion.

4″ flange before and after composite repair.

Test Number	Nominal Pressure (psi)	Tested By	Test Pressure (barg)	Test Temperature (°C)	Comments
1	150	OIS Limited	30 (start)	15	60 minutes soft gasket
			30 (end)	15	No leaks
2	300	Motherwell Bridge Inspection Limited	81 (start)	19.5	30 minutes
			81 (start)	19.5	Soft gasket, No leaks
3	600	Motherwell Bridge Inspection Limited	160 (start)	19.5	30 minutes
			159 (end)	19.5	Spiral gasket, No leaks

Table 3 Wood Group report data on flange face forming performance at different operating conditions.

The most important test: The test of time

Corrosion of the flange face is a common problem affecting pressure vessels, where the face needs to be completely isolated in order to prevent oxidation. Back in 2008, four newbuild pressure vessels, two desalters, a dehydrator and a separator, designed to handle hydrocarbons at 120°C on a Brazil FPSO required corrosion protection. These vessels are critical pieces of equipment that remove high salinity formation water from the crude oil stream. After carefully evaluating design and operating temperatures and pressures as well as anticipating chemical resistance requirements, a total vessel corrosion protection solution was specified. The entire vessel was internally lined with a ceramic filled novolac epoxy coating. Difficult to access areas that commonly suffer from corrosion, such as small bore nozzles and flange faces, were isolated from the environment with the use of epoxy coatings and composites. Prefabricated formers were designed to form the material on the raised flange faces.

The vessels were then put in service on the FPSO operating in the Jubarte field for the next three years. In February 2013, one of the vessels was opened for inspection and the result was described as "flawless". Lining, composite formed flange faces and small bore nozzles were all in excellent condition with no signs of deterioration.

Flange repairs on a North Sea FPSO

In November 2014, a deck water seal of inert gas generator system on an FPSO that handles sea water at ambient temperatures suffered internal corrosion. Existing coating failure led to severe metal loss on the adjacent flanges. 2″, 4″ and 24″ flange faces were reformed with the use of formers and an epoxy composite material. The application was carried out over a weekend and the entire solution, from first notification, including former fabrication for the 24″ flange, was completed in less than a week. The vessel was returned to service with minimum disruption to the production cycle.

4″ flange before and after composite repair

Summary

The use of composite materials for flange face repair and protection is a viable alternative where hot work is undesirable and shutdown may be too costly. Further innovations in polymer materials including faster cure times, surface tolerance and simplified surface preparation techniques make the composite technology even more attractive in both flange maintenance and protection situations. ■

For more information: www.belzona.com

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Ali Ramady, Emerson Process Management, looks at three key elements and challenges behind reservoir modeling in Africa today and how they are contributing to extending field life.

Extending field life in Africa - the role of reservoir monitoring

WITH THE CONTINUED fluctuations in oil and gas prices and the decline in drilling activity, many African operators today are focusing on improving recovery rates and extending life from their existing fields.

Cost containment has also become a key driver at all levels of the industry. In Algeria, for example, state energy company Sonatrach has demanded its service providers cut their prices by up to 15 per cent as the OPEC member country tries to ward off the impact of falling oil prices and reduce the US$23bn a year it currently spends on service costs.

Alongside traditional EOR (Enhanced Oil Recovery) technologies, 3D reservoir modeling is now playing a key role in guiding development decisions at the outset of the field's lifecycle.

3D reservoir modeling is the standard platform for the mapping, understanding and predicting of reservoir behavior. By building a realistic representation of the geometry of the reservoir, operators can accurately map out fluid flows and volumes and make field development decisions that have a major impact on the field's lifecycle and production capabilities for years to come.

This article looks at three key elements and challenges behind reservoir modeling in Africa today and how they are contributing to extending field life. They include the seismic interpretation stage; the need for rapid model updating; and the need to strengthen reservoir modeling skills throughout Africa.

The seismic interpretation stage

Many African prospects are still at the interpretation stage where the seismic has been acquired but obstacles remain as to finding a cost effective means of incorporating such data into the reservoir modeling workflow.

In some cases, the data might be challenging to interpret or changes might need to be made to the interpretation to produce a geologically consistent model. In other cases, the creation of a reservoir model or an accurate prediction of volumes might be required as quickly as possible to help with future field development plans.

There is also the need to understand and quantify uncertainties pertaining to the geological data and reservoir descriptions. How operators achieve this can have a major impact on field development and the lifetime of the field.

Too often, however, operators are faced with cumbersome and bottleneck-ridden workflows at the seismic stage as well as an inherent ambiguity in the data.

Such ambiguity can be down to a number of factors, such as limited seismic resolution and quality, and constraints on velocity for depth conversion. The ambiguity also increases rapidly as the interpreter moves away from control points, such as well logs.

The result is that African operators have inadequate solutions for quantifying geologic risk – especially as they move into more complex tectonic settings and more economically marginal prospects.

Model-driven interpretation

Against this backdrop, Emerson has developed a proven workflow known as model-driven interpretation that allows users to build models directly from the geophysical data. The workflow takes place within Emerson's reservoir modeling software, Roxar RMS.

African operators have inadequate solutions for quantifying geologic risk.

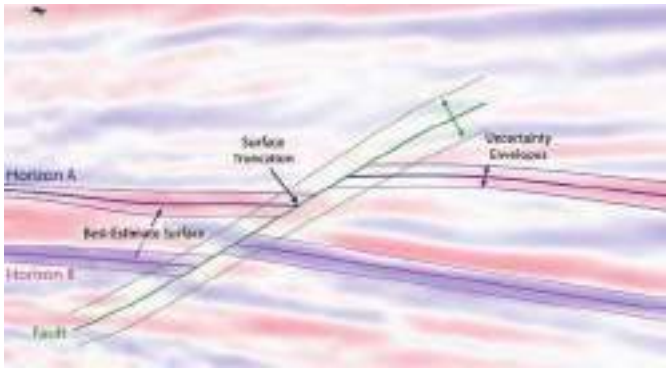

Figure 1 - A best estimate surface and an associated uncertainty envelope.

With the workflow, users can set and collect uncertainty information associated with an interpretation; easily and reversibly test geologic hypotheses; and add more detail to the model as and when required.

The workflow involves a geologically consistent structural model being created (and updated) every time the interpreter makes a measurement of a subsurface feature. Uncertainty information is collected and paired with an interpreted geologic feature (horizon, fault, etc) to create an uncertainty envelope. Here, the interpretation is not merely a collection of control points, but consists of the integrated geological representation of a structural model that satisfies those measurements.

Figure 1 illustrates how measurement uncertainty is applied to a simple seismic section where the interpreter measures a best estimate surface and an associated uncertainty envelope.

The workflow is essentially purpose-driven where users can focus on the critical data points that influence the model - where the faults create a discontinuity horizon depth, for example.

In this way, African geologists and geophysicists can be brought together in the context of subsurface model building with a solution that allows domain experts to quickly integrate and share knowledge across the prospect lifecycle. The result is a faster and more efficient workflow, quick and easy QCing (with no manual deletions of unacceptable points), no bottlenecks through varying data quality, and the ability to handle complex geologies.

Through model-driven interpretation, African operators have a model that has a significant impact on improving field development decisions and extending field life. In one recent offshore Middle East example, the operator used the workflow to quantify Gross Rock Volume (GRV) uncertainty, leading to reduced risk and valuable input into field appraisal and development plans.

Rapid model updating throughout the workflow

Yet, it is not just at the seismic interpretation stage that reservoir modeling is characterised by bottlenecks and inefficient workflows.

