EGYPT OIL&GAS NEWSPAPER

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CRUDE OIL AND UPSTREAM

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DRILLING ACTIVITY
REPORT - 2017

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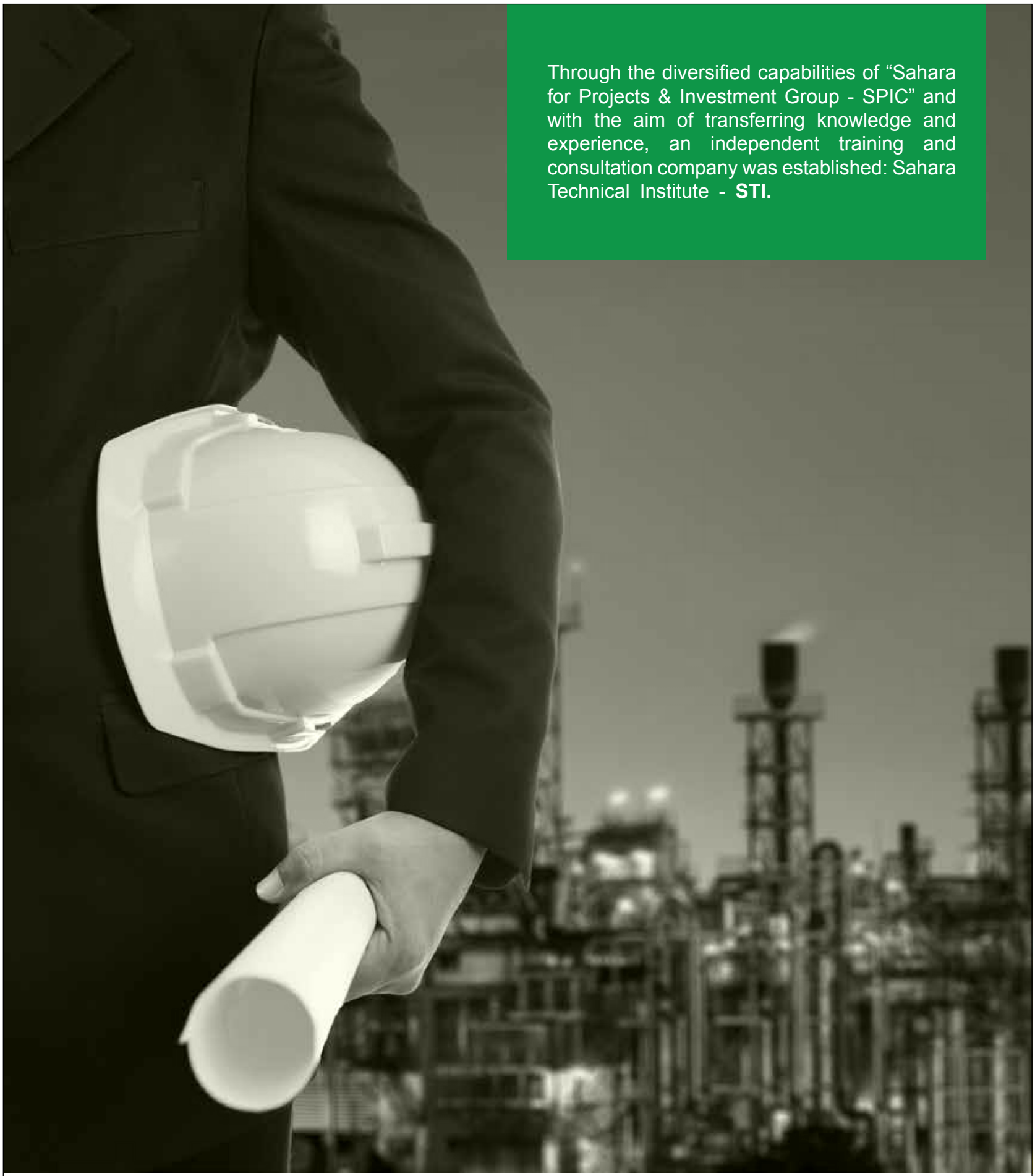

Through the diversified capabilities of “Sahara for Projects & Investment Group - SPIC” and with the aim of transferring knowledge and experience, an independent training and consultation company was established: Sahara Technical Institute - **STI.**

Sahara Technical Institute

With an aim to become a world class Oil & Gas professional education and practical Training excellence Institute in the Middle East and Africa region, STI provides strategic solutions to the industry dilemma “Hands on practice”.

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EDITOR'S NOTE

As I write these lines we farewell a beautiful year and prepare an endless list of surprises for the coming one. In fact I am writing this month's note surrounded by gifts and Christmas decoration, as the office celebrates the end of the year.

We chose to begin the year with a crude oil and upstream theme; in efforts to ensure that our readers welcome the year with a rich issue, this month is tailored to include most of the current topics you prefer to read about.

We begin with the talk of the town, Egypt's mega gas project, Zohr. The issue includes a complete breakdown of production, cost, and operation figures, as well as long term projects.

Maintaining the upstream focus, this month's report-in-print provides a two year overview of drilling activities in Egypt, broken down by area and specification. Along the same line, we thought it would be a good idea to include a five year overview of Egypt's bid round activity, covering tenders, awards, and investment cost per concession.

One of the lesser addressed topics in the upstream sector is brownfields. As most crude fields approach maturity, operators need to shift to newer lines of technology to extend the production lifespan of these fields. Along the same lines comes our analytical take on enhanced recovery mechanisms, where experts provide their opinion on the potential and challenges of the topic.

Enhancing production efficiency alone is not enough to counter the volatility of oil prices, which renders drilling cost reduction methods a core topic in this issue as well.

We could not discuss crude oil or upstream without zooming in on risk analysis in exploration and production, as a paramount topic, we chose to focus on the views of experts on the matter.

Moving on to matters of crude, we shift a bit downstream beginning with an examination of Egypt's newest mega project, Tahrir Refining Complex; further zooming in on the topic we focused on the potential of mazut processing in the country. Where we present a comparison between the benefits of further processing mazut verses the cost and usage of maintaining it as is. We chose to conclude the downstream sector with an overview of the development plan for the sector, updating you with what has been planned and what is in the works.

On a lighter line, this month has blessed us with several intriguing events. We begin with the most interesting, hosted by the Ministry of Petroleum and Mineral Resources, Safety Stand Down witnessed the participation of 138 companies in safety awareness. Other stimulating events this month includes Halliburton's launch of a new training program; the graduation of Shlumberger's latest Technician Development Training Program class; and STI's appreciation ceremony of its course participants from different neighboring countries such as Libya and Chad.

Finally, we are proud to announce the contribution of IHS Markit this month, in addition to our supportive partners at D Code Consultancy.

As always thank you for your readership and support,

Happy New Year!

EDITOR IN CHIEF

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Inside this Issue

EGYPT OIL&GAS NEWSPAPER

EGYPT'S LEADING OIL AND GAS MONTHLY PUBLICATION

EGYPS EGYPT PETROLEUM SHOW

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Zohr Begins Production, Projected to Save Egypt $700M per Year

Production has officially begun at the Zohr natural gas field on December 16th. The field's initial production capacity is 350 million cubic feet per day (mcf/d). Natural gas from the field is processed in the onshore processing facility and is then pumped into the national grid. Output from the field is expected to rise to 1 billion cubic feet per day (bcf/d) by the end of June 2018 and to 2.7 bcf/d in 2019. Production from the Zohr natural gas field will permit the country to cut its imports of liquefied natural gas by approximately $700 million per year, the Head of the Petroleum and Mining Industries Chamber, Hamdy Abdel Aziz, said. For their part, Eni has announced that production from Zohr started "in a record time for this type of field," according to the company press release.

84% of Q1 FDI Flows to Energy Sector

Egypt's energy sector received approximately 84% of the country's foreign direct investment (FDI) during the first quarter of 2017/2018.With FDI at $3 billion dollars during the quarter, the energy sector received approximately $2.5 billion from FDI.

Atoll Starts Production at 300 mcf/d

The Atoll natural gas field conducted test production at a rate of 300 million cubic feet per day (mcf/d), the Minister of Petroleum and Mineral Resources, Tarek El Molla, stated. Actual production from the field will start in the third week of December, according to El Molla.

Gas-Market Regulations to be Issued in February

The government will publish its executive regulations for the new gas market law in February, the Minster of Petroleum and Mineral Resources, Tarek El Molla, said. By encouraging investments in Egypt's natural gas sector, the law—Number 196 for 2017— increases Egypt's chance to become a regional energy hub, the minister stated.

"It will increase direct and indirect investments in the Egyptian economy and create new job opportunities," El Molla said.

EGPC to Acquire Maersk's Stake in EDC

The Egyptian General Petroleum Corporation (EGPC) will purchase Maersk Drilling Company's 50% stake in the Egyptian Drilling Company (EDC) for $100 million. The purchase will be made in cash. After the transaction, EGPC will be the sole owner of EDC. Maerks Drilling, which is a part of A.P. Moller-Maersk, is divesting EDC as a part of its strategy to focus on offshore drilling.

Egypt to Allow IOCs to Export Gas in Five Years

Egypt will allow the international oil companies (IOCs) operating in Egypt to export surplus natural gas in five years, the Minister of Petroleum and Mineral Resources, Tarek El Molla, said. A new clause in Egypt's exploration and production contracts will permit IOCs to export excess natural gas, the minister noted, adding that the contract changes are part of Egypt's larger strategy to become a regional energy hub.

Egypt's Natural Gas Output Rises to 5.5 bcf/d

With the Zohr natural gas field coming online, Egypt's natural gas output rose to 5.5 bcf/d, the Minister of Petroleum and Mineral Resources, Tarek El Molla, said. The country had been producing 5.1 bcf/d. Natural gas production had already climbed significantly during 2017. Natural gas output has risen 25% from the 4.4 bcf/d produced in 2016.

Butane Production, Consumption

Consumption
341,200 tons

Consumption Y.o.Y.
- 5.4%

Production
135,800 tons

Production Y.o.Y
-14.21%

Egypt to Decrease Monthly LNG Imports by 3 Cargoes

Egypt will decrease its imports of liquefied natural gas (LNG) by three cargoes a month when the Zohr natural gas field comes online, the Minister of Petroleum and Mineral Resources, Tarek El Molla, said. The country's imports of LNG will decrease to five cargoes per month, saving the government $60 million every month. He predicted that production from Zohr could reach 1 bcf/d by next June. Combined with production from the Atoll field, which is expected to reach 300 mcf/d, the new production should put Egypt on the path to self-sufficiency, he said.

Number of Households Linked to Gas Grid Hits 8.2M

The government announced that 8.2 million households were connected to the natural gas grid by the end of 2017, according to an official at the Egyptian Natural Gas Holding Company (EGAS). This figure represents an increase of 200,000 from September. EGAS aims to increase the number of households connected to the grid to 9 million during 2018.

Petroleum Exports Rise to $1.8B in Q1

The value of petroleum exports rose 20% to reach $1.8 billion in the first quarter of fiscal year (FY) 2017/2018. This number is up from $1.5 billion during the first quarter of FY 2016/2017. Exports of petroleum were up 16.66% during the first eight months of calendar year 2017 from $1.8 billion in 2016 to $2.1 billion in 2017. Increases in crude oil exports comprised most of the jump between January and August, as crude exports rose by $222 million from $213 million in 2016 to $435 million in 2017.

Egypt's Gas Flares 11th Largest Globally, Could Cover 5% of Electricity Production

Egypt's energy sector is ranked the eleventh worst worldwide in terms of natural gas lost to flaring, Bjorn Hamso, a World Bank official, stated at an event in Cairo. He noted, however, that Egypt had climbed two places—from 9th to 11th. During the same event, the Director and Head of Natural Resources at the European Bank for Reconstruction and Development (EBRD), Eric Rasmussen, explained that flared gas could cover 5% of the country's domestic electricity production. About 2% of Egypt's natural gas production is flared, added Nabil Salah, Vice Chairman for Production at the Egyptian Petroleum Corporation (EGPC). Seventy percent of Egypt's flared gas comes from small fields with production rate lower than 5 mcf/d, Rasmussen noted. Adel Hanif, a Principle Banker at EBRD, stated that reducing gas flaring was an important component of the modernization program. "Emissions will continue. Our job is to reduce it as much as possible," he explained.

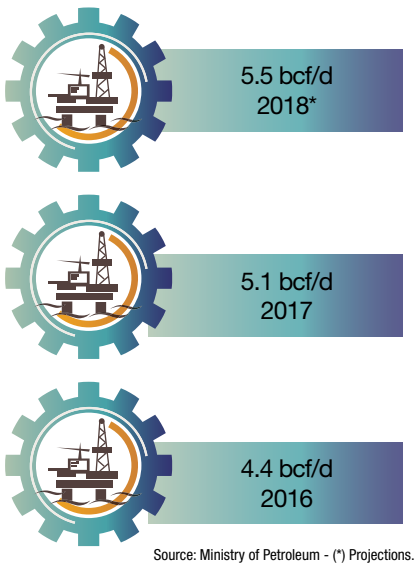
Egypt Spent EGP 23.8B on Fuel Subsidies in Q1

The government spent EGP 23.8 billion on fuel subsidies during the first quarter of fiscal year (FY) 2017/2018, announced the Minister of Petroleum and Mineral Resources, Tarek El Molla. The government had initially allocated EGP 27.7 billion for the quarter. The Egyptian government currently sells many fuel products below the cost of their production. The cost of producing diesel is estimated at EGP 5.7 per liter, but it is sold at EGP 3.65 per liter. Similarly, while 80-octane gasoline costs EGP 5.7 per liter to produce and it costs EGP 6.4 per liter to produce 92-octane gasoline, the two products are sold at EGP 3.65 and EGP 5.

Egypt to Sign Strategic Partnership with EU

Egypt and the European Union (EU) will sign a memorandum of understanding (MoU) outlining a strategic partnership in the oil and gas industry. The Minister of Petroleum and Mineral Resources, Tarek El Molla, met with representatives of the EU to discuss investments in underwater pipelines to connect Egypt and Europe. Egypt is looking to cooperate with the EU to bolster its plans to become a regional energy hub and develop its human resources and boost energy efficiency, El Molla said. The minister noted that the EU has partnered with Egypt to advance the government's modernization program in the energy sector.

Natural Gas Production



Source: Ministry of Petroleum - (*) Projections.

EGPC Signs 3 E&P Agreements with a Combined Value of $50M

The Egyptian General Petroleum Corporation (EGPC) signed three oil and gas exploration and production (E&P) agreements worth $50 million. Trident Petroleum Company signed an agreement with EGPC to explore the East Eish El Malah and the Magaweesh Concession areas. The agreement is worth $10 million. Apache's Khalda Petroleum signed a $20 million agreement with EGPC for oil and gas exploration in the Alam Shaweesh Concession. A third agreement—valued at $20 million—was signed by EGPC and Apex International for oil and gas exploration in the Gharb El Deen Concession. If commercial discoveries are made, EGPC and the partnering company will establish a joint venture to develop the finds. Both EGPC and the partner company would each own a 50% stake in the joint venture. Disagreements arising from the contracts will be settled in the Cairo Regional Center for International Commercial Arbitration (CRCICA).

Egypt Gas Signs EGP 66.9M Protocol with NUCA

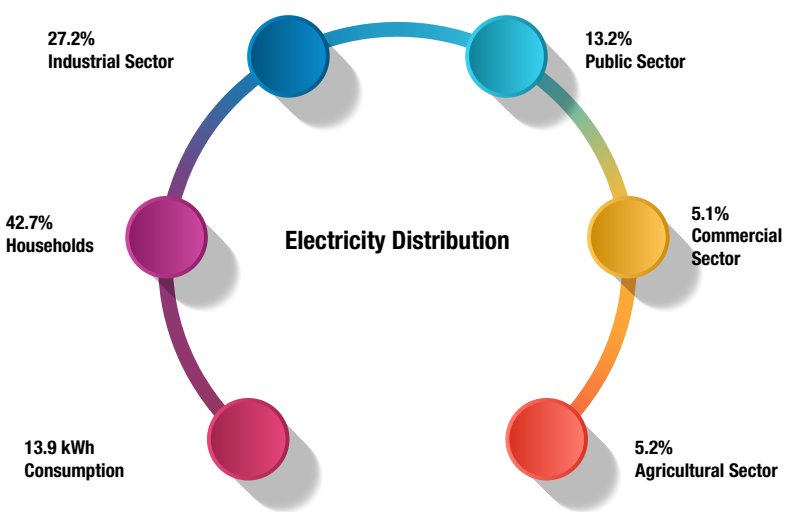
Egypt Gas Company has signed a cooperation protocol worth EGP 66.9 million with Egypt's New Urban Communities Authority (NUCA). The protocol provides for the connection of the New Administrative Capital and 21,810 housing units to the national gas grid. The project will begin in 2018.

Diesel Consumption Falls 18% Y.o.Y.

Consumption of diesel dropped to 1.082 million tons in September, an 18% year-on-year (Y.o.Y) decrease from the 1.3225 million tons consumed in September 2016. An official at EGPC had previously said that consumption for September and October stood at 2.5 million tons. Meanwhile, diesel production increased 1.9% Y.o.Y. to 568,000 tons in September 2017, according to statistics released by the Central Agency for Public Mobilization and Statistics (CAPMAS).

Government to Prioritize Energy Rationalization in New Budget

The government aims to implement reforms to rationalize its energy subsidies and expenditures, according to its Official Publication for the Preparation of Fiscal Year (FY) 2018/2019. The government proposes to shift subsidies from the energy sector toward other sectors. It further plans to implement structural and financial reforms in the financial sector to prevent price distortions and ensure a steady energy supply. The annual publication released by the Egyptian Ministry of Finance outlines the government's budget priorities.



Egypt Supports Production-Cut Extension

Egypt supports the procedures and initiatives taken to keep the global oil and gas market balanced, the Minister of Petroleum and Mineral Resources, Tarek El Molla, said. He stated that a balanced market benefits both consumers and producers and ensures sufficient oil and gas investments. The minister further noted that energy markets are rapidly balancing and that the main challenge for the industry is to keep petroleum prices at a rate that can attract investments. The comments were made at the OPEC ministerial meeting. Egypt attended the meeting as an observer.

Petroleum Exports

El Molla: Women Central to Modernization Program

Women make up 40% of the workforce in the government's modernization program in the oil and gas sector, the Minister of Petroleum and Mineral Resources, Tarek El Molla, said during a speech at the She Can Forum. The minister highlighted the important role women play in both the Egyptian and global oil industry. He noted that women are employed throughout the industry and said that the

Butane Imports Decline by 33.6%

Butane imports declined by 33.6% year on year (Y.o.Y) to reach 153,400 tons in September 2017, compared to 231,800 tons in September 2016. Despite the decrease in imports, butane consumption has decreased by 4.7%, reaching 314,200 tons in September 2017, from 329,800 tons in September 2016, according to statistics released by the Central Agency for Public Mobilization and Statistics (CAPMAS). Meanwhile, butane production recorded a slight increase of 0.13% to reach 154,800 tons of butane in September 2017, compared to 154,600 in September 2016.

Fire Breaks Out in Beni Suif Pipeline

A fire broke out in an oil pipeline yesterday in Beni Suif. An oil leakage caused the fire. It occurred on the road to Manshaet El Haj in Ehsna City. Ten fire trucks were required to put out the blaze. The pipeline was shut down due to the fire. Another pipeline in the vicinity, from Tebbin to Menia, was also shut down until the fire was brought under control. One injury was reported: A guard at a neighboring company received second-degree burns.

EGPC Sells 550K Butane Cylinders in Two Weeks

The Egyptian General Petroleum Corporation (EGPC) sold 550,000 butane cylinders during the first two weeks of December as the temperature fell and butane consumption increased. The state-owned company was selling approximately 210,000 butane cylinders per week during the summer, the Head of EGPC, Abed Ezz El Regal, said.

Net FDI in Oil Sector

$4B
2016/2017

$1.7B
2015/2016

Schlumberger, TGS Announce Survey in Red Sea

Schlumberger and TGS-NOPEC Geophysical Company (TGS) announced a new project to conduct a 2D seismic survey in the Red Sea. The survey is set to begin this month and to be completed during the first quarter of 2018. Using new imaging and acquisition techniques to map the geological structures, the companies plan to conduct a 10,000 kilometer 2D seismic survey. The project will merge non-seismic and seismic data. The survey is part of a larger agreement between Ganope, TGS, and Schlumberger, which entails that the latter two will have exclusive rights for minimum of 15 years to a 70,000 square kilometer area in the Red Sea.

TransGlobe Increases Output by 27%

TransGlobe Energy Corporation announced that its production had increased by 27% in 2017. Output is expected to average 15.4 million barrels of oil equivalent per day (mboe/d), a marked increase from the average of 12.1 mboe/d in 2016. Out of this total, 12.8 mboe/d were produced in Egypt while 2.6 mboe/d were produced in Canada. The company noted, however, a snag that impacted operations in Egypt. The company sold approximately 510,000 barrels of its Egyptian oil in November, netting $24.5 million.

Shell Renegotiating Burullus Contract

Royal Dutch Shell is renegotiating its agreement with the Egyptian government for its development of the Burullus field, a governmental source said. The company is renegotiating the share of natural gas it receives as compensation for its investments, the source indicated. The government and Shell have already agreed to changes for Phase 9B. Shell aims to finish two Phase 9B test wells during the first quarter of 2018. Production from Burullus has increased to 450 million cubic feet per day.

ExxonMobile Exploring Investment Opportunities

ExxonMobil met with the Ministry of Petroleum and Mineral Resources to explore investment opportunities in Egypt, according to the Minister, Tarek El Molla. The company has expressed interest in exploration for oil and gas in the Mediterranean. Despite the meetings, there are no current investment negotiations between the government and the international oil company, the minister noted. "We have been discussing with them, visiting them. They've visited us […] We are exploring all opportunities for having more and further upstreamers in Egypt," Molla said. "I would be happy to have them with us," El Molla added, noting that no investment decisions had yet been made. Exxon Mobil declined to comment upon the report.

Total to Add 9 Gas Stations in 2018

Total plans to open nine new gas stations in Egypt next year. The stations will be located in Alexandria, the Delta, and Cairo. The company is looking to expand in the Delta and Upper Egypt, the company's Managing Director for Egypt, Ian LePetit said. Total is looking to increase its footprint along highways and in villages, he added.

Merlon to Invest $66M in E&P

Merlon plans to invest $66 million in exploration and production (E&P) operations in Egypt during fiscal year (FY) 2018/2019. The investments will be channeled through the company's subsidiary, Egypt Petrosilah. Petrosilah, which is a joint venture between Merlon and the Egyptian General Petroleum Corporation (EGPC), is preparing to start seismic surveys in its concession areas to discover potential well sites and increase its reserves of 60 million barrels of oil and gas, the Head of Petrosilah, Taher Abdel Rahim, stated. Petrosilah launched a tender to conduct a seismic survey on the northern area of its Fayoum concession, Abdel Rahim said, adding that the survey will be finalized before the end of 2018 and that the company will then start drilling.

Fire Breaks out at SOPC Facility

A fire broke out at the mazut coking complexes of the Suez Oil Processing Company (SOPC) at the beginning of the month. The fire was controlled in less than 15 minutes, according to the Head of SOPC, Mohamed Eliwa. Four employees suffered from temporary suffocation and one employee was badly burned. No serious damage occurred to the facilities and operations quickly resumed.

Total to Add 9 Gas Stations in 2018

Total Egypt plans to establish nine new gas stations in 2018. The stations will be located in Alexandria, Delta region, and Cairo as Total's strategy for the coming period is to expand in Delta regions and Upper Egypt, Total Egypt's Managing Director, Ian LePetit. Total Egypt's plan is to reach the vital areas in highways, as well as villages, and to provide better service to the Egyptian market.

Noble Energy Considers Investing in Egypt's Oil & Gas Industry

Noble Energy expressed interest in investing in Egypt's oil and gas sector and the possibility of linking the natural gas fields off Cyprus to Egypt's natural gas infrastructure. During a meeting between Egyptian and company officials, Nobel Energy indicated it could consider participating in Egypt's upcoming oil and gas tenders. The officials also discussed the possibility of building a pipeline to connect Cyprus' natural gas to Egypt. Participating in the meeting were the Minister of Petroleum and Mineral Resources, Tarek El Molla; the Chairman of Noble Energy, Keith Elliot; and the Vice President of Global Marketing for Noble Energy, Brian Essner.

Shell Participates in the BEBA Delegation

Shell Egypt was among the firms in the delegation of the British Egyptian Business Association to the United Kingdom. The delegation sought to boost economic relations and market new investment opportunities to British investors. It focused on three sectors: finance and banking, national projects, and the New Administrative Capital. The delegation included representatives of 40 companies and five governmental representatives.

Apache's Gross Production Rises in Q3

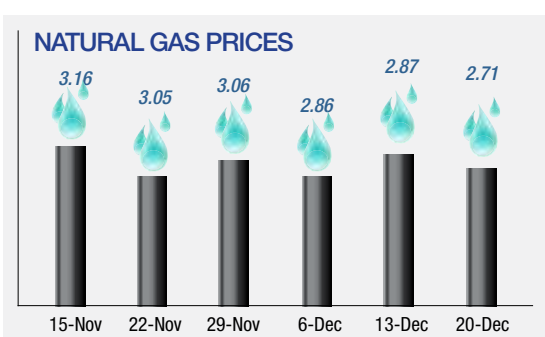
Apache's gross production rose to 339,000 barrels of oil equivalent per day (boe/d) in the third quarter. The figure represents an increase of approximately 1.5% from the company's production of 334,000 BOE/d in the second quarter. The company operated 12 rigs in Egypt during the third quarter, approximately one-third of the rigs it operated globally. Apache's adjusted production, however, declined to 87,000 BOE/d, as rising crude oil prices reduced the number of cost-recovery barrels awarded to the company.

SDX Completes Work-Over Program

SDX completed a work-over program at the North West Gemsa Concession to reverse production declines from the concession's wells. The program installed or updated electrical submersible pumps (ESPs) at twelve wells with the goal of restoring production from the concession to approximately 5,000 barrels of oil equivalent per day (boe/d). Production from the concession rose slightly from 4,502 boe/d in the second quarter to 4,556 boe/d in the third quarter, according to SDX's figures. The company also performed tube and pump maintenance at three wells at the Meseda Concession. In addition to its maintenance work, the company completed the expansion of its processing facility at the Meseda Concession, increasing its capacity from 10,000 barrels per day (b/d) to 20,000 b/d.

Petrojet, NPCC Sign MoU

Petrojet signed a memorandum of understanding (MoU) with National Petroleum Construction Company (NPCC) to enhance oil and gas project cooperation. The agreement was signed by the Chairman of Petrojet, Salah Ismail, and the CEO of NPCC, Aqeel Madhi.



Halliburton Egypt Launches New Training Program

In November 2017, Halliburton Egypt launched a new training initiative, named 'The Internal Training Program'. The program has been developed by Halliburton's Regional Manager for Egypt and Libya, Osama Abdel Halim.

The training program focuses on combining operational necessities with on-job training, in which the participants learn about the practical and theoretical levels of many of the departments within Halliburton.

The program targets fresh graduates from engineering departments in a number of universities. With over 1,000 applicants, candidates chosen had a sound ability to navigate a number of different tests, as well as pass several behavioral and operational interviews.

The first class accepted into the program includes ten participants –seven men and three women. They will receive three months of training under the supervision of specialized trainers from Halliburton.

The trainees will receive theoretical and operational training from different departments in the company, including the Production Development Department; the Production Solutions Department; the Cement and Fluid Department; the Sperry Drilling Department; the Cables Department; and the Exploration Department.

Trainees must work hard to achieve the targets and follow the instructions to get through the operational and behavioral evaluations, which included practical sessions in workshops, field sites, and drilling locations.

At the end of the training program, each trainee will be evaluated for a job vacancy at Halliburton by a team consisting of the company's regional manager, production manager, and HR manager.

Halliburton Egypt believes that it has a responsibility towards the nation and its future generations.

The primary goal of Halliburton's training initiative is to create equal opportunities for everyone and positively affect governmental efforts to enhance practical knowledge and human capital. In doing so, the company will boost the Egyptian economy and create a better future for the oil and gas industry.

Halliburton considers itself a partner in developing young employees, Abdel Halim said, expressing his pleasure to announce the beginning of the training initiative in Egypt. He added that the program is currently implemented in other locations in the Middle East and North Africa.

SAUDI ARABIA

In the face of continuing fiscal pressure, **Saudi Arabia plans to raise fuel prices in January to better align domestic prices with the international market. Gasoline prices will jump by approximately 80%. Jet fuel prices will be raised to match international prices.** The increase will be over a number of years until they reach international levels, and will include gasoline, kerosene, diesel, and heavy fuel oil.

On the international front, **Saudi Arabia raised its prices for Asian and European purchasers of its Arab Light crude**. The official selling price (OSP) of Arab Light to Asian importers rose to a premium of $1.65 per barrel over Platts' Oman-Dubai benchmark—up $0.40 from December's price. Arab Light prices for Europe also rose. While the crude is still trading at a discount of $1.20 per barrel to the Brent crude index, the OSP climbed $0.60. Bucking the trend, Arab Light prices for the US fell $0.20 to a premium of $1.00 per barrel above the Argus Sour Crude Index (ASCI).

Saudi Aramco is seeking bookrunners and coordinators for its IPO. JP Morgan, Morgan Stanley, and HSBC, as current advisors to the company, could have the inner track for roles in the IPO process, source indicated. Goldman Sacks and Citi are also competing for a role in the listing. The company is planning to make its appointments early next year.

In terms of contracts Saudi Aramco signed two deals; **the first was an MoU with Schlumberger valued at $1.6 billion**. The companies signed two contracts, requiring the US-based company to provide well and drilling services for up to 274 oil and gas wells for a period of three years. **The MoU with the US-based company was accompanied by MoUs with other companies worth $8.8 billion.**

The second deal Saudi Aramco inked was with Saipem, where it awarded the company an engineering, procurement, and construction contract. The contract is to span until 2021. The company will install a pipeline, upgrade the Manifa water-injection system, and conduct other activities for the Saudi oil company.

Furthermore, **Saudi Aramco has retained Citi to oversee a $2 billion loan backed by UK Export Finance (UKEF)**. The loan will facilitate Saudi Aramco's purchase of goods and services from Britain. While no figures have been released, Citi's commission for the service is considered modest. The agreement, however, will permit the bank to develop a working relationship with Saudi Aramco.

In rolling out its 2018 budget, **Saudi Arabia indicated that it expects government oil revenues to rise by 12%.** According to the government's budget statement, **the kingdom is predicting that oil revenues will rise to $131 billion in 2018 from $117 billion this year.** "Assuming Saudi Arabia will continue to comply with the OPEC production cuts throughout 2018, the budgeted increase in oil revenue reflects an expectation of higher export prices," Ziad Daoud, an economist with Bloomberg Economics, stated.

UAE

ADNOC is considering changes to its pricing mechanism. It recently asked for feedback from its Asian customers on whether it should abandon its retroactive- pricing system in favor of forward pricing. The company did not lay out the details of how the forward pricing would work.

ADNOC offered 1.25 billion shares in ADNOC Distribution on the Abu Dhabi Securities Exchange for the price of 2.5 AED. **The shares represent a 10% stake in the company and sold for approximately $851 million**, resulting in a market capitalization for the company of $8.5 billion. The offering was oversubscribed and the stock opened at 2.9 AED.

OPEC

OPEC and its oil-producing allies will announce in June their plans for exiting the production-cut agreement, the UAE Energy Minister, Suhail bin Mohammed El Mazroui, indicated. "We will announce[…] a strategy in the June meeting. That does not mean we will exit in June. That means we will come up with a strategy," he said. **He refused, however, to speculate on the nature of the plans**.

OPEC oil production fell by 300,000 barrels per day in November, recording its lowest point since May. Production declined from 32.78 million barrels per day to 32.48 million barrels per day. In November, OPEC went beyond its obligatory production limits under its agreement with a group of non-OPEC oil-producing states, making 112% of its agreed-upon cuts. One-third of the reduction, however, came from Angola due to field-maintenance projects.

LIBYA

Nafusa Oil Operations plans to begin producing 10,000 barrels per day (b/d) of oil from Block 47 in Libya's Ghadames Basin. Funds for the project have not yet been approved.

Libya's pipeline exports of natural gas to Italy were temporary halted by a technical glitch. Pipeline flows were halted on December 17th after an issue arose in a feed pipeline. Shipments were resumed after four hours. The pipeline, the Greenstream Pipeline, runs from Mellitah, Libya, to Italy.

IRAQ

Kurdistan. A new well—drilled to a depth of 3,100 meters—hit good quality oil from the Kometan and Cretaceous Shiranish Reservoirs.

Iraq's oil ministry announced that the completion of a new unit **at the Kirkuk refinery has increased its capacity by 13,000 barrels per day**. The refinery now has the capacity to refine 56,000 barrels per day of oil.

Iraq signed a one-year oil-swap deal with Iran. **Iraq will export between 30,000 and 60,000 barrels per day from its northern Kirkuk oilfields to its neighbor in exchange for Iranian oil**. The deal is subject to renewal.

Petrofac won a $160 million contract from Basra Oil Company for the Iraq Crude Oil Export Expansion Project (OCOEEP). The contract is a two-year extension of Petrofac's current responsibilities. **Under the contract, Petrofac is responsible for operations and maintenance at an offshore facility approximately 60 kilometers from the El Fao Peninsula**. The facility supports the Basra Oil Company's export operations by loading tankers. It includes a central platform, 300 kilometers of subsea pipes, and a fleet of 14 vessels, according to the press release.

Iraq plans to build a nation-wide network of oil pipes. The pipeline would eliminate, or at least alleviate, the need to truck crude across the country. The pipeline would also be connected to neighboring countries.

Russian President Vladimir Putin lauded the work of the Russian energy company, Rosneft, in the semiautonomous Kurdish region in northern Iraq. "We presume that there is no reason why we should not develop relations with the Kurdish people and we'll be doing that," Putin declared. The central government in Iraq has expressed irritation with Rosneft for its operations in the Kurdish region.

Iraq has begun reconstruction efforts on the Baiji Refinery. The government plans to bring one unit online next year that will have the capacity to refine 70,000 barrels per day (b/d). The refinery was captured by Islamic State militants in 2014. Prior to that, it was Iraq's largest oil refinery, processing between 250,000 and 300,000 b/d. It was recaptured by federal forces in 2015, but, having been damaged during local fighting, it remained inoperable.

Iraq plans to use drones to protect its oil pipelines beginning next year. "We will use drones and advanced surveillance systems to protect oil pipelines from any attacks or deliberate sabotage acts. The minister ordered the use of the drone system as of the first quarter of the coming year," Asim Jihad, a Ministry Spokesperson, stated. **The Iraqi Oil Minister, Jabbar El Luaibi, has instructed his ministry to begin the process of searching for drones to carry out the mission**.

Iraq's Oil Marketing Company (SOMO) announced plans to sell up to four million barrels of Basra crude in a special auction. The proposed shipping dates are January 20th and January 23rd. The company is prepared to ship two million barrels each date.

In another auction, **SOMO did not receive any bids for the shipment of two million barrels of Basra Heavy.** The minimum bid for the crude was the official selling price (OSP) plus $0.01. The crude would have been shipped in February and was designated for the Asian market.

The Iraqi Oil Minister, Jabber El Luaibi, said that it was too early to discuss exiting the production-cut agreement.

KUWAIT

In a cabinet shake-up, **Bakheet El Rashidi, CEO of Kuwait Petroleum, was appointed as Kuwait's new oil minister**. Under El Rashidi, the company has invested in refining operations across Asia. He replaced Issam Almarzooq, who was appointed to the position in December 2016.

Global oil demand will increase 1.5 million barrels per day next year, the new Kuwaiti Oil Minister predicted. "That [higher demand] will support oil prices and support refining margins," the minister said. "Refining margins will be better than this year because they are linked to demand growth."

Construction at the Duqm Refinery in Oman will begin next year, the Kuwait Oil Minister, Bakheet El Rashidi, said. The minister indicated that **$5 billion in loans for the project will be finalized during the first quarter of 2018**. The project is a joint venture between Kuwait Petroleum Company and Oman Oil Company.

BAHRAIN

Bahrain Petroleum Company awarded a contract to an international consortium including Tecnicas Reunidas, Samsung Engineering, and TechnipFMC.

The $4.2 billion contract aims to expand Bahrain's only refinery, Sitra Oil Refinery, as a part of the company's Modernization Program. The expansion plan aims to increase Sitra's capacity by around 34.8% to reach 360,000 barrels per day.

OMAN

BP awarded Petrofac an $800 million contract for the second stage of development at the Khazzan natural gas field in Oman. The company will be conducing work on the central processing facility at the field **with the goal of increasing output from the field by 500 million cubic feet per day to 1,500 mcf/d**.

Construction at the Duqm Refinery in Oman will begin next year, the Kuwait Oil Minister, Bakheet El Rashidi, said. The minister indicated that $5 billion in loans for the project will be finalized during the first quarter of 2018. The project is a joint venture between Kuwait Petroleum Company and Oman Oil Company.

ALGERIA

Sonatrach signed a memorandum of understanding with DEA to provide a framework for the company to operate in Algeria. DEA is exploring upstream opportunities in the country

Production has begun at Algeria's Reggane Nord natural gas field. Four wells at the natural gas field have been brought online. The consortium operating the field plans to increase production to 280 million cubic feet per day (mcf/d) after an additional six wells come online. The field is operated by the Groupement Reggane Nord, consisting of DEA (19.5%), Sonatrach (40%), Repsol (29.25%), and Edison (11.25%).

IRAN

Indian imports of Iranian oil fell to a 21-month low in November. **Imports from Iran were down 43% from October to 266,000 barrels per day**. India is set to receive more Iranian oil this month, however, as tankers containing four million barrels of crude have already set sail from Iran toward India.

Gazprom signed two MoUs with Iran for the development of Iran's natural gas assets. **The Russian oil company signed the MoUs with the National Iranian Oil Company and the Oil Industry Pension Funds**. Per the agreements, Gazprom is to conduct technical surveys and provide development plans for three Arabian Gulf natural gas fields

Iranian crude exports to South Korea plunged 21.6% in November from October's totals. Iran shipped 1.3 million tons of crude to South Korea during the month of November—316,575 barrels per day. Exports were also down year-on-year, falling approximately 25% from the 1.73 million tons Iran shipped to South Korea in November 2016. **Despite the decline in November, crude exports to South Korea are still up for the year**.

Iran's Qeshm Gas Condensate Refinery will begin operations in January. The refinery will have the capacity to process 120,000 barrels per day. It will produce kerosene, jet fuel, diesel, naphtha, and liquefied petroleum gas (LPG). "The refinery's feedstock will be provided by offshore platforms in Hengam and South Pars gas fields," the President of the Iranian Offshore Oil Company, Hamid Bovard, said.

Iran has signed a one-year oil-swap deal with Iraq. **Iraq will export between 30,000 and 60,000 barrels per day from its northern Kirkuk oilfields to its neighbor in exchange for Iranian oil**. The deal is subject to renewal.

LEBANON

Lebanon awarded two offshore concessions to Total, Eni, and Novatek. The companies received preliminary licenses for blocks 4 and 9. The concessions are the first of their kind granted by Lebanon. The companies have a month to complete and submit paperwork and then contracts will be signed. **The government expects drilling to begin in 2019**.

The government will receive at 55% of natural gas revenues from discoveries made off the Lebanese coast, the Minister of Energy and Water, Cesar Abi Khalil, said. "On the commercial level, the government's cut was based on nine different scenarios. Block four, for example, the government's share ranged between 55% to 71%, and this is in line with the international average. As for block nine, the state's share was from 55% to 63%," the minister stated. **Some have estimated that Lebanon could have up to $600 billion worth of natural gas in its territorial waters**.

QATAR

Qatargas signed a contract to deliver 1.1 million tons of LNG to OMV annually for five years. The first shipment will arrive in January 2019. The LNG will be shipped to Rotterdam in the Netherlands. The regasified LNG will then be able to be transported via Europe's gas pipelines.

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Critical Supply Chain and Procurement Strategies in the Era of Low Oil Prices

By Vinodkumar Raghothamarao, Director Consulting, Energy Wide Perspectives & Strategy, IHS Markit EMEA

Oil and Gas companies operate in dynamic and complex environments, where they face constant supply and demand challenges. Now with Brent oil prices hovering at 50$ range, the need of the hour is to evaluate the supply chain and procurement techniques and costs. Sector companies need to focus on the non-hydrocarbon supply chains that handle the parts, materials and services required to run the business. The non-hydrocarbon supply chain is very critical to deliver the equipment and services required to find, extract, refine and finally market the oil and gas. Procurement and supply chain strategies are set to be in the forefront of critical issues plaguing oil and gas companies especially in the current era of low oil prices.

We have found that oil and gas supply chain practices clearly lag behind (in certain geographies) those of some other industries that use advanced techniques such as optimised inventory management, collaborative supplier relationship management and so on. In this article, we provide a brief insight about the opportunities and areas where supply chain practices can be improved amongst the IOCs/NOCs, and highlights other industries that companies in the oil and gas space can learn from, including improved service to internal customers and reduced costs.

According to Harvard Business School Review, purchased products and services account for more than 50% of the average oil and gas company's total costs. Thus, even a 5% reduction in purchase costs can result in a significant increase in the profit margin for oil and gas companies. To achieve this, sector companies should look at the following opportunities in order to deliver better supply chain value: Supply Chain Market Intelligence; Materials/ Supplier Relationship Management; and Supply Chain Talent & Technology.

Supply Chain Market Intelligence is the process of acquiring and analysing information in order to understand the present and future market; support current and future sourcing and market sector strategy execution; and enable the business to better anticipate changes in the external marketplace and react before others do. Supply Chain Market Intelligence is key to any industry and more so for the dynamic oil and gas industry. Effective supply chain market intelligence helps oil and gas companies deal with strategic supply chain challenges such as constrained capacity, infrastructure and volatile markets. It also helps companies make the right decisions about which markets to buy from, how to determine the right price to pay and what benchmarks and targets will provide the right competitive edge.

The hydrocarbon industry is heavily dependent on suppliers to provide complex services and critical equipment to support on-going projects and operations. More than often, contract management and supplier relationship management are not up to the mark, and as a consequence, the oil and gas companies take on supplier risks. To improve supplier relationship management, the companies should adopt a method of supplier benchmarking. Oil and gas companies need to measure the robustness and performance of different contractors for various spend categories, and constantly seek dialogue with them so that the suppliers are in unison with the necessary obligations in terms of safety, training, equipment and staffing requirements. For contract management, we have seen some oil and gas companies with non-efficient processes such as non-compliance of contracts with established suppliers.

Another method that can help the oil and gas company in pricing negotiations is the use of the Should-Cost model, and in addition, the Total Cost of Ownership (TCO) model. In the former, the total acquisition cost for a particular equipment or service is arrived at by taking into account the design cost, supplier operating cost, supplier margin, and transaction and acquisition costs. The Should-Cost model for different spend categories will empower oil and gas companies to effectively negotiate contract terms and conditions with the suppliers. In the case of the TCO approach (more suitable for long lead and critical capital intensive equipment), the different costs including the acquisition costs, and operation and maintenance costs are arrived at before choosing the right supplier at the competitive price. Some of the IOCs have adopted measures such as the Should-Cost and TCO models but these are yet to be adapted by other regional and local players in the oil and gas industry.

Even though the advent of technology has helped oil and gas companies to find and extract more oil, there is a need to seriously consider supply chain and procurement systems which provide additional real value. Needless to say, modern supply chain solutions and systems really helpful to address the above mentioned concerns. These supply chain solutions should cater for inventory management; demand forecasting, contractor management, master data management and e-procurement. Demand forecasting/planning coupled with inventory management and e-procurement form the crux of the oil and gas supply chain strategy. Oil and gas focused supply chain technology solutions have completely revolutionized the way supply chain planning is being carried out in different industries. There has been a paradigm shift in the way oil and gas companies have embraced e-procurement or shown interest in e-procurement systems.

Even with the best in class supply chain processes and systems, without the right people, the best in class supply chain practice cannot be sustained nor can the full benefits of supply chain really be enjoyed. As with any other industry, the oil and gas industry also has to grapple with the shortage of supply chain and procurement talent due to an aging workforce and growing skill shortages. Some of the measures that can be effectively adopted are training and grooming of talent in critical supply chain functions, establishment of supply chain centre of excellence and industry-academia collaboration to nurture supply chain talent.

Operating companies can improve and deploy the best in class supply chain practices through the implementation of some of the following measures: Firstly, to understand the "total value" of major spend categories. This requires thoroughly identifying costs and options across the supply chain for each category and determining appropriate interventions (e.g., seeking new supplier, changing specifications, altering contract terms). Secondly, to build custom fit procurement processes that provide better clarity, engage suppliers early in the process. Moreover follow through to execution and into operations. Thirdly, to manage risks across the entire spending portfolio—not just within individual projects or commodities, or splitting capital from operations spend. Fourth, to proactively manage the supply base, select relevant suppliers, focus on alignment and sustainability (i.e., dynamic relationships), and ensure company ownership and accountability is clear to suppliers. And finally, to institutionalize the capabilities required for supporting procurement and supply chain activities. Today, these scarce skills are at a premium. In the next few years, it will be just as important to cultivate the right talent here as it will in the most critical technical and operational areas.

Going forward, we realize that even though some of the supply chain best practices have trickled through the oil and gas industry, there is always still scope for further improvement. Better demand planning and optimized inventory management will help oil and gas companies maintain oil and gas equipment uptime and hence benefit from improved productivity. Improved spend category management and collaborative supplier relationship management coupled with increased automation of transaction processing, will lead to sourcing savings and identification of secondary saving opportunities. Effective deployment of supply chain best practices is the way forward for the oil and gas companies to reduce costs in this era of low oil prices and to focus on oil and gas production and exploration in the most optimized way. It will be really interesting to see how oil and gas companies can effectively manage local content sourcing coupled with the adoption of best in class supply chain practice in 2017.

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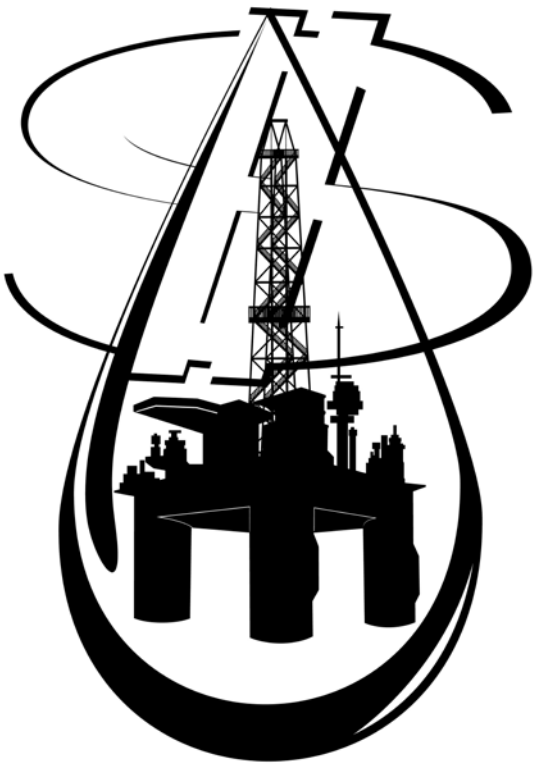
A Five Year Overview of Egypt's Bid Rounds

By Tamer Mahfouz



A paramount indicator of the health of the investment climate in Egypt's hydrocarbon industry is the performance of industry bid rounds. The fluctuating level of interest, value of the deals, and so forth tell tales not only about the investment influx in the sector, but of the confidence in the government as well as the economic prospects of the industry.

Between the second quarter of 2011 and fourth quarter of 2013, the government offered no oil or natural gas tenders. During this period, the Central Bank of Egypt (CBE) was propping up the Egyptian pound (EGP) and little was done in the way of reforms. The uncertainty of Egypt's political future, however, caused many existing and potential oil investors to withhold investments until the political situation became clearer in the last quarter of 2013.

The first bid round since 2011 was announced during the last quarter of 2013. Up until mid-2017, the Ministry of Petroleum and Mineral Resources had signed around 76 concession agreements for exploration and field development. The deals promise a combined minimum investment budget of $15.3 billion. Signing bonuses were worth just over $1 billion with the companies committing to drill at least 319 exploratory wells.

Tenders are offered by the Egyptian General Petroleum Corporation (EGPC), the Egyptian Natural Gas Holding Company (EGAS), and Ganoub El Wadi Petroleum Holding Company (Ganope). The areas mainly covered are the Western Desert, Eastern Desert, Gulf of Suez, Nile Delta, and the Mediterranean Sea. In 2018, however, other areas in the Red Sea within Egyptian territory waters will be offered for the first time, according to a Tarek El Molla, the Minister of Petroleum and Mineral Resources.

Egypt's Oil Investments

Exploration investments for hydrocarbons declined from EGP 26.87 billion in 2013 to EGP 4.11 billion in fiscal year (FY) 2015/2016, according to the latest figures from CBE. This was mainly due to the collapse of oil prices worldwide in mid-2014 and the realization that the new average oil price would hover closer to $60 per barrel rather than the excess of $100 a barrel that existed prior to 2014.

Bid Rounds: 2013

A number of concession agreements were signed in the last quarter of 2013. Dana Petroleum was awarded two concessions the West Al Dakhla-1 and the West Dakhla-2, each approximately 17,500 square kilometers (sq km) in the Western Desert, with a minimum investment budget of $24 million and a signing bonus of $1 million. The company agreed to drill a minimum of four exploratory wells. The agreement was signed with Ganope. Furthermore, Dana Petroleum signed an agreement to explore in the South Wadi Dara Concession in the Gulf of Suez, covering an area of 52 sq km. The company committed to a minimum investment of $3.5 million in addition to a signing bonus of $500,000. The agreement was signed with EGPC.

Dana Gas won a tender to explore for natural gas in the 2,980 sq km. Block 6 of the North Arish Concession in the Mediterranean Sea. The agreement was for a minimum investment budget of $71.5 million and a signing bonus of $20 million. Under the terms of the deal, Dana Gas was required to drill three exploratory wells. The agreement was signed with EGAS.

Another EGAS agreement was signed with the Italian Egyptian Oil Company (IEOC). It was awarded the Shorouk Offshore concession, which stretches over 3,765 sq km. in the Mediterranean Sea. The company committed to invest, at a minimum, $150 million in the concession—on top of the $5 million signing bonus—and drill at least two exploratory wells. This concession is where the Zohr field (100 sq. km.) was discovered in 2015.

BP alone won two tenders in 2013. For a minimum investment of $330 million and a signing bonus of $10 million, it was awarded an agreement for the North El Max Offshore Concession, covering an area of 4,680 sq km in the Mediterranean Sea. The agreement required the drilling of a minimum of two exploratory wells. The second bid round that BP won was for the North Tennin Offshore Concession, spanning 5,195 sq km in area. The company committed to invest a minimum of $370 million—not including a $20 million signing bonus—and dig two wells. Both concessions were offered by EGAS.

In the same year, EGAS signed an agreement with Edison to begin exploration in the 3,750 sq km, North Thekah Offshore Concession in the Mediterranean Sea. Edison promised to invest $170 million and dig at least two wells. It also awarded EGAS a signing bonus of $7.1 million.

Petroceltic won the tender for the South Idku Onshore Concession, with an overall area of 1,575 sq km. in the Nile Delta. The minimum investment was set at $23.5 million and the signing bonus at $5.1 million. A minimum of three exploratory wells had to be drilled per the agreement. The contract was signed with EGAS.

Sea Dragon Energy won a contract for South Disouq Concession in the Delta was signed for a minimum investment budget of $17 million and a signing bonus of $4 million. A minimum of three exploratory wells had to be drilled per the agreement, which was signed with EGAS.

DEA, formerly RWE Dea, won a bid round for the 45.6 sq km. Ras Budran Concession in the Gulf of Suez. The contract requires a minimum investment budget of $17 million and signing bonus of $4 million. The tender was auctioned by EGPC. Under the terms of the contract, DEA committed to dig at least three wells.

TransGlobe made several expansions throughout the year. It signed concession agreements for the exploration rights in the concessions of Northwest Gharib (655 sq km), Southwest Gharib (195 sq km) and Southeast Gharib (508 sq km) in the Eastern Dessert. Moreover, the company was awarded the South Ghazalat Concession (1,414 sq km) in the Western Desert. The combined minimum investment requirement for these concessions was $101.1 million with signature bonuses of $40.6 million, according to the company's website. Each concession has an initial three-year exploration period with the option to extend it by two two-year terms. The company agreed to drill a minimum of 70 exploratory wells. All these agreements were signed with EGPC

Bid Rounds: 2014

There were far fewer concession agreements in 2014 than in 2013 as global oil prices more than halved during the second half of the year. Tharwa Petroleum Company was awarded the Abu Sennan Concession, covering an area of 1,600 sq km in the Western Desert. The company agreed to invest at least $15 million in the concession in addition to granting a $5 million signing bonus. The agreement was signed with EGPC.

Apache signed a concession agreement with EGPC to explore for oil in the West Kanayes Concession, with a total area of 1,027 sq km. It committed to invest a minimum of $28 million and drill seven wells. The agreement came with a signing bonus of $15 million. Apache and Tharwa Petroleum Company signed a second agreement with EGPC to drill for oil in the Siwa Concession, agreeing to invest $16 million and drill four wells. In addition, the companies gave a $10 million signing bonus.

Dragon Oil signed a concession agreement with Ganope for the East Zeit Bay Concession in the Eastern Desert, which covers 93 sq km. It agreed to invest $39 billion to explore for oil and drill three wells; in addition to granting a $6 million signing bonus.

Bid Rounds: 2015

This year saw a second surge in the number of concession agreements offered by the three government bodies. By the end of the year, however, there were unmistakable signs of a massive foreign-

2013 Awards

Dana Petroleum
Al Dakhla-1
West Dakhla-2
Minimum investment $24 M
Signing bonus $1M

South Wadi Dara
Minimum investment $3.5M
Signing bonus of $500,000

Dana Gas
Block 6 of North Arish
Minimum investment $71.5M
Signing bonus of $20M

Eni
Shorouk Offshore concession
Minimum investment $150M in the concession
Signing bonus of $5M

BP
North El Max
Minimum investment $330M
Signing bonus $10M

North Tennin
Minimum investment $370M
Signing bonus $20M

Edison
North Thekah
Minimum investment $170 M
Signing bonus $7.1M

Petroceltic
South Idku
Minimum investment $23.5M
Signing bonus $5.1M

Sea Dragon Energy
South Disouq
Minimum investment $17M
Signing bonus of $4M

DEA
Ras Badran
Minimum investment $17M
signing bonus of $4M

TransGlobe
Northwest Gharib
Southwest Gharib
Southeast Gharib
South Ghazalat
Minimum investment $101.1M
Signature bonuses $40.6M

2015 Awards

HBS
Halif
Minimum investment $9M
Signing bonus $1M
Southwest Alamein
Concession

Eni
Ashrafi (with Engie)
Minimum investment $40M
Signing bonus $9M
North Leil
Minimum investment $130M
Signing bonus $1M
Southwest Meleiha
Minimum investment $37M
Signing bonus $20M

BP
Baltim (with Eni)
Minimum investment $80M
Karawan Offshore
Minimum investment $145M
Signing bonus $5M

Edison
Northwest Habi
Minimum investment $86M
Signing bonus $1.5M
Northwest Gendy
Minimum investment $20M
Signing bonus $3.1M

Petroceltic
North Port Fouad (with Edison)
Minimum investment $100M
Signing bonus $5.1M

DEA
Northwest El Amal
Concession
Minimum investment $45M
Signing bonus $2M
Ras Fanar
Minimum investment $45M
Signing bonus $1.5M

Total
North El Mahala
Minimum investment $20M
Signing bonus $3M

Dana Gas
North Salhiya
Minimum investment $22M
Signing bonus $5M
El Matareya (with BP)
Minimum investment $75M
Signing bonus $15M

TransGlobe
Northwest Sitra
Minimum investment $16M
Signing bonus $2M

Badr el Din
Sitra Concession
Minimum investment $200M
Signing bonus $100M

Apache
South Umm Baraka
Minimum investment $30M
Signing bonus $25M

2016 Awards

Eni/ BP
North El Hammad
Minimum investment $80M
Signing bonus $3M
Ras El Esh
Minimum investment $75M
Signing bonus $3M

BP
North El Tabya
Minimum investment $65M
Signing bonus $3M
Northeast Ramadan
Minimum investment $46M
Signing bonus $5M

Apex
West Badr El Din
Minimum investment $19.4M
Signing bonus $1.7M
Southeast Meleiha
Minimum investment $5.26M
Signing bonus $3.5M

Royal Dutch Shell
North Um Baraka
Minimum investment $35.5M
Signing bonus $18M

IPR/Cypriot Medtera
North El Baraka
South El Baraka
Minimum investment $3.3M
Signing bonus $200,000

Trident
Northwest Tair El Bahr
Minimum investment $4.5M
Signing bonus of $500,000

2014 Awards

Tharwa Petroleum
Minimum investment $15
Signature bonuses $5M

Apache
West Kanayes
Minimum investment $28
Signature bonuses $15M
Siwa (with Tharwa)
Minimum investment $16
Signature bonuses $10M

Dragon Oil
East Zeit Bay
Minimum investment $39
Signature bonuses $6M

2017 Awards

Trident
Esh El Melaha
Minimum investment $2.4M
Signing bonus $500,000

Apache
North West Razak
South Alam El Shawish
Minimum investment $73M

exchange supply shortage that would create the deep-rooted black market the following year.

HBS International Egypt Ltd. Was awarded a contract by EGPC, to invest a minimum of $9 million and drill at least four exploratory wells in the Halif Concession in the Western Desert. The signing bonus was $1 million.

Similarly, Eni won several blocks that year. One tender was for the Ashrafi Concession with an area of 124 sq km in the Gulf of Suez. Eni co-signed with Engie to invest a minimum of $40 million, with a signing bonus of $9 million and a drilling commitment of a minimum of two exploratory wells. Together with BP, Eni won a second concession agreement for the Baltim Concession (1,250 sq km) in the Mediterranean area. The companies agreed to invest a minimum of $80 million and dig at least two exploratory wells. The contract was signed with EGAS.

EGAS awarded IEOC the North Leil Offshore Concession with an area estimated at 5,105 sq km in the Mediterranean Sea for a minimum investment commitment of $130 million and a signing bonus of $1 million. In the Western Desert the company won a tender offered by EGPC for the Southwest Meleiha Concession with 2,058 sq km in area, agreeing to invest at least $37 million and grant a signing bonus of $20 million. Furthermore, the company co-signed with BP a concession agreement for the Karawan Offshore Concession covering an area of 4,565 sq km. The companies committed to invest a minimum of $145 million—on top of a signing bonus of $5 million—and dig two wells.

Edison signed a concession agreement with EGAS for the Northwest Habi Offshore Concession, covering an area of 2,468 sq km in the Mediterranean Sea. Per the agreement, the company was to invest at least $86 million with a signing bonus worth $1.5 million, and committed to dig a minimum of two exploratory wells. Furthermore, the company won the license to the Northwest Gendy Concession, covering 1,955 sq km in the Western Desert. It agreed to a signing bonus of $3.1 million, minimum investments of $20, and the drilling of at least three wells. The company also co-signed with Petroceltic to explore for natural gas in North Port Fouad Offshore Concession (3,440 sq km) in the Mediterranean Sea, agreeing to invest $100 million, dig two wells, and grant a signing bonus of $5.1 million. Edison co-signed with DEA an agreement to search for oil in the Northwest El Amal Concession (365 sq km) in the Gulf of Suez worth $45 million with a signing bonus of $2 million. The companies committed to digging two wells.

DEA was awarded the Ras Fanar Concession –187 sq km in surface area— in the Gulf of Suez. The company agreed to invest at least $45 million in the concession and dig four wells. Additionally, it granted a $1.5 million signing bonus.

HBS signed a concession agreement with EGPC to explore for oil in the Southwest Alamein Concession (2,888 sq km) in the Western Dessert with minimum investments of $12 million and a signing bonus of $8 million. It committed to drilling three wells. In addition, the company signed a concession agreement with EGPC for the North Ghazalat Concession (1,856 sq km) in the Western Desert with minimum investments of $15 million and bonus of $12 million. HBS agreed to dig a minimum of five exploratory wells.

Total signed a concession agreement for the North El Mahala Onshore Concession, covering an area of 1,088 sq km in the Nile Delta region. The company agreed to invest a minimum of $20 million, dig two wells, and grant a $3 million signing bonus.

Furthermore, EGAS signed a concession agreement with Dana Gas for the North Salhiya Onshore Concession –1,524 sq km in area—in the Nile Delta for a commitment to invest a minimum of $22 million in the concessionary area and dig to five exploratory wells. Dana Gas also gave a $5 million signing bonus. Dana Gas and BP co-signed another concession agreement for the El Matareya Onshore Concession (960 sq. km.) in the Nile Delta, agreeing to invest $75 million, grant a signing bonus of $15 million, and drill a minimum of three exploratory wells. That agreement was also with EGAS.

TransGlobe won the tender for the Northwest Sitra Concession, with a total area of 1,946 sq km in the Western Desert, for a minimum investment budget of $16 million and signing bonus of $2 million. The company agreed to dig at least two exploratory wells. The agreement was signed with EGPC.

Badr el Din Petroleum Company signed an agreement for the Sitra Concession (700 sq km) in the Western Desert. Under the terms of the agreement, it is obligated to invest $200 million in the concession and drill a minimum of three exploratory wells. The company granted a $100 million signing bonus.

EGPC awarded Apache the South Umm Baraka Concession in the Western Desert for a minimum investment of $30 million, and a signing bonus of $25 million. The agreement requires Apache to drill at least two exploratory wells.

Bid Rounds: 2016

Despite an increasing gap between the dollar's formal exchange rate at banks and the exchange rate on the black market throughout 2016, new concession agreements were successfully tendered throughout the year. IEOC and BP co-won agreements for two Mediterranean Sea concessions which were offered by EGAS. The first was the North El Hammad Offshore Concession (1,389 sq km) for a minimum investment budget of $80 million and a signing bonus of $3 million, requiring the companies to drill two wells. The second was for the Ras El Esh Concession (1,927 sq km) for a minimum investment budget of $75 million and signing bonus of $3 million, agreeing to dig two wells.

Separately, BP signed an agreement for natural gas exploration in the North El Tabya Concession (2,084 sq. km.) in the Mediterranean Sea with EGAS for a minimum investment budget of $65 million and a signing bonus of $3 million. The company agreed to drill two wells. It also signed an agreement to develop the Northeast Ramadan Concession for a minimum investment budget of $46 million and signing bonus of $5 million, committing to dig at least three exploratory wells.

Apex International Energy was awarded two concessions in the Western Desert by EGPC. The first was the West Badr El Din Concession (4,180 sq. km.) for $19.4 million with a signing bonus of $1.7 million. The company agreed to drill three wells. The second was for the Southeast Meleiha Concession (2,058 sq km) for a minimum investment budget of $5.26 million and a signing bonus of $3.5 million. Per the terms of the contract, the Apex will dig six wells.

Moreover, EGPC signed a concession agreement with Royal Dutch Shell, awarding it the North Um Baraka Concession (5,624 sq km) in the Western Desert for a minimum investment budget of $35.5 million and a signing bonus of $18 million. Shell agreed to dig seven wells.

IPR and Cypriot Medtera co-signed an agreement with Ganope to explore for oil and gas in the North El Baraka (11,860 sq km) and South El Baraka (10,900 sq km) concessions in the Western Desert. The North El Baraka agreement was for a minimum investment budget of $1.85 million and a $100,000 signing bonus and came with a requirement to dig at least one exploratory well. The South El Baraka agreement required $2.45 million in investments and a $100,000 signing bonus. The companies agreed to dig one exploratory well at the concession.

Another agreement that Ganope signed was with Trident Egypt Petroleum Company to develop the Northwest Tair El Bahr Concession, covering an area of 241 sq km, and to drill six wells for a minimum investment budget of $4.5 million and a signing bonus of $500,000.

Bid Rounds: 2017

In 2017, there have been a limited number of concession agreements as the EGP has stabilized after it was floated in late 2016.

In November, Trident Petroleum Company signed a concession agreement to develop the Esh El Melaha Offshore (North Magawish) Concession, with an area of 194 sq km. The company committed to drill at least four exploratory wells for a minimum investment budget of $2.4 million and a signing bonus of $500,000. The agreement was with EGAS.

Apache signed two agreements in the Western Desert; one for the North West Razak Concession, spanning across 4,764 sq km, with minimum investments of about $61 million. The second agreement was for the South Alam El Shawish Concession, covering 1,591 sq km in area also with investments of about $12 million.

Bids in progress

EGPC currently is offering two concession areas in the Eastern Desert. One is for the Wadi Dara Concession (50 sq km). The other is for Block G in the West Gharib Concession (20 sq km). The submission deadline is set for December 28th.

Furthermore, Norwegian PGS is conducting seismic tests in the Western region of the Mediterranean for bid rounds that are expected to be announced during the first half of 2018, an unnamed ministry official told Al Shorouk News.

EGPC has indicated that there will be several tenders for Gulf of Suez concessions in 2018, including the Northeast October, Northeast El Hamad, Northeast Ramadan, East Badry, and North Asran Offshore Concessions. Additionally, EGPC is preparing to offer tenders in the Western Desert for the Northwest Razak, Southeast Meliha, South Alam El Shawish, and Southeast Siwa Concessions.

Meanwhile, Ganoupe is currently in the assessment phase of its latest two bid rounds for 10 blocks in the Western Desert and Gulf of Suez. This phase is set to end before the start of 2018 with bid rounds announced in due course. Conducting the geophysical sweep are WesternGeo Schlumberger in the Gulf of Suez for $670 million and TGS in the Western Desert for $50 million, as reported by Trade Arabia.

During the second half of 2018, the ministry of petroleum and mineral resources (MoP) announced that it will hold two bid rounds in Blocks A and B, each covering 20,000 sq km in the Red Sea. Winners are expected to be announced, and agreements signed, by the first quarter of 2019. Similarly, Ganope will offer Block C in the Red Sea, at roughly the same time. MoP is hoping to announce at least one bid round in the Red Sea every year starting 2020, according to various media reports quoting El Molla.

EGYPT OIL&GAS NEWSPAPER

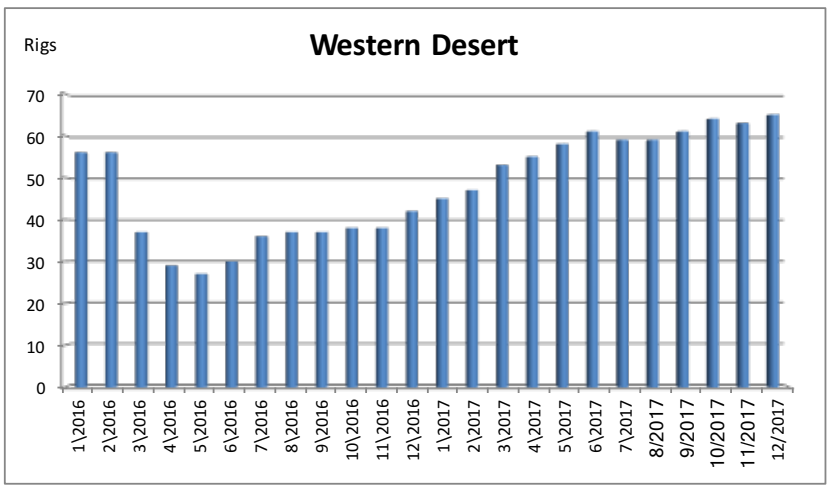
Drilling Activity Overview - 2017

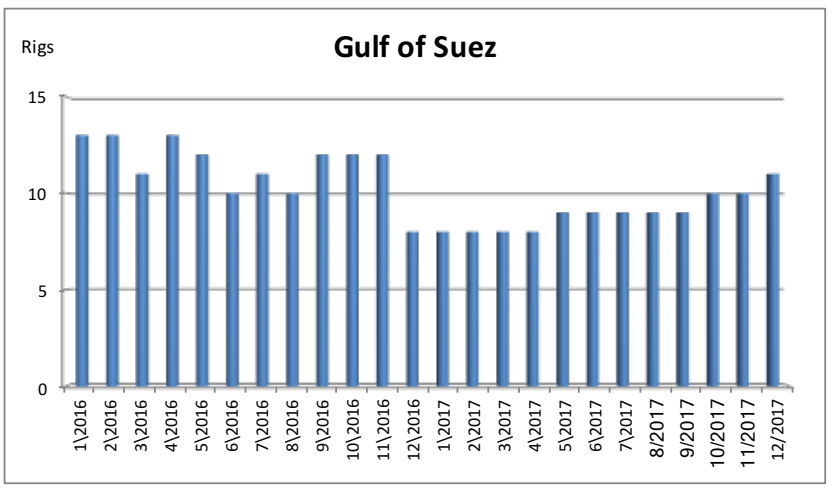
Drilling Activity Overview - 2017

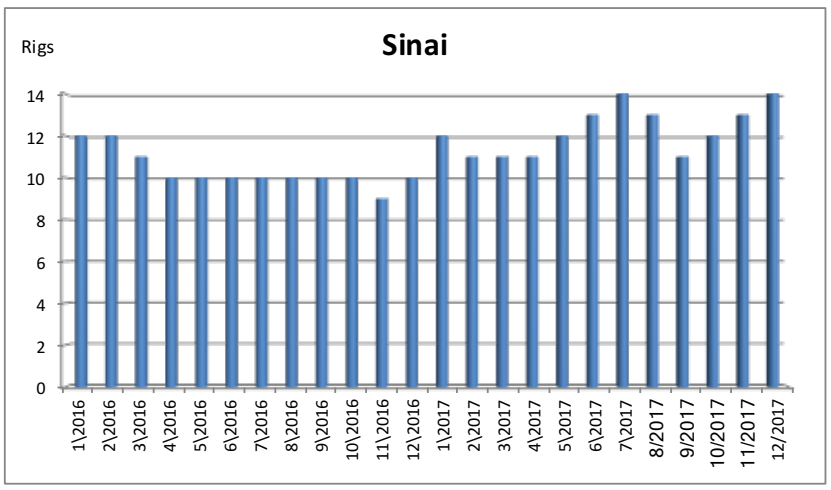
Covering from January 2016 to December 2017

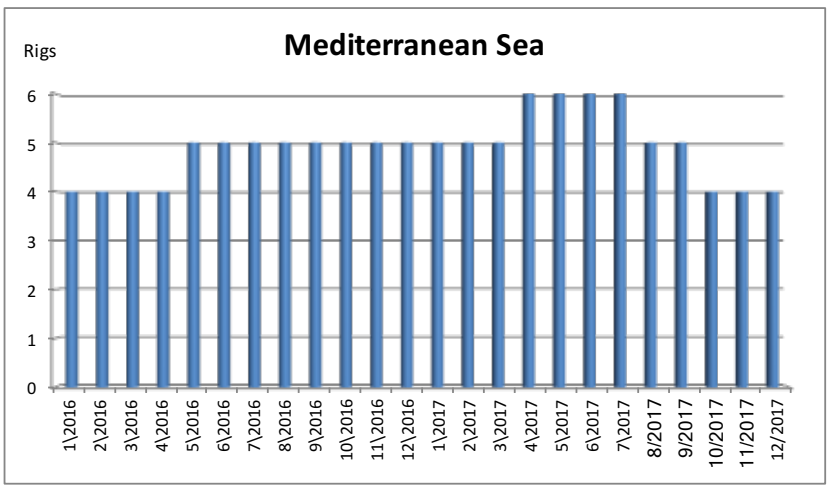
Rigs per Area

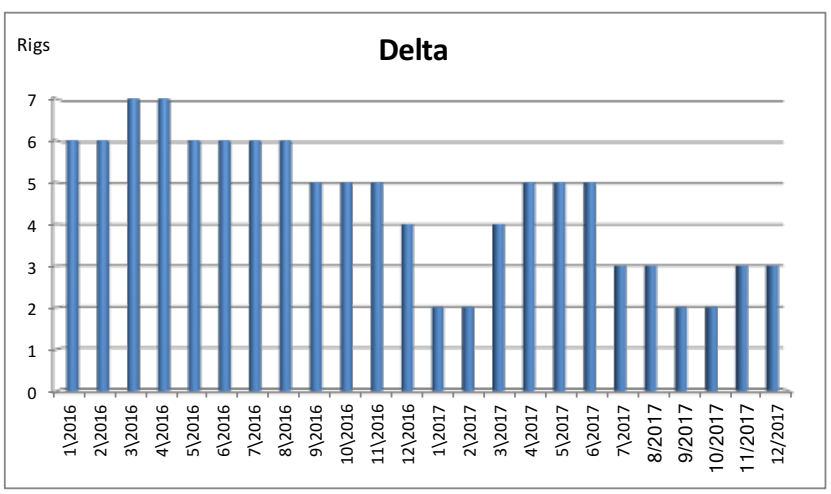
The below data has been compiled from official sources and covers a two year duration, from January 2016 to December 2017. The data is intended as a raw presentation of the performance of rig activity across Egypt, and by no means presents a conclusive view. Any and all decisions made based on this report are the sole responsibility of the decision maker.

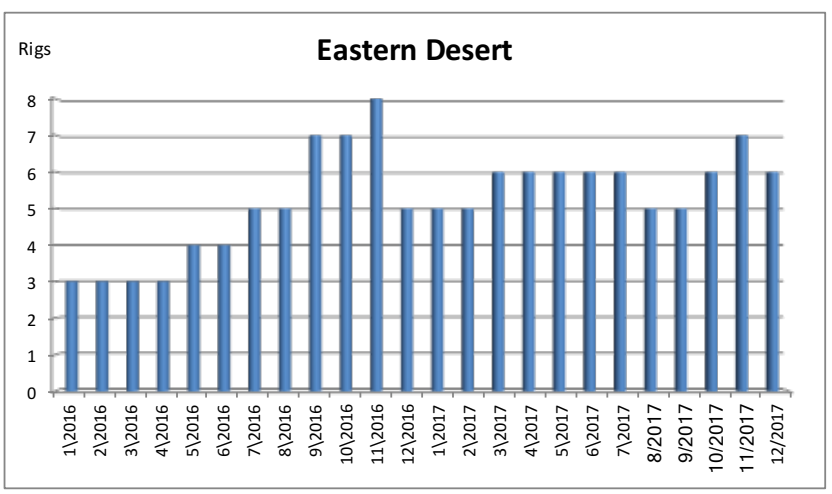




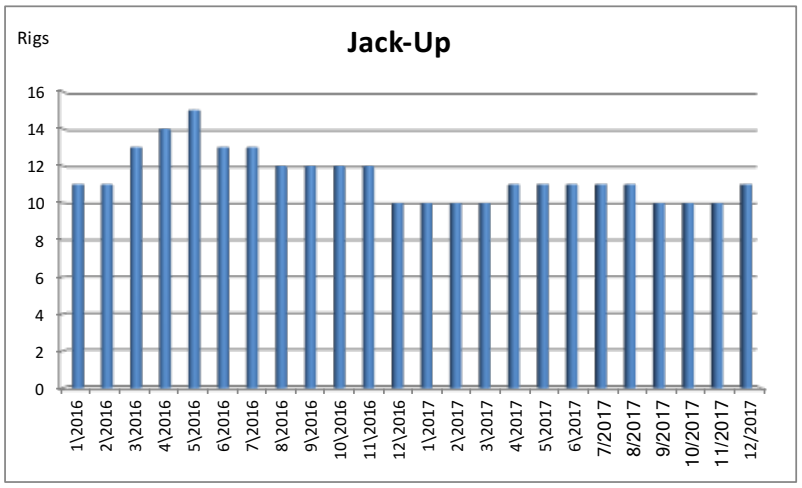


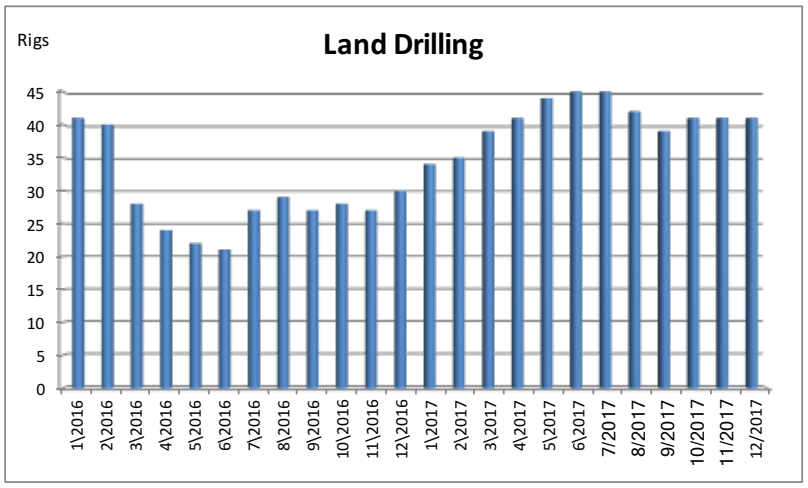


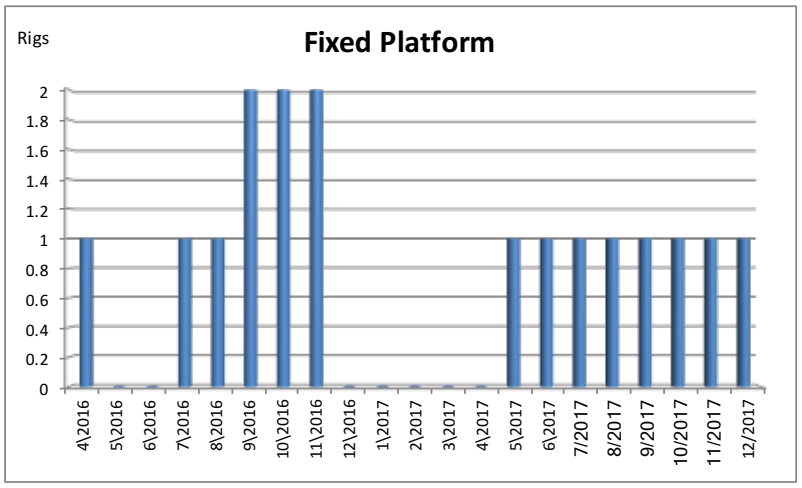


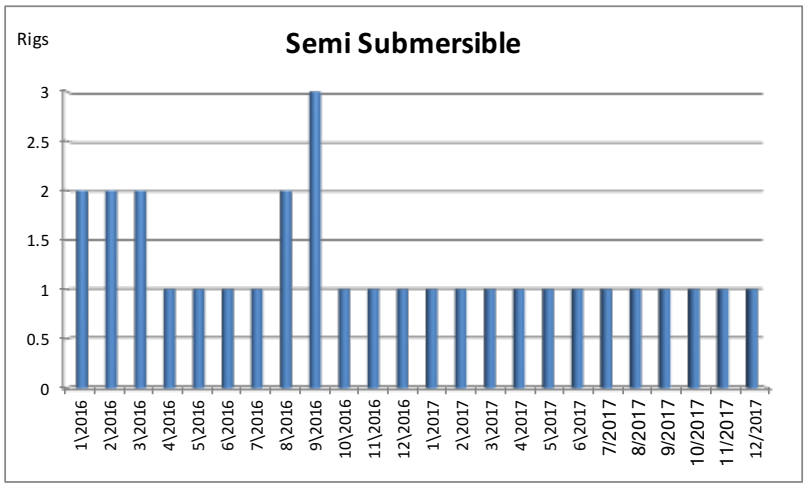


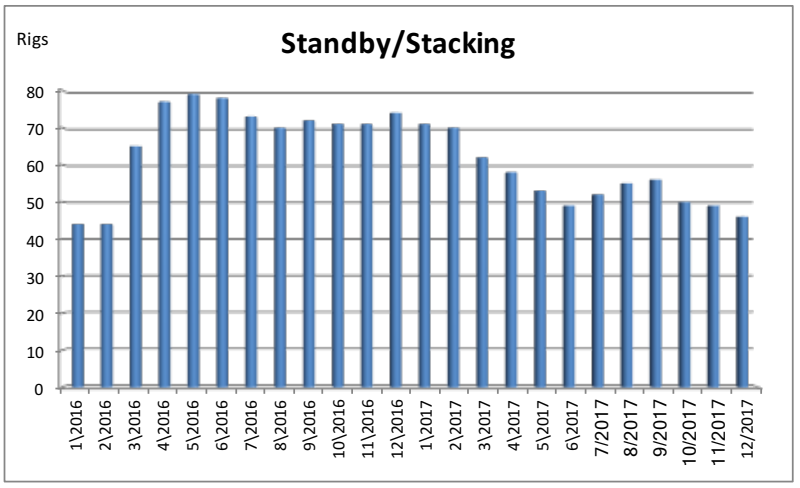
Rigs per Specification

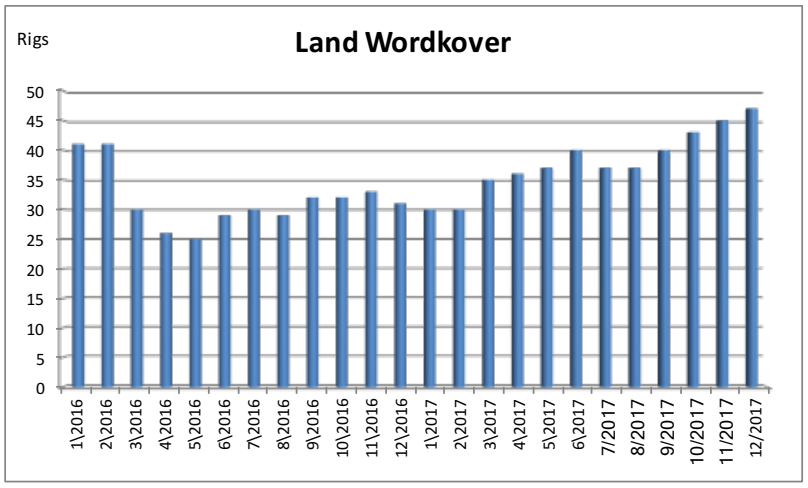


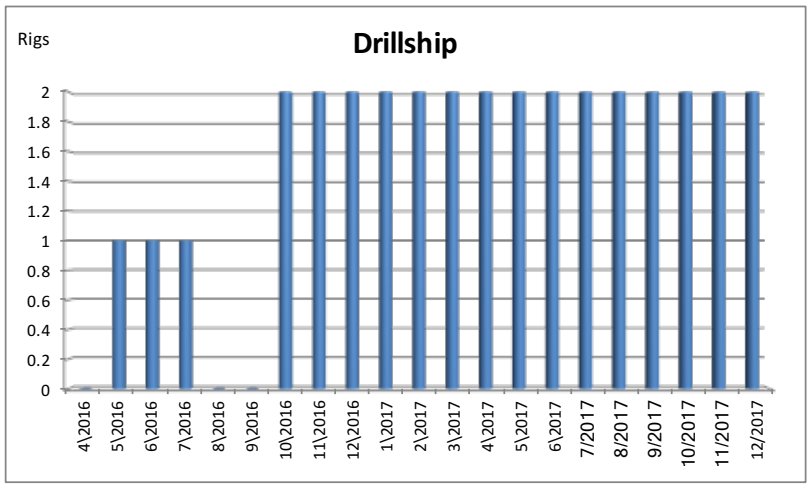


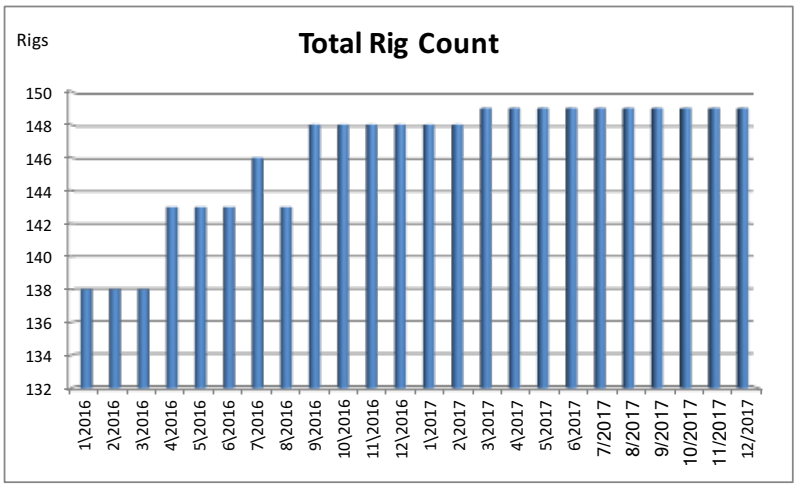












E&P Risk Analysis:
Expecting the Unexpected

By Mahinaz El Baz

Exploration and production (E&P) of hydrocarbons is a high-risk venture. Geological processes are dynamic and uncertain with respect to structure, reservoir seal, and hydrocarbon charge. Economic evaluations of E&P activities contain uncertainties related to costs, probability of finding and producing economically viable reservoirs, global oil prices, and supply and demand dynamics. Even after reaching the development and production stage, engineering parameters and concepts include a high level of uncertainty in relation to their critical variables—such as infrastructure, production schedule, quality of oil, operational costs, and reservoir characteristics. These uncertainties originate from geological processes along with economic and engineering concepts and involve high-risk decision scenarios with no guarantee of the discovery and development of hydrocarbons.

Experts argue that "future trends in oil resource availability depend largely on the balance between the outcome of the cost-increasing effects of depletion and the cost-reducing effects of the new technology. Based upon that scenario new forms of reservoirs exploitation and managing will appear where the contributions of risk and decisions models are one of important ingredients. This trend can be seen in the last two decades," noted Suslick and Schiozer in their study on Petroleum E&P for the Journal of Petroleum Science and Engineering.

Current E&P strategies are driven, in part, by international oil companies' (IOCs) aim to rapidly evolve new technologies. New technological advances have allowed the further exploration of "well-established basins as well as new frontier zones such as ultra-deep waters. Those technology-driven international hydrocarbon exploration and production strategies combined with new and unique strategic elements where risk analysis and decision models represent important components of a series of investment decisions," write Sulick and Schiozer.

Risks Facing E&P Activities

Oil and gas companies face many types of risks, ranging from volatile commodity prices—which are more linked to global socioeconomic factors than supply and demand—to increased quality, health, safety, and environmental (QHSE) pressures resulting from major accidents that negatively impacted the environment, the industry's image, and its social lease, according and IDC Energy Report on reducing risk in oil and gas operations. In addition, there are fundamental uncertainties and risks in normal E&P activities related to asset damage, business interruption, pollution, injuries, and damage to properties. Risks can be classified as risks of non-compliance and cost overruns, according to the IDC report. As the level of information increases, many uncertainties and risks are mitigated and consequently the importance of the uncertainties related to the recovery factor increases.

On the other hand, some experts divide risks facing E&P into geological, political, economic and financial, environmental, and cyber security risks. Geological risk involves the prediction by geologists based on historical data, statistics, and analogues of other similar basins and work with comparable geological characteristics of the probability of hydrocarbons. The estimate could prove either correct or incorrect, stated Donwa et al. in a paper on risk assessment in the oil and gas sector published in the Journal of Business Administration and Management Sciences Research.

Politics is another factor that creates risk as it impacts hydrocarbon industry regulation. "In our current time, [the political risk] factor is become more important and the international investment company must take it into account before they make a decision to invest: Would my company survive, if I lose the investment in this country? This question must be answered," Kenanah Shereih, Researcher in Petroleum Economics, said. IOCs are mainly covered by a range of regulations that limit where, when, and how extraction is done. This interpretation of laws and regulations differ from one country to another. Thus, companies tend to prefer countries with stable political systems and a history of granting and enforcing long-term leases, according to Tamara Joy Somers's thesis on Political Risk in the Oil and Gas Industry in Emerging Markets, 2014. Experts argue that political risk can be obvious, such as in developing countries with a history of sudden nationalizations or in nations that adjust foreign ownership rules to guarantee that domestic corporations gain an advantage. On the other hand, a political change is not necessarily a bad thing, as political changes can improve the business climate, such as when China opened for economic reform and foreign trade and began to generate steady investment growth. Political risk analysis can therefore contribute to identifying and capitalizing on unexploited opportunities, stated Donwa et al.

In addition, economic factors play an important role in the performance of E&P activities. Macroeconomic factors include economic growth, inflation, employment, interest rates, and business sentiment. Any change in one or more of these factors can constitute an E&P risk. The price of oil and gas is another primary factor in deciding whether a reserve is economically feasible or not. Basically, the higher the geological barriers to extraction, the more price risk a given project faces.

As unconventional extraction techniques cost more than a vertical drill down to a deposit.

Furthermore, supply and demand fluctuations are a very real risk for the industry players. Operations take a lot of investment and time to get going. The uneven nature of production is part of what makes the price of oil and gas volatile. Other economic factors play into this, as financial crises and macroeconomic factors can dry up capital or otherwise affect the industry independently of the usual price risks.

Environmental risk is another serious risk facing the upstream industry in general and E&P activities in specific. It can be considered as the most serious due to the interaction of consequences and the probability of an event. The risk is related to environmental issues and refers to both the hazardous outcome and the probability of its occurrence as a consequence of man's activities in the environment, explained M. A. Ayoade in a paper on environmental risk and the decommissioning of offshore oil platforms in Nigeria. "Environmental risks include blowouts, fires and explosions, spills, unintentional discharges, pipeline strikes and failures, and platform strikes and failures," Dismukes and Christopher wrote in a paper on diversifying risk in the energy industry.

New Types of Risk

Rapidly improving technology in the hydrocarbon industry creates a new type of information-technology (IT) related risk. Cyber security threats targeting sector companies are real risks facing E&P activities. Concerns were originally raised about the security of process systems with the revelation that the highly sophisticated Stuxnet virus was capable of invading process control systems and potentially disrupting processes of systems on drill rigs. For instance, the cyber-attacks on Saudi Aramco and RasGas in 2012 were a huge shock for many oil and gas companies in the Middle East and North Africa (MENA) region. The Saudi company was the victim of a significant cyber-attack. The company announced that 30,000 of its workstations had been infected by a virus, according to IDC Energy. Qatar's RasGas was hit by a similar attack, resulting in the company going offline for a few days.

A group of hackers—who called themselves the Cutting Sword of Justice—claimed responsibility for the attack on Saudi Aramco. They allegedly infected the organization's systems by replicating malicious software for political reasons. Some IT analysts credit a virus called Shamoon for both attacks. "Both Saudi Aramco and RasGas managed to limit the damage and the attacks did not affect extraction or processing. Such a bold attack, however, had important repercussions on the IT strategies of oil and gas organizations operating in the Middle East, demanding new projects on risk assessments, new IT security policies, and the adoption of additional security solutions," according to a paper prepared by Roberta Bigliana for IDC Energy Insights

Although technology creates new types of risk, it provides solutions to mitigate this risk as well. IT "capabilities such as mobility, cloud and Big Data/analytics offer opportunities to transform the way information is managed, used, and distributed across the company, according to Bigliana. She goes on to say that '[h]aving timely, updated, and contextualized information is a prerequisite to be able to make sound decisions and operate effectively and efficiently on assets, reducing the possibilities of mistakes and ultimately mitigating risks. The same goes for data integration."

Risk Assessment Methods

Risk assessment is "the process used to identify hazards in the workplace and assess the likelihood that these hazards will cause harm to employees and others," according to trade union congress. It is a crucial part of risk analysis and management as it entails the overall process of risk identification, analysis, and evaluation. In the oil and gas industry characterize with a lot of working equipment and complicated technologies, and high risk working environment, major E&P players must assess the level of risk associated with their investment and infrastructure in order to provide a mitigating measure. Risk assessment is carried out to identify these risks and to develop remedies to mitigate them.

Risk can be assessed either qualitatively or quantitatively. "Qualitative risk assessment is the process of prioritizing the risks by assessing the probability of occurrence and impact while quantitative risk analysis is the process of numerically analyzing the effect of the identified risks on the investment objectives," stated Donwa et al. Some experts argue that there is no single method of risk assessment that covers all types of oil and gas investment risk or workplaces risk. Different risk analysts employ different methods. Every method, however, involves decisions being made on how acceptable a risk is. This decision is based on the value that they place on the safety of their investment and health of their workers, Donwa et al. argue. "The most common approaches used in the industry are EMV & Monte Carlo simulation […] these methods lead to a very similar result and all methods are built based on a deterministic economics model. Therefore, only by using a clearly defined robust deterministic economic model, including all relevant cost and revenue variables, their mathematical treatment, and functional correlations, the E&P risk could be better addressed. The process [to] address the E&P risk must be a continuous process along the cycle life of the petroleum project in order to support the preparation of strategies and the decision-making process," Shereih noted.

Other experts think that there are better approaches to address E&P risk. "I prefer the top down approach in both cases, new entry or new project. This means performing regional risk analysis on the status of politics, [the] financial situation [of] the government, and [the] infrastructure existing in the region—followed by economic modeling exercises and scenarios development then merging or integrating the previous steps to come up with a full risk analysis. [Yet] it varies from [one] company to another based on size and risk appetite," explained an industry expert in risk analysis who requested anonymity.

Egypt: What Experts Think?

Egypt, like other oil and gas producing countries, faces different types of E&P risk. "Risk can vary from [one] company to another based on the business model; domestic or export market; area of operations, and also project phase. However, there are common risks for everyone: for example guarantees of payment, ease of getting permits from authorities for drilling purposes especially in the Western Desert and Sinai, [as well as] depleting reserves in major oil and gas field around Egypt. I believe these are the main uncontrollable risks IOCs are exposed to in Egypt. Other risks can be controlled through close monitoring and negotiation with the government which is showing flexibility to meet IOCs' demands on many occasions.… It is very simple to overcome these challenges through better alignment, coordination, and communication between host authorities," explained the expert.

In addition, Stephen Fullerton, Research Associate at Wood Mackenzie, thinks that "the main risk for E&P companies in Egypt is still non-payment of receivables. Although this has improved in recent years, companies still view this as a major risk. A lesser risk would be infrastructure bottlenecks, especially available processing capacity in the Western Desert. Outside of Egypt the main risk will be slowing demand driving down oil prices globally in the near term." E&P activities involve a number of operational risks, including explosions, fires, and the release of hydrocarbons into the air, water or soil—resulting in serious harm to the environment or multiple deaths or serious injuries.

When asked about the best methods and approaches to address E&P risk in Egypt, experts stressed the importance of companies' risk assessments. "Companies need to stick to realistic criteria when sanctioning projects and make sure they break-even at lower prices," noted Fullerton. Tackling an HSE angle, Mohamed Maghraby, a HSE Professional, stated that "operational facilities which have the potential of a major accident due to the storage, handling, or processing of hazardous or toxic materials are classed as major-hazard facilities. Safe operation of all major-hazard facilities is demonstrated through the safety case developed specifically for the unique operations and situation. The safety case is the means of ensuring and demonstrating that suitable and sufficient measures are in place to prevent a major accident or environmental event and to reduce the effects of these events should they occur."

Despite the conventional methods to mitigate E&P risk in Egypt, technology is a potential unconventional approach. "New technologies and software have always been a good aid to E&P companies in managing upstream related HSE risks," noted Maghraby. Technology can help in "accessing remote areas especially in the Western Desert, and reaching out ultra-deep waters in the Red Sea and West Mediterranean. [Moreover, it helps in] optimizing depleting reserves and utilizing every single barrel we can produce GOS [Gulf of Suez], WD, East Mediterranean. [Technology enables companies] to convert the non-economic discovered reserves to economic prospects and further explore the shale gas prospects in [the] WD with no major effect on the environment," stated an industry expert in risk analysis.

Furthermore, experts stress on the importance of flexible modeling. "In the current environment due diligence is key. Properly appraising a resource and having a good geological and commercial model prior to sanctioning a project will go a long way to making sure the project is a success. This may mean that an extra appraisal well or more seismic is needed but should prevent any nasty surprises when the field comes on-stream," noted Fullerton.

E&P is considered a capital-intensive business. Its activities have recorded success in dealing with the uncertainty associated with its operations over the years. Although the cost of these processes has fallen and success rates have increased considerably due to improved technology, the average rate of return is still low. Thus, experts argue that greater utilization of risk analysis is necessary to ensure that IOCs receive a good return on their investments.

High Drilling Cost: **Efficiency's Main Challenge**

By Mahinaz El Baz

The fall of international oil prices has forced industry players to consider controlling, optimizing, or cutting drilling cost to increase efficiency and maintain positive profitability ratios. Drilling a well is a costly process with a high element of risk that requires strict monitoring. Exploration and production (E&P) companies may spend 50% or more of their capital budgets on drilling and completion costs. Some companies—those with large unconventional resource components—may spend much more, according to RISC's analysis on well-cost reduction. It is essential for most international oil companies (IOCs) to develop drilling techniques and implement new technologies that reduce drilling costs.

High Drilling Cost: Causes and Solutions

The high cost of drilling and completion (D&C) is considered one of the biggest challenges facing E&P companies. For an average offshore oil and gas operator, D&C accounts for about 40-50% of total capital expenditure; for many onshore operators, these costs can be as high as 65%, according to a study conducted by McKinsey & Company. "Drilling is a very expensive operation, especially offshore drilling," Ahmad Shehata, Directional Drilling Services Coordinator at Schlumberger, noted. For offshore wells, about 70-80% of these costs are time related, suggesting that any compression in delivery time will have a direct benefit to the bottom line, noted the study.

Different factors impact the drilling cost during different stages. Major aspects impacting drilling cost include drilling footage, drilling cycle, formation, well type, drilling accidents and failures, surface casing, production casing, drilling bits, the components of drilling fluids, and different well sketches, according to a research paper by Qu et al. On average, half of this cost is in leasing rigs and the remaining half is in equipment, engineering services, consumables, and project management. Although there are many factors that affect drilling costs, drilling footage and the drilling cycle are the main components of the total drilling cost, according to a study on drilling cost optimization in hydrocarbon fields by Bahari and Seyed. Moreover, the drilling cost can be divided according to impacting factors into fixed and variable costs. The fees that are not affected by the drilling footage and drilling cycle are called fixed costs. The expenses that are influenced by the drilling footage and drilling cycle are called variable costs, according to Qu et al.

In many locations D&C costs are much higher than they need to be. Many of the factors that influence coast are within the control of the E&P company—such as ageing equipment, superseded technology, a non-aligned contracting and procurement process, inefficient specification, design and operating practices, sub-optimal continuous improvement processes, lack of organizational empowerment, and limited competition for service. On the other hand, there are factors out of the company's control, such as low activity levels, high labor costs, remote operations, weather conditions, and lack of infrastructure, according to RISC.

High drilling costs directly affect profitability by increasing the breakeven reserve volume and/or prices. RISC's analysis shows that a D&C cost reduction of 50% or more is necessary to monetize the substantial potential that exists in many portfolios in some cases. In addition, drilling returns depend on the cost to drill and complete a well, plus ongoing production costs versus the cash inflow from the sale of the oil and natural gas produced from the well. Cash inflows depend on commodity prices and the volume of production, a study by CBRE Clarion Securities notes. The two key variables, aside from oil and natural gas prices, are costs and production volume. Efficiency gains arise from either a reduction in costs or an increase in production. Maximizing cost reductions can be achieved through optimizing five levers, according to McKinsey & Company.

The first lever is to drive learning curves rigorous portfolio and planning optimization at all levels, in order to prevent overwork and thus reduce the steepness of the learning curve. Optimizing this lever can achieve up to a 20-25% reduction in the average cost per well. The second lever is about standardizing and simplifying wells to reduce unit costs, a proven cost-reduction method that enables improvements in several other related areas. The potential cost reduction of up to 10-15% arises through several related mechanisms. Furthermore, the third lever includes initiatives to reduce non-productive time (NPT) and improve efficiency. This lever is a collection of many smaller efforts that have been proven to provide at least a 5-10% reduction in total well delivery costs. Applying a normal toolkit to prevent rework, reduce waiting time, eliminate contingencies, and enable processes to be executed at the same time—instead of in sequence–can cut NPT in half.

Procurement and supply chain management (SCM) is a key driver of cost reduction. 90% of the industry's capital spending and 70% of its operational expenses are for contracted services and products. Hence, the fourth lever refers to basic procurement best practices. Implementing better practices can reduce costs by 10-15%—a significant step toward the 50% target. However, this requires a fundamental rethinking of commercial models and an aggressive approach to take advantage of the current market downturn. Many experts believe the downturn may offer even greater potential savings. Finally, rigorous performance management is required to revitalize the performance drive, and that alone has been proven to reduce well costs by up to 5-10%. As wells are hard to compare, operators tend to view each drilling job as different and resist ambitious targets for time improvements. With the standardization of drilling plans, it becomes easier to set bold targets.

Discussing the current and potential methods to reduce the cost of drilling a well in Egypt, Shehata thinks that cost reduction can be achieved through planning and experience sharing between the operators and the service providers under the supervision of the Ministry of Petroleum and Mineral Resources. Moreover, he believes that investments in training and human capital will also reduce the cost.

Drilling Techniques: From Vertical to Horizontal

IOCs are developing drilling techniques to reduce

50% of total capital expenditure is for D&C

the high costs of D&C. Horizontal and vertical drilling are two different techniques that are used to explore and develop oil and natural gas. Horizontal drilling sometimes referred to as directional drilling "involves drilling a well to a predetermined depth based on seismic and other geological data and then turning the well horizontally to a set lateral length. The well is then completed and the production of oil and natural gas begins," according to bizfluent. On the other hand, "vertical drilling involves drilling a well straight down into the earth until the drill bit reaches the formation being developed. The well is then completed and starts producing oil or natural gas."

Horizontal drilling has become more common recently, according to bizfluent. "Wells drilled horizontally are much more productive than vertical wells, due to extended contact with the formation," the website states. "The achievement of desired technical objectives via horizontal drilling comes at a price," according to Lynn Helms. The average horizontal well is more expensive and is more technically difficult to drill than the average vertical well. "A horizontal well can cost up to 300% more to drill and complete for production than a vertical well directed to the same target horizon," Helms continues. Despite their higher cost, an increasing number of horizontal wells are being drill around the world, according to Roy Nurmi writing the Middle East Well Evaluation Review. "Although drilling a horizontal well is more difficult than a vertical well […] the benefits greatly outweigh the challenges," explained Marek Bartlomowicz, Technology and Performance Manager at Husky Drilling.

Deciding to go for horizontal or vertical drilling is associated with some technical and financial factors. In an oil reservoir which has good matrix permeability in all directions, no gas cap, and no water drive, the drilling of horizontal wells would likely prove to be a financial folly as a vertical well could achieve a similar recovery of oil at lower cost. However, when low matrix permeability exists, the greater exposure to the wellbore provided by horizontal drilling could produce greater dividends, according to the Office of Oil and Gas at the Energy Information Administration.

Horizontal drilling becomes financially viable, even the preferred option, when the reservoir rock is on a horizontal plane or when gas or water coning could be expected to interfere with full recovery. In these circumstances, horizontal drilling can produce 2.5 to 7 times what a vertical well can produce. The higher production rate results in a higher rate of return on investment for the horizontal project than would be achieved by a vertical project, Helms noted.

90% **of the industry's spending & 70% of its operational expenses are for contracted services and products.**

Drilling a horizontal well includes many benefits. In addition to the higher production rates, the developing cost for many horizontal-well projects—defined as well cost divided by well reserves—is about 25-50% lower than the cost of buying proved reserves. Fewer horizontal wells are needed as compared to vertical wells to produce the same amount of oil. This results in a reduced need for surface pipelines and locations, according to S. D. Joshi. "Horizontal drilling is better for the environment, because multiple horizontal wells extending in different directions can be drilled from a single pad site, effectively reducing the surface environmental footprint," said Bartlomowicz.

On the other hand, horizontal drilling has distinct disadvantages in addition to the higher drilling costs. Notably only one zone can be tapped by a horizontal well. If the reservoir has multiple pay-zones—especially with large differences in vertical depth—or large differences in permeabilities, it is not easy to drain all the layers using a single horizontal well.

In Egypt, the government is making efforts to cooperate with energy firms. IOCs tend to avoid horizontal wells due to their high costs; however, the government should encourage firms to drill them, Ahmed Shohdy, Development and Operation Geologist at Saudi Aramco, argues.

New Trends and Technologies

As low oil prices negatively affect both industry profits and cost estimations, industry "operators are turning, in part, to technological solutions and innovative techniques to reduce drilling cost and increase capital efficiency in the short-term," according to an analysis from IHS Markit.

"Rapid changes in price, such as the halving of the oil benchmark between 2014 and 2015, naturally bring into focus the need for oil companies and their suppliers to reduce costs to maintain viable returns. Technology helps on two fronts. The first is in raising short-term production, the key denominator in the cost-per-barrel equation. The other involves attacking capital costs and operating expenses head on. Both place an emphasis on efficiency," said Paul Markwell, Vice President of Upstream Oil and Gas Consulting and Research at IHS Energy, according to IHS Markit's press release.

Experts argue that investing in drilling technology should be viewed as a long-time strategy. "Producers must commit to unwavering innovation through the oil and gas price cycles if they are to meet demand safely and at competitive costs," Markwell said, according to IHS Markit. In the course of technological innovation, increased investments will stand in contrast with the aim of cost-saving and profit-taking. If investments in technological innovation are reasonably planned, short-term costs could rise but higher long-term production should offset it, according to Qu et al.

Creating a balance between petroleum supply and demand represents a real challenge for IOCs. In 2014, the increase in the global supply of petroleum and other liquid fuels was almost twice the increase in consumption, according to estimates by the US Energy Information Administration. As a result, companies are aiming to apply drilling technologies to help in improving their operations in a few fundamental areas.

Scientists argue that companies should focus on decreasing rising well costs, lowering operating costs, or streamlining business functions in the well lifecycle. "Organizations operating in this sector know firsthand that continued success means being able to constantly improve efficiency for capital deployments. As a result, finding new avenues for efficiency is an ongoing concern," according to Capgemini Insights & Data. "To meet demand and remain competitive…operators are pursuing a range of cost-cutting and efficiency initiatives including automation, hiring robots, and mechanization of high-cost, repetitive oil and gas activities, such as drilling," Manufacturing Engineering writes. Furthermore, some IOCs are willing "to apply data-driven analytics to draw key insights from high-volume data streams, such as detecting when a piece of drilling equipment is going to fail or identifying 'sweet spots' in unconventional oil and gas plays. In still other instances, operators are increasing their use of mobility technologies to improve the efficiency and effectiveness of their field workforces," according to James D. Sawyer, writing for Advanced Manufacturing.

Application in Egypt

Applying new drilling technologies is expected to benefit the petroleum industry in Egypt, providing decision makers with accurate information and more advanced analysis to help forecast production. Furthermore, collaboration between IOCs and national oil companies could transfer new drilling technologies to Egypt if managed efficiently by the Ministry of Petroleum and Mineral Resources, according to Shehata.

Maintaining profitability in an era of relatively low the oil prices has become more challenging. The combination of falling fuel prices and the rising costs associated with drilling and hydraulic fracturing have squeezed profit margins, making greater efficiency vital for producers' success. As a result, IOCs have adopted a number of measures to cut drilling costs and increase efficiency. Quantitative analysis in many case studies shows that lower drilling costs could carry significant benefits in the low-price environment.

A Deeper Look into the Prospects of Hydrocarbon Recovery Factors

By Mahinaz El Baz

Hydrocarbons will likely remain the major component of the global energy mix, especially as energy demand is expected to increase by 50%, according to a paper published in the Journal of Applied Polymer Science by Miller et al. The contribution of renewable energy sources could prove insignificant in the face of growing demand. While global production could drop by 40 million barrels per day (b/d) by 2020, the world will need an additional 25 million b/d for supply to keep up with consumption, according to a study by Zitha et al. that was published by the Society of Petroleum Engineers.

With energy demand increasing and supply declining, discovering new fields and maximizing production from existing fields is extremely important. At present, most oil is recovered via water flooding in the primary and secondary phases. This process recovers approximately 35% of the oil, leaving approximately 65% in place. This gap in recovery represents a substantial opportunity, according to a report about Hydrocarbon Recovery Optimization by Shell. In the current business environment, affordable technologies will play a pivotal role in meeting demand. Experts think that many current and future field development projects will involve complex improved oil recovery (IOR) and enhanced oil recovery (EOR).

Scales of Reservoir

As discovering new oilfields becomes more difficult, the majority of international oil companies (IOCs) are currently focused on maximizing the recovery factor (RF) from their oilfields and maintaining a commercial rate. Studying the static properties and dynamic behavior of the hydrocarbon system on various scales is essential for IOCs to be able to maximize hydrocarbon RF. The average RF from mature oilfields around the world is between 20-40%. This contrasts with the typical RF from natural gas fields of between 80-90%, according to a paper published in Philosophical Transactions of the Royal Society by Muggeridge et al. Improving the oil recovery rate to that typical at natural gas fields could more than double global supply of recoverable oil. This would provide more time for companies to develop alternative and unconventional energy technologies, Muggeridge et al. write.

"Oil recovery processes involve the interplay of flow, transport, rock/fluid interactions, and thermodynamic processes on the meso-scale," Zitha et al. argues. Physical and numerical modeling is the main tool to observe these processes. Advances in information technology (IT) methods and increased computational power should improve numerical simulations. "A full appreciation of the new tools will lead to the development of a novel generation of numerical simulators that can capture the physics of the oil recovery processes better and thus can better predict the behavior of reservoir systems. Such simulators should be based on improved mechanistic modeling of [the] physical-chemical processes underlying enhanced oil recovery. As a first step, the derived mechanistic models will be up-scaled to the core scale and validated by dedicated laboratory experiments. Finally, the models thus developed will be up-scaled to the field scale," Zitha et al. argues.

Oil Recovery Phases

The lifecycle of an oilfield is divided into three major stages: production buildup, plateau production, and declining production, according to the Society of Petroleum Engineers. Sustaining production levels over the duration of the lifecycle requires the ability to control the recovery mechanisms involved. Scientists explain that a regular oil field has three main recovery phases—primary, secondary, and tertiary (known as EOR)—which are intended to progressively improve total recovery.

Wells are drilled during development phase, which is gen¬erally associated with the primary phase. During this phase, oil is produced using its own pressure. Oil and rock expand as reservoir pressure declines. "For primary recovery, the lifecycle is generally short and the recovery factor does not exceed 20% in most cases," noted Zitha et al. The secondary phase starts after natural pressure falls to an insufficient level to push the oil out, a report by the US Geological Society authored by Verma notes. In the secondary phase, to increase reservoir pressure, water or gas is injected into the reservoir to force the oil out. Water and gas injections only boost RF if the reservoir has "good horizontal and vertical permeability," permitting "gravity to keep the fluids segregated," according to Verma. "For secondary recovery, relying on either natural or artificial water or gas injection, the incremental recovery ranges from 15-25%. Globally, the overall recovery factors

"The latest trends involve applications of smart fluids and nanofluids, in addition to modification of biopolymers like xanthan gum, cellulose, and starch."

for combined primary and secondary recovery range between 35-45%," stated Zitha et al. This phase ends as profits fall.

This is when EOR techniques are applied. EOR refers to unconventional methods to recover hydrocarbons from oilfields, such as re-pressurizing the reservoir with miscible-gas or soluble-chemical injections, according to Corex. Interest in EOR techniques is growing around the world as most mature oilfields cannot maintain their production rates without EOR. Similarly, some oil reserves known as un-easy reserves require EOR from the beginning to produce an economically viable amount of oil. Some experts argue that EOR can not only optimize oil extraction but can also significantly extend global oil reserves if oil prices rise to the point where it becomes an economically feasible option, Muggeridge et al. note. EOR could unlock as much as 300 billion barrels of oil worldwide, according to the International Energy Agency.

"EOR techniques involve water-flooding by polymer in Agiba sessions on a narrow scale and steam flooding in Scimitar Petroleum Company. Concerning miscible flooding by CO2, it is widely applied in US, but not in Egypt."

IOR, while sometimes confused with EOR, refers to improvements in oil recovery achieved through the identification of oil that had been previously bypassed. Seismic surveys are used to locate these oil deposits and then new wells are drilled to extract the oil, according to Sneider et al. in a paper for the American Association of Petroleum Geologists. "Using combinations of traditional EOR and IOR technologies it has been possible to achieve RFs of between 50-70% for some fields but this is still less than the typical RF for a gas field," the Society of Petroleum Engineers notes.

Future Techniques

In recent years, progress has been made in the 'modeling of the earth' system. However, there is an ongoing need to improve up-scaling techniques to permit the complex modeling necessary for IOR and EOR. IOCs are seeking to develop expertise in these technologies. A broader use of visualization techniques, such as high-resolution and x-ray computed tomography and nuclear magnetic resonance, could lead to new insights into the recovery mechanisms, argue Muggeridge et al. "Recently, new technologies using the electromagnetic waves and using enzymes have been developed to improve oil recovery. These technologies are still under research and [are in the] development stage," Dr. Mahmoud Abu El Ela, Professor of Petroleum Engineering at Cairo University, notes.

There is also ongoing academic research to develop new nanotechnologies for the oil and gas industry. "Fruition of such research could bring about considerable changes on way oil exploration and production is done. For instance, swarms of nanodevices transported by flood water could aid real-time mapping of reservoir fluids, resulting in unprecedented accuracy. Nano-devices are also being contemplated as carriers of chemicals that can be delivered directly to the oil/water interface to modify the microscopic displacement pattern," Zitha et al. write.

"The latest trends involve applications of smart fluids and nanofluids, in addition to modification of biopolymers like xanthan gum, cellulose, and starch. Moreover, some recent academic research tend to microbial EOR by injection of some bacterial species capable of oil degradation in the reservoir, but this is on academic scale only not on industrial scale," Dr. Abdelaziz El Hoshoudy, a Researcher at the Egyptian Petroleum Research Institute, stated.

Furthermore, George Basta, and Waleed Tarek Kortam, Reservoir Engineers at Scimitar Production Egypt Ltd., believe that the latest trend is for environmental friendly and low-cost methods, such as solar EOR and solvent EOR (VAPEX). There is another global trend that aims to reduce water usage and CO2 emissions in the oil recovery process while cutting back on energy consumption to reduce operating costs, they added.

Egypt's Oil Recovery Status

At present, oil in Egypt is mainly recovered in the primary and secondary phases. El Hoshoudy noted that "EOR techniques involve water-flooding by polymer in Agiba sessions on a narrow scale and steam flooding in Scimitar Petroleum Company. Concerning miscible flooding by CO2, it is widely applied in US, but not in Egypt." In the same context, Abu El Ela noted that, "currently, the oil reservoirs in Egypt are mainly producing under the primary and secondary recovery mechanisms-water-flooding projects-with limited applications of EOR techniques including steam stimulation technique thermal-EOR method-and polymer flooding known as chemical EOR method."

Referring to case studies, Basta and Kortam stated that "primary recovery production with the aid of artificial lift, then pressure maintenance recovery production like water flooding is already implemented in fields: Karama Field, Morgan Field, Ramadan Field, and October Field. While EOR techniques are implemented in Issaran field since 2004 through [the use of] thermal EOR. Currently, there is a new thermal EOR project starting in Lagia Field."

Highlighting the benefits of implementing more EOR in Egypt, El Hoshoudy mentioned that the amount of residual oil remaining in reservoirs after primary and secondary techniques is estimated to be one billion barrels. "If 50% of this amount were recovered by different EOR technologies it will provide the national income [with] hundreds of millions of dollars," he stated.

Experts argue that implementing EOR techniques will benefit Egypt's hydrocarbon industry. "The increasing energy demand in Egypt needs to be met with an increase in energy supply. Conventional oil resources will become depleted [with] time, and new methods and strategies are needed to extract unconventional resources. This will be achieved by EOR implementation. It is critical to start implementing EOR as soon as possible so that by time and by gaining experience, EOR applications become more economic. EOR can be a great tool to increase the economic resources in Egypt. Moreover, Egypt can benefit from implementing EOR by gaining experience and knowhow. If implemented correctly, we can then look forward to becoming pioneers of EOR methods in the future. According to international reports, unconventional resources make up around 75% of global oil in place, and so becoming experts in EOR implementation is a great opportunity that could benefit Egyptian engineers and companies," Basta and Kortam write.

Challenges of Using EOR in Egypt

There are many financial challenges and technical concerns that could prevent the wide application of EOR technologies in Egypt. "The main challenge is related to oil prices, as EOR application is a costly process, so countries and companies resort to it in case of high oil prices. Other challenges are related to petroleum companies' policies in which studies and applications of EOR studies are restricted to the foreign partner, which is mainly focused on exploration and drilling, not interested in EOR," noted El Hoshoudy.

Affirming El Hoshoudy's opinion, Basta and Kortam believe that there are financial challenges facing the application of EOR in Egypt, such as the pilot test price, the modeling costs, the capital cost to modify the surface and down-hole systems, and the operating costs. "Other challenges are mainly technical, as the [main purpose of] EOR implementation is usually the unconventional oil reservoirs. The challenges faced also include finding accurate tools to support the studies, which increases the risk of studying, but with the help of universities, companies can find solutions," Basta and Kortam argue.

"Currently, the oil reservoirs in Egypt are mainly producing under the primary and secondary recovery mechanisms-water-flooding projects-with limited applications of EOR techniques."

Abu El Ela believes that "most of the current oil production in Egypt comes from mature fields. The rate of replacement of the produced reserves by new discoveries has been declining steadily in the last decades. In addition, operators are focusing on redeveloping and improving oil recovery from existing oil reservoirs because of increased exploration costs for new oil fields and the limited opportunity for discovering major high-quality oil reserves. Therefore, the increase of the recovery factors from mature fields by applying the EOR technologies will play a key role to meet the growing energy demand in the coming years. However, there are several challenges before applying such technologies—technical challenges and the associated costs—to the Egyptian oil fields." On the other hand, "to improve the performance of the existing fields, most of the development plans recommend several solutions such as drilling of infill wells, using of artificial lift technologies such as gas lift, ESP, sucker rod pumping, and PCP or carrying out stimulation operations," he argues.

Recovering hydrocarbons is becoming more difficult at a time when oil fields are declining; hence effective techniques are essential to extract more oil from mature fields. Each step to improve recovery, however, comes with increased costs due to the complexity of the fields. Operational excellence in the primary and secondary phases is a prerequisite for successful implementation of EOR technologies. Excellent and cost-effective reservoir monitoring, for instance, is essential to make well-informed field-development decisions, mitigate project risks, and meet production targets

TAHRIR
Petrochemicals Complex

By Tamer Mahfouz

The current administration aspires to make the Suez Canal and the area surrounding it the spearhead of Egypt's economic revival and its investment hub. The region has mega projects that depend on the Suez Canal for their economic feasibility, such as the Suez Canal Economic Zone (SCZone). and the New Administrative Capital, which part of its economic lure is its connection both to the SCZone and the seaports at the southern tip of the Suez Canal.

In addition to these national projects, the largest petrochemicals complex in Egypt is currently being built in SCZone. Dubbed the Tahrir Petrochemicals Complex, the $10 billion complex will be built by Carbon Holdings, a private company established in 2008 that specializes in the construction of petrochemical plants. The complex will be built on the northern outskirts of Ain Sokhna. Its exports are forecasted to equal 25% of Egypt's oil and non-oil exports, according to Carbon Holdings. Production is set for 2019.

Given the scale of the plant, supplying it with crude could prove a challenge, especially as it is unclear whether the new plant will use Egypt's heavy crude, which is cheap and abundant though complex and expensive to refine, or the lighter variant imported from the Gulf Cooperation Council (GCC) countries and Libya. This decision could have a noticeable effect on Egypt's crude oil imports and exports, depending on where the oil comes from and how much will be re-exported.

In Figures: Egypt's Refining Industry

Despite a slow growth rate, Egypt is the biggest oil refiner in Africa in terms of the number of operational refineries. The sector's investments topped EGP 724.5 million for oil refining and EGP 48 billion for petrochemicals in fiscal year [FY] 2015/2016, according to the Central Bank of Egypt (CBE).

To meet domestic demand, the government paid around $9.67 billion to import refined oil products during FY 2016/2017, according to CBE. This was roughly equal to 17% of Egypt's imports. Meanwhile, petrochemicals exports totaled $2.7 billion during the same year, accounting for almost 12.5% of all exports.

The Complex

Taking three years to build, the Tahrir Petrochemicals Complex should be ready by the end of 2019. During the construction phase, the complex is expected to create 20,000 temporary job opportunities, according to Ahmed El Kharashy, the Managing Director of Business Development at Carbon Holding, as reported by Construction Business News. The complex will be built on 5 million square meters in close proximity to Ain Sokhna Port. Once completed, it should create around 50,000 direct jobs and 25,000 indirect job opportunities, according to El Kharashy. To be financially feasible, the company forecasts that its revenue should top $6 billion.

The cost of the complex is estimated at $10 billion, according to El Kharashy. Of this total cost, approximately $3.4 billion is planned to come from international funding agencies, such as the U.S. Export-Import Bank, the Export-Import Bank of Korea, the Korean Insurance Corporation, and the Italian Export Credit Agency. Meanwhile, the government announced that it will be paying the remaining $6.6 billion until 2020.

The Tahrir Petrochemicals Complex is split into three separate sites. The first site is where the naphtha cracker facility is located. Its maximum annual production capacity will be around four million tons, making it the biggest in the world, according to El Kharashy. The second site is dedicated to facilities that produce associated oil derivatives. The last site has three polyethylene units with a forecasted maximum annual production capacity of 1.4 million tons of both ethylene and polyethylene, 900,000 tons of propylene, 250,000 tons of butadiene, 350,000 tons of gasoline, and 100,000 tons of hexene-1. Another separate production line will have a maximum annual production capacity of 1,060 tons of ammonium nitrate. Also in the complex will be two polypropylene production facilities.

To support this production process, the Tahrir Petrochemicals Complex will feature a 3,800 cubic meter water desalination facility to treat seawater coming from the Red Sea, which will be necessary for production. There will also be a 300-megawatt (MW) power plant to ensure a continuous supply of electricity to the plant.

To execute the project Carbon Holdings commissioned a number of high-profile multinational firms. It signed a contract with Foster Wheeler, a multinational project management firm, to handle the complex's project management operations. The value of the contract has not been disclosed. KBR, another multinational that provides engineering and technology support services, has been retained to carry out a feasibility study and the front-end engineering design works for the ammonium nitrate plant. SK E&C, a Korean developer and large-scale infrastructure builder, is the consultant on the polyethylene plant. Linde Group, a German chemicals company, will serve as the consultant for the ethylene plant. The value of the contracts with SK E&C and Linde Group total $3.6 billion.

To secure engineering, procurement, construction and commissioning services, Carbon Holdings signed contracts with specialized companies, Maire Tecnimont for $1.7 billion, Archirodon Group

for $1.95 billion and Drake & Scull International for $599 million. Maire Tecnimont will build the utilities center, seawater desalination plant, wastewater treatment plant, power plant, and auxiliary packages and systems. Archirodon Group will supply the tanks, jetty works and pipelines. Lastly, Drake & Scull International will construct the storage facilities and ancillary buildings. Furthermore, General Electric was contracted by Carbon Holdings to supply the aero gas turbines, steam turbines, generators, water filtration and desalination equipment as well as compressors and other equipment for $500 million. To develop the automation processes and ensure reliability, Carbon Holdings signed a $150 million contract with Emerson Process Management.

Other than announced capacity there are no official production figures forecasted for the complex; however, its exports are projected to account for 25-30% of the dollar value of Egypt's total exports, according to El Kharashy. He added that the complex's exports will be mostly directed to strategic markets in Europe and North America.

Finding Supply

It is unclear how much crude the Tahrir Petrochemicals Complex will require to reach the forecasted $6 billion revenue mark. What is clear, however, is that given the huge production capacity of the complex, supplying it will likely either significantly eat into Egypt's heavy crude oil exports, estimated at $3.8 billion during FY 2016/2017 according to CBE, or significantly increase the country's imports of light crude oil, which were at $1.5 billion in FY 2016/2017. This decision will greatly depend on whether the Tahrir Petrochemicals Complex will be equipped to refine heavy or light crudes—or both.

Economic Impact of Crude, Refining, and Petrochemicals

$2.7 B
Petrochemical exports in FY 16/17

17%
Of Egypt's total imports are crude

12.5%
Of Egypt's total exports are petrochemicals

EGP 724.5M
Investment in oil refining in FY 15/16

EGP 48B
Investment in petrochemicals in FY 15/16

$9.67B
Crude imports in FY 16/17

As it stands the Egyptian government is in negotiations with Iraq for an additional one million barrels of Basra Light every month, Bloomberg reported in November, quoting the former Head of the Egyptian General Petroleum Company (EGPC), Tarek El Hadidi. "This will be a good way to secure our crude supplies," said Hadidi during an oil conference earlier in the year, adding "we are trying to have an agreement with other countries as well [...] government to government deals." Earlier in the year, the Egyptian government successfully negotiated with the Iraqi government to supply it with one million barrels of oil a month for 12 months. Negotiation with Libya started after Saudi Aramco decided to halt its monthly supply of around 700,000 barrels of Arab Light to Egypt in late 2016.

Meanwhile, the Egyptian government is still negotiating with Saudi Aramco for a resumption in 2018 of the 700,000 barrels per month that it previously received from the company, according to a November article by Bloomberg. "Instead of shipping the products from Aramco, we could get the crude from Aramco and process it in our refineries in Egypt," said Tarek El Molla, the Minister of Petroleum and Mineral Resources in mid-November, as reported by Bloomberg. "With the good business relationship that we have, we can develop new horizons and new types of contracts and deals."

Tahrir Petrochemical Complex

$10B
Construction cost

25%
Expected to contribute to Egypt's total exports.

2019
Launch date

5M m2
Size of complex land

50,000
Direct jobs upon completion, plus 20,000 Indirect jobs

$6B
Forecasted revenue

Overall though, finding suitable crude oil to be processed by the Tahrir Petrochemicals Complex should not prove difficult given that most of the major regional oil exporters are exporting crude oil to be processed elsewhere. The key to securing sufficient supply for the complex, however, lies with the willingness of the Egyptian government to pay international market prices rather than discounted prices—such as it has from Iraq and Saudi Arabia.

The difficulty of negotiating such agreements is that the countries that rely on crude oil exports have seen huge declines in local oil investments and their respective foreign-currency reserves since mid-2014 when oil prices more than halved before eventually settling at around $50 to $60 a barrel. Such difficulties will continue going forward despite the recent hike in global crude oil prices. Oil-exporting countries will see the price hike as an opportunity to recuperate at least a portion of their losses.

Competition

While no regional country has as many operational refineries as Egypt, the production capacity of some of these plants are much higher than Egypt's refineries. For example, Egypt's largest refinery, MIDOR, has a maximum production capacity of 100,000 barrels a day (b/d), comparing its production with UAE's five operational refineries the story will show different results. The biggest of them is the Abu Dhabi-based Ruwais Refinery, which can refine 400,000 b/d. It is owned by Abu Dhabi National Oil Company (ANDOC), the owner of the country's second largest refinery, the Jebel Ali Refinery, which has a refining capacity of 140,000 b/d.

Similarly, Saudi Arabia has ten operational oil refineries, five of which are owned solely by Saudi Aramco. The rest are partly owned by Saudi Aramco. The largest refinery in Saudi Arabia is the Ras Tanura Refinery. Recent upgrades have seen the plant's maximum capacity reach 550,000 b/d. The refinery produces high-octane gasoline and diesel and has an LPG plant, among other facilities. Other large refineries, which produce around 400,000 b/d, are the Jazan Refinery, which opened in 2016 and is solely owned by Saudi Aramco; the Yasref Refinery, which is jointly owned by Saudi Aramco and Sinopec; the Jubail Refinery, which is jointly owned by Saudi Aramco and Total; the Yanbu Refinery, which jointly owned by Saudi Aramco and ExxonMobil; and the Rabigh Refinery, which is partially listed on the Saudi Arabian stock exchange and is co-owned by Saudi Aramco and Sumitomo Chemical.

A lost opportunity?

For some, the real opportunity for the Tahrir Petrochemicals Complex will be to refine the locally-produced heavy crude—something few refineries in the world can do. This strategy would mean lower supply costs for the state as well as higher profit margins for Carbon Holdings which would be using locally-supplied heavy crude, a cheaper product then imported light crudes.

Focusing on refining heavy crudes could additionally pay dividends in the long run. As global crude oil reserves decline, heavy crude oil will be increasingly easier to find than the light crude oil, which has long been in high demand by refineries around the world. "In general, crudes are trending heavier," said Jeff Hazle, the Technical Director at the National Petrochemical and Refiners Association, in an interview with Rigzone. He noted that refineries around the world are already facing this reality. Cindy Schild, Refining Issues Manager with the American Petroleum Institute (API), points out that the available crudes are simply not as sweet as they used to be. This has pushed refiners to invest in more flexible and complex plants so that they can refine both heavy and light crudes.

Conversion has already started in the US and Canada. Refineries, such as Marathon, Motiva, and Husky, have either begun upgrades to their facilities or announced plans to do so. Meanwhile, Hyperion Resources has gone further by announcing the construction of a 400,000 b/d heavy oil refinery. Elsewhere in the world, Venezuela-based Petrobras and Petroleos de Venezuela are jointly building a 200,000 b/d refinery in Brazil. GS Caltex in South Korea announced the addition of a new heavy oil unit at one of its refineries to produce gasoil and other products. In India, Reliance Industries announced a 580,000 b/d facility that will also refine heavy oils.

The Tahrir Petrochemicals Complex could have a distinct long-term advantage over other refineries in the region because it is still under construction, making it easier and cheaper to adapt it for the processing of heavy crudes.

Understanding the Prospects **of Brownfields IN EGYPT**

By Sarah Samir

As conventional oil fields are nearing maturity, market players have long shifted their focus towards maximizing the commercial viability of existing mature fields. Conventional brownfields account for around 65% of global oil production. In addition, crude production from brownfields in Egypt comprises approximately 77%, Kamel El Sawi, President of Kuwait Energy Egypt, noted during the Future of Egypt's Brownfield Development Roundtable. These percentages give both international and local market playerss a strong incentive to develop the best and most cost-effective technologies to enhance the value of brownfields.

Brownfields Well Revival

In Egypt, several techniques are being followed to boost production from mature fields. "We use in Egypt a lot of technologies in terms of improved recovery, such as water flooding and, even more advanced techniques, such as steam injection," Mohamed Zahran, Senior Reservoir Engineer at Shell Egypt, told Egypt Oil & Gas, adding that "the wells performances are frequently reviewed and repairing strategies are implemented whenever it is

required. A lot of well interventions are designed to improve the wells performance such as stimulation with acidizing, hydraulically fracturing and others, [as well as] introducing of new artificial lift. Recompletion of the wells is also implemented frequently."

Brownfields Drilling Case Studies

There are several methods and technology to further enhance the value of brownfields. Among the technologies used is perforating, which creates a flow path between the wellbore and the near reservoir and includes drilling a hole from the wellbore through the casing and cement sheathes into the producing zone. One of the companies implementing this technology is Pemex. It contracted Schlumberger to executed perforating work on "a brownfield in Latin America struggle[ing] with economic and operational challenges," according to Schlumberger's 'Case Study: ACTiveOptiFIRE System Perforates Three Intervals, Increases Well Production 18% in Brownfield Well.' Schlumberger argues that perforating technology can be used to enhance production from brownfields.

Deloitte announced in November 2017 that it had launched—in cooperation with FOROIL— a new technology that would enable its upstream clients to boost output and reserves from brownfields. The FOROIL method works through using historic output data with high-performance computing and mathematical modeling. "This technology could have as much impact on the industry as 3D seismic," Scott Sanderson of Principal Deloitte Consulting LLP told reporters at the time of the announcement.

Operators further use seismic stimulation in mature fields, due to its effectiveness on sandstone, carbonate reservoirs, and diatomite. Seismic stimulation is a promising alternative to shale plays re-fracturing. The seismic stimulation tool works by creating elastic waves to prepare the lightest phase first. It is accompanied with less water production and produces more oil production. Seismic stimulation "is best applied to fields having gas-oil ratios of less than 2,000 standard cubic feet per barrel [cf/b]. Thick oil is less inclined to move regardless of the elastic wave strength," according to Bill Wooden and Sergey Kostrov's article, entitled 'Seismic Stimulation Advances EOR Technology.'

Seismic stimulation is preferred over other enhanced oil recovery (EOR) techniques due to its elastic waves—which have no vertical or horizontal plane barriers—and because other EOR methods usually are more expensive and ineffective in reservoirs that are highly heterogeneous.

Seismic stimulation has been used by Abraxas Petroleum Corporation to enhance oil output from a carbonate on its Bishop-Huddleston lease in West Texas. The stimulation increased oil output by 17 barrels per day (b/d), according to an article entitled 'Seismic stimulation improves production from West Texas carbonate' by Wooden and Kostrov.

In Egypt, one of the companies working on brownfields recovery is Apache's Khalda Petroleum Company. Khalda Petroleum "started re-fracturing the old fractured zones and got oil gain; conducted a successful ESP pump upgrade in a field [at the] same time to increase the reservoir recovery factor; reviewed old well logs with young engineers [with] new points of view; and tested new shallow zones. We discovered a new extended oil reservoir which covers all RZK concession," Mohamed Gabery, Senior Petroleum Engineer at Khalda Petroleum Company, told Egypt Oil & Gas.

Moreover, he pointed out that the "Gulf of Suez Petroleum Company (GUPCO) used a new coiled tubing technology from Halliburton and revived [around] 12 wells that were abandoned due to limitation of access to the well due to fluid properties."

Brownfields are Important for Egypt's Economy

Reviving oil brownfields is very important for the Egyptian economy. While Egypt's newest discoveries are natural gas discoveries, the country continues to use oil and to pay billions of dollars to import petroleum products. Egypt's oil fields are close to maturity. BP announced in the early 2000s that oil fields in the Gulf of Suez region, which are processed by Gupco, its joint venture with EGPC, would be cut-off economically before of the extraction of all their resources. EGPC and BP then negotiated an extended license that improved the fiscal terms of the fields' development.

In addition to BP, Eni had talks with EGPC regarding the "terms for its Belayim fields and, in 2009, extended its development lease until 2030," as mentioned in Wood Mackenzie's 'Egypt Upstream Summary.'

Speaking about Egypt's brownfields, El Sawi stated during the Future of Egypt's Brownfield Development Roundtable that "there is an absence of new discoveries all over the world since about more than ten years back.[…] This brings a very big importance for the development of brownfields." He added that "since 2008 when the oil price reached $147, most of the companies all over the world started thinking in a different way, to develop the mature brownfields."

Brownfields can benefit the Egyptian economy. The Vice President of Oilfield Services at BHGE, Jerome Jammal, argued during the roundtable that the country must develop its brownfields for the sake economic development and future generations.

Reviving brownfields can benefit the country on several levels. Notably it can reduce environmental health and safety risks that result once the property is cleaned up and returned to productive use, according to 'What's the Most Important Benefit of a Brownfields Redevelopment Project?' in Environmental Standards.

Egypt should consider all its options in order to extract the most oil from its brownfield. In order to maximize economic value, the developer should assess "land-use options for specific brownfield sites by integrating different models that consider ecological, social and economic aspects of redevelopment in order to provide a full 'sustainability' assessment," including "an estimate of costs for the remediation of soil and groundwater and deconstruction of derelict buildings; an assessment of the market value of the site based on the quality of location and financial risks associated with the investment; a summary monetary assessment based on the remediation costs and market value; and a sustainability evaluation based on the sustainability goals of local government planning policies," according to the European Union's 'New Framework to Assess Brownfield Development Potential.'

The economic benefit of reviving brownfields in Egypt is "important, but indirect" according to Zahran, who told Egypt Oil & Gas that "it shows up in the pay back of government debts to foreign companies and investment in human resources development."

Support of brownfield-recovery strategies could encourage investors to invest more funds in increasing oil output.

Main Challenges

Oil production from Egypt's Gulf of Suez fields started in the 1960s. Production peaked in 1993 at 912,000 barrels per day (b/d) and has been declining since then. Production is expected to bottom out by 2029, according to Wood Mackenzie's 'Egypt Upstream Summary.' With production ebbing, it is important to revive maturing fields and to face the challenges of brownfields.

One of the challenges faced by the companies working in brownfields is related to technology usage. "We [in Egypt] have most of the technologies but some of them are not implemented on a wide scale, such as seismic acquisitions of the old fields, 4D seismic, enhanced oil recovery—such as polymers, surfactants and other technologies," Zahran told Egypt Oil & Gas.

Addressing brownfields, in any country, can be challenging on several levels. "Brownfield sites consume scarce soil resources and may cause environmental and health risks, as well as economic and social costs," according to the European Union's 'Science for Environment Policy THEMATIC ISSUE: Brownfield Regeneration.' Therefore, it is very important to study the economic aspect and cost of the brownfield redevelopment project before implementing it. The areas subject to redevelopment should be studied over three levels: the socio-economic level, smart growth level, and environmental level, according to an article published by the European Commission entitled 'New Tool to Compare and Prioritise Brownfield Sites for Redevelopment.'

In Egypt, one of the challenges the country faces in its efforts to revive its brownfields is its current agreements. "The concession agreement is prepared before the exploration start, so when you include a mechanism or different fiscal regime to develop the brownfield later on, this will complicate the agreement too much," Mostafa El Bahr, Former Chairman of Agiba Petroleum Company, previously said. He noted that it is difficult to know when to incorporate brownfield terms into a concession agreement. "I think we need to include this while we are signing the development lease because in this case you will be in a better position to identify more or less how much oil you have, how much of this will be recovered and the recovery factor and what do you need to spend to recover this oil," he said.

Egypt also faces management and data challenges when it comes to reviving brownfields. These challenges include "old managers who cannot develop their mindsets [to cope] with the new technologies, ideas, and new solutions, and who cannot develop their managerial style to get the maximum benefits of their engineers," Gabery told Egypt Oil & Gas. He further listed "bad training for the responsible engineers; [poor] database[s] in some companies for well logs & operations; old agreements between EGPC/EGAS and the investors; and the relatively high capital cost needed for shale gas reservoirs, which may need different investors."

Egypt has been adopting several techniques to face these challenges and to maximize output from its brownfields. Egypt recently implement "revival strategies [including] making a good database for old well logs; reviewing these logs; using new mindsets [of] young engineers and getting approval from the open-minded top managers; being brave to test unconventional zones and try new stimulation solutions; making workshops between national engineers, geologist and geophysicist in operating companies; training for the engineers, geologist and geophysicist on new technology; and encouraging paper publications in journals and conferences to share success stories," Gabery said.

In order for Egypt to boost its output from oil brownfields, the country needs to assess its strategies, review its agreements, reconsider the implementation of technology, and measure the costs and profit of reviving these fields.

An Examination of Egypt's **Zero-Mazut Plan**

By Sarah Samir

To reach and maintain prosperity, countries must continually seek new development. Like others, Egypt is on a continuous journey toward the development of its different sectors, especially the downstream oil and gas sector. The government is adopting different methods and plans to strengthen its downstream capability and, eventually, to boost its economy. With the government's plan to become mazut-free by 2021, the country is heading towards an environmentally friendly era. Egypt plans to perform hydrogen cracking on mazut to add value to the base product. Even though the Egyptian economy currently utilizes mazut in a number of different ways, the plan holds out the promise of the creation of a higher-value product that could benefit the economy as a whole.

Mazut in the Local Market

Egyptian production of mazut is higher than its combined production of diesel and liquefied petroleum gas (LPG). As published figures are scarce to come by, the latest available figures are for 2012, where production of residual mazut reached around 175,000 barrel per day (b/d), diesel and LPG output amounted to 146,000 b/d and 17,000 b/d, respectively, according to the Egypt Liquefied Petroleum Gases Production and Consumption by Year Index, published by IndexMundi Data Portal.

Local consumption for the same year reached 211,000 b/d of mazut, 254,000 b/d of diesel, and 85,000 b/d of LPG, according to Index Mundi Data Portal. While Mazut is widely used in several sectors in Egypt, electricity is by far the largest consumer of the fuel.

Consumption of mazut by the electricity sector reaches 26,000 tons during normal periods and up to 30,000 tons at peak times, the Head of the Egyptian General Petroleum Corporation (EGPC), Abed Ezz El Regal, told Amwal Al Ghad in early August.

Comparing 2012 production and consumption figures, the gap between mazut production and consumption was around 36,000 b/d. Egypt needed to import approximately 68,000 b/d of LPG and 108,000 b/d, indicating that diesel and LPG imports were higher than mazut imports at the time.

As the years passed, mazut production in Egyptian refineries has been increasing, permitting some Egyptian refineries to export the heavy oil product. The mazut exporting refineries include Alexandria Mineral Oils Company (AMOC) and Cairo Oil Refining Company (CORC).

AMOC produced a total of 636 million tons of mazut during the period between July 2016 and March 2017, according to the Advisor to the Head of AMOC for Investments and Planning, Ramy El Dakany. The company increased its mazut exports during the months of May and June 2017, the Chairman of AMOC, Amr Mostafa, told Al Mal News in August. He added that the refinery exported two 65,000-ton cargoes worth $16 million during this period.

CORC, meanwhile, produced 2.2 million tons of mazut during fiscal year (FY) 2016/2017, the

Head of CORC, Mohamed Hashiesh, stated in the company's general assembly. Assuit Oil Refining Company (ASORC) produced 2.1 million tons of mazut over the same time period, according to the Head of ASORC, Nagy Abdel Ghaffar..

Mazut does not have a high economic value. Prices vary from industry to industry, however, based upon the level of subsidies each sector receives. In November 2016, mazut prices for food industries reached EGP 1,500 per ton; prices for brick kilns and other manufacturing industries were EGP 2,100 per ton; and prices for electricity and cement producers reached EGP 2,500 per ton. In July 2017, however, the price of mazut for the cement industry increased to EGP 3,500 per ton, Ezz El Regal told the media in July.

Environmental Impact of Mazut

Mazut, in its current state is a non eco-friendly fuel source. The Prime Minister's Decree No. 338 of 1995 stated that the "use of [m]azut and other heavy oil products, as well as crude oil, shall be prohibited in residential areas."

Mazut is a huge cause of air pollution as "industrial [f]uel consumption contributes approximately 50% of the pollution load from all fuel consumption," stated M. A. K. Smith in The Development of an Air Pollution Abatement Strategy for Cairo, Egypt. Smith adds that it contributes approximately 21% of the total particulate load (TPL).

Moreover, mazut-powered industrial plants "emit large amounts of gases that feed global warming," Rana Khaled stated in an article titled: Air pollution indoors and outdoors high, threaten health and environment.

The environmental impact of mazut is due to its components. Mazut is "a mixture of different heavy hydrocarbons [such] as asphaltenes, petroleum resins, paraffins, unsaturated, cyclic and polycyclic hydrocarbons," and further contains other elements that affects nature like "sulfides and heavy metals," according to the Effect of Mazut on Structural and Functional Indicators of Activated Sludge in Sofia Wastewater Treatment Plant "KUBRATOVO," by Irina Schneider, Mariyana Ducheva, Ivaylo Yotinov, Yovana Todorova, Elmira Daskalova, Yana Topalova, Vesela Stefanova.

Mazut waste from factories affects the country's water and soil. "The effects of an oil spill [on] the Nile environment is extremely hazardous," Abdel Aziz El Guindi, former Head of the Egyptian Environmental Affairs Agency (EEAA), explained to Al Ahram Weekly. He noted that mazut contains components that can vaporize, some components that solidify, and some components that interact with light. Therefore, mazut has "toxicological effects on aquatic life, and, consequently, on human life."

In Egypt, "subsidizing energy products with high environmental impacts; fuel oil and gas oil, is extremely harmful to the environment," the World Bank's Egypt: Energy-Environment Review, published in 2003, stated. It adds that "the full cost to the economy is almost [EGP] 800 [per] ton," which, if included in the customer's purchasing price, would definitely "increase [the] priority given to policies which reduce [m]azut consumption."

The review stated that the low prices of mazut produce "excessive use; poor signals for fuel substitution; and inadequate revenues within companies which supply fuels, leaving them with lower capacity to make investments in new equipment, maintenance and emissions control equipment." Eventually, the review argues, low prices will have a negative effect on the Egyptian environment.

In addition, "mazut contains heavy metal, nitrogen and sulfur compounds that transform to sulfur oxides and the nitrogen oxides but this can be avoided or decreased by using more advanced burners which [are] called low-NOx burners and also by using some additives," Mohamed Hegazy, Process Engineer at CORC, told Egypt Oil & Gas, adding that "mazut usage as a fuel needs much more maintenance and its combustion produces sulfuric compounds which cause corrosion of equipment."

Mazut consumption is very dangerous as mazut "emits toxic gases, like sulphuric acids and nitrogenous acids," when burned in the "steam generation boilers which [are] found all over [the] country," Kareem El Semary, Process Engineer at Middle East Oil Refinery (MIDOR), told Egypt Oil & Gas. He further noted that emissions from this process exceed the limits set by the Egyptian environmental association and Egyptian law.

Encouraging the increase of natural gas consumption by decreasing its prices would "reduce the environmental impacts of mazut consumption," according to the World Bank's review.

Governmental Vision

Egypt has an ambitious plan that aims to develop the efficiency of Egyptian refineries and to add new units in these refineries to prepare it for a zero-mazut future, the Deputy Head for Operations at EGPC, Amr Moustafa, told Al Bawaba News in late 2016. The main driver behind the government's vision to free the country from mazut is the preference for using domestically produced natural gas, Moustafa told Egypt Today.

The Egyptian government has already taken steps in order to convert mazut to higher-value products in support of its goal of switching usage away from mazut by 2021. The state-owned ASORC is currently executing a project to establish a hydrogen-cracking unit to turn mazut into other products, such as diesel, naphtha, and gasoline, the Head of ASORC, Nagy Abdel Ghaffar, stated during the company's general assembly.

ASORC is also aiming to develop its existing refinery through building a new grass root zero mazut refinery complex, the Assiut Hydrocracking Complex (AHC). "The existing ASORC refinery processes around 90,000 [barrels per stream day] of crude oil and is configured as a hydro-skimming facility," Ahmed Ezz, Process Engineer at ASORC, told Egypt Oil & Gas.

This hydrocracking complex will play an important role in the government's plan to be mazut-free as it "will convert ASORC's fuel oil into more valuable products and improve ASORC's middle distillates quality," Ezz pointed out, adding that "the AHC design will be based on the zero-fuel-oil concept and will have the production targets of maximizing the diesel production and minimizing production of the light ends, except liquefied petroleum gas."

State-owned AMOC has similarly announced plans to invest $500 million in a project to transform mazut into other products.

Alternative Mazut Conversion Method

Egypt has the option of several higher economic value products that can be produced from mazut. According to Ezz, Egypt "can convert mazut to many valuable products such as LPG, benzene of different octanes, diesel, kerosene, and coke."

In order to produce diesel from mazut, the country must use a hydrogen cracker while it needs to implement fluid catalytic cracking (FCC) to produce LPG, Ezz explained. He added that "installing some units such as DHTU [diesel hydro-treater unit], HCKU, FCC, and coker" could provide alternative means of converting mazut to more valuable products.

With ASORC establishing a hydrocracking unit, the state could be aiming to produce diesel. LPG, however, has a higher economic value. In addition, LPG is easily portable and safe to transport, which will reduce transportation costs.

The European LPG Association (AEGPL) notes on its webpage that LPG has a lower environmental risk as "its combustion emits 33% less carbon-dixoide than coal and 15% less than heating oil." Thus LPG usage could help Egypt meet global environmental standards.

Mazut can also be turned into "asphalt and bitumen throughout a chemical process called propane de-asphalting," according to El Semary.

These options mean that the Egyptian government has a variety of higher value products that can be produced from mazut.

Challenges and Economic Reality

To meet its target, Egypt will need to upgrade its refining facilities. At "this time, I think MIDOR is the only refinery in Egypt containing a hydrocracker, maybe CORC also," Ezz said. He expects that "in the future there will be many refineries which will install hydrocrackers to maximize valuable products, especially diesel or solar."

El Semary agreed with Ezz. The "MIDOR refinery, for example, got rid of mazut […] by processing [it] in a delayed coking unit and converting it to LPG, naphtha, light diesel, heavy diesel and coke," he explained. He noted that these products are all more valuable than mazut.

Meanwhile, Technip is implementing a project to perform hydrogen cracking on low-value products, such as mazut, at the Asssiut refinery to increase the output of higher-value products. The Assiut project aims to "augment the production of middle distillates such as LPG, [n]aphtha and [g]as oil to cover the local market needs and to export the surplus," according to the Ministry of Petroleum.

The industrial transport sectors are highly reliant on "mazut and diesel, while the majority of electricity generating power plants have been transferred to natural gas powered plants, instead of mazut powered plants," according to the World Bank's review.

Although Egypt's electricity-generating power plants consume 26,000 tons of mazut per day, in addition to natural gas, Ezz El Regal told the media in August that Egypt has no need to import additional mazut due to the volume of natural gas that the country has secured. As most generating plants are using natural gas or diesel, a surplus of mazut is not of a high value.

In FY 2014/2015, Egypt imported 6.530 million tons of oil equivalent (toe) of diesel, 4.148 million toe of mazut, and 2.465 million toe of LPG. Egypt's industrial sector consumed 3.207 million toe of diesel, 2.719 million toe of mazut, and 19,000 toe of LPG. Meanwhile, households consumed 4.123 million toe of LPG and 101,000 toe of mazut. In addition, the transportation sector consumed 3.812 million toe of diesel and 339,000 toe of mazut, according to Egypt's Energy Balance for the Year 2014/2015, published by Central Agency for Public Mobilization and Statistics (CAPMAS).

Egypt's refining sector "produces a surplus of low value products, such as [m]azut, and a deficit of higher value products, e.g. gas oil and LPG. [Thus,] the balance of Environmental Resources Management World Bank/EEAA four payments for the oil sector [was] negative [at the time of the review], due to the need to import large quantities of certain high value products," the World Bank's review stated.

Converting mazut to diesel and LPG will help the Egyptian economy to recover from large outlays of foreign currency reserves on imports. The Egyptian government has started executing several projects in order to convert Egypt's mazut to other products by 2021. This development of the downstream sector to add value to mazut and will additionally benefit the country's environment by reducing emissions.

Medilink International:

Medical Support Services Partnering the Oil & Gas Industry in North Africa & Beyond

Medilink International is a specialist medical support services company providing first-class services to clients operating in some of the world's most remote and challenging regions. The company has a long track record of involvement in North Africa having started life in the early 1990s serving the petroleum industry in Libya. Over the past two decades, Medilink has gone from serving this one key market in North Africa to a global operation.

Headquartered on the central Mediterranean island of Malta, Medilink offers a wide portfolio of medical assistance from first responder services, remote site clinics, