EGYPT
OIL&GAS
NEWSPAPER

THE EGYPTIAN RIG MARKET: OFFSHORE VS. ONSHORE

Egypt's Leading Oil And Gas Monthly Publication
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EDITOR'S NOTE

As the Egypt Oil & Gas Technical Committee launches its 2nd Upstream Operational Excellence Convention this month, we have especially prepared our December issue in line with the discussion on enhancing upstream operations.

In our interview section, you can learn about our Technical Committee's vision and plans through the words of Thomas Maher, the committee's Chairman, and President and COO of Apex Egypt. We also bring you Paul Welch, SDX President and CEO, who commented on SDX's operations and ambitions in the Egyptian oil and gas sector.

Our featured articles include insights on the usage of biocides to prevent the disruption of production facilities and the degradation of the hydrocarbons quality. You can also find the opinion of experts who commented on asset integrity plans within the Ministry of Petroleum's Modernization Program, in addition to an analysis of the economics of mature fields and an overview on the challenges of mega projects carried out by joint ventures.

Our Research & Analysis department has contributed to this issue with a report on Egypt's rigs, divided by type and area in a one-year timeframe (2017-18).

To everyone attending the Egypt Oil & Gas 2nd Upstream Operational Excellence Convention, we hope the event provides an opportunity to share ideas and insight. To our readers, as always, thank you for your readership and support.

EDITOR IN CHIEF

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EGYPT'S LEADING OIL AND GAS MONTHLY PUBLICATION

EGYPS EGYPT PETROLEUM SHOW

Proudly the Official Publication

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This publication was founded by **Mohamed Fouad** and **Omar Donia**.

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EL MOLLA CONFIRMS PLANS FOR NEW PRODUCTION SHARING MODEL

Minister of Petroleum Tarek El Molla has confirmed that Egypt is working on a new model for production and sharing agreements between the government and international oil companies. The new model will see oil firms covering the exploration and production (E&P) costs and receiving shares of the production in return, officials stated in mid-October. The companies would then have the freedom to sell their production share to a buyer of their choice, the officials explained. “So far the feedback that we received from different partners is very positive and they are enthusiastic to participate in the bid round on this basis,” El Molla said during a meeting with a US business delegation.

EL MOLLA, PETRONAS DISCUSS FUTURE INVESTMENTS IN EGYPT

Petroleum minister Tarek El Molla met with Petronas CEO, Wan Zulkiflee, to review the company’s future investments in the Egyptian oil and gas sector. During their talk, they also discussed the status of the 9B project, which is underway in the West Delta Deep Marine (WDDM) in partnership with Royal Dutch Shell. El Molla pointed out that Egypt’s efforts to develop the petroleum agreements represent an important message for all international investors in this sector. Petronas’s interests exceed E&P activities as there are investment opportunities in the fields of manufacturing, and the marketing of petroleum products, Zulkiflee explained.

UK RECEIVES EGYPTIAN LNG CARGO

British gas terminal Dragon LNG received a liquefied natural gas (LNG) shipment from Egypt at the end of October. The cargo was shipped in the Shell-chartered Maran Gas Spetses and arrived at Dragon LNG’s Milford Haven terminal on October 31. The gas was shipped from Egypt’s Idku liquefaction plant. Shell had increased the amount of natural gas exported from its Idku liquefaction plant to 250 million standard cubic feet per day (mmscf/d), up from 150 mmscf/d in fiscal year (FY) 2016/17.

EGYPT’S GAS RESERVES INCREASE BY 33.3% SINCE 2015

Egypt’s natural gas reserves increased by 33.3% reaching around 90 trillion cubic feet (tcf), compared to 60 tcf in 2015, as the country added new natural gas fields, including Zohr and Atoll, to production. The total gas reserves rose by around 37 tcf, petroleum minister Tarek El Molla stated on the sidelines of a symposium of the Canadian-Egyptian Business Council. In one year, four major Egyptian natural gas fields in the Mediterranean Sea with investments of $27.2 billion, were added to production. The fields are Zohr, Noroos, Atoll, and Northern Alexandria.

FINANCE MINISTRY TO ALLOCATE $80/BARREL OF OIL IN THE 2019/20 BUDGET: GOVERNMENT OFFICIAL

The Egyptian Ministry of Finance will calculate the 2019/20 budget using a benchmark oil price of $80 per barrel, a senior government official revealed. The cabinet has started working on the new budget aiming for GDP growth to increase to 6% in the upcoming fiscal year, up from a projected 5.5% in 2018/19, the source said. The finance ministry expects oil prices to average $80 per barrel during FY 2019/20 and believes this to be a realistic threshold on which to base its fuel subsidy calculations, the source explained.

MIDOR SIGNS $1.2B LOAN AGREEMENT

Middle East Oil Refinery (Midor) has signed the final contracts for a $1.2 billion syndicated loan from Italy’s CDP, France’s BNP Paribas, and Crédit Agricole. The agreement was signed by the three European banks, as well as the National Bank of Egypt (NBE) and the National Bank of Abu Dhabi, which are the financial advisors for the Midor project. The loan will part-

finance the $2.3 billion Midor expansion project, which aims to boost the refinery's capacity by 60%. The contract's signing was attended by Minister of Petroleum, Tarek El Molla, Italian Ambassador to Egypt, Giampaolo Cantini, and head of Italy's Servizi Assicurativi del Commercio Estero (Sace), which acts as the loan's guarantor.

BANQUE MISR APPROVES $181.5M LETTER OF CREDIT TO EGPC

Banque Misr approved granting a letter of credit worth $181.5 million for the Egyptian General Petroleum Corporation (EGPC), an official at the bank stated. The letter of credit aims to finance EGPC in importing crude oil and petroleum products. Minister of Petroleum Tarek El Molla revealed last week that the country currently spends more than $1.5 billion each month on securing the local demand for petroleum products. The money is spent on importing petroleum products and on buying the production shares of international oil companies (IOCs).

EGYPT, IMF REACH STAFF-LEVEL AGREEMENT FOR $2B LOAN DISBURSEMENT

The International Monetary Fund (IMF) reached a staff-level agreement with the Egyptian government on October 30, paving the way for the release of the fourth loan tranche of $2 billion. An IMF team, led by Mission Chief to Egypt, Subir Lall, conducted the fourth review of Egypt's economic reform program between October 18 and October 31. The IMF's Executive Board will now study the agreement and make a decision about whether to approve the release of the fourth tranche. "The Egyptian economy has continued to perform well, despite less favorable global conditions, supported by the authorities' strong implementation of the reform program," Lall said.

EGYPT'S PRODUCTION OF CRUDE OIL AND CONDENSATES INCREASES TO 660,000 B/D

Egypt's crude oil and condensates production increased to 660,000 barrels per day (b/d) in October 2018, said Abed Ezz El Regal, head of EGPC. Production grew due to the recent discoveries, especially during the period between 2014 and 2018, in addition to the development projects in old fields whose output has decreased, Ezz El Regal pointed out. Launching new crude oil E&P tenders will boost total production with a possibility to reach 700,000 b/d in the upcoming period, which will support the refining industry that currently receives great governmental interest, Ezz El Regal noted.

NATURAL GAS PRODUCTION INCREASES BY 19.59% YOY

Egypt's natural gas output rose by around 19.59% year-on-year (YOY) to reach 4.023 million tons in August 2018, compared to 3.364 million tons in August 2017. The informatics monthly statistical bulletin published by the Central Agency for Public Mobilization and Statistics (CAPMAS) reveals that Egypt's consumption of natural gas dropped by around 6%, down from 4.577 million tons in August 2018 to 4.302 million tons in August 2017. On a monthly basis, figures show that Egypt's gas production grew by 3.87% in the month of August 2018, up from the 3.873 million tons produced in July 2018.

PETROLEUM PRODUCTION ROSE BY 1.53% YOY IN AUGUST

Production of crude oil, condensates, and butane increased by around 1.53% YOY in August 2018, producing 2.852 million tons compared to 2.809 million tons in August 2017. Statistics published by CAPMAS show that consumption of petroleum products in Egypt decreased by 15.87%, recording 2.652 million tons in August 2018, from the 3.094 million tons consumed in the same month in 2017. On a monthly basis, Egypt's petroleum production in August 2018 rose by around 1.2%, up from the 2.818 million tons produced in July 2018.

EGYPT TARGETS BOOSTING CRUDE OIL PRODUCTION BY 10,000 B/D

The Egyptian Ministry of Petroleum and Mineral Resources is aiming to increase crude oil production by 10,000 barrels per day (b/d) by the beginning of 2019. The country is working on boosting the total production of crude oil and condensates to reach 670,000 b/d, supported by the recent oil discoveries. The production is set to increase due to the development of a number of existing oil fields, in addition to the new fields that will soon be linked to production.

EGYPTIAN BUTANE IMPORTS DROPPED BY 7.33% YOY

Egypt's butane imports decreased by 7.33% year-on-year (YOY) as the country imported 148,000 tons in August 2018, compared to 159,700 tons in August 2017. The informatics monthly statistical bulletin published by the Central Agency for Public Mobilization and Statistics (CAPMAS) show that Egypt's butane consumption dropped by 6.8% to record 295,300 tons in August 2018, down from the 316,900 tons used in the same month of 2017. Meanwhile, the country's output decreased by around 2.3% as it produced 160,000 in August 2018, compared to 163,700 in August 2017. On a monthly basis, the country's butane imports dropped in August 2018 by 15.9% from the previous month as it imported 176,000 tons of the product in July 2018.

DIESEL CONSUMPTION DROPS BY 17.89% YOY

Egypt's diesel consumption dropped by 17.89% YOY to reach 1.014 million tons in August 2018, down from 1.235 million tons in August 2017. Statistics published by CAPMAS reveal that Egypt's diesel output increased by around 3.5%, producing 650,000 tons in August 2018 compared to 628,000 tons in the same month a year earlier. The country's monthly diesel consumption decreased by 10.74% in August 2018, down from the 1.136 million tons consumed in July 2018. Meanwhile, the country's production rose by around 22.87% in August 2018, down from the 529,000 tons produced in July in the same year.

EL SISI: EGYPT CONSUMES $42B WORTH PETROLEUM PRODUCTS/YEAR

Egyptians consume around $42 billion worth petroleum products each year, said President Abdel Fattah El Sisi during the 'Rebuilding Societies and States in the Context of Post-Conflict' discussion at the World Youth Forum in Egypt. El Sisi explained that in light of the high demand, Egyptians will suffer from significant living difficulties in case of any chaos. El Sisi highlighted the necessity of recognizing the factors required to preserve countries and maintain their existence. The Central Bank of Egypt (CBE) previously revealed in a press release that Egypt imported petroleum worth $12.4898 billion in FY 2017/18, around 3.95% higher than $12.0155 billion spent on petroleum imports during the previous fiscal year.

PETROLEUM MINISTRY TO SETTLE IOC ARREARS BY 2019 END

The Egyptian Ministry of Petroleum plans to settle total arrears for international oil companies (IOCs), which have reached $1.2 billion, by the end of 2019, official sources at the ministry stated. The Egyptian oil and gas sector pays around $1 billion to $1.5 billion in exchange for IOCs' oil and gas production shares in order to prevent rebuilding up debts and to cover local market hydrocarbon demands, the sources pointed out. IOCs' arrears had recorded $6.3 billion before 2014 and has since been decreasing as the government continues repayments.

EGYPT-ISRAEL GAS DEAL: PIPELINE CAPACITY ISSUE CASTS SHADOW OVER GAS EXPORT AGREEMENT

Israel's domestic pipeline infrastructure does not have the capacity to transfer the contracted quantities of natural gas from the Tamar and Leviathan fields to Egypt, sources told Hebrew language business daily TheMarker. The Israeli pipeline, which belongs to Israel Natural Gas Lines (INGL) company, has an annual carrying capacity of 2 to 3 billion cubic meters (bcm), sources said. However, Israel's Delek-led consortium are contracted to sell 3.5 bcm/y to Egypt under the terms of the agreement, signed with Egypt's Dolphinus Holdings in February 2018.

PETROLEUM MINISTRY EYES CHINESE INVESTMENT OPPORTUNITIES

Egypt has promising investment opportunities with China in the fields of energy, oil and natural gas, stated Ashraf Farag, deputy minister of petroleum for agreements and exploration. Farag's words came during the speech delivered on behalf of Minister of Petroleum, Tarek El Molla, at the Sixth Arab-Chinese Conference. The Ministry of Petroleum is looking to increase cooperation with China in several fields in the oil and gas industry, including petrochemical and fertilizer projects. The speech pointed out the importance of having a joint integration between the two countries in order to support different investment areas with recent technologies and well-trained technicians.

EL MOLLA DISCUSSES INVESTMENTS WITH EXXONMOBIL

Egypt's Minister of Petroleum Tarek El Molla met with Bryan Mitlon, President of ExxonMobil Fuels and Lubicants Company, and Hesham El Amrosy, Chairman and Managing Director of ExxonMobil Egypt, to discuss investments in the Egyptian oil and gas sector. The meeting came as part of the ministry's strategy to expand oil and gas activities and to exploit new opportunities that provide value to the Egyptian economy. ExxonMobil is looking forward to increasing the cooperation and expanding its oil and gas activities, said Melton, praising the development of the Egyptian sector over the past four years.

EGYPT SETS $20B E&P FDI TARGET OVER THREE YEARS

The Egyptian Ministry of Petroleum and Mineral Resources plans to attract $20 billion in foreign direct investment (FDI) for exploration and production (E&P) over the next three years. The ministry aims to boost Egypt's natural gas production to reach 8 billion cubic feet per day (bcf/d) by 2021, up from the current 6.2 bcf/d production, a source at the ministry said. Gas reserves have increased by around 50% because of linking new gas discoveries to production at the Zohr and Atoll fields, the source added. The production increase will help to cover local demand and provide surplus for export.

TOWN GAS TARGETS DELIVERING NATURAL GAS TO 285,000 HOUSEHOLDS IN 2018

Town Gas Company hopes to deliver natural gas to around 285,000 households by the end 2018, an official source at the company said. The company is responsible for pumping natural gas to households, industrial units and commercial properties in areas such as Cairo, Giza, Port Said, and Alexandria. It currently contributes around 42% of the total gas delivered to households in the governorates in which it operates. Minister of Petroleum Tarek El Molla last month told DMC TV that the government has so far connected 9 million households to the national gas grid.

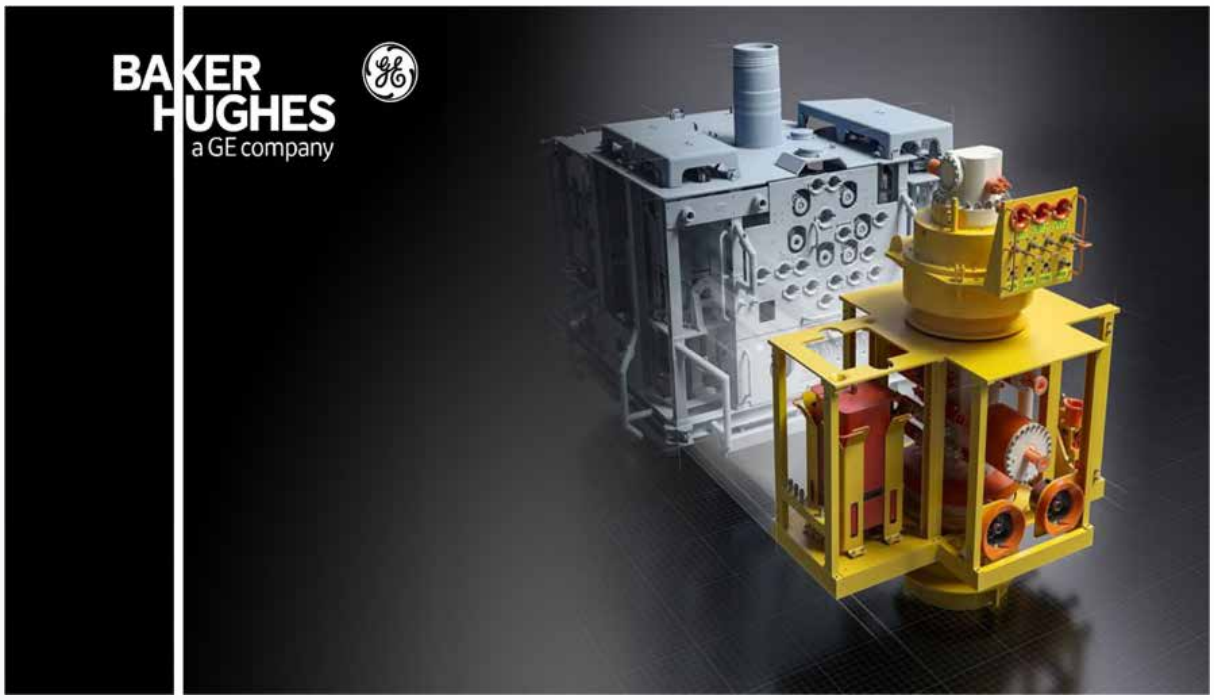
EGYPT TO EXPORT 150 MMSCF/D NATURAL GAS TO JORDAN IN DECEMBER

The Egyptian Ministry of Petroleum will increase natural gas exports to Jordan to 150 million standard cubic feet per day (mmscf/d) by the end of 2018. The estimated export capacity from Egypt to Jordan is 1 bcf/d, an official at the ministry stated. The ministry finalized negotiations with Jordan in September to sign a deal to export around 250 mmscf/d of Egyptian natural gas to a Jordanian power plant, an official source at the ministry previously announced. Egypt resumed gas exports of around 50mmscf/d to Jordan in July 2018 via the pipeline connecting the two countries.