Reservoir modeling is also often hidden in silos within organisations and there is a reliance on both a single model and a linear workflow (from geophysics to geomodeling to reservoir engineering) that becomes the basis for field development decisions.

Such models, however, are ill-equipped to quantify the uncertainties associated with different elements of geological data (migration, time picking, time to depth conversion, for example) and can take weeks and months to

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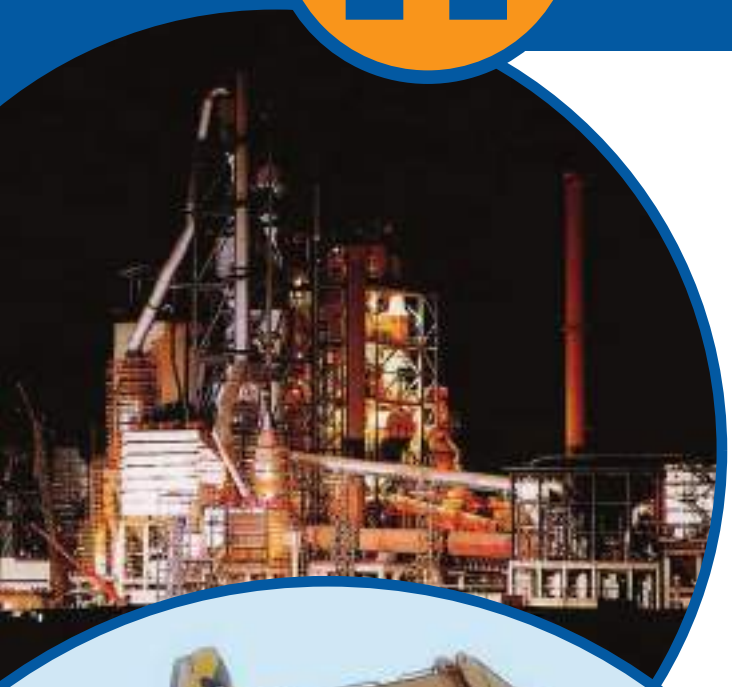

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move from initial model development to full flow simulation. There is also a danger that some data and knowledge won't transfer between disciplines with too many future decisions based on just assumptions.

An alternative solution, however, is a multi-realisation workflow where the modeling process is highly automated and flexible enough to incorporate new data or concepts as soon as they are available and at any time. Such a workflow should also utilise all available data throughout the workflow chain and enable collaboration between disciplines.

That's what has been achieved within Roxar RMS across the prospect lifecycle. Not only is there closer integration between the geophysics and geomodeling domains through model-driven interpretation but a more seamless and flexible workflow right through to simulation via Emerson's reservoir engineering tool, Roxar Tempest.

The modeling workflow generates multiple and consistent models that can capture uncertainties at all levels as well as the ability to incorporate new data, such as newly drilled wells or new velocity models, as and when required. This, in turn, is used by the simulation model for field development planning, well placement and as input to economic analysis.

The latest version of Roxar RMS (Roxar RMS 2013.1) also includes the further integration of fault uncertainty tools with structural modeling and 3D gridding. This enables users to build fault uncertainty models in full and investigate a wide variety of scenarios corresponding to the uncertainty in the input data.

The ability to combine all available data as well as the easy updating capabilities are of significant benefit to African operators – especially due to the huge cost savings when working on existing models rather than creating new models from scratch.

More accurate, consistent and integrated reservoir models, where data and uncertainties can be propagated and linked, can subsequently have a key influence on the future health and lifespan of the reservoir.

Today, many of the world's highest recovery fields are modeled using Roxar RMS – an example of how important it is to get the model 'right'. Together, such workflows enable the estimating of the impact of realistic structural uncertainties on key outcomes, such as volumes in place and simulated reserves, or their impact on well performance and net present value.

The ability to combine all available data as well as the easy updating capabilities are of significant benefit to African operators .

The reservoir engineering phase

Effective and robust reservoir modeling workflows are also crucial as input into reservoir simulation and history matching. Emerson also provides a full range of reservoir engineering and simulation tools not just for reservoir simulation but also for the gridding and upscaling of geological models, visualisation of results, assisted history matching and production uncertainty predictions.

In one example, US-based Norwest Corporation and its client needed a reliable full-field simulation model to optimise high-pressure air injection and a horizontal infill drilling programme for a tight reservoir in the Williston Basin in the US.

Through the adoption of Roxar Tempest, they achieved an excellent history match, and used the model to optimise the timing and sequence of infill drilling, and to convert producers to injectors.

Production and injection forecasts matched actuals at the end of the first year - even during transient operations - and estimated recovery was more than doubled. Such technologies can be applied to Africa as well.

Building & strengthening skills – The Roxar Academy

Using reservoir modeling to help extend field life in Africa's fields, however, remains dependent on not just the technology but also the asset team members.

To this end, there is a need in Africa to transform technicians, graduates and asset team members - new to the latest reservoir modeling developments - into highly productive and proficient team members. This must be achieved against a backdrop of falling oil prices and a focus on cost containment.

With these issues in mind, Emerson has established the Roxar Training Academy in Africa with the goal of increased reservoir modeling skills in-house.

Skills taught cover both general reservoir modeling skills and those specific to Roxar RMS. In the former, for example, they might include advanced reservoir modeling techniques, dynamic analysis, well planning and reservoir uncertainty, and in relation to Roxar RMS, topics might include simulation grid design and upscaling, well planning, and advanced structural and property modeling.

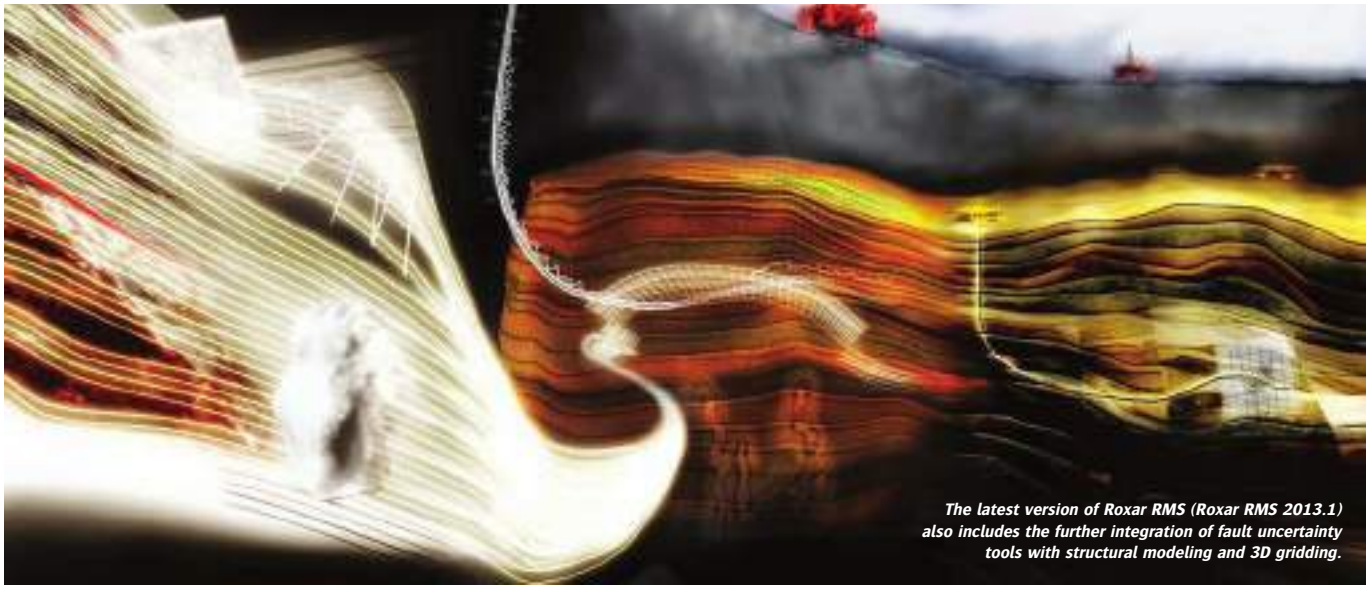
The results are essential skills for extending field life in Africa today.

New challenges, new approaches

It is a fact that 'easy oil' is gone but significant oil deposits remain to be explored and developed in Africa. However, this can only be achieved through addressing the challenges seen in the current climate.

Technologies and approaches, such as Roxar RMS, enable faster, more accurate, and more intuitive modeling.

This, in turn, helps geoscientists and reservoir engineers make better decisions and ensure that the right field developments plans are put in place at the outset. At a time in Africa where cost containment is key and oil prices continue to struggle, it's encouraging that technologies that focus on more productive and longer-life fields in the future are still being advanced. ■



The latest version of Roxar RMS (Roxar RMS 2013.1) also includes the further integration of fault uncertainty tools with structural modeling and 3D gridding.

Trelleborg provides floatover technology to first projectin West Africa

TRELLEBORG'S ENGINEERED PRODUCTS' supply of floatover equipment for Phase 3 of the DSO Escravos Gas Project - the operation's first floatover in West Africa - has been successfully completed.

Contracted by Hyundai Heavy Industries (HHI), Trelleborg provided Leg Mating Unit (LMU) pads for the floatover process, as well as surge fenders, shock pads and rubstrips to constitute the project's boat landing systems.

SM Lee, section chief of Engineering Group at HHI, said: "Sea conditions are particularly rough in this region, meaning that the installation had to be very precise and the time frame in which the floatover process could be conducted, would be minimal. As such, we needed a solution that could handle the challenging environment, preventing the jacket and topside from being damaged during installation. Trelleborg's floatover technology integrated well with our products and provided a successful floatover."

Trelleborg's elastomeric pads were incorporated into HHI's LMU steel structures. The pads are designed to take up static and dynamic forces of the topside structure, as well as the horizontal forces of open sea motions during the floatover mating operation.

Due to the large amount of load placed on the elastomer pads during the process, they must be carefully engineered to provide optimum protection of the jacket and withstand environmental impact.

Additionally, particularly adverse weather and sea conditions for this project meant Trelleborg engineers had to account for especially high sea swell and unpredictable winds when customising floatover technology for DSO Escravos.

Trelleborg's Leg Mating Unit pads were used in the floatover process.

Julian Wee, managing director from Trelleborg's engineered products operation commented: "If damage occurs to the jacket, it can result in downtime and costly rectifications. This simply isn't an option. We were able to supply reliable, tailored solutions that would perform for the long-term, providing HHI with peace of mind."

Through extensive testing at the company's in-house facility, Trelleborg was able to meet the strict requirements put in place by HHI.

Mr Taofik Adegbite is the managing director and CEO of Nigerian oil and gas service company, Marine Platforms Limited. In this interview with Oil Review Africa, he discusses how the company got started and the problems it had to overcome.

Despite many challenges the dream has become a reality

WHAT WAS THE thought behind setting up Marine Platforms? The three of you that set up this company were entrepreneurs, but this is a company dealing with technical issues first and foremost.

All three of us realised that we were not technocrats or experts. We knew what we did not know, we respected and realised our weakness, and so we decided to do something about it. We decided to partner with experts, with companies with knowhow.

We also brought in expatriates; we never said this was just a Nigerian content thing; we were going into deep water, which was a new frontier, especially for indigenous operators, and we knew that that would demand a high level of expertise, so we went to the North Sea where there were experts to strengthen our team.

But why deep water? This was a newly established company and you wanted to start at the deep end. Why not take the easy jobs?

We had a clear strategy from the beginning. We knew that a critical factor, especially in the Nigerian scenario, was the high barrier to entry. We were in for the long haul and we wanted something that would be sustainable over time. We realised that strategically if we went to this new frontier -deep sea - and we made a success of it, then we would be able to sustain the business for a long time.

Going into a new frontier means confronting hurdles - what were they and how were you able to overcome them?

The most important one at that time - and I keep emphasising this, so that other Nigerian companies can learn from it - was the issue of acceptance, convincing those on the other side, especially the major oil companies, that one is up to the task. Companies that are investing millions of dollars from their shareholders' funds are not looking for guinea pigs, and are not interested in green horns messing up their assets, especially when there are companies out there already tested and which are ready and available to do the jobs; so the issue of acceptance was the most difficult hurdle in the early stages, both from the operators and also from the financial institutions. The risk element was high for them to let a fledging company on board.

There was also the issue of skilled personnel

Taofik Adegbite is the managing director and chief executive officer of Marine Platforms Ltd.

in those early days, as there was quite a lack of sufficient Nigerian skills. So we had to bring in expatriates which was not easy either as they were needed in other parts of the world, especially in other emerging markets such as Brazil and Mexico. So it was expensive and a major challenge bringing in expatriates, especially when the community issues in the Niger Delta were factored in.

So, when did you get the break? When was your tipping point?

It was the Shell Bonga job, a deep water assignment. We had to compete with already entrenched companies. When that job was executed, Marine Platforms joined the big league. We also absorbed all the learning in that job and the subsea assignment thereafter with Chevron helped to consolidate our position.

You and Marine Plaforms are highly spoken of concerning integrity within the industry, and even outside Nigeria. What is it about you and Marine Platforms?

We work on a self discovery frame of mind in Marine Platforms. As soon as someone knows who he is, what he can do and is sincere, it is quite easy to build on that. Once I know who I am and what I can do, I am comfortable in my skin; people will connect with that sincerity of purpose.

I try to make people see a win-win situation – during the building of the African Inspiration (diving support vessel), there were all kinds of challenges, financial challenges for instance, and the ship builder, Havyard, appreciated our sincerity and transparency, and, working together, we found solutions to all the challenges.

What is your take on the Local Content?

Local content means everything to us. Marine Platforms is a product of the local content. Without the local content programme, we would not exist. The programme brought an awareness of what is available, what Nigerians are capable of doing.

Does Marine Platforms have a policy of owning its own assets?

Yes, we like to own our own equipment, so then we can maintain and repair, and we can start to build our own equipment as we go on. We would like to see ships being built in Nigeria one day, in my lifetime. I want that to happen. There is a need to spread the manufacturing process, as it creates a balanced world.

And we are not only just concerned with acquiring assets; we also look for quality. It may be expensive to acquire, but we save on operational costs.

Again, integrity comes in here; if one is operating a vessel that is cheaper to acquire, for instance, but is unreliable during operation, it damages the brand and negatively impacts on the integrity of the company, so yes, we acquire assets, but we also look for reliability and quality.

Has the partnership worked well so far?

It has, and sometimes, it had to do with what we went through together during the difficult early days when there was no revenue. During that period, we all collapsed into one, we bonded together and we still watch each other's backs, we went through the furnace together and we came out stronger. What has also helped is that we knew our strengths, our capabilities and we not only respect those strengths and capabilities, but we also excel in them. It is a dynamic leadership with respect for all the three partners. ■

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Close reservoir monitoring and analysis are integral to today's digital oil field, and Africa's energy sector is seeing the benefits.

Reservoir monitoring: The numbers game

NEW TECHNOLOGY MEANS oil companies can now monitor the inside of reservoirs - things like temperature, pressure, and flow - more accurately than ever before. Over time, this can make a huge difference to a field's longevity, efficiency, and ultimately, profitability. That's pretty much vital in an industry where economics is the name of the game.

Leading international firms such as Schlumberger, Halliburton and Weatherford, and lots of others, all provide expert reservoir monitoring solutions to Africa's energy sector. And the race to develop new technology, to gain added insight for operators and to boost competitive advantage, continues apace. All of these groups are continually evolving their reservoir solutions offer, both through investment and through consolidation.

Another firm, Emerson Process Management, recently acquired Norwegian tech firm Yggdrasil, a provider of flow assurance and production optimisation software. Emerson plans to incorporate Yggdrasil's METTE production optimisation solution into its existing Roxar reservoir management software portfolio. (See article from Emerson Process Management on page 40).

This will give operators an integrated workflow from seismic interpretation and reservoir modeling to reservoir simulation and production optimisation, it says.

> The race to develop new technology, to gain added insight for operators and to boost competitive advantage, continues apace

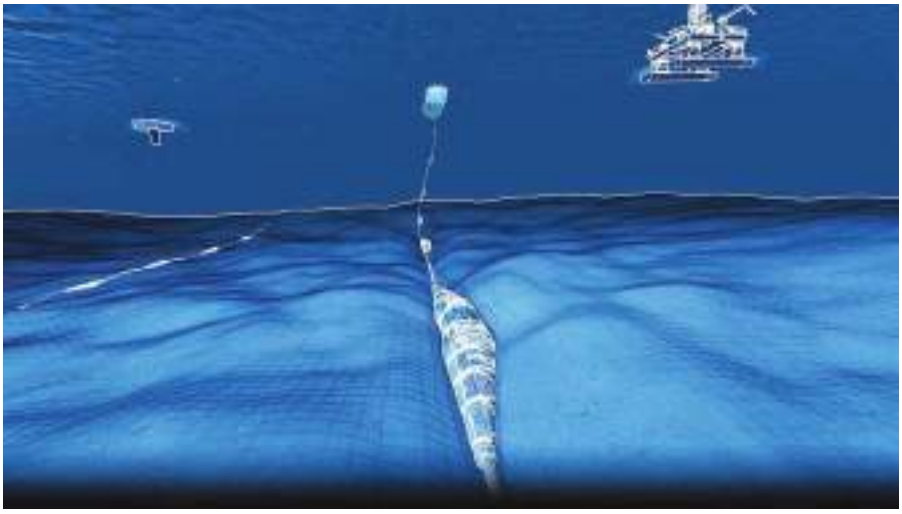
Every well tells a story

For operators, production and reservoir monitoring can tell a well's story like nothing else.

In essence, it enables engineers on the surface, perhaps located remotely miles away, to understand as much as possible what is going on beneath the ground.

In skilled hands, and with the right tools, it is now possible to understand the unique characteristics of any reservoir through changes in pressure, temperature, flow, acoustics, and seismicity.

That's not to underestimate the complexity or difficulty of that task - a quick glance at Mauritania's poorly performing Chinguetti field shows how things don't always go to plan - but the computer power at the fingertips of engineers today is mightily impressive.



PGS´s complete subsea reservoir monitoring system - OptoSeis PRM.

According to some estimates, a typical oil rig might produce about one terabyte of data each and every day. The swift processing of this information enables real-time monitoring and rapid decision making. And in an industry where extra days and wells can spell many millions of dollars in added costs, that is precious indeed.

Old and new

The concept applies equally across the life-cycle of any upstream asset, from newly discovered fields to long-term producers.

The world's largest oil field, Ghawar in Saudi Arabia, discovered in 1948, has been producing continually since 1951 - or 64 years.

It's fair to say that the oil industry and the technology available to it has moved on considerably during that time.

Throughout these years, however, local engineers have strived to better understand the reservoir with the available tools of the time.

That challenge continues today to maintain the kingdom's most valuable asset.

At the other end of the scale, and across the Red Sea in sub-Saharan Africa, new projects are relying on many of the same tools.

Canadian independent Africa Oil Corporation (AOC) is using reservoir analysis as it edges closer to development on its eastern Africa projects.

In Kenya, on the South Lokichar blocks 10BB and 13T, appraisal drilling and extended well tests have been feeding back data for the number crunchers to plot the next course of action.

It's all a long way from the giant that is Ghawar, but the stakes are just as high for all those involved.

Five reservoir zones on the Amosing field were tested across two wells, being separately produced in one well while pressure responses were measured in the other well, AOC said recently.

Production from all five zones hit a combined average constrained rate of 4,300 bpd under natural flow conditions.

AOC noted that the pressure data supports "significant connected oil volumes" and "confirms lateral reservoir continuity between the wells" which bodes well for the future development of the field.

Effectively, the data is enabling the operator to almost 'see' underneath the surface.

Strength in numbers

US firm Vaalco Energy also cited "reservoir pressure" among other key factors following monitoring and assessments, after announcing it had brought into production the Southeast Etame 2-H well in Cameroon.

The first development well drilled in the Southeast Etame field, it was brought online in July, producing approximately 3,400 bpd.

Vaalco said it plans to continue to produce the well at the current rate "to monitor wellhead and downhole pressure and to optimise fluid throughput"

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Shell is using advanced technology to deliver safe, economic deep-water projects in Nigeria.

at the recently commissioned platform site.

"While we believe the Etame 2-H well is capable of producing at even stronger rates, we are producing at these levels to optimise production and allow us to gather additional data about the productive capacity and extent of this previously untapped reservoir," Vaalco boss Steve Guidry commented in July.

All of this information - for Vaalco, for AOC, and for all other operators - makes the decision-making process just that little bit easier.

Aside from understanding reservoir characteristics better, which is crucial for the successful management and development of the field, there are advantages on a wider level.

Certainly, it raises visibility in terms of production potential and leads to a more accurate reserves assessment, essential for good bookkeeping back in the office. This is important not only for an operator to work out development costs and so on, but also to present to investors and financial backers and to de-risk a project's profile.

In the case of emerging frontier areas like eastern Africa, this granular information can also help to unlock development across the basin, and reduce further exploration costs, as uncertainties and unknowns are taken away.

Production monitoring

Once any oil field is up and running, then the day-to-day monitoring of reservoir performance becomes high priority.

While the reality of this work may not be as dramatic as news of that first discovery, or the commencement of production, it is a prerequisite for any successful and viable commercial project.

Nigeria's lead foreign investor Shell optimises its oil and gas production with a clutch of advanced IT systems it calls Smart Fields.

This technology integrates digital information from sensors in wells and on surface equipment with remotely controlled valves and various computer applications to better monitor a well and extend its productive life.

It enables real-time monitoring, control, and intervention to improve performance and even correct underperforming wells, useful on both new projects and long-established mature fields.

A plethora of tools now exist to undertake these tasks, with the big industry service companies boasting a whole suite of products and monitoring technology, much of which is now deployed throughout Africa.

Schlumberger's portfolio, for instance, includes a whole host of flow meters, downhole monitors and state-of-the-art surveillance software, among other tools.

Collectively, these can provide operators will a complete picture of what is going on inside the reservoir to better understand and manage production operations.

And these tools are invaluable also for enabling enhanced oil recovery when a field reaches the end of its normal productive life, but leaving up to two-thirds of its oil still in the ground.

As Africa's oil industry matures, these technologies will only continue to grow in importance as operators seek to maximise the potential of their assets. ■

These tools are invaluable also for enabling enhanced oil recovery.

Schlumberger recently launched its Quartet wireless downhole reservoir testing system.

Halliburton introduces Illusion frac plug

HALLIBURTON'S COMPLETIONS TOOLS business line, a long-standing industry leader in total composite plug technology, has introduced the Illusion frac plug, the only fully dissolvable frac plug on the market. The new high-performance, 10,000 psi rated product shortens the time to production by eliminating the need to mill out plugs after fracturing, saving time and money for operators, says the company.

The Illusion frac plug revolutionises plug-and-perf completions for fracturing in unconventional markets. Plugs can be installed at any position in the wellbore to enable optimal placement of perforations for improved fracturing, without prepositioned locator subs or other equipment that remains in the wellbore post-frac. Illusion frac plugs dissolve completely to leave an unrestricted bore for production, and since no intervention is required to clean the wellbore after the frac, risk is reduced and production may be brought on sooner to improve the net present value (NPV) of the asset.

Artie Burke, vice president of Completion Tools said, "We have successfully run Illusion plugs for our customers in the Eagle Ford, Bakken, and Woodford (in the US) shale plays. This is a truly game-changing technology for the industry. We're excited to bring this next-generation product to the market that will reduce risk, allow production to commence sooner and improve the overall cash flow for our customers."

Despite recent very low prices, exploration and production of deepwater oil and gas are likely to be viable in the longer term. But there are still challenges. In our second article on the subject, Mark Adeosun, author of Douglas-Westwood's recently published World Deepwater Market Forecast 2015-2019, tells Vaughan O'Grady about the factors driving – and hindering –continuing development of deepwater E&P – particularly in Africa.

Deepwater dilemmas

YOU WOULD THINK that in the current uncertain oil price climate, deepwater E&P, let alone ultra-deepwater E&P, would be unpopular. Not necessarily, said Mark Adeosun, author of Douglas-Westwood's recently published World Deepwater Market Forecast 2015-2019*. "As production from mature basins onshore and shallow water fields declines," he pointed out, "development of deepwater reserves has become increasingly vital and will be inevitable in the long run."

And water depths have been increasing; the deepest platform currently under development is SBM's Turritella FPSO in the Gulf of Mexico at 2,900 metres with its deepest well at over 3,000 metres. Such depths would once have seemed barely believable but now, said Adeosun, "this trend is expected to continue, with ever-improving innovation and technology allowing for deeper developments that are more cost-effective. However," he added, "short-term, ultra-deepwater developments will suffer, with the low oil price making capex-intensive projects less desirable."

Nevertheless Adeosun is confident that development in Africa will grow over the long term as the region has yet to maximise its deepwater potential. And the signs are good. "In recent years," he explained, "we have seen massive exploration activity taking place in East Africa, resulting in enormous gas finds. Exploration activities in the deepwater of countries such as Equatorial Guinea, Côte d'Ivoire, Senegal and Sierra Leone, which are not conventional deepwater exploratory regions, have all yielded hydrocarbon in commercial quantities. This underlines the long-term potential of deepwater developments within the region." And of course, with a new democratic government in Nigeria, a reform of the oil industry will be high on the agenda "leading to increased exploratory activities in the region's largest hydrocarbon producer".

Or so many observers hope. But there may still be other challenges to deal with, such as African requirements for defined levels of local input. However, as Adeosun put it, the issue of local content affects numerous oil and gas producers worldwide and it is not particular to the African continent. Thus the growing pressure on oil companies and their suppliers to adhere to defined levels of local content rules will result in a continual creep of market share to local suppliers and service firms. "The local firms may, however, lack sufficient capacity or experience to deliver on schedule, often resulting in higher prices," he noted, adding, "Yards in the West African region do not yet have the necessary infrastructure to complete large deepwater projects, hence intensifying the difficulties of complying and working with a defined level of local content input." He suggested, however, that the formation of joint venture companies with local firms has enabled local content by training of nationals.

Strong role for technology

There are more positive developments, of course. Technology in particular has a strong role to play in enhancing deepwater production and aiding cost control. Among the advances relevant to this type of exploration is floating production. At the time of writing there are over 40 FPSOs currently operating offshore Africa and, according to Adeosun, this number is forecast to grow over the next few years. "Many of the upcoming developments in the region will require floating platforms due to their distance from shore and lack of existing infrastructure," he pointed out. "Furthermore, large developments such as the Angolan 15/06 Eastern Hub and Kaombo will be onstream in the next few years, while Eni's Sankofa-Gye Nyame FPSO was awarded this February, despite the low oil price."

However, it's not necessarily all good news for FPSO builders. "Greater availability of FPSOs may affect project cost as operators with nearby discoveries decide to tie their fields into existing FPSO units rather than develop entirely

The Pazflor FPSO, offshore Angola, is the world's largest floating production, storage and offloading vessel.

new vessels," suggested Adeosun, adding: "One stumbling block for FPSOs is local content, which is required in a number of important countries. Most yards in the region are not equipped to develop the large, high-spec vessels required and delays and cost inflation have been common as a result of this."

There are, of course, many other technological factors that will keep costs down, such as telecommunications. "A crucial element for optimising exploratory and operational performance is dependable real-time communication," said Adeosun. But the oil price itself is likely to remain the primary stumbling block and many of the factors that affect global oil prices — including geopolitical influences, accidents like the Macondo Oil spill, and economic growth — are unpredictable. So is price uncertainty likely to remain the norm? Or can we expect extended periods of relative calm?

"Whilst the oil industry has always been inherently cyclical," suggested Adeosun, "Douglas-Westwood expects oil prices to recover in the long term to support required activity. Forecasting prices is more difficult than ever, but continued short-term volatility seems very likely as the market struggles to find balance."

That's the global finding. What about African deepwater oil and gas? Are there any possible future hazards or threats that E&P companies should be aware of?

"Deepwater exploration and production has become increasingly politicised in recent years," said Adeosun. "Territorial calms, border disputes and political stability are situations that remain unpredictable. The long awaited Petroleum Industry Bill (PIB) which could help overhaul the beleaguered oil industry in Nigeria appears to be on the back burner, while border disputes between Ghana and Côte d'Ivoire within the maritime borders of the TEN (Tweneboa, Enyenra, Ntomme) field are examples of restrictive circumstance to E&P companies."

There is definitely room for hope, however. "With the right reforms and stability within the oil-rich regions such as the Nigerian Niger Delta, there will be no major hazards to E&P companies, outside of the current price environment," said Adeosun. He concluded, "Douglas-Westwood expects to see continuous investment within the region." ■

**Mark Adeosun joined Douglas-Westwood in 2013, and has since conducted research into various oil and gas projects, with a focus on offshore drilling and deepwater activity. For more information:http://marketreports.douglas-westwood.com/report/oil-and-gas/world-deepwater-market-forecast-2015-2019*

Alderley to supply produced water treatment packages to Angola

ALDERLEY PLC HAS been awarded by SAIPEM, a contract to design, engineer and fabricate two FPSO produced water treatment packages for the Kaombo FPSO project in Angola. The project will be undertaken by Alderley Process Technologies, a subsidiary of Alderley plc. The Kaombo field is located 260 km offshore Luanda in Angola and will produce around 230,000 bopd.

The operator Total has a 30 per cent share on Block 32. The other partners are Sonangol Pesquisa & Produção, Sonangol Sinopec International Ltd, Esso and Galp.

Scope of supply is for two identical produced water treatment systems that will each process 170,000 bpd produced water. The systems comprise Alderley's AP20 de-oiling hydrocyclones, Alderley's AP25 de-sanding hydrocyclones, Compact Flotation Unit (CFU), a sand wash vessel and an additional oily water reject treatment stage.

The complete produced water treatment system is designed to meet the oil-in-water discharge levels of <20mg/l and 0.5 per cent by weight, oil on sand.

Tony Mansfield, managing director, Alderley Process Technologies, commented: "Alderley has delivered a number of produced water treatment packages specifically designed for an FPSO environment. We recognise the strategic importance of this flagship project for Total and its partners and we are proud to be able to leverage on our extensive experience to offer the best technologies for their produced water requirements."

The systems are being designed and engineered by an Alderley Process Technologies team in the UK and manufacturing will take place in the Middle and Far East.

GE Oil & Gas to offer new and time-saving riser connectors

GE OIL & GAS is investing in the development of new completion and workover riser connectors for the offshore market, which will enable operators to save valuable rig time during operations.

GE Oil & Gas awarded Subsea Riser Products Ltd (SRP), an Acteon company, a contract to develop and qualify SRP's Nimway 510 and Nimway 710 completion and workover riser connectors, which are designed for water depths of up to 3,000 metres.

Nimway is a new design of high-capacity, quick make-up connector involving proven technologies and a novel tensioned sleeve design that has evolved from SRP's experience in designing high-pressure dynamic flanges. Reliable metal sealing and dual bore capability are two of the connector's system architecture benefits, says the company.

GE Oil & Gas has obtained exclusive rights to SRP's 5¼ inch and 7⅜ inch 10,000 psi connectors for at least two years, with the option to extend annually.

Carl Roemmele, WellAccess leader of GE Oil & Gas, said: "The Nimway connector work is a vital piece of the Subsea WellAccess portfolio that will differentiate GE's offering in terms of code compliance, operational running speeds and costs. When we add it to the other WellAccess products we are developing, we will have a technically differentiated product line that will be a compelling offer for our global customers."

SRP is currently putting the new connectors through a qualification programme, which involves manufacturing the connectors, welding them to production-grade pipe and then testing their endurance using hydrostatic pressure, bending and resonant fatigue tests. The qualification programme is due to be complete by the first quarter of 2016.

The design and machining work for the contract will be done in the UK, with forgings procured from Italy. The qualification testing work will be completed primarily in Houston, USA.

Crude oil pumping with one seal only

PETROCHEMICAL COMPANIES CONTINUOUSLY increase their output of feedstock and finished products all over the globe to satisfy the vast growing demand for fuel, bitumen and other petrochemical products. The growth of production requires higher storage capabilities including large and reliable positive displacement pumps.

Energy demand, HSE regulations and above all the reduction of operating costs are in focus of today's terminal operators. Leistritz Pumpen has perfect pumping systems to achieve operators' goals:

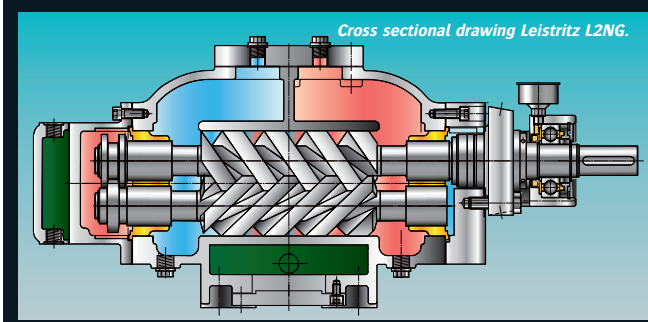
Both of the twin and five-spindle screw pumps of series L2NG and L5NG belong to the group of self-priming rotary positive displacement pumps. They are designed for a pressure range up to 16 bar (232 psi) and suitable for transport of light abrasive and corrosive, high or low viscous storage fluids with poor or good lubricity.

The pumping capacities start at a few litres per minute and go up as high as 1,700 cu m/h, while viscosities from one up to 100,000 centistokes and pumping temperatures up to 280°C can be achieved.

Besides loading or unloading duties, these pumps can also be used as circulating, blending and stripping pumps.

Leistritz Series L2/L5 pumps are of single volute design with two, respectively five spindles and only one seal to atmosphere. Compared to time-geared, double volute twin screw pumps with four shaft seals, these two Leistritz pump series have therefore considerable advantages in Capex and Opex!

The drive spindle is hermetically sealed and rotates with the idler spindles in the bores drilled into the pump casing, which encloses the spindle set with small clearances. The idler spindles are driven by the drive spindle through hydraulic force. The special epicycloidal profile of the spindles guarantees the perfect closure of the pumping chambers, so that the liquid is moved continuously and almost pulsation-free in axial direction from the suction area to the pump discharge port. This pumping process guarantees a highly efficient operation at reduced power consumption, which results not only in lower initial equipment costs, but also into reduced operational costs.


Cross sectional drawing Leistritz L2NG.

The rotors of all Leistritz pumps are manufactured out of a single piece of bar stock. It guarantees limited shaft deflection and lowest possible bearing loads at highest process safety. Surface hardening up to 64 HRC complete the robustness of the screws against wear.

Besides loading or unloading duties, these pumps can also be used as circulating, blending and stripping pumps.

The L2 Pump series has a double helix drive and triple helix idler spindle, while all rotors of the L5 Pump series have double helix profile, thus already balanced by design.

Spindle pitches are kept reasonably low to reduce the axial flow velocity in the pumps, resulting in an excellent priming capability.

The design of these pumps, with a reduced number of parts compared to a double volute twin screw pump, ensures an extremely short downtime for service, says the company.

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Subsea 7's latest HCV

CONSTRUCTION OF SUBSEA 7's state-of-the-art new heavy construction vessel (HCV), the Seven Arctic, is proceeding on schedule with the vessel targeted for delivery in 2016.

The vessel, which is in dry dock at Hyundai Heavy Industries (HHI) in South Korea, is being readied for the installation of key capabilities including a 600t Vertical Lay System (VLS) and a 900t crane.

Both the 600t VLS and 900t crane are currently being assembled in South Korea by Dutch heavy construction equipment manufacturer, Huisman, ready for installation later in the year.

Chief among the vessel's specifications is a unique knuckle boom rope-luffing crane which can operate in a series of configurations, with capacity of up to 900t. When combined with the 600t VLS, deck space of 2,600 sq m, two work-class ROVs and a 7,000t underdeck basket for the storage of flexible pipe and umbilicals, the Seven Arctic will provide a step change in the management of ever more complex deepwater subsea field development projects.

The unique 900t crane, with its combination of flexibility and capability, offers many different operational modes, which can be selected for 900t, 600t, 300t, and high-hook operations.

New cement evaluation technology from Baker Hughes

This new technology enables operators to evaluate more comprehensive data.

BAKER HUGHES RECENTLY announced the release of its latest cement integrity evaluation service. Designed to assess the integrity of cement used in oil and gas wells, Integrity eXplorer is the first service of its kind to use electromagnetic-acoustic sensors, rather than the traditional acoustic-based techniques.

Baker Hughes said the new technology is more accurate, allowing operators to directly evaluate the integrity of cement bonds in any current wellbore environment or cement mixture.

"In our role as innovation leaders, we realise that applying yesterday's technology to today's challenges may not meet our customer's emerging needs" said Mariano Gargiulo, vice president of Baker Hughes' Wireline Services business. "This is especially true in today's demanding environments that can test the accuracies of traditional evaluation methods."

Cement compressive strength has typically been used as a key indicator of cement quality, but Baker Hughes claimed a more detailed assessment was now required, particularly given the importance of the reliability of cement-bond logs for upstream operators. The new service provides users with comprehensive data on the properties of the respective cement, allowing them to make better-informed decisions, the company said.

Marsol International launches emergency intertidal support capabilities

MARSOL INTERNATIONAL LTD, a Dubai-based global marine solutions provider focused on the offshore oil terminal market and related infrastructure, has launched a specialist Emergency Pipeline Repair Service (EPRS) to safeguard shallow water intertidal zones.

EPRS has been developed over the last six years to service all types of environmental situations and geotechnical configurations, to address the inherent challenge of accessing delicate areas not normally serviced from sea or shore.

Marsol International has worked with various partners to develop multipurpose tools and equipment which offer functionality and versatility resulting from the company's experience in developing specialist diver operated equipment, capable of work in dry areas, the intertidal zone and subsea.

Mike Young, managing director of Marsol International, explained: "Should a pipeline require repair, time is of the essence.

Safeguarding against environmental damage, minimising the impact on production and ultimately protecting company reputation is vital - EPRS offers an experienced team who can act fast. That said, we firmly believe that prevention is better than cure, so Marsol also offers a pre-emptive Pipeline Integrity Management service to ensure all bases are covered."

Due to various clients' requests for a turnkey solution, EPRS has been launched to best service the needs of a niche market in the environmentally delicate intertidal zone. This requires a different, but complementary, skill set from subsea or deepwater pipeline repair.

Premium liner-hanger system for critical applications

WEATHERFORD INTERNATIONAL HAS introduced the IntegraLine liner system with swage technology at the International Association of Drilling Contractors (IADC) World Drilling 2015 Conference and Exhibition.

Operators today are more likely to encounter challenging well environments than routine ones. Designed and engineered by Weatherford for critical environments, the IntegraLine high-performance liner system provides maximum reliability in critical applications such as ultra deepwater, extended-reach, and sour-gas wells with high pressures and temperatures, said the company.

The IntegraLine liner system is comprised of three premium components: the polished bore receptacle, liner-top packer, and rotational hanger. The packer features swage sealing technology that forms an anti-extrusion, gas-tight barrier between the outer diameter of the packer body and the inner diameter of the host casing.

This configuration reduces equipment failures that may threaten well integrity, allowing clients to achieve total depth efficiently while withstanding harsh conditions.

Alternative components are also available to create a fit-for-purpose liner-hanger solution for specific, complex applications.

"Mitigating risks through the use of reliable technology is crucial to any operation," said Brent Emerson, vice president of Well Construction at Weatherford.

"We are here to do that for critical wells. Our new IntegraLine system is another step in our continued technology evolution to provide premium solutions to our clients. We offer a comprehensive service from application engineering to the successful installation of liner systems that will ensure well integrity."

In a gas and condensate well in Alberta, Canada, the IntegraLine liner system with SwageSet packer established a gas-tight seal that enabled fracturing through the liner. Stimulation pressures reached 8,288 psi (57,144 MPa), and the system maintained zero pressure losses throughout the frac application, sai the company.

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Project Databank

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OIL, GAS AND PETROCHEMICAL PROJECTS

Project	Sector	Facility	Budget (US$)	Status	Start Date	Completion Date
GMT - Port Gentil Omboue Road	Infrastructure	Roads	900,000,000	Construction	2013-Q4	2020-Q4
AFDB-Ndende-Doussala-Dolisie Road	Infrastructure	Roads	275,000,000	Feasibility Study	2014-Q1	2018-Q4
CCSI - ACE Fibre Optic Network	Infrastructure	Fibre Optic Cable	1,200,000,000	Feasibility Study	2014-Q4	2018-Q4
HNR - Dussafu Ruche Marin	Oil	Exploration	4,300,000,000	Construction	2011-Q2	2016-Q4
VAALCO Congo Basin Etame Marin Block	Offshore	Oil Field	3,200,000,000	Construction	2001-Q4	2018-Q4
Impact - Offshore Gabon Block D14	Offshore	Oil & Gas Field	600,000,000	Feasibility Study	2014-Q3	2019-Q4
Impact - Offshore Gabon Block D13	Offshore	Oil & Gas Field	600,000,000	Feasibility Study	2014-Q3	2019-Q4
Impact - Offshore Gabon Block B7	Offshore	Oil & Gas Field	600,000,000	Feasibility Study	2014-Q3	2019-Q4
Noble Energy - Offshore Gabon Block F15	Offshore	Oil & Gas Field	3,200,000,000	Feasibility Study	2014-Q3	2019-Q4
Marathon - Block Tchicuate (G13)	Oil, Gas, Offshore	Oil & Gas Field	3,100,000,000	Feasibility Study	2014-Q3	2094-Q
GOC - Mandji Island Refiner	Refining	Refinery	1,000,000,000	Construction	2012-Q3	2074-Q
AFDB - Gabon-Congo Trans-African Highway	Infrastructure	Roads	94,000,000	Feasibility Study	2015-Q1	2018-Q1
Gabon Government - Libreville Champ Triomphal	Construction	Mixed-Use Development	97,000,000	Construction	2013-Q3	2020-Q4
Gabon Government - Port Gentil-Omboue Road	Infrastructure	Roads	600,000,000	Construction	2014-Q1	2017-Q4
GMPW - Medoumane Highway (RN2)	Infrastructure	Roads	63,000,000	Construction	2012-Q4	2015-Q4
Gabon Government - Libreville National Assembly	Construction	Office Buildings	110,000,000	Construction	2013-Q1	2016-Q2
Olam - Gentil Fertilizer Plant	Fertilisers	Ammonia & Procurement	1,500,000,00	Engineering	2011-Q3	2017-Q4
Total - Anguille Field Redevelopment	Offshore	Oil & Gas Field	2,000,000,000	Construction	2008-Q1	2015-Q2
Gabon Government - Libreville Conference Center	Construction	Convention & Exhibition Centres	100,000,000	Construction	2012-Q1	2015-Q2
Eni - Block D4	Gas, Offshore	Gas Field	3,200,000,000	Construction		
Vaalco - Ebouri Oil Field	Oil, Offshore	Oil Field	2,000,000,000	Construction		
Shell - Gamba License BCD10	Oil, Gas, Offshore	Oil & Gas Field	4,500,000,000	Construction		
Ophir Energy - North Gabon Basin Blocks A3 & A4	Oil, Gas, Offshore	Oil & Gas Field	3,500,000,000	Feasibility Study	2014-Q4	

Project Summary

Project Name	HNR - Dussafu Ruche Marin
Name of Client	Harvest Natural Resources Inc
Budget ($US)	400,300,000,000
Award Date	2012-Q3
Facility Type	Exploration

Status	Construction
End Date	2016-Q4
Location	Offshore Gabon

Project Backgrounds

Dussafu Ruche Marin, situated offshore Gabon, West Africa, is located in the Dussafu PSC

Project Status

June 2015	The Dussafu Joint Venture has exploitation rights for a period of up to 20 years.
Decemeber 2014	Panoro Energy reported that the fully processed seismic data from the 2013 outboard 3D survey is in process
October 2014	FID is scheduled to be made in early 2015-Q1
October 2014	Production is expected to start in 2016-Q4
July 2014	Harvest Natural Resources (HNR) has signed a declaration of commerciality (DOC) with the Government of Gabon for the Dussafu block

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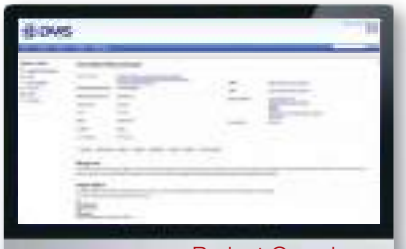
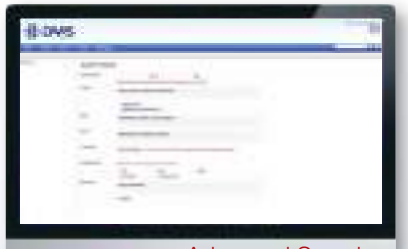


Project Overview



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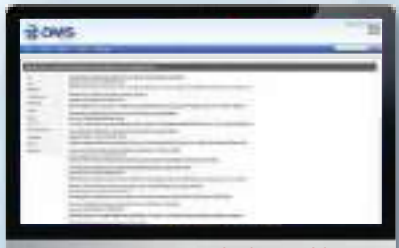
Bidders List



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Agruko is a start-up company headed up by Jane Harvey. With many years' experience in getting the right people to the right place, at the right time, she appreciates first-hand the challenges to mobilise personnel in a safe and timely manner. She has developed technology which pulls all project/person/company specific information together into one dashboard, where you can set requirements and can easily see which staff are 'flight ready'.

In and out of Africa - mobilising staff in growing economies

WITH AN INCREASING number of oil and gas discoveries on the continent, Africa possesses many of the world's fastest-growing economies. Currently, the region supplies over 10 per cent of the world's oil* and retains a further eight per cent of the world's untapped, but proven reserves. Improvements in the political stability of the region have made it more attractive for international energy companies to explore the rich natural reserves within the new oil-producing countries such as Kenya, Uganda and Ghana to maintain global demand.

There are over 500 oil operators and service contractors operating in Africa, all working against numerous challenges – namely mobilisation of personnel, local content initiatives, regional legislation, energy policies, political instability and ongoing security threats. These challenges are twinned with the significant shortage of trained oil and gas professionals in the region.

Akrugo aims to improve the efficiency of project delivery by giving users a single platform to store information, which can be accessed simultaneously by multiple users.

Mobilising international staff

As companies mobilise international staff to ease the shortage of skilled local workers, African governments progressively make localisation regulations and policies more stringent forcing a leaner expatriate team. It is vital that these personnel are transported efficiently in and out of the region in order to ensure their security and maximise their productivity. As well as passports, visas and medicals, efficiently managing the intricacies of flights, secure transfers and accommodation minimises delays and ensures that the right person arrives at the right time. An overview of validity of training and competency for the whole workforce is also crucial to ensure the right person is selected for the job in order to mitigate HSEQ risks: one of the biggest concerns in any company, particularly when developing a local, potentially inexperienced, workforce.

***Left** – Nichola Collinson, operations director, Akrugo.*
***Right** – Jane Harvey, managing director, Akrugo.*

The critical information required to manage these processes is often held in a variety of applications which is a challenge for many project managers and co-ordinators – and that's when things are going to plan. Unforeseen disruptions travelling to and from the region, civil unrest and industrial accidents require easily accessible information which is available 24 hours per day, seven days per week. Finding this information, and ensuring its accuracy, can be a confusing process. It is ultimately the project's safe and timely delivery that matters, and how you gather and store this information is crucial.

Having worked in the international oil and gas industry and understanding first-hand the challenges of mobilising staff to remote and challenging locations, Jane Harvey's background includes engineering, consultancy and project management for large service contractors. A challenging part of this journey was mobilising teams to projects in remote and high-risk locations across the Middle East.

Mobilisation can affect the bottom line

From her experience it was clear that mobilisation isn't solely a concern for HR or logistics teams; its wider impact directly affects project delivery and, ultimately, the bottom line. Having staff information stored in a variety of formats poses challenges in extracting accurate information when needed; in day-to-day logistics, and even more so in an emergency. It was clear to Jane that a joined-up approach to mobilisation was required, and her appreciation of these inherent challenges meant that she was well-placed to empathise and offer a practical solution.

Working with business director Nichola Collinson, who has spent the last 18 months mobilising in and out of high risk areas for a major international operator, the pair brought together their collective skills and experiences, giving them a well-rounded appreciation of the mobilisation challenges faced by the industry. They applied this understanding to address these challenges and have spent the past 12 months developing the software required to offer Akrugo as the solution.

A bespoke approach

Akrugo's bespoke approach aims to improve the efficiency of project delivery by giving users a single platform to store information, which can be accessed simultaneously by multiple users. The information stored is bespoke, with company, project, or region-specific information. It is this tailored approach that sets Akrugo apart. From personal experience, Jane and Nichola appreciate that every project, in every region is different, and an easy-to-use and flexible approach to staff mobilisation was not available in the market place.

As the global price per barrel of oil drops, and the international oil and gas community looks to substantial growth regions, such as Africa, innovative and efficient approaches to solve real-life operational challenges are fundamental to success and long-term sustainability. ■

**PwC – On the Brink of a Boom, Africa Oil and Gas Review, July 2014*

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Thermatel TA2 thermal mass flow meter

MAGNETROL HAS RELEASED its Thermatel TA2 thermal mass flow meter with Foundation fieldbus digital output communications

This addition signifies the growth of the TA2 and the Magnetrol commitment to continued success in flow. The TA2 with Foundation fieldbus offers all of the advantages of the standard TA2, such as:

- Dual gas calibration with two unique curves (EX: propane and natural gas)
- Field adjustability to install in different gas types or adjust for different gas mixes
- Calibration verification procedure provides cost savings due to decreased process downtime and unnecessary recalibrations
- Internal resettable and non-resettable totalisers
- Strong signal at low flows and low pressures with high turndown
- ISO 17025 and NIST traceable calibrations

Thermatel TA2, in conjunction with the Eclipse Model 706 guided wave radar, E3 Modulevel and Orion Enhanced Jupiter magnetostrictive level transmitters, form the Magnetrol fieldbus family.

Pan-African satellite coverage from Globalstar

Globalstar ground station.

GLOBALSTAR INC HAS announced that its gateway in Gaborone, Botswana, has gone live, enabling Globalstar to deliver affordable simplex coverage over the African continent. This new gateway, in partnership with Broadband Botswana Internet (BBi), provides Globalstar's full line of simplex services, including its SPOT portfolio of affordable personal tracking and life-saving solutions.

Much of the African continent has limited terrestrial and/or mobile infrastructure. In these regions in particular, Globalstar's satellite services, which leverage the industry's only complete next generation satellite constellation in orbit, provide a compelling must-have solution for seamless tracking of people and assets. The Globalstar network enables professional, corporate and government users to monitor vital infrastructure, taking advantage of the capabilities of machine to machine (M2M) and the emerging Internet of Things (IoT). Globalstar simplex solutions can also enhance the effectiveness of life-saving emergency first responder services.

A wide range of Africa-based commercial and government users, as well as consumers, can now take advantage of Globalstar's new blanket simplex coverage:

Oil & gas providers operating in Africa can benefit from precise, time and resource-saving solutions from the M2M-based, SmartOne product line. Remote workers in remote areas on land or offshore, can keep head office, customers, family and friends abreast of their location with SPOT Gen3.

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