EGYPT POSTS PRELIMINARY 5.3% Q1 GDP

Egypt's economy grew by 5.3% in Q1 2018/19, according to preliminary government data revealed by Minister of Planning, Hala El Said. The natural gas, construction and IT sectors, as well as Suez Canal revenues were the main contributors to the economic growth rate, El Said pointed out during the weekly cabinet meeting, chaired by Prime Minister Mostafa Madbouly. A report published this month by the European Bank for Reconstruction and Development predicted that the Egyptian economy would grow by 5.5% in FY 2018/19, up from 5.3% in FY 2017/18.

Shaping the future at Baker Hughes, a GE Company (BHGE), with a new lightweight compact subsea tree, designed to reduce overall system costs across the total life of the field



The industry is emerging from a significant downturn with global offshore capital investment projected to significantly in the next few years. Despite the improved outlook, the right economics are key. Subsea projects must be made more competitive in the wider energy supply market, by developing smarter solutions that drive cost out, as well as efficiency and productivity up.

BHGE revolutionary Aptara™ lightweight compact tree reduces not just initial CAPEX but also OPEX over the entire life-of-field. This TOTEX-lite approach uses a unique industry-first tree cap design that allows it to be adapted on the seabed to address the changing requirements over the life-of-field.

These simpler, lower-cost vertical subsea systems incorporate 4-inch, 5-inch and 7-inch production bores, 10,000 / 15,000 / 20,000 psi pressure ratings and can be run with or without a tubing head spool. The tree can be deployed in up to 3,000 m of water.

While BHGE Aptara™ lightweight compact tree is built on mature field-proven technology, its design is driven by BHGE life-of-field approach. It uses an innovative flow path that reduces size and complexity, which supports faster field development, lower field total expenditure (TOTEX) and increases value from the reservoir. The configuration has also been simplified, with a lower valve count requirement that still provides all the functionality needed and compliant with industry standards.

The Aptara™ lightweight compact tree has been designed with the entire lifecycle in mind and BHGE Make to Order variant can be delivered in 10 months. By reducing the number of components, the footprint and weight of the tree is reduced by around 50% compared to a traditional deepwater tree. With this reduction in size and complexity, comes a reduction in costs across the entire manufacturing cycle of the tree. Its size and weight offer flexibility during installation and enable vessel optimization. To flow the well, a Subsea Test Tree (SSTT) system can be used, either before or after tree installation, as well as a traditional Open Water Completion Workover Riser (CWOR).

The Aptara™ lightweight compact tree includes integrated flow metering, comprising BHGE's Virtual Flow Meter (VFM), downhole flow meter (SureFLO™) and water cut measurements at the tree, providing accurate oil, gas and water flow rate measurements at the wellhead. It also supports enhanced real-time condition monitoring and diagnostics enabling active control and monitoring of subsea equipment integrity.

Winer of the World Oil Award 2018 for "Best Deepwater Technology", Aptara™ lightweight compact tree is part of BHGE's APTARA family of lightweight, modular technology solutions, designed to be more responsive to changing conditions across the life-of-field and cut total cost of ownership by up to 50%.

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ENI, NATURGY IN TALKS TO RE-OPEN DAMIETTA LIQUEFACTION PLANT

Talks between Eni and Naturgy regarding the re-opening of the Damietta liquefaction plant are at an advanced stage, and operations are expected to start in 2019. The Ministry of Petroleum had reached an agreement in September with its partners in the Damietta liquefaction plant to gradually re-open the facility and export natural gas produced from Zohr in 2019. The re-opening of the plant will come after a six-year halt since the government diverted export supplies to the domestic market in July 2012. The Egyptian government recently settled a long-running dispute with Union Fenosa regarding the halting of gas supplies to Damietta in 2012.

APACHE INVESTS OVER $1B IN EGYPT IN 2018

Apache invested more than $1 billion in the Egyptian oil and gas sector during 2018, David Chi, vice-president and general manager of Apache Egypt, said. The company is confident that the Egyptian economic reform program will help to attract more investments to the oil and gas sector, Chi pointed out on the fringe of a symposium organized by the American Chamber of Commerce in Egypt. Chi further praised the new gas law, which is playing an important role in liberalizing the gas market and boosting investments which will promote Egypt's strategic position as an energy center in the region.

ENI STARTS DRILLING NINTH ZOHR WELL

Eni started drilling the ninth well at the Zohr natural gas field at a cost of $300 million, a source in the oil and gas sector said. Eni began drilling this well in order to add 250 million standard cubic feet per day (mmscf/d) of natural gas by the end of 2018, which will increase the field's total production to 2.25 billion cubic feet per day (bcf/d). The drilling is set to be completed in November but the company will delay linking it to production until the sixth 400 mmscf/d capacity gas processing unit starts operating in December, the source added. This will bring the plant's total processing capacity to 2.4 bcf/d.

SHAWCOR PRESENTS THE FLEXPIPE LINEPIPE TO EGPC

Shawcor presented its flexpipe to a team of engineers working in the Egyptian General Petroleum Corporation (EGPC) at the company's headquarters in Cairo on October 29. The company is a global integrated supplier of pipeline solutions to the oil and gas industry, and has several production plants, sales offices, and support centers across the world. Shawcor leads several organizations, including the Shawcor Composite Production Systems, which is responsible for its flexpipe systems. Shawcor Composite Production Systems has installed over 20,000 miles of pipe and 160,000 fittings since 2003.

ENI TO INVEST $5B IN ZOHR GAS PROCESSING PLANT

Eni estimated that it will invest $5 billion to construct a gas processing plant for Zohr natural gas field. The plant's capacity is set to be 3.2 bcf/d of natural gas, with an aim to connect Zohr's estimated 2.95 bcf/d production. All gas processing plants will be completed by the second half of 2019. Five units of the plant were established so far with a capacity of 2 bcf/d, while the sixth unit will be finalized by December bringing the total capacity to 2.4 bcf/d of natural gas. The company estimated that production will reach 2 bcf/d after connecting eight wells to production.

APACHE FOUNDER RAYMOND PLANK DIES AT 96

Raymond Plank, founder and former CEO of Apache, died on November 8 at the age of 96. Plank established Apache Corporation in 1954 in Houston, in cooperation with two friends, turning the corporation into a global energy firm. Apache financed its drilling operations via individual partnership, yet Plank kept looking for a more permanent financing until he came across a law firm that helped draft the company's first publicly-traded partnership in 1981, said Roger Plank, Raymond Plank's son. Plank was known for suggesting "outlandish ideas to get people thinking," said Tony Lentini, a former Apache executive.

BP TO INVEST $1.8B IN EGYPT

BP will invest $1.8 billion in Egypt next year, according to BP's chief executive Bob Dudley. "We've spent in the last two years $6.8 billion in Egypt and it will be about $1.8 billion next year," Dudley said in an interview in Abu Dhabi. BP's regional president of North Africa, Hesham Mekkawy, previously said that the company will invest $2 billion in Egypt during 2019. BP's latest spending plans are a substantial decrease from the $4 billion invested in Egypt in 2017. Dudley also confirmed that the company will be investing significantly in Abu Dhabi, promising $1 billon each year.

SHELL INCREASES NATURAL GAS EXPORTS VIA IDKU

Royal Dutch Shell increased its exports of natural gas from the Idku liquefaction facility to 300 mmscf/d, up from 250 mmscf/d in October, according to a source at the Egyptian Natural Gas Holding Company (EGAS). Exports increased due to the declining gas consumption of power plants during the winter, the source explained. Shell exports a shipment of liquefied natural gas (LNG) every 10 days, according to Idku's export records. The Dutch oil giant's ownership of the Idku plant has enabled it to export natural gas from its offshore Burullus and Rosetta fields.

TRANSGLOBE ALLOCATES $24.1M CAPITAL BUDGET FOR EGYPT IN 2019

TransGlobe Corporation announced it will allocate a $24.1 million capital budget for Egypt during 2019. The company has set aside $7 million for drilling two exploration wells in the Egyptian Eastern Desert, in West Bakr 1 and NW Gharib, as well as an appraisal well at South Ghazalat. Meanwhile, the company allocated the remaining $17.1 million for one development well in the NW Gharib 38A pool, three development wells in West Bakr, in addition to development and maintenance projects in the Eastern Desert, and 10 recompletions in West Bakr, including facility and water handling expansion.

MUBADALA TO ACQUIRE 20% OF NOOR CONCESSION

UAE investment fund Mubadala has reached an agreement with Eni to buy a 20% stake in the Noor offshore concession. Eni currently owns 85% of the concession's stakes, while Tharwa Petroleum owns the remaining 15%. The agreement is still pending Egyptian government's approvals and is subject to certain conditions. The Egyptian cabinet had approved in March 2018 an exploration and production (E&P) agreement for the North of Sinai offshore concessions in the Mediterranean Sea. According to the agreement, Eni and Tharwa will invest $105 million to drill two exploratory wells in two phases over six years.

ABU SENNAN OIL PRODUCTION REACHES 3,800 B/D

Rockhopper Exploration Company announced that Egypt's Abu Sennan concession production has reached around 3,800 barrels per day (b/d), of which 22% (around 840 b/d) is the company's share. The figures come in line with the first half of 2018 rates, the company said. The company succeeded in its primary objectives in the Abu Roash-C and has good oil shows in Abu Roash-D, Abu Roash-E, and Abu Roash-G, which are parts of Al Jahraa 6 well. Rockhopper announced an oil discovery in the deeper Bahariya section, which produces 550 b/d.

PETROLEUM MINISTRY PAYS $111M IN ARREARS TO DANA GAS

Emirati company Dana Gas has announced receiving $111 million of arrears from the Egyptian Ministry of Petroleum and Mineral Resources. The company's average production in Egypt has declined to 345,000 b/d from 396,000 b/d during the first nine months of 2018. The reduction happened due to the natural decline in the fields' production rates as well as the company's decision to delay making any new investments due to unpaid arrears. The Ministry of Petroleum is set to settle its total arrears of $1.2 billion to international oil companies (IOCs) by the end of 2019.

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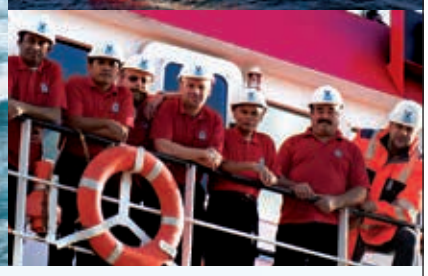

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SAUDI ARABIA

Saudi Arabia aims to acquire 30% of Russia's Novatek Arctic LNG project, Saudi Energy Minister Khalid al-Falih told Ekhbariya TV on October 25. He added it was a "very ambitious project," and the biggest example of Russian companies and the Saudi private sector cooperating.

Saudi Aramco could decrease the official selling price (OSP) differentials of crude oil bound for Asia in December. The decrease in Asia's selling prices is because of Dubai's weak crude oil structure and product cracks. The Dubai crude market structure is an important component in Saudi OSP calculations. **Traders expect that the OSP differentials for Asia-bound Arab Medium crude would either be stable or decreased by 25 cents per barrel.**

Saudi Aramco and petrochemicals company SABIC will build a new integrated industrial petrochemicals complex in the port city of Yanbu on the Red Sea coast. The complex is expected to have a processing capacity of 400,000 b/d of oil from which it will produce around 9 million tons of chemicals and base oils annually. It is expected to be operational in 2025.

Saudi Aramco has agreed to supply 130,000 b/d of crude to private Chinese chemical group Hengli Petchem for 2019, Aramco's second major marketing alliance with a private Chinese refiner. The deal was signed at the China International Import Expo in Shanghai and is worth an estimated $3.6 billion based on current market prices, a Hengli release stated.

LIBYA

Libya's oil and gas revenues fell to roughly $1.57 billion in August, a $445 million drop off from the previous month. The company blamed a contractual waiver in the country's so-called Oil Crescent region after fighting had closed the Es Sider and Ras Lanuf export hubs in June. The company assured that September revenues would be back to "normal levels following healthy advanced spot sales and on-target production." **Libya is currently producing 1.3 million b/d of crude.**

Libya's al-Bayda oilfield has resumed operations following five months of inactivity due to heavy fighting. Al-Bayda was closed in June after oil storage facilities were damaged during an attack on the eastern ports of Es Sider and Ras Lanuf. The field has a current production capacity of around 12,400 b/d.

IRAN

The US has granted eight Iranian oil importers temporary waivers from the sanctions imposed on the country's energy sector on November 5. The waivers have been granted in exchange for continued import cuts in order to not drive up oil prices. US Secretary of State Mike Pompeo said the eight nations will be expected to end Iranian imports entirely but could not possibly eliminate all imports by the November 5 deadline. Some of the nations have been identified as US allies such as **Italy, India, Japan and South Korea. In addition, both Turkish and Iraqi officials have said that their countries have been granted waivers.** Leading Iranian oil importer **China is reportedly still in negotiations** with the US regarding the terms of a waiver, but is among the eight nations. The sanctions will include an **embargo on Iranian energy trade and the blacklisting of 700 Iranian individuals and entities as well as pressuring the global banking network SWIFT to stop serving Iran's banking industry.**

South Korean Hyundai Engineering & Construction canceled a $521 million agreement to build a petrochemicals complex in Iran. Hyundai E&C said that the customer's ability to fund the project had been hit due to the country's declining economic situation.

The UK's Rhum gas field, in which the National Iranian Oil Company (NIOC) holds 50%, will continue working after meeting US sanctions conditions against Iran. NIOC subsidiary IOC will see its revenues from the field held in escrow while the sanctions are in effect. IOC will also be stripped of its decision-making powers for the duration of the sanctions.

France will push to create the necessary mechanisms to allow EU countries to maintain trade with Iran following the re-introduction of US sanctions on November 5, France's Minister of Finance, Bruno Le Maire, said in an interview with the Financial Times (FT). "Europe refuses to allow the US to be the trade policeman of the world," Le Maire told the FT. The minister confirmed that the **EU is planning to create a special purpose vehicle (SPV) independent of the US financial system.** This would permit companies to continue trading with Iran without fear of retaliatory action from the US. EU member states have so far not been granted sanctions exemptions from the US. Major European companies such as Total and Peugeot have pulled out of the country as a result.

BAHRAIN

The Bahraini cabinet approved full ownership of oil spill service companies by foreign firms and investors on October 29. The approval was granted based on a proposal by the Minister of Oil Sheikh Mohammed bin Khalifa Al Khalifa and a memorandum submitted by the Minister of Industry, Commerce and Tourism Zayed bin Rashid Al Zayani.

UAE

The Abu Dhabi National Oil Company (ADNOC) has started to fill up storage tanks contracted from the Indian government since the first week of November. ADNOC already filled two-thirds of the 5.86 million barrel tank capacity at the Mangalore Strategic Petroleum Reserves (SPR) facility with Das crude. ADNOC holds a seven-year agreement with the Indian government allowing it to access the storage and sell a portion of the crude to Indian refiners.

Emirates National Oil Company (ENOC) has been planning to undertake a month-long maintenance for its 140,000 barrels per day (b/d) condensate splitter in November. The maintenance process will include the integration of a new crude distillation unit (CDU) pipeline which is expected to be operating by late next year.

ADNOC revealed plans to boost its production capacity to 5 million b/d by the end of 2030. The Abu Dhabi's Supreme Petroleum Council (SPC) has approved ADNOC's plans that also include targets to increase oil production to 4 million b/d by 2020. The approval of ADNOC's new strategies will enable the UAE to achieve gas self-sufficiency, the company said in a statement.

ADNOC has signed a 10-year agreement with China's Wanhua Chemical Group for selling liquefied petroleum gas (LPG). The Chinese company's LPG purchases from ADNOC will reach 1 million metric tonnes per year. ADNOC did not reveal the value of the agreement.

ADNOC has signed the first of a series of concession agreements with Italian oil giant Eni. ADNOC will award Eni a 25% stake in its offshore ultra-sour gas mega project as a part of a 40-year deal. The Ghasha concession consists of the Hail, Ghasha, Dalma and other offshore fields.

ALGERIA

State-owned Algerian firm Sonatrach has signed two offshore exploration contracts with oil majors Total and Eni. "Together with Sonatrach and Total, we will have the opportunity to explore the deep waters of the Algerian offshore, a virtually unexplored geological province," Eni chief executive Claudio Descalzi said.

Algerian state energy firm Sonatrach has signed a contract with Italy's Maire Tecnimont for the LPG Train 4 – ZCINA Hassi Messaoud project in Algeria. The project is for the implementation of a new LPG train with a capacity of 8 million standard cubic meters per day, as an extension of the existing ZCINA Facility in the Hassi Messaoud area, in central Algeria. **It is expected to be completed within 30 months of the commencement date.**

Emerson and Fores Engineering has signed a $32 million modernization contract with Algerian state-owned Sonatrach for its gas processing plant in Alrar. Emerson will use its technologies to develop the production operations and the security of the processes in the plant. The project is designed to help Sonatrach enter the top 25% of companies in terms of operational and capital performance.

EGYPT OIL AND GAS
TECHNICAL COMMITTEE

Egypt Oil & Gas Technical Committee:

COOPERATION FOR OPERATIONAL EXCELLENCE

An Interview with **THOMAS MAHER**,
EOG Technical Committee Chairman
President and COO of Apex Egypt

BY MARIANA SOMENSI

As the Egypt Oil & Gas (EOG) Technical Committee gears up for the 2018 Upstream Operational Excellence Convention, we had the opportunity to talk to Thomas Maher, the committee's Chairman, and President and COO of Apex Egypt, to discuss about the committee's vision, latest activities, and plans for the future.

Could you comment on the EOG Technical Committee's vision and its role in the Egyptian oil and gas sector?

The vision of the EOG Technical Committee is to unify the sector's voice and to work in parallel with the government to enhance the well-being of the petroleum industry. We do this by bringing together exploration and production (E&P) companies, service companies, government entities, and leading industry experts under one roof to address the challenges the industry is facing, and to find potential solutions.

How do you feel about the outcome of the committee's activities since its creation?

I believe the committee's advocacy and activities have increased over time since its creation in 2013. The impact has been positive and continues to increase with an increased level of committee members and projects. The emphasis up until now has been on communicating best practices and technologies to others in the form of conventions, roundtables, and workshops. In the future, we are looking harder at jointly addressing specific industry challenges with our government partners via working groups, such as artificial lift and produced water handling, and publishing our conclusions and recommended solutions for the sector to benefit from.

With Egypt's oil and gas industry entering a new era, especially in natural gas production, what are the committee's future plans to help Egypt achieve its goals?

We are currently working on a plan with EGPC and EGAS to jointly address and propose solutions for a number of field challenges that currently limit production gains. Team leaders have been named for the four challenge areas, including 1) Artificial Lift, 2) Water and Waste Management, 3) Asset Integrity and 4) Agreements. The committee is also providing technical support to the EOG Research & Analysis Team who are working on a compendium of historical Egyptian concession agreements to be released early in 2019.

In what ways does the Technical Committee cooperate with the Egyptian government to enhance the oil and gas sector's performance?

I can give you three examples. The first are the Upstream Conventions we plan, organize, and help deliver with the support of the EOG Events Team. These conventions are used to support the Ministry of Petroleum's Modernization Program, particularly where we focus on some of the program pillars, such as Investment Attraction, HR Management, Upstream Performance, and Decision Support and Data Flow. The second example is our Young Professionals Subcommittee who are planning a Young Professionals' Day on December 4 in support of the Modernization Program's third pillar, HR Management. Motivational speakers, live coaching sessions, and an oil and gas ideas workshop are being planned. The young professional participants will come from the Ministry of Petroleum, EGPC, EGAS, Ganope, and the joint venture (JV) operating companies. The third example is the Field Best Practices Workshop we planned and delivered at Qarun Field Base in September. This was a successful effort appreciated by the 80 attendees from the JV operating companies and led by EGPC CEO Eng. Abed Ezz El-Regal. We hope to continue offering these workshops twice a year at different JV's in the future.

How do the companies involved in the committee collaborate to work for the collective benefit of the industry above the individual interests of each company?

I feel very fortunate that I chair a large committee of 35 like-minded and dedicated professionals representing many companies for the good of the industry. These unselfish committee members realize that as the industry improves, their individual companies are also likely to benefit. Most of the work is actually performed at the subcommittee level, who are responsible for our many activities, including the Upstream Convention, Field Best Practices Workshop, EGPC/EGAS Collaboration, Young Professionals, and corporate social responsibility (CSR).

The Technical Committee has recently launched the EOG CSR Subcommittee. What vision has driven the committee to elaborate a subcommittee focusing on CSR?

Yes, the CSR Subcommittee currently has 18 company representatives and had their inaugural meeting in September. The subcommittee is guided along consistent lines with Egypt's Vision 2030 and the Ministry of Petroleum's Modernization Program, allowing the sector to contribute to the country's ambitions and developments. It is not the intention of the CSR Subcommittee to interfere with the good CSR work that the individual companies are doing in their areas of operations, but rather to seek group initiatives and projects that we can do together to benefit the community. We also plan to include the young generation into the subcommittee's plans and actions, and increase CSR awareness to the young professionals in the oil and gas sector.

Could you comment on the CSR Subcommittee's recent activities and future plans?

The CSR Subcommittee has decided to focus initially on four areas: Health, Education, Awareness Campaigns, and Long-Term Projects. We have formulated teams to study possible projects in each of these four areas. The Health team is currently looking into a sector-wide blood drive that will stress the importance of having an ample blood supply to the community at large. We hope to kick this off at the annual Egypt Petroleum Show (EGYPS) in February. We are also in dialogue with the Ministry of Petroleum on how the committee can support pillar seven of the Modernization Program: Decision Support and Data Flow. We would like to devise a web-portal to archive and make available to the sector the presentations from our conventions, roundtables and workshops, as well as other publications we hope to deliver in the future.

In your opinion, what are the Egyptian petroleum sector's main challenges and what measures should be prioritized to overcome them?

I think the maturity of our Gulf of Suez and Western Desert fields require new thinking on fiscal terms that will increase the investment needed to increase crude oil production and reserves that Egypt needs. While upstream investment has been extremely strong in the offshore Mediterranean gas province, investment in the Gulf of Suez in particular, and also in the Western Desert, has decreased significantly over the past five years. While everyone is aware of the strong growth in natural gas in the Mediterranean as a result of increased investment, the same cannot be said of crude oil production from the Western Desert and Gulf of Suez.

The government has shown a real willingness to modify fiscal terms to attract an increase in foreign investment. Two recent examples are the upcoming Red Sea bid round that will have a new model form concession agreement tailored to high risk, deep water exploration, and in the mining sector following a year-long study by Wood Mackenzie based on global best practices. I believe this kind of thinking where fiscal terms are fit-for-purpose rather than one-size-fits-all is welcomed and consistent with the Modernization Program's Investment Attraction pillar.

Given your experience in the sector, what do you consider to be Egypt's most assertive move to boost its oil and gas sector's performance?

I believe the paying down of the past dues or arrears owed to the many producers in Egypt has resulted in increased investment and a renewed confidence for new foreign investors to come in. Arrears have come down from $6.5 billion to about $1.2 billion at present with a promise by the government to pay all remaining arrears by the end of 2019. The result of that effort has seen the majors (Eni, BP, Shell) investing heavily in the offshore Mediterranean, increasing gas production, and the cessation of liquefied natural gas (LNG) imports and the resumption of exports by pipeline to Jordan and soon to Europe. I believe this has also resulted in new companies such as Apex International Energy, SOCO International and United Energy Group recently entering the sector. I suspect more foreign direct investment will be announced in 2019 when EGPC, EGAS, and Ganope bid round awards are announced.

The Ministry of Petroleum is also announcing large bid rounds over vast areas of Egypt and its waters, both in the Mediterranean and in the Red Sea, with more regularity. This is good for the sector's future. Last, but not least, I am confident that the assertive move by the ministry to bring the sector up to global standards via the Modernization Program will also bear fruit in the future. The sixth pillar, Egypt as an Energy Hub, and its willingness to partner with Cyprus and Israel, is just one of the many pillars under this program that is attracting investment and creating jobs.

> "THE COMMITTEE IS ALSO PROVIDING TECHNICAL SUPPORT TO THE EOG RESEARCH & ANALYSIS TEAM WHO ARE WORKING ON A COMPENDIUM OF HISTORICAL EGYPTIAN CONCESSION AGREEMENTS TO BE RELEASED EARLY IN 2019."

INVESTING IN EGYPT'S GROWING PRODUCTION:

An Interview with PAUL WELCH, SDX President and CEO

BY MARIANA SOMENSI

SDX Energy is a petroleum company focused on exploration and production (E&P) activities in North Africa with 10 years of operations in Egypt. As the oil and gas sector opens new doors for international oil companies (IOCs) in the country, we have talked to Paul Welch, SDX President and CEO, about the company's history and plans in the Egyptian market.

Could you tell us about SDX's history and establishment in Egypt?

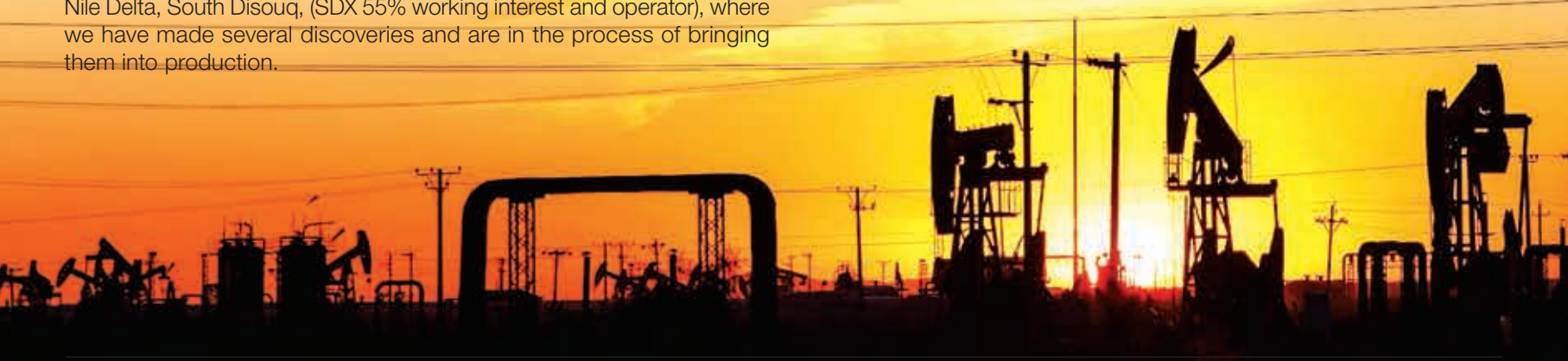
The company began its activities in Egypt in 2008, when it acquired several exploration concessions offshore in the Gulf of Suez. Concurrently, the company acquired Premier Oil's 10% equity in the North West Gemsa block and then farmed into the Kom Ombo block in Upper Egypt. We then acquired the Shukhier Marine block from NPC, followed by the acquisition of the South Disouq block in 2014 as part of an EGAS bid round application. SDX Energy itself was established in October 2015 when Sea Dragon Energy merged with Madison Petrogas, picking up a 50% equity interest in the Meseda block in the Eastern Desert as part of the transaction.

In January 2017, we further expanded our Egyptian portfolio through the acquisition of Circle Oil's assets, acquiring an additional 40% equity interest in the North West Gemsa block, taking our equity position to 50%. At present, we have two producing assets located onshore in the Eastern Desert, which are North West Gemsa (50%) and Meseda (50%), and a very exciting exploration and now development opportunity in the Nile Delta, South Disouq, (SDX 55% working interest and operator), where we have made several discoveries and are in the process of bringing them into production.

What makes Egypt an interesting place for SDX to operate?

In our view, Egypt is one of the best oil and gas countries to operate in globally. The country has an excellent business environment and is home to multiple world class hydrocarbon basins. As a business, we see considerable opportunities for us to grow within Egypt by developing our existing assets, through exploration bid rounds, and potentially through additional acquisitions.

> *"WE BELIEVE WE ARE A GOOD AMBASSADOR FOR THE COUNTRY'S OIL AND GAS SECTOR, GIVEN OUR COMMITMENT TO INVESTING HEAVILY IN THE REGION AND OUR CLEAR AMBITION TO INCREASE OUR PRESENCE IN THE COUNTRY."*



How does the company expect to expand its presence in Egypt and North Africa?

In recent years, we have had considerable success with increasing production in our existing licences in Egypt through the drill bit. As a result, we are currently developing our South Disouq asset, where we expect to achieve an initial gross plateau production rate of 50 million standard cubic feet per day (mmscf/d) of natural gas when it comes online.

Given the company's strong cash position and track record of concluding accretive transactions, we feel that SDX is well placed to make more acquisitions, in addition to participating in future licensing rounds.

What do you believe to be SDX's main asset?

Given our recent success in Egypt, we no longer have one main asset but essentially an asset portfolio. That portfolio consists of two oil producing assets in the Eastern Desert, Meseda and North West Gemsa, and then our exploration and development opportunity in the Nile Delta, South Disouq, which will be primarily a gas producing asset but with deeper oil potential. We have started development operations on the SD-1X processing facility, the well tie-ins and a 10 kilometer pipeline connecting the processing facilities to the main export line, which will enable us to commence production from the licence in the near future.

How can the company help Egypt achieve its ambitious plans for the oil and gas sector?

We believe we are a good ambassador for the country's oil and gas sector, given our commitment to investing heavily in the region and our clear ambition to increase our presence in the country. However, none of our success would be possible were it not for the support of the government and our partners.

Given Egypt's growing economy and increasing demand for domestic oil and gas production, we feel that as an ambitious business keen to grow its output in the country, we are well placed to assist Egypt achieve its energy goals. Specifically, we see the development of our South Disouq asset, which will produce from start up 50 mmscf/d (or 8,333 barrels of oil equivalent per day) as a direct contributor to Egypt's plans. However, production at all our assets has increased this year so we are doing our part across the portfolio to contribute to Egypt's growth plans.

What is the company's policy to ensure low cost production?

We pride ourselves on our strict financial discipline and always try to ensure that our funds are used as efficiently as possible. This is underpinned by a portfolio of low cost onshore producing assets and exploration prospects. This focus on capital discipline, and asset location and type, means that we are one of the lowest cost producers in the region and can remain cash flow positive down to around $10 per barrel of Brent at the corporate level.

Having financial discipline means that we focus on controlling our costs both from an operating and capital investment perspective. We focus on costs because it is something that we can control, knowing that we cannot control the oil price. We then develop and invest in assets that allow us to maintain this focus to ensure that we can prosper throughout the exploration and production cycle. When prices are low, we are resilient, but when prices increase, we become highly cash generative. Egypt's asset base has many opportunities that fall within this framework, which is why we have been so keen on expanding here.

Could you describe SDX's partnership with government officials and industry players? How does this partnership enhance operations and attract investment?

We need to have strong in-country relationships and to ensure that all our stakeholders, whether they be local employees or the government, benefit from our business success. We are very grateful to the relevant authorities for their continued support and, whilst we always look to increase our network, we believe we have the right business relationships in place to execute our plan of increasing the company's presence in Egypt.

What are the company's investment plans in Egypt?

SDX has made significant investments into Egypt to date and we plan to continue deploying capital into the region, providing employment and supporting the communities in the areas where we operate. We have invested approximately $45 million in drilling capex in the 12 months to June 30, 2018 across our North African portfolio, with a significant portion of this going towards our South Disouq development in the Nile Delta.

As a company, we firmly believe in Egypt as a country to invest in. The country is one of the most stable operating locations for producers in the world and combined with its competitive fiscal terms and the low-cost operating environment, we think the area will remain a mainstay for the oil and gas industry for decades to come.

> *"WE HAVE INVESTED APPROXIMATELY $45 MILLION IN DRILLING CAPEX IN THE 12 MONTHS TO JUNE 30, 2018 ACROSS OUR NORTH AFRICAN PORTFOLIO, WITH A SIGNIFICANT PORTION OF THIS GOING TOWARDS OUR SOUTH DISOUQ DEVELOPMENT IN THE NILE DELTA."*

THE EGYPTIAN RIG MARKET:

OFFSHORE VS. ONSHORE

BY AMINA HUSSEIN & REHAM GAMAL

The Egyptian rigs market is one of the largest markets in the North African region. Recently, it has gone through several changes, which serves the new discoveries - such as the discovery of the giant gas field Zohr in 2015 - and accordingly attracts attention to the country's onshore and offshore hydrocarbon resource potentials.

However, the changes slowed down from October 2017 to September 2018, as the rigs market did not witness significant swings either in the absolute number of rigs, types or areas. This report will analyze Egypt's rigs in this one-year timeframe.

Egypt has two main types of rigs: onshore and offshore rigs. The equipment used in them are not so different as both methods need tools like exploratory equipment, waste-water/oil separators, pipelines, pumps, and storage tanks. However, there are some ultimate differences within the structure of the drilling rig itself.

OFFSHORE RIGS

There are two types of offshore rigs in Egypt: the first one is the moveable offshore drilling rigs, as jack-up, semi-submersible, and drillship rigs; while the second type is the fixed rigs/platforms. These offshore rigs are used in the Gulf of Suez, the Mediterranean Sea, and the Delta regions.

JACK-UP RIGS

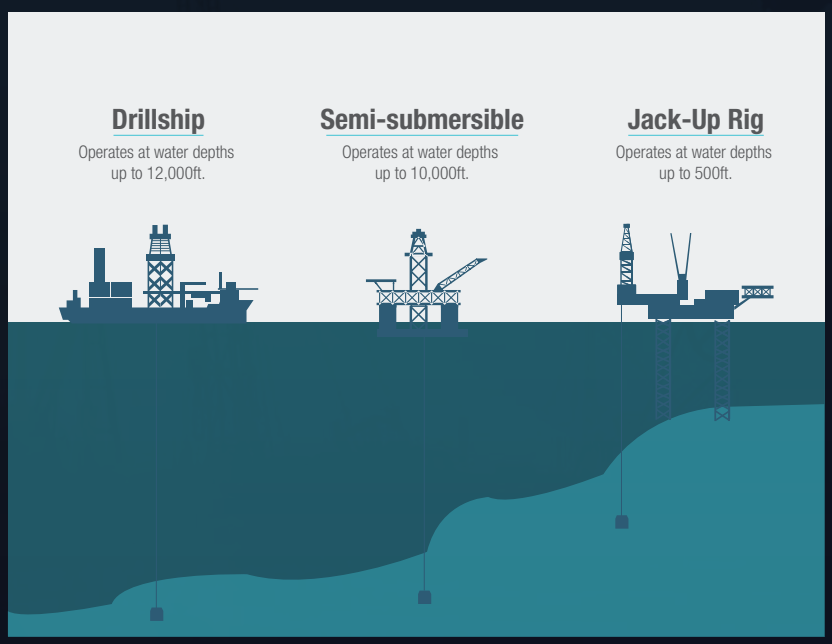
A jack-up rig is a platform that stands above the water level and normally consists of three legs that reach down the sea floor. Those legs can be jacked up so that the rig can move to the position where it is supposed to drill next. This type of rig can only operate in up to 500-feet-depth waters; however, it drills most of the offshore wells in Egypt thanks to its several advantages. First, it is less expensive to build than the other offshore rigs; second, it needs a smaller crew; and third, it has less maintenance costs. It represents 74% of the total offshore rigs and 7% of the total rigs in Egypt during the year from October 2017 and September 2018.

DRILLSHIPS

A drillship is exactly as it sounds: a ship-based vessel that is designed to carry out drilling operations from mid-water to ultradeep-water areas that reach water depths of up to 12,000 feet. The drilling equipment is built up on the deck, with the derrick placed in the middle of the ship, below which there is an opening that the well is drilled through. Drillships have the advantage, which semi-submersible lack, of carrying a variable deck load. Although they are not as stable as semi-submersible rigs in rough water, they can be relocated from one place to another much faster. Drillships represent 14% of the total offshore rigs in Egypt.

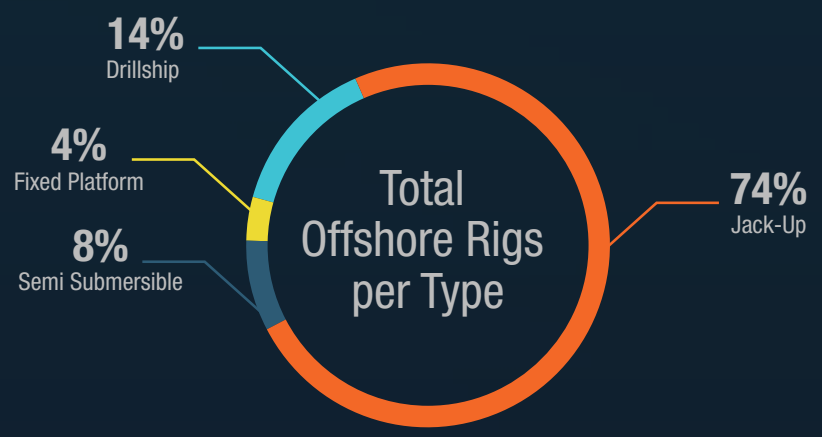
SEMI –SUBMERSIBLE RIGS

Semi-submersible rigs are the most common type of offshore drilling rigs in the world. The rig is partially covered with water, but still floats above the drill site. While drilling, the lower hull is filled with water, which gives the rig significant stability unlike the jack-up rig. In addition to this advantage, and with technology development, a depth of 10,000 feet can be achieved easily and safely by the rig. However, this technology increases the operating cost, which can vary between around $200,000 and $450,000 per day. Semi-submersible rigs represent 8% of the total offshore rigs in Egypt.



FIXED PLATFORMS

Fixed platform rigs are built on concrete or steel legs anchored directly inside the sea at the well location, which makes the rigs very stable. The more wells there are to drill, the more attractive the platform rig becomes, as they have the lowest per-day cost. However, they cannot reach deep-water floors. Fixed platforms represent only 4% of the total offshore rigs in Egypt.



ONSHORE RIGS

This category of rigs represents the first development in drilling operations. Land rigs come in different sizes and strengths. They are classified based on two main criteria: maximum drilling depth and mobility. Egypt has two types of onshore rigs: land-drilling and land workover. They are used in onshore fields in the Eastern Desert, the Western Desert, and Sinai.

LAND-DRILLING RIGS

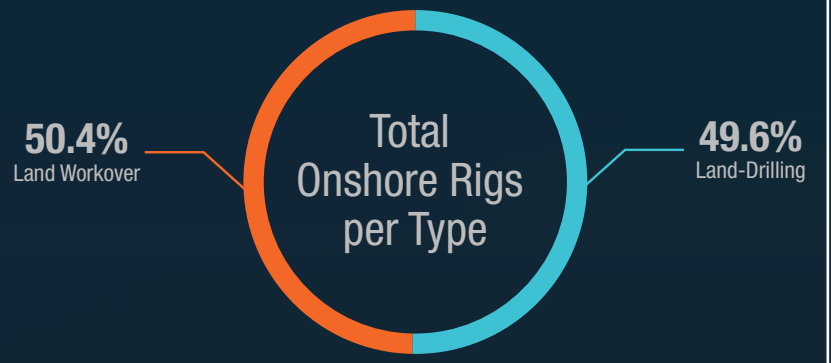
Drilling rigs are machines that basically create holes in the earth subsurface. A land-drilling rig is one of the most important pieces of oilfield equipment. Land-drilling rigs are used during several stages throughout the life cycle of oil and gas fields. They can be available with different sizes and power capabilities, and can be used in different applications.

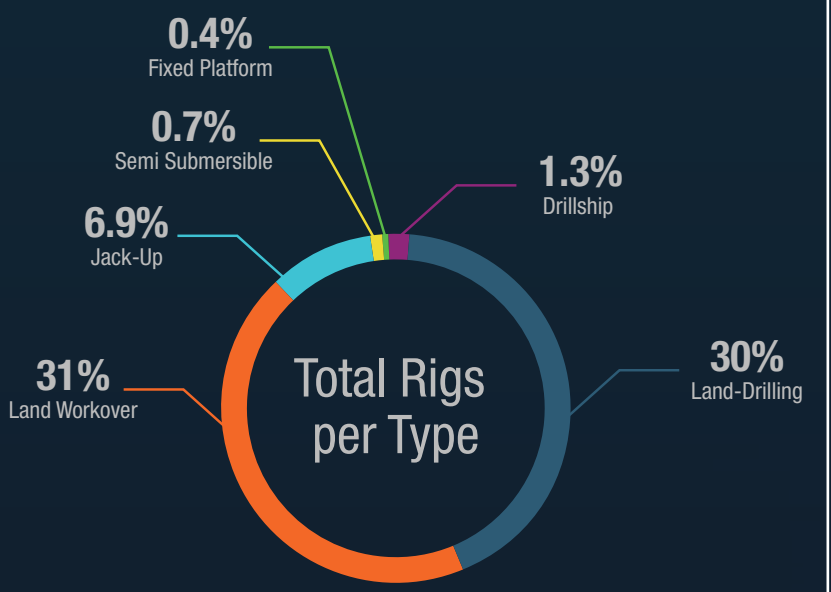
The supply market of land-drilling rigs is divided into rig manufacturers and land-drilling services suppliers, which supply supportive services including the rig crew and other drilling equipment. Land-drilling rigs represent 49.6% of total onshore rigs and 30% of Egypt's total rigs.

LAND WORKOVER

Workover rigs are available for both onshore and offshore purposes. The land workover rigs are mainly used during the production stage, as they are used for a workover program and well repair, production enhancements or for other well treatments.

The types of workover rigs range from 150 to 1,000 horsepower. They have a surface depth that is equipped with diesel engines and transmissions, and is available from 8000 to 30000 feet. Land workovers represent 50.4% of total onshore rigs and 31% of Egypt's total rigs.





OFFSHORE VS. ONSHORE RIGS

There are two aspects to compare between offshore and onshore rigs in terms of efficiency: timeline and cost. As for timeline, offshore drilling contracts last for longer time than the onshore ones. Onshore drilling requires less of a time investment as many inland rigs can drill oil in a matter of months.

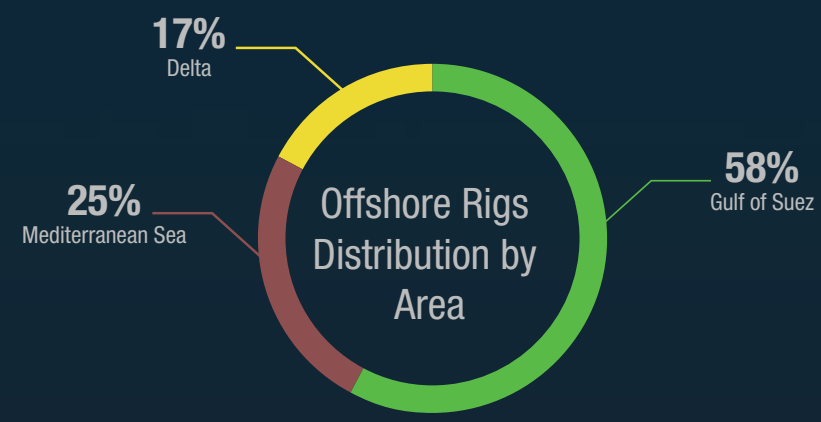
Given the long timeline of offshore drilling contracts compared to onshore, in addition to the added risks, offshore drilling requires more initial investments. However, the profitability rates of offshore drilling rigs have been improving. As for onshore drilling rigs, the cost can be lower, since the timeline of the contract is often shorter.

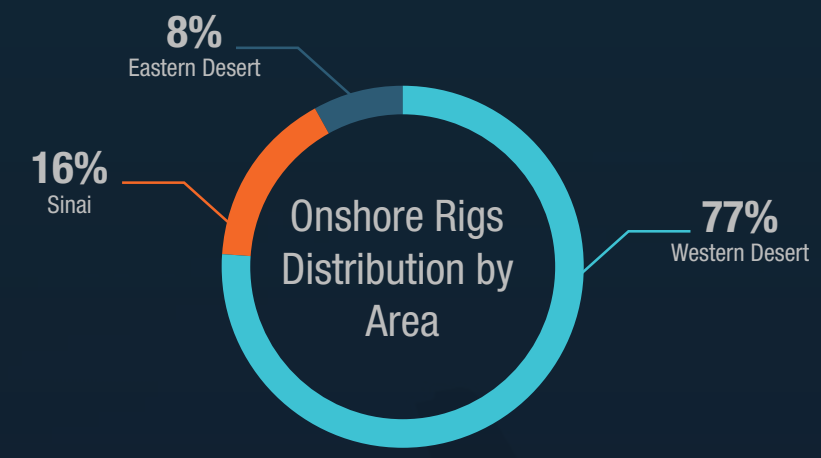
RIGS PER AREA

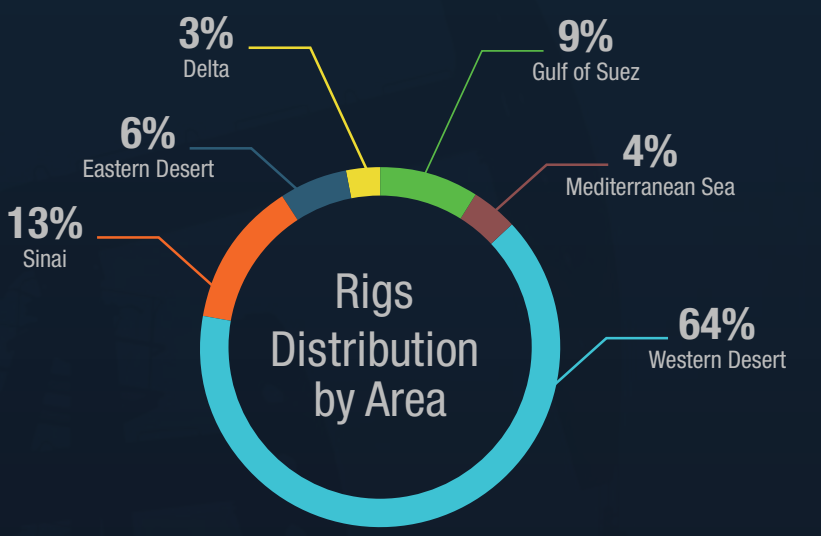
Rigs are spread across Egypt's hydrocarbon producing areas. Most of Egypt's rigs are located in the Western Desert, which contains around 64% of the total rigs in the country, followed by Sinai with 13%.

The Gulf of Suez's rigs represent the highest percentage of the total offshore rigs per area in Egypt, reaching 58%, while the Mediterranean Sea represents 25%, and the Delta only 17%.

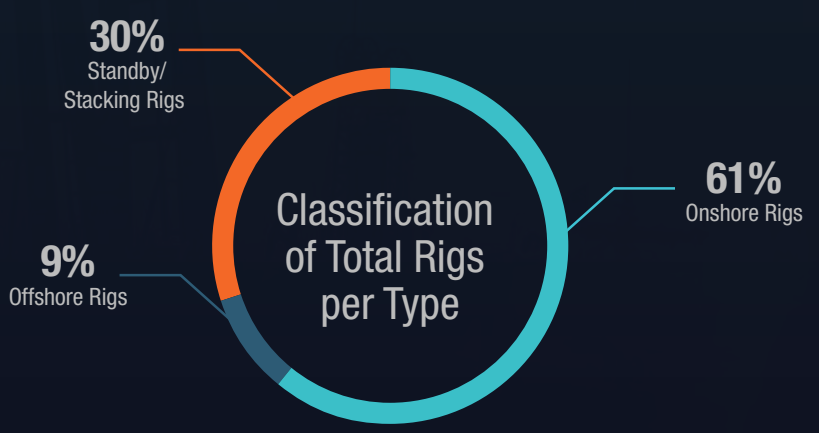
On the other hand, most of the onshore rigs exist in the Western Desert as it has approximately 77% of the total onshore rigs in Egypt, while Sinai represents 16%, and the Eastern Desert only 8%.







Although the country is known for its offshore fields, the Egypt's rig market features show that the oil and gas industry depends more on the onshore rigs, representing around 61% of total rigs, while the offshore rigs represent only 9%. It is worth mentioning that the remaining 30% are considered as standby rigs, which are awaiting decision from the investor or another party to start drilling.



PRICES & PROFITS:
BALANCING PRODUCTION COSTS AND OUTPUT REVENUES FOR MATURE FIELDS

BY FELIX FALLON

Mature fields - those whose have reached their peak production and started to decline-- are still exploited until their economic limit has been reached and the cost of operations become higher than the returns on production. This point at which a field becomes a financial liability is variable, and is dependent on a number of factors, such as the current oil price, the crude type, the state of surrounding infrastructure, the projected depletion curve, and the ease of extraction.

Weighing up the risks and rewards of continuing to invest in mature fields comes down to how much a company believes it can minimize expenses and maximize production. More pressingly, the decision of when to pull out of a mature field is based on a balance of costs related to producing an asset and the cost saving associated with abandoning an asset.

Mature fields remain a popular investment - in 2015, more than 70% of global oil and gas production came from fields that are more than 30 years old - they have predictable declines in production and predictable revenues. However, as production curves decline and surrounding infrastructure ages, mature fields present both technical and operational challenges that affect the viability of making or maintaining an investment.

Economic Viability of Initial Investment

The viability of investing in a mature or aging field is somewhat dependent on the price of oil at the time of investment, as it gives an estimation of what the post-investment gains will be relative to the sum of the investment. Mature oil fields require constant attention and infrastructure upgrades in order to maintain the pressure needed to pump oil. If the projected revenue from the sale of oil is high, these maintenance costs are easily covered and the breakeven point lowers. To maximize the profit garnered from a high oil price, the prospect of increasing production capacity by investing in a mature field is tempting.

A theory pioneered by economist Harold Hotelling demonstrates the need to pump more when the price of oil is high. Its central idea is that with a non-renewable resource, a significant opportunity cost is paid in regard to production; more production in the current period means less production in future periods. Therefore a producer should immediately change its production rates in response to changes in the price of oil.

However, the high operating costs of oil extraction make this model not fully actionable in real situations; the expense of reserving oil production capacity for times of high oil prices may be too much to react to every price fluctuation. The lag times from the production to the sale of the oil - especially with offshore fields, where between two and four years can pass before the oil is sold - also limit putting a purely reaction-based investment and production model into action.

Fluctuations in production investment depending on oil prices do not entirely happen in line with Hotelling's theory, but rather correlate more with the inverse; limited investment during times of low oil prices is common. However, this does not represent causation, and is mostly because of tighter budgets across the board.

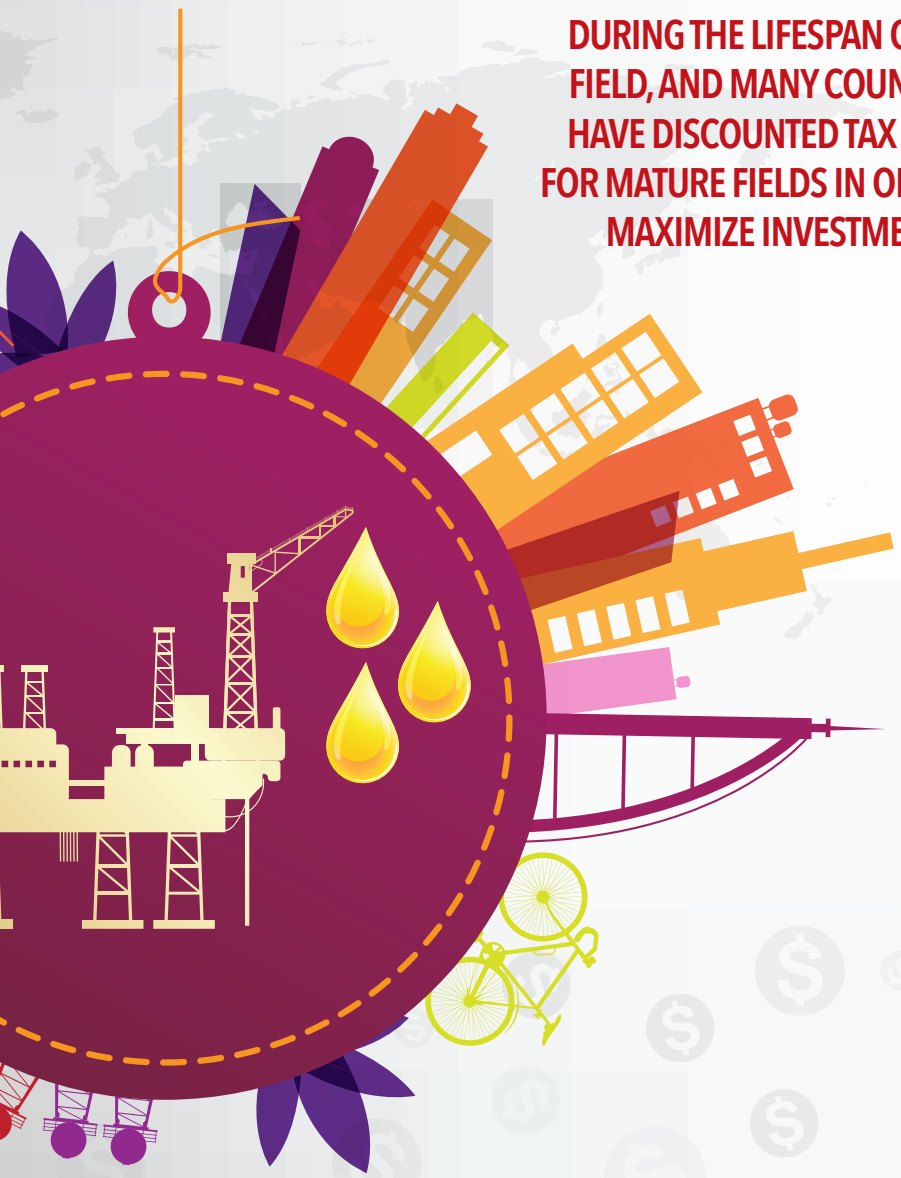
The choice to invest in a mature asset therefore is not dissimilar from the choice to invest in a new asset and depends on the local investment environment, the particular investment strategy of a country or company, the scope of the investment, and projections for the geological classification and provable size of the field.

The differences come down to the details, for a new asset the cost of building or connecting the surrounding infrastructure is taken into account, whereas that cost lies in potentially maintaining or upgrading surrounding infrastructure for aging assets. Besides, tax policies often change during the lifespan of the field, and many countries have discounted tax rates for mature fields in order to maximize investment. In 2012, the UK government introduced tax breaks for mature fields in order to stimulate investment.

IN 2015, MORE THAN 70% OF GLOBAL OIL AND GAS PRODUCTION CAME FROM FIELDS THAT ARE MORE THAN 30 YEARS OLD.

Reserves in mature fields are also often harder to extract than new fields. Extracting from brownfields often requires using different technology and specialized drilling techniques. Enhanced Oil Recovery (EOR) refers to the process of producing hydrocarbons in an oil field from unconventional methods and can include displacement of oil by CO2 gas injections or water-flooding with soluble chemicals. The costs of a CO2-EOR project are site and situation-specific. Detailed reservoir studies, project plans, and economic assessments are required to determine the economic viability of a specific CO2-EOR project, and costs can vary widely based on location, the geologic characteristics of the target field, the reserves left in the target field, and the amount of CO2 required. The total CO2 costs (both purchase price and recycle costs) can amount to 25% to 50% of the cost per barrel of oil produced.

TAX POLICIES OFTEN CHANGE DURING THE LIFESPAN OF THE FIELD, AND MANY COUNTRIES HAVE DISCOUNTED TAX RATES FOR MATURE FIELDS IN ORDER TO MAXIMIZE INVESTMENT.



Mature fields benefit economically due to the existing wellbores and surface infrastructure. Although some infrastructure may need renovation or replacement, the infrastructural costs of mature fields are often much lower compared to new developments. While the balance of payments according to expected revenue and infrastructure payments must be considered, the use of existing infrastructure is an actionable way to conserve costs and increase the viability of the field. In 2006, in order to promote the effective use of existing infrastructure, including platforms and pipelines, the Norwegian Ministry of Petroleum and Energy instated third-party access to facilities. The aim of these regulations was to promote the efficient use of facilities and infrastructure, providing incentives for licensees to conduct exploration and production activities close to existing infrastructure.

The Economic Limit: When to Abandon an Asset

The point at which to abandon an asset is determined more by contemporary oil prices than the choice to initially invest in them. The price of oil has a more direct effect on the economic limit of a field than it does on initial investments as the lag time for returns is shorter and the decision to withdraw from an asset is more time and profit sensitive than investment strategy. Calculations analyzing costs related to producing an asset vs the costs saved by abandoning an asset determine at which point that asset becomes a financial liability.

An oil field's decline in production has to be carefully managed in order to prolong reaching the economic limit. Solutions such as Baker Hughes' DeclineShift and Halliburton's UpLift look to do exactly this. By optimizing flow rates through field-specific techniques and equipment, production efficiency is increased and costs can be saved. The same is true for increasing economically recoverable reserves by identifying bypassed hydrocarbons or extending field life reservoir management practices such as optimizing displacement efficiency and controlling reservoir pressures.

Each method acts on a different side of the economic limit equation; saving costs and increasing possible production. Therefore, mitigating costly liabilities such as low oil prices or infrastructure renovation is a must.

Mature Assets Beyond Limits

Oil fields can be operational from between 30 and 100 years, and the economic limit is not the ultimate technical limit of recovery. Technological and methodical improvements can further extend the life of a mature asset. The ultimate oil recoverable can change the economic limit; if a different technique or method is used, the viability of production can change.

Jonathan Williams, geoscience team leader at BP told the Society of Petroleum Engineers at a forum discussion: "You have really got to think of it in terms of how much ultimate recovery potential you have already achieved and where are you in that production profile… That gap between what you are producing and what is the capacity—and therein lies the opportunity."

As many of the world's oil basins have been explored and large discoveries are occurring less frequently, it is becoming critical for companies to improve mature field recovery in order to continue meeting production and revenue targets, and to be able to sustain global oil production in the long term.

Old, but not Dead

The economic viability of investing or reinvesting in mature assets is - as with new assets - dependent on a wide array of disparate factors; the geological makeup of a particular field, the reliability of the surrounding infrastructure, the financial capabilities of a given company, the local tax and regulation environment, and the price (or projected price) of oil; all contributing to the economic limit of a mature asset. A crucial difference between investment in an aging field and in a new field is the large volumes of hydrocarbons in place that have been identified through drilling, testing, historical production, and pressure data, which significantly decrease risks and preliminary associated with oil production.

AIM FOR THE FUTURE: ASSET INTEGRITY AND THE MODERNIZATION PROGRAM

BY SARAH SAMIR

Since the oil crash of 2014, it has become increasingly important for oil and natural gas operators to review the value of their assets, and to manage their integrity. Developing an asset integrity management (AIM) system helps operators to evaluate their business situation, offshore and onshore, and to enhance productivity. AIM systems ensure that companies are able to maintain the integrity of their assets while adopting cost-effective methods. Having a clear AIM system allows companies to optimize operations, and to ensure safety through analyzing their equipment, infrastructure and workforce.

COMPANIES SHOULD CONSIDER THE AGE DEMOGRAPHIC OF EMPLOYEES TO AVOID BOTH HAVING AN AGING WORKFORCE AND ONE THAT IS PREDOMINANTLY YOUNG AND INEXPERIENCED.

AIM IN THE OIL AND GAS SECTOR

As global oil prices dropped in 2014 and remained low until 2017, oil and gas leaders began to introduce AIM systems to improve their work efficiency. The Egyptian oil and natural gas industry now has a growing need of a more sustainable workplace that reduces risks, generates value, and aligns with health, safety and environment (HSE) considerations. Integrity threats are growing as the technologies used in one project increase.

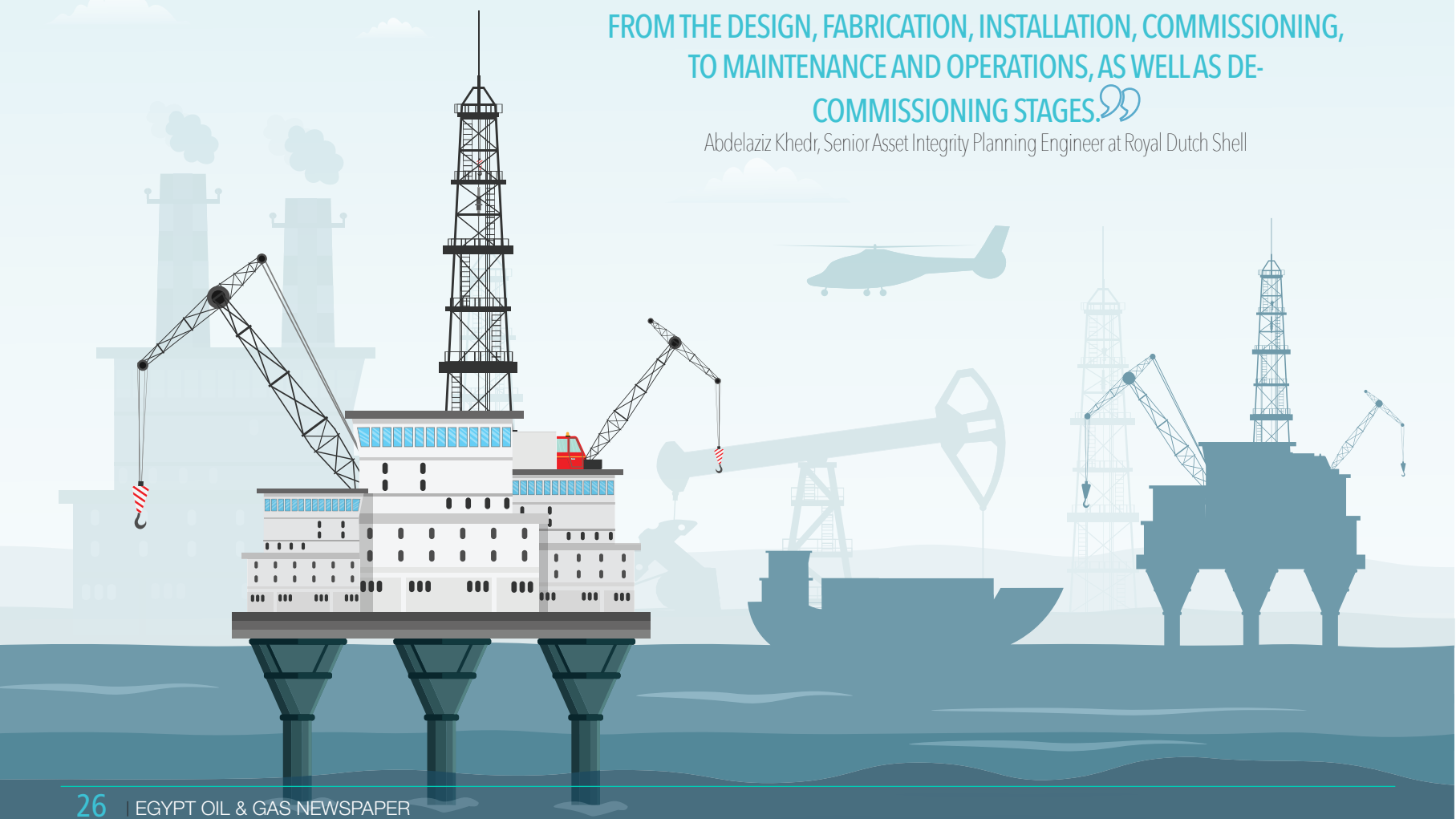
Operators need to introduce an AIM program that measures design, technical and operational integrity; one that maintains their assets without risking the project's objectives. Within an oil and gas company, assets that require integrity management include production facilities, equipment, the workforce, and infrastructure.

"All high-risk assets should be managed with such a system. Risks to people, process, environment, reputation and cost shall be considered," Abdelaziz Khedr, Senior Asset Integrity Planning Engineer at Royal Dutch Shell, told Egypt Oil & Gas. "Drilling rigs, offshore platforms, pipelines, refineries, petrochemical plants, LNG trains, gas plants and even fuel stations all have high risks and shall be governed by some level of AIM recommended practices based on the relative risk impact levels," he said.

For any oil and natural gas operation, having an AIM program in place is key for developing the business. Leaders must understand how asset management affects the company's operations, expenditure, productivity levels and long-term planning. Moreover, conducting due diligence is a crucial part of assessing the company's current AIM performance and understanding how asset management can be improved in the future.

"ASSET INTEGRITY ALLOWS [THE EGYPTIAN INDUSTRY] TO GET OPTIMUM RELIABILITY AND INHERENT SAFETY LEVELS STARTING FROM THE DESIGN, FABRICATION, INSTALLATION, COMMISSIONING, TO MAINTENANCE AND OPERATIONS, AS WELL AS DE-COMMISSIONING STAGES."

Abdelaziz Khedr, Senior Asset Integrity Planning Engineer at Royal Dutch Shell



MAINTAINING ASSET INTEGRITY

Whenever asset failure occurs, the company first should identify the cause. Inspections and analysis should then be carried out, and a plan should be made to maintain the asset in the future. Upon implementing the plan, the company should monitor the process and results in an effort to continue either improve its performance or reduce the risk of failure.

AIM systems operate by inspecting different assets in order to estimate their lifespan and calculate what is required for their maintenance. One of the approaches to achieve this is risk-based inspection (RBI), which prioritizes inspecting equipment, assets, and components. This approach is conducted through the use of inspection data and past operating conditions in order to make strategic predictions and identify risks before failure occurs. The RBI inspections are focused on engineering analysis and centered on assessing the potential for failure.

"Asset integrity allows [the Egyptian industry] to get optimum reliability and inherent safety levels starting from the design, fabrication, installation, commissioning, to maintenance and operations, as well as de-commissioning stages," Khedr said.

"The practices of asset integrity all over the asset's lifecycle allow the [oil and gas] plants to also run in a cost effective way through the profitable operation and the additional life it gives to the asset," he added.

Managing the workforce effectively is another cornerstone of a sound AIM program. Companies should consider the age demographic of employees to avoid both having an aging workforce and one that is predominantly young and inexperienced. Moreover, an AIM program should try to reduce the rate of employee turnover, which can bring instability to oil and gas operators.

AIM AND DIGITIZATION

Sharing experience in exploration and production (E&P) of oil and natural gas helps the country decrease costs and enhance output. The Egyptian Ministry of Petroleum's Modernization Program includes pillars for supporting decision-making and improving data flow. "In Egypt, the ministry's oil and gas Modernization Program is clearly based on the vision that harnessing data and leveraging new technologies will improve operations and drive the next level of productivity for Egypt," Matthias Heilmann, President and CEO of BHGE Digital Solutions, previously told Egypt Oil & Gas in an interview.

A key part of this pillar is the development of a shared data bank. In February 2018, the ministry signed an agreement with Schlumberger to establish a database of E&P activities which aims to promoting and facilitate E&P tenders.

The website would help digitizing the Egyptian oil and gas sector, which "is a key enabler of maintaining a sustainable AIM system since AIM requires the involvement of technical, operational and financial teams, which result in huge set of inputs and outputs that require the assistance of technology and digitalization," Dr. Mohamed ElHabbal, an AIM expert, told Egypt Oil & Gas.

Moreover, having a shared databank would help the Egyptian industry as it will " spread out and highlight perfect implementation practices, and show mistakes that are a precious opportunities for improvement," said Khedr, adding that a "shared databank will give [the industry] the opportunities to optimize the building and operation of new assets."

WORKFORCE DEVELOPMENT

The Egyptian oil and gas sector is prioritizing workforce development in its Modernization Program due to its critical role in the oil and gas sector. "Personnel training, and empowerment is crucial to implement a successful AIM system," explained Dr. ElHabbal. "People are the brain of the system and they are responsible for designing the system, implementing the system and ensuring its sustainability," he said.

Well-trained employees are vital for managing asset integrity as they take decisions related to the AIM programs, its budgets, and implementation, according to Khedr.

The ministry is keen to develop its people through training young professionals and helping them build their own career path to reach measurable and realistic goals.

Moreover, the ministry empowers the oil and gas sector's employees through providing them with equal opportunities, removing gender disparity in the workplace, and encouraging women to take the lead and reach managerial positions.

INFRASTRUCTURE

Egypt's oil and gas infrastructure has become even more important in recent years given the government's plan to transform the country into a regional energy trading hub. The government is keen on developing the existing infrastructure and establishing new infrastructure that develops oil and gas production, and treats, distributes and markets hydrocarbons.

Egypt has a wealth of infrastructure, including production facilities and units that are important to treat produced oil and gas. Developing these facilities and establishing pipelines that connect these facilities to nearby fields is important because it saves time and money spent on transportation.

Egypt is also developing its import terminals and is constructing a subsea pipeline to enable Cypriot natural gas to reach its liquefaction plants. The Idku and Damietta liquefaction plants are designed to liquefy natural gas so that it can be exported via ship. The country is working on developing the plants and on settling a $2 billion fine in an arbitration case with Union Fenosa in order to be able to re-open the Damietta plant.

AIM FOR THE FUTURE

Egypt can develop its petroleum sector through setting AIM programs. The Modernization Program is developing the sector's assets and managing their integrity. Khedr tells us that further sector-wide initiatives may better help the industry manage its assets and reduce risks. He recommends "a Supreme Council of Asset Management responsible for the standardization of asset management practices in addition to setting the strategies and requirements." By ensuring asset integrity, the government, local companies and international firms can be certain that the oil and gas industry is well maintained, produces high quality hydrocarbons, and preserves the health and safety of workers, as well as the environment.

> "PERSONNEL TRAINING AND EMPOWERMENT IS CRUCIAL TO IMPLEMENT A SUCCESSFUL AIM SYSTEM. THEY ARE RESPONSIBLE FOR DESIGNING THE SYSTEM, IMPLEMENTING THE SYSTEM, AND ENSURING ITS SUSTAINABILITY."
> Dr. Mohamed ElHabbal, AIM expert

JOINT VENTURES FOR OIL AND GAS MEGA PROJECTS: A SECTOR'S CORE

BY DINA EL-BEHIRY

Joint ventures (JVs) are a major tool for the oil and gas sector's environment, which is mired with complexity and continuous risk. JVs are entities between two or more companies to establish a project. Each partner included in the JV has to realize that trust and establish proper communication. This is the core that will determine a JV's success.

Embarking on a JV enables the partners to have access to new markets, new technologies, deal with different situations and share the project's benefits and risks. On the other hand, partners may have unclear or different objectives for the project, and companies from different cultures may find effective collaboration harder to achieve.

When it comes to using the JV for establishing a mega project, these advantages and disadvantages may be amplified by the fact that a higher number of partners are involved. Hence, mega projects require establishing a special structure to deal with the higher complexity. Partners must take many factors into consideration including the political, economic, norms and rules of the host country.

Nowadays, establishing JVs for oil and gas mega projects is hindered by the many challenges that need to be clearly addressed from the very beginning of the project to identify the required methodologies needed to overcome them.

BARRIERS TO CONSIDER

Mega projects are a necessity to maintain progress in the oil and gas sector. Day after day, these massive projects have proven their importance by the economic transformations they have achieved. However, these projects are faced with many barriers that may be gauged from the beginning of the exploratory phase until the production phase. That is why, while establishing these projects, there is a question that must be raised: how can mega projects succeed and be built on time and on budget? To answer this question, the challenges associated with these projects must be considered.

The first challenge that faces any mega project is its feasibility. Before initiating the project, the partners have to check whether it will be feasible to do the project or not, taking into consideration all political, economic and social factors that will affect its outcome.

The unclear role of the partners participating in the mega project may also be a main challenge. From the beginning of the project, each partner must clearly understand the project's vision and objective. This will enable the partners to recognize their rights, duties and the ideal way to perform their roles in a way that will contribute to achieving the project's goal. That is why misunderstanding the partnership concept is problematic when failing to understand how they need to implement their roles. Besides, the size of the role has to be considered also, meaning that if one partner holds a greater stake in the project, the others must understand it will have a larger role in managing the project. On the other hand, if the project's roles are divided evenly among the partners, they are all expected to exert the same effort.

The planning phase is in many ways the most important stage of developing a mega project. If the project's plan is not clear, depends on misleading information or does not take into consideration the project's circumstances, this could result in budget shortfalls and missed deadlines.

Moreover, mega projects are inherently risky because of their high complexity. That is why, the unequal sharing of risks and benefits among the partners could be a major challenge - especially if an unexpected problem arises. The funding may be

ONE OF THE MAIN CORES TO GUARANTEE THE MEGA PROJECT'S SUCCESS IS TO BUILD A TEAM WITH THE MOST SUITABLE MIX OF ABILITIES FOR THE PROJECT.

a challenge too if financial responsibilities are not clearly agreed.

When it comes to the execution phase, there will be different challenges that may appear including sourcing the needed resources for establishing the project. Some countries suffer from lack of resources and importing materials will add to the cost of the project. Furthermore, companies will need to ensure that the necessary technology is accessible.

Employing workers with inadequate training throughout the execution phase can also be fraught with risk. The workers will not understand completely their missions while handling the project and how they must perform to link it to production which may waste time and resources.

If all of these challenges and others are not taken into consideration from the beginning, the situation may deteriorate. The partners may either be over-optimistic for the project's results or become overwhelmed by problems posed by poor execution and weak organizational design.

CROSSING THE BARRIERS

Partners need to figure out how to cope with the challenges surrounding JV mega projects. To do so, the owners have to establish a framework to organize and manage the project's life cycle from exploration and planning to production through to decommissioning.

The first step to overcome these challenges is carrying out a well-researched feasibility study. This will help the company determine the likelihood of success and to provide an advanced projection of the potential costs and returns.

Besides, the partners must also agree on a management system and a means of allocating tasks and responsibilities between them. Each company will fulfill specific responsibilities in the project and provide finance for it. How these obligations are distributed will be confirmed during planning, and a management system should be in place for when the exploration phase of the project begins. Putting these structures in place will help to avoid any problems or conflicts when the project is underway.

After this step, the owners have to specify formal phases as check points, meaning that, before moving from one phase to another, there must be specific measures to be reviewed. In this way, there will be transparency in the decision-making process throughout the stages.

Furthermore, one of the main cores to guarantee the mega project's success is to build a team with the most suitable mix of abilities for the project. That is why, the owners have to ensure that their workers are fully trained, understand completely their roles and perform them correctly. Having a team with clear roles and shared goals will help to minimize bottleneck situations.

Engineering is one of the most important skills needed in any successful mega project. That is why all successful international oil companies have highly-skilled engineers who are trained in all the latest technological innovations and techniques.

National governments almost always play a major role in the development and direction of mega projects. Due to their size and scope, large energy projects are often seen as critical infrastructural projects that necessitate government involvement. The state can help by removing regulatory barriers, simplifying legal procedures, and providing access to resources, infrastructure and technology needed for the project's development.

All mega projects must engage in risk management, which requires that the companies not only consider predictable risks but also plan for unexpected ones. Conducting a proper risk assessment requires careful planning, technical knowledge, and the study of other companies' past experiences.

A LIGHT AT THE END OF THE TUNNEL

Amid the challenges that hinder the progress of oil and gas mega projects, the owners of these projects need to think about the future and how fruitful the results will be when they exert their efforts to figure out how to stand against this dilemma. During the life cycle of the mega project, the owners have to set specific standards and techniques to define the project's boundaries.

In order to guide mega projects in the future, we must encourage research that analyses the previous technical and operational experiences of other companies. In these studies, they need to discuss the problems faced by other mega projects and how the owners managed to overcome them.

Most importantly, this research should study the projects with the greatest foot prints around the world to benefit from their success stories, from their methodologies, and to have a wider view of the necessary steps to developing a successful JV mega project over the long term. Case studies of failed mega projects can be prepared in a bid to help prevent future ventures from suffering the same consequences. This should be done in the knowledge that individual projects operate within different environments, and that the challenges faced by one may not necessarily be transferable to another.

Deepening research into the subject will make great strides in measuring the performance of mega projects, determine the problems they face and demonstrate how they are solved. This will help develop effective methodologies to be taken into consideration by future efforts to establish JV mega projects.

COMBATING WELL CONTAMINATION WITH BIOCIDES

BY MATTHEW HOARE

The threat of microbial contamination is a constant headache for oil and gas companies operating in all parts of the world. Bacterial growth is the cause of a number of problems that disrupt production facilities and degrade the quality of hydrocarbons. From pipeline corrosion and pump damage to the souring of oil and gas, failing to deal with contamination can have a significant economic effect on a company's operations.

Chemical experts resort to biocides in an effort to contain contamination and kill harmful microorganisms. However, different chemicals will produce different effects, and some are more effective in specific environments. Selection will therefore depend on the problem that the company is trying to tackle; the nature and location of the microorganisms.

THE CONSEQUENCES OF CONTAMINATION

The growth of microorganisms within wells, pipelines and storage facilities can present a number of problems for upstream and downstream operations. The presence of sulfate-reducing bacteria (SRB) is particularly problematic. This type of bacteria reduces sulfates present in hydrocarbons to hydrogen sulfide (H2S) which is the compound that can result in frequent well failure. H2S actively reduces the hydrocarbon content of oil and gas, degrading the quality and increasing the sulfur density. Having high concentrations of H2S will require removing it in a process known as 'sweetening'.

Sour reservoirs also cause the formation of iron sulfide (FeS) which interacts with the metal surfaces of pipelines, transmission systems and tanks, causing corrosion. SRB-induced corrosion is a serious problem for the industry, and is, according to some estimates, responsible for as much as 40% of corrosion in gas pipelines. Data collected by Qarun Petroleum Company (QPC) and presented during the Egypt Oil & Gas Field Best Practices workshop in September showed that FeS scale was responsible for 40% of all workovers at the company's wells.

The accumulation of scale can also disrupt flow by clogging electrical submersible pumps (ESPs), submersible recirculation pumps (SRPs), and valves, leading to equipment failure. Any such occurrence will require repairs, forcing the company to take the well offline and halting production. Well downtime and the costs of replacing broken equipment can result in considerable economic losses and otherwise impedes the efficiency of the production facility.

The accumulation of FeS scale can be accelerated by a number of factors, not limited to a high concentration of H2S. Temperature, well pressure and pH are all variables in determining the speed at which FeS accumulates. Scale therefore is especially prevalent in highly-pressurized sour gas wells.

Health and safety must also be considered regarding H2S, which is a highly toxic compound that can be hazardous in relatively small quantities. Not only can inhaling the gas prove fatal in serious cases, H2S is also extremely flammable. It is essential therefore that H2S detection and monitoring guidelines are implemented.

BIOCIDE TYPES

SRB is produced when contaminated water comes into contact with oil. This can occur during many stages of the production cycle, including the use of non-sterile drilling fluid, contaminated water in the borehole and the presence of water in transmission systems. Because the potential sources of contamination are so numerous, it is almost impossible to prevent hydrocarbons from coming into contact with sulfate-reducing microbes.

The principal way of mitigating the spread of microorganisms is via the use of biocides – chemicals that can be deployed to neutralize the bacteria and prevent migration. Biocides perform differently depending on the environment, and companies should carefully select which chemical (or combination of chemicals) is appropriate for the task at hand.

Biocides can be broadly categorized into oxidizing and non-oxidizing chemicals. Common oxidizing biocides include chlorine dioxide, bromine and hydrogen peroxide while aldehydes, acrolein and tetrakis (hydroxymethyl) phosphonium sulfate (THPS) are all regularly-used non-oxidizing biocides.

Although oxidizing biocides kill bacteria quickly, they also have a tendency to interfere with other corrosion-deterring chemicals and actually produce corrosion themselves. It is for this reason that oxidizers are rarely used downhole and are usually restricted to usage topside.

The two most common biocides used downhole and within transportation systems are glutaraldehyde and THPS. Glutaraldehyde, a chemical commonly-used in commercial biocides, can be used to neutralize fungus and bacteria. It is advantageous due to the diverse environments in which is remains effective; being able to withstand a wide range of temperatures and pH values, as well as being water soluble. THPS meanwhile is also soluble in water, has low toxicity and is effective in combating bacteria (including H2S), fungi and algae. Most importantly, it is able to remove FeS from the metallic interior of pipelines, tanks and transmission systems.

Although some biocides produce better results than others, none are completely effective on their own. Part of this is due to bacteria's ability to increase its immunity when continuously exposed to a particular chemical, and normalize to the environment. Companies should therefore alternate between biocides; exploring different blends and routines to refine their biocide programs and increase their efficiency.

APPLYING BIOCIDES

Biocides may be applied via batch treatment and continuous treatment. Batch treatment sees the application of a single dose of biocide on a weekly or monthly basis, while continuous treatment exposes microorganisms to the biocide continuously. Batch treatment applies a significantly higher quantity of biocide in an effort to eliminate the bacteria, and continuous treatment is applied to prevent new microbial growth. Exposing bacteria to biocide on a continuous basis risks increasing the resistance of the bacteria, requiring companies to alternate between different types of biocide.

A brush pig may also be sent down the pipe in front of a batch of biocide. The brush pig removes quantities of FeS and other corrosive deposits from inside the pipeline, before the biocide makes contact with the lining of the pipe.

HEALTH AND SAFETY

Most biocidal chemicals and compounds can both damage the environment and pose a threat to humans. It is critical therefore that companies ensure that robust health and safety procedures are adhered to by company employees. Any residual or surplus biocide must be disposed of correctly to ensure that there are no harmful consequences for the surrounding environment.

SELECTION CRITERIA

In choosing which combination of biocides to apply, companies must weigh up a number of different factors. Most importantly, it must be effective within the physical conditions of the downhole environment. This will usually be done via both on-site and laboratory trials (although conducting tests on site will always prove more useful in assessing effectiveness). Testing different biocides at different concentrations will help companies select the most appropriate combinations for the well in question, as well as the dosage. Of course, cost will also factor into considerations. Determining which is the most cost-effective biocide is not as simple as selecting the cheapest chemical. Establishing which one will best protect the equipment from the harmful effects of H2S and FeS and ensure the continuation of production should be the main concern for the company.

ALTHOUGH SOME BIOCIDES PRODUCE BETTER RESULTS THAN OTHERS, NONE ARE COMPLETELY EFFECTIVE ON THEIR OWN.

SRB-INDUCED CORROSION IS A SERIOUS PROBLEM FOR THE INDUSTRY, AND IS ACCORDING TO SOME ESTIMATES, RESPONSIBLE FOR AS MUCH AS 40% OF CORROSION IN PIPELINES.

IRAN SANCTIONS:

WINTER DEMAND, LIMITED OPEC SPARE CAPACITY

BY SIMON FLOWERS, CHIEF ANALYST AT WOOD MACKENZIE

The oil market faces a precarious few months. The imposition of US secondary sanctions on Iranian exports on November 5 is the critical factor behind Brent's rally to over $80 a barrel in October. There is enough supply to meet demand this winter, but the margin for error is worryingly narrow.

After the the implementation of the nuclear deal in January 2016, Iranian production and exports recovered to pre-sanctions levels within six months. Exports reached a peak of 2.8 million barrels per day (b/d) in April 2018, including 300,000 b/d of condensate. Buyers have come from numerous countries, with the bulk sold into Asia, the Mediterranean, and Northwest Europe.

Since the US withdrew from the nuclear deal in May 2018, Iranian crude and condensate exports fell to around 1.8 million in September on our estimates. South Korea, a big customer, has cut all imports since August. European buyers are winding down – France stopped in July; Italy, Spain, and Greece follow this month. Beyond November 5, we expect crude exports to fall to 1 million b/d, though it could vary month to month; and condensate to 100,000 b/d. Crude sales will be concentrated around a core of supportive state buyers: China, India, and Turkey.

It will be difficult for Iran to maximize exports when virtually all trade in oil is cleared in US dollars, putting international oil companies, many national oil companies, traders, and banks off limits. Crude exports contribute one-third of government revenues, so there is a huge incentive for Iran to use every conceivable lever.

We have seen Iranian crudes discounted by $1 per barrel compared with similar Middle East grades, the biggest for a decade. Iran is hoping the European Union's (EU) barter proposal – goods as indirect payment for oil – opens doors, though we doubt any big oil traders will leap at the opportunity. Access to shipping insurance is also a problem, though Iran has its own fleet of 60 tankers and has offered cargoes CIF (cost, insurance and freight) to buyers. Specialized tanker trackers suggest Iranian tankers are operating ghost with disabled ID systems to avoid detection.

As for condensate, Iran's production is around 750,000 b/d; big in global terms, with about half exported. The condensate is produced in association with gas needed for the domestic market, so it cannot be shut-in like oil. During the 2012-2015 sanctions, Iran increased condensate sales to cushion the impact of lost oil exports. It is not clear if they will have the same flexibility under the new sanctions. South Korea, the biggest buyer, and the UAE, have now stopped condensate imports.

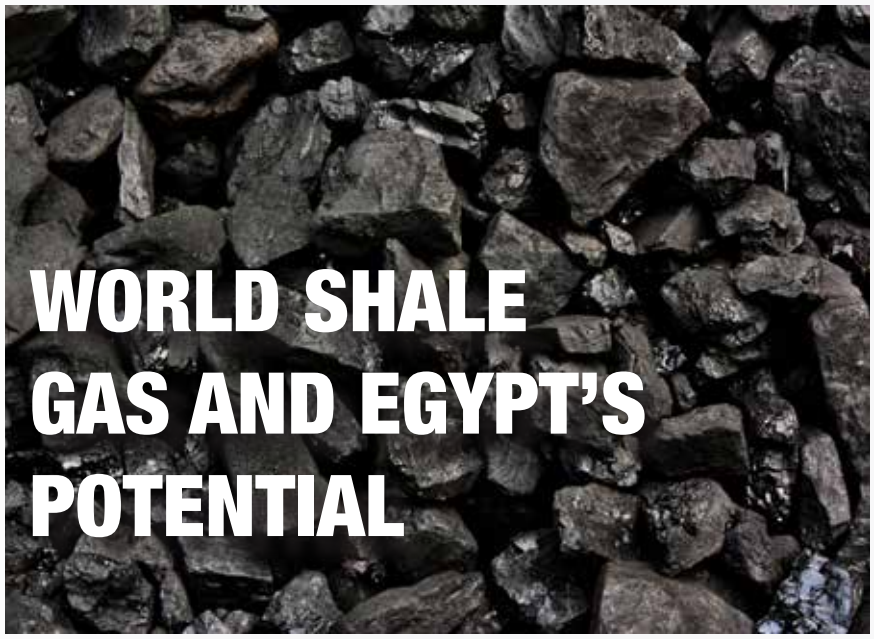
WHAT DOES THIS MEAN FOR THE OIL MARKET?

The biggest risk is this winter. Losing another 1 million b/d or more from Iran comes on top of a similar loss in supply from Venezuela over the last couple of years. Saudi Arabia, the UAE, and Kuwait have stepped up production since July to minimize the increase in price as the market tightens. We think there is just enough growth in supply from elsewhere to muddle through the next few months, meet winter demand and avert a price spike. Brent should hold around $78 a barrel, but it is a very fine line. The Organization of Petroleum Exporting Countries' (OPEC) spare capacity was an ample 4 million to 5 million b/d two years ago. There is only 700,000 b/d of additional available within 30 days right now.

That means the market is vulnerable to strong demand in a cold winter or any new supply outage.

DO THINGS LOOK BETTER ONCE WINTER IS OVER?

The situation may look better once the northern winter is over, but only up to a point. We forecast that Brent will ease and average $74 a barrel in 2019. We expect supply to grow 1.6 million b/d in 2019, with US tight oil driving this. That is well ahead of 1.2 million b/d of demand growth and should lead to a healthy inventory build during the year. But with Iran in the full grip of sanctions and Venezuela continuing to decline, that limited OPEC spare capacity will cast a shadow over the market for some time.



WORLD SHALE GAS AND EGYPT'S POTENTIAL

Once the issues of the availability and cost of conventional gas become a major problem, Egypt is supposed to begin planning for the gradual replacement of this gas through the exploitation of other sources, in order to secure energy supplies. The exploitation of shale gas is among the objectives that must be developed and work towards achieving it. Egypt has large reserves of shale gas, and exploiting this unconventional vital source, as an alternative to conventional gas, is one of the most important concerns of the country.

EGYPT'S SHALE GAS POTENTIAL

Egypt has large attractive rock formations of about 100 trillion cubic feet (tcf), according to estimates by the US Energy Information Administration (EIA). The most attractive formations are located in the north-west of the country. Although they are far from water resources, many international oil companies (IOCs) have expressed interest in undertaking explorations in those areas. Following a slight decline in conventional gas production before the entry of Zohr gas field recently, as well as the production of conventional oil reserves reaching a plateau, the Egyptian petroleum sector now has to attract foreign investors and IOCs to develop its shale potential. Egypt's vision for producing shale gas has become clearer after these new discoveries, which increases the attractiveness of the country's shale deposits in the eyes of investors.

In this regard, the necessary precautions and preventive measures must be taken during the exploitation of this energy source to preserve the environment and groundwater. Some fear the impact of shale exploitation on the environment, agriculture, and the health of the local population.

According to regional technical studies by some international organizations, the available indicators demonstrate significant national capabilities of shale gas, and show promising prospects in terms of recoverable quantities. Confirming the commercial quantities of these resources requires a program that includes drilling a number of wells and an exploration plan lasting between five and 15 years. A report by the US Department of Energy on the reserves of unconventional hydrocarbons confirmed that Egypt's reserves exceed 100 tcf of recoverable shale gas, where Egypt ranks 17th in the world.

According to the report, these reserves are located in the north-west basins of Western Desert. Below are a table and a map showing the main shale gas basins in Egypt.

GAINING EXPERIENCE FROM AMERICAN COMPANIES

The techniques and technologies for the exploitation of shale gas are used by IOCs across the world. Equipment and experience of horizontal drilling technology may be the easiest to transfer, but the high cost of equipment and materials used in cracking limit the possibility of making them available in some places in the world. In addition, the largest operating companies are stable in the US, and can be utilized by adopting policies to attract foreign investors, providing the necessary climate.

HASSAN SALEM
Egyptian General Petroleum Corporation (EGPC)
Reservoir Engineering Studies General Manager

EGYPT VISION 2030

MODERNIZING MANAGEMENT AND UPDATING TECHNOLOGY IN THE OIL AND GAS SECTOR

Management is the secret code of any success or achievement made in productive sectors such as the oil and gas industry. The application of advanced management systems has become an urgent necessity for coping with huge changes and great progresses in oil and gas industry worldwide. On the other hand, the great scientific revolution and new technological developments are playing a very important role in economic growth and the comprehensive development of different fields. Therefore updating technology in line with international standards is a must for vital industries like oil and gas.

There is no doubt that the Egyptian oil and gas industry is to some extent matching international technical standards. However the sector still needs more remedial actions related to managerial aspects, strategic planning methods, new innovative policies, economic exploitation of available resources (especially human resources), and technology updates. This will lead to cost reduction and increasing profits.

The enhancement of the oil and gas sector should include all sides of industry starting from the exploration phase, passing through the upstream phase and arriving at the downstream phase. Old managerial systems have to change and update, and innovation must be encouraged. This must happen alongside human resources development, and the implementation of strong motivation policies and accurate evaluation systems.

Technological updates should be introduced in parallel to managerial changes. This will allow companies to achieve their targets safely, on-time and with minimum cost. Only then can higher returns be obtained from oil and gas projects.

The oil and gas industry in Egypt has a promising future and we are looking forward to making our country one of the most important energy hubs in the world. In order to get there, we are in serious need for fast managerial, legislative, and economic modifications. These improvements must be publicized in all areas of the oil and gas sector without exception. Of equal importance, we need to have a strong will for change in order to achieve these ambitions in the near future.

ENG. MOHSEN AHMED FARHAN
Drilling Department Head
General Petroleum Company (GPC)

EGYPT OIL&GAS RESEARCH & ANALYSIS

GDP Growth Rate

Q1 2018/19

5.3%

Annual Inflation Headline CPI

SEP 2018	OCT 2018
16.0%	**17.50%**

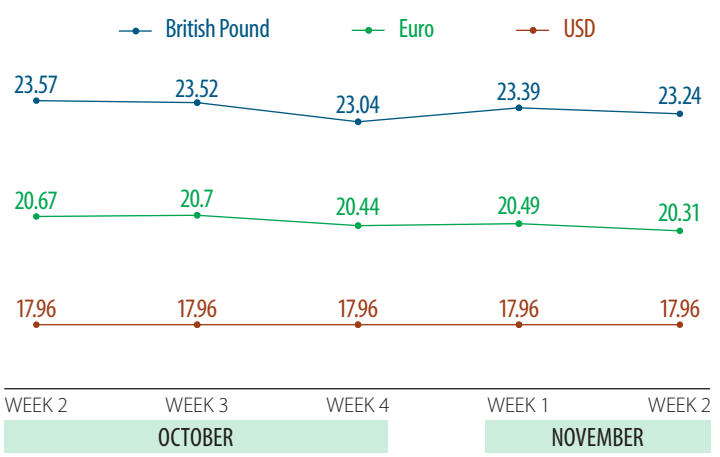
Net International Reserves

SEP 2018	OCT 2018
$44.46bn	**$44.50bn**

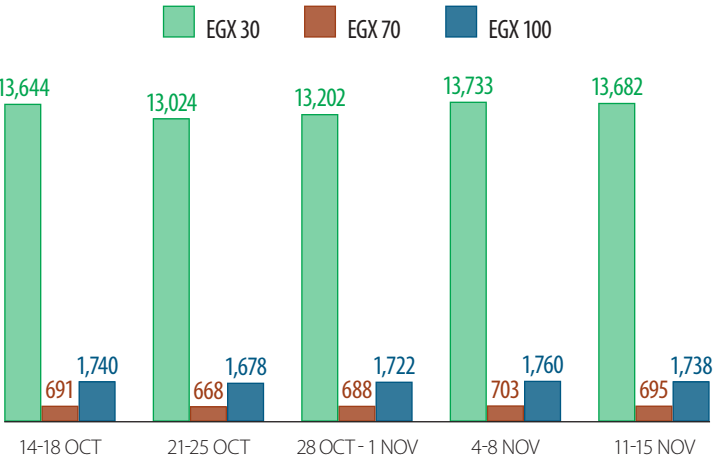
The Monetary Policy Committee Meeting on 15 November Kept Interest Rates Unchanged

OVERNIGHT DEPOSIT RATE	OVERNIGHT LENDING RATE
16.75%	**17.75%**
RATE OF THE MAIN OPERATION	THE DISCOUNT RATE
17.25%	**17.25%**

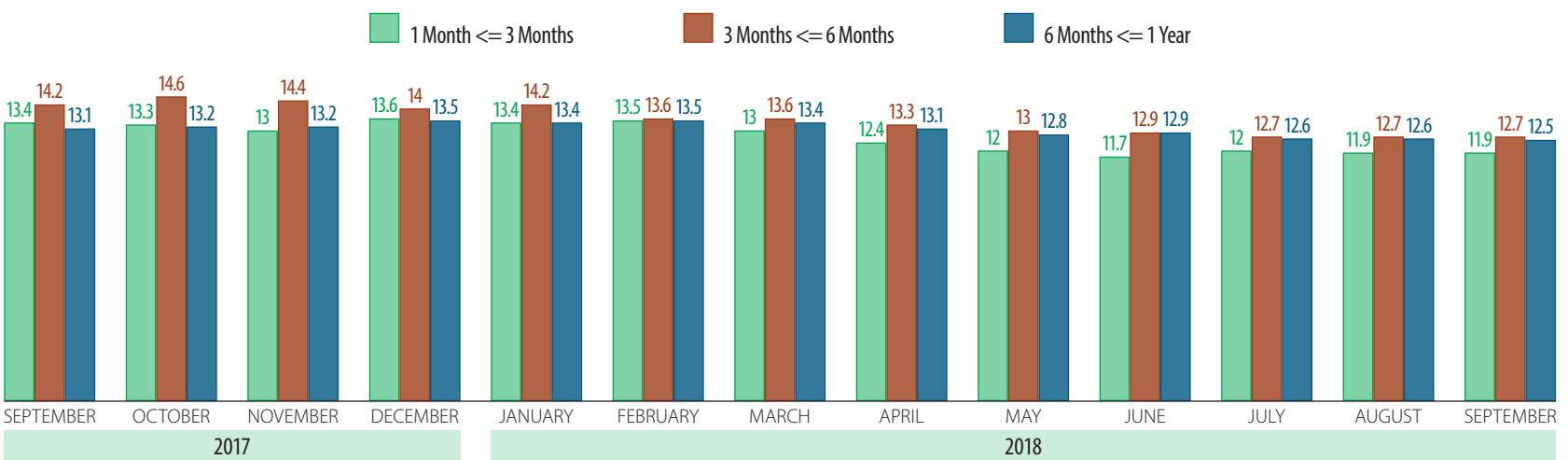
Exchange Rates



Capital Market Indicators



Average Interest Rates (%) (EGP Deposits)

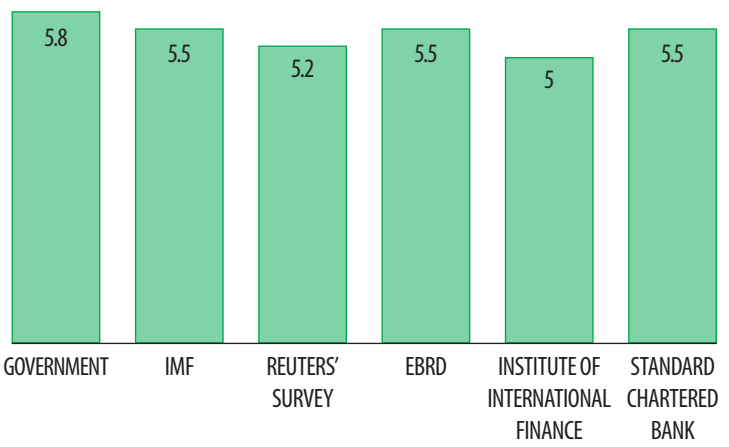


Sources of Raw Data: Central Bank of Egypt, Egyptian Exchange and Ministry of Planning, Monitoring and Administrative Reform.

RESEARCH BY HAGER MAGDY

EGYPT OIL&GAS RESEARCH & ANALYSIS

GDP Growth Rate Projections (%) (FY 2018/19)



The volume of trade exchange between Egypt and the US reached $**5.6**bn in 2017 recording the top trade exchange in Africa, and the sixth highest trade exchange volume in the Middle East

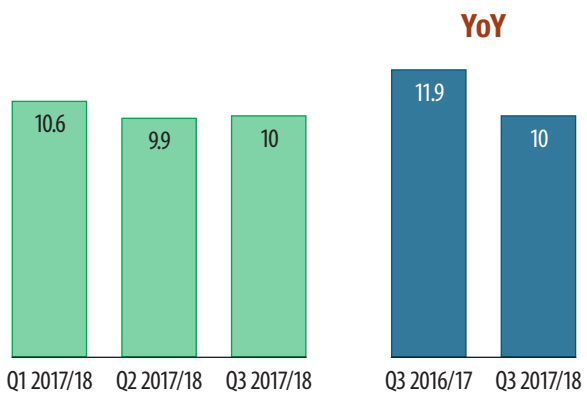
The IMF reached a staff-level agreement with the Egyptian government paving the way for the release of the fifth loan tranche of $**2**bn

Egypt has so far received $**8**bn of the three-year $**12**bn loan backed by the IMF's Extended Fund facility

Rank of Egypt in Ease of Doing Business Index (Out of 190)

Ease of Doing Business	Starting a Business	Protecting Minority Investors	Getting Credit	Paying Taxes	Resolving Insolvency
2018: 128 ▲ 2019: 120	2018: 103 ▼ 2019: 109	2018: 81 ▲ 2019: 72	2018: 90 ▲ 2019: 60	2018: 167 ▲ 2019: 159	2018: 115 ▲ 2019: 101

Unemployment Rate (%)

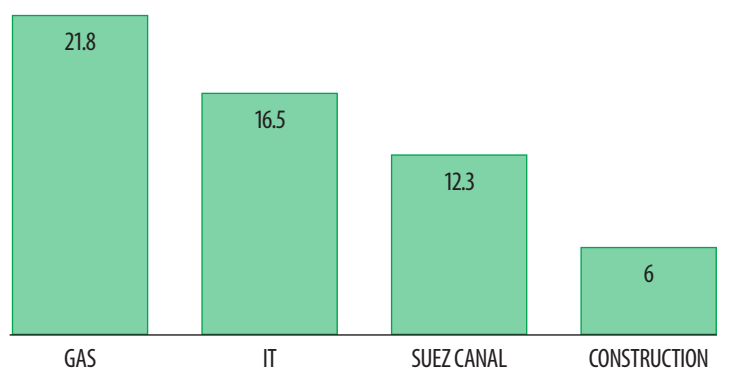


Remittances from Egyptians Abroad (USD Bn)

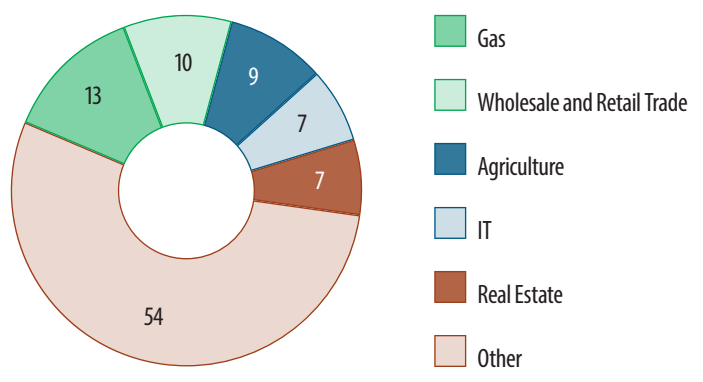
Egypt's Credit Rating

STANDARD & POOR'S	BB STABLE
MOODY'S	B3 POSITIVE
FITCH	B POSITIVE

Sectoral Growth Rate (%) (Q1 2018/19)



Sectors' Share in GDP Growth (%) (Q1 2018/19)



Sources of Raw Data: IMF, Reuters, EBRD, IIF, Standard Chartered Bank, MoP, MPMAR, WB, CAPMAS, CBE and MoF.

RESEARCH BY AMINA HUSSEIN

Midor has signed the final contracts for a **$1.2 billion** syndicated loan to partially finance the **$2.3 billion** **Midor expansion project**, which aims to boost the refinery's capacity by **60%**

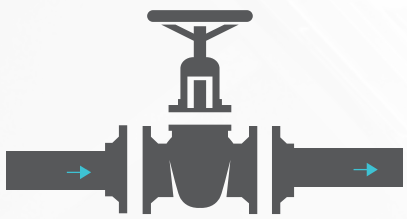
2019 Investments in Egypt

- TransGlobe Energy Corporation will invest **$24.1 million**
- BP will invest **$1.8 billion**
- Petrosilah Petroleum will invest **$55 million**

Egypt will launch the first oil and gas E&P bid in the **Red Sea** before the end of **2018**

Egypt's Abu Sennan concession **production**

reaches around **3,800 b/d**



Enppi and **Petrojet** have completed **60%** of their natural gas network expansion project in **Jordan**

Gas Sector Growth Rate in Q1 2018/19 **21.8%**

Gas Sector Share in GDP Growth Rate in Q1 2018/19

Ministry of Petroleum Pays **$111 million** in arrears to Dana Gas

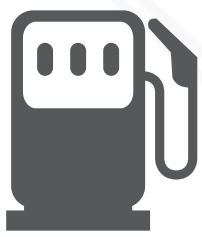
Egypt's crude oil and condensates production **increased** to **660,000 b/d** in **October 2018**

EGYPT OIL&GAS RESEARCH & ANALYSIS

A new well of the **9B phase** in the **WDDM** project is added to production at a capacity of **20 mmscf/d**

A new drilling technology used in **9B phase** that will boost production to **400 mmscf/d** of natural gas and **3,000 b/d** of condensates

Egypt pays between **$700 million** and **$800 million** monthly to buy IOCs production shares



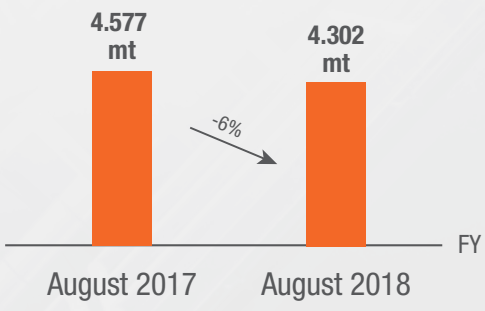
Egypt spends over $1.5 billion monthly on

- importing petroleum products
- buying the production shares of IOCs

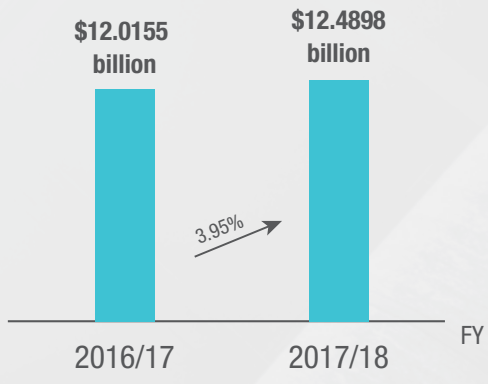
A new crude oil E&P tenders are launched, which will boost **total production**

to reach **700,000 b/d**

Egypt's Natural Gas Consumption (YoY)

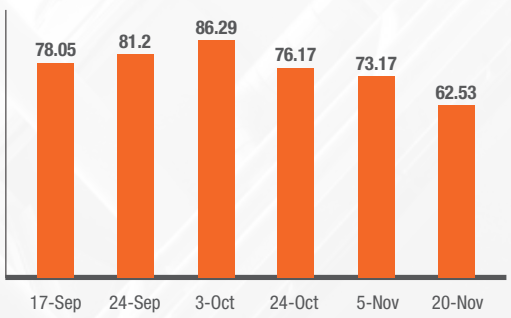


Egypt Imported Petroleum Worth (YoY)

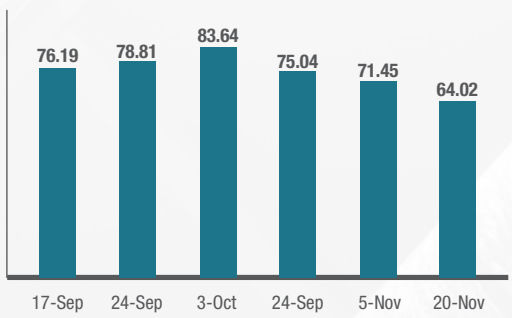


Sources of Raw Data: Ministry of Petroleum, Ministry of Planning, Eni and Central Agency for Public Mobilization and Statistics.

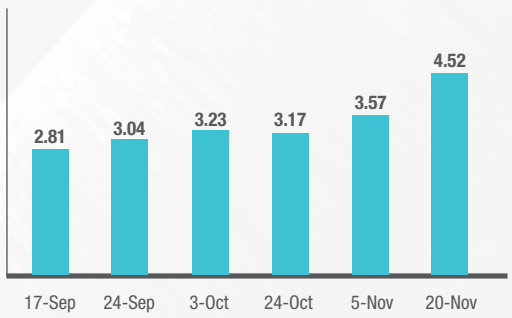
BRENT PRICES



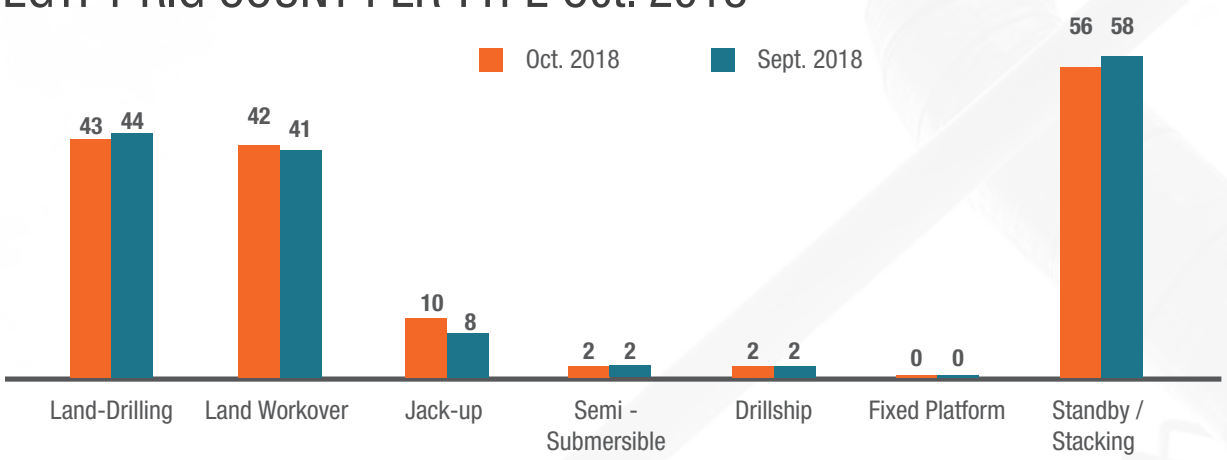
OPEC BASKET PRICES



NATURAL GAS PRICES



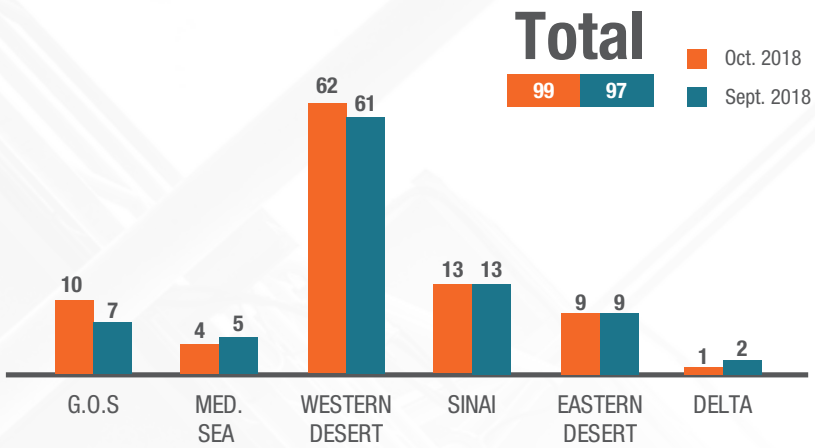
EGYPT RIG COUNT PER TYPE Oct. 2018



Total

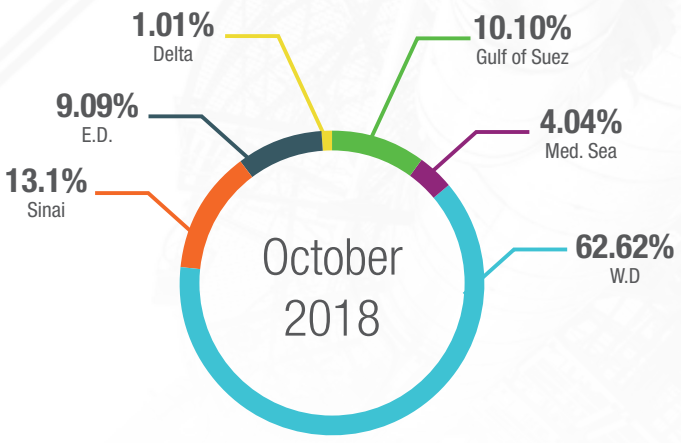
155	155

EGYPT RIG COUNT PER AREA Oct. 2018



The difference between the total of rigs per area and per type is due to the standby / stacking number.

Distribution of Rigs



Egypt Production Oct. 2018

Total

17,443,000	Barrels
201.7003461	BCF
196305	MCF
2,688,582	Barrels

	CRUDE OIL	GAS	SOLD GAS	CONDENSATES
MEDITERRANEAN SEA	18,000	117.260904	114127	838,136
EASTERN DESERT	2,030,000	0.22099574	215	-
WESTERN DESERT	9,930,000	40.9697436	39875	1,374,714
GULF OF SUEZ	3,880,000	3.1176306	3029	70,411
DELTA	9,000	40.1284031	39056	389,822
SINAI	1,570,000	0.0026691	3	15,499
UPPER EGYPT	6,000	0	0	0

Egypt Drilling Updates

REGION	COMPANY	WELL	WELL TYPE	RIG	DEPTH	WELL INVESTMENTS
EASTERN DESERT	KUWAIT ENERGY	W.ELXHALIG-1X	EXP	ECDC-6	4,352	1.200 M$
WESTERN DESERT	AGIBA	ROSA N-12	Development	ST-6	11,768	2.500 M$
	APACHE	DAHAB NE-1X	EXP	ST-10	12,360	3.100 M$
	GPC	NES-11	Development	EDC-16	8,212	1.406 M$
	GPC	NES-12	Development	EDC-16	7,943	1.320 M$
	KHALDA	HERUNEFER W-6X	EXP	EDC-58	15,933	3.505 M$
		WKALA-23	Development	EDC-17	14,491	2.340 M$
		SIWA J-1X	EXP	EDC-11	15,100	1.303 M$
		SIWA I-1X	EXP	ST-4	14,252	2.411 M$
		HORI-1X	EXP	EDC-17	13,500	1.407 M$

*DRILLING are for October 2018.

HELD UNDER THE PATRONAGE OF HIS EXCELLENCY ABDEL FATTAH EL SISI PRESIDENT OF THE ARAB REPUBLIC OF EGYPT تحت رعاية فخامة الرئيس عبد الفتاح السيسي رئيس جمهورية مصر العربية

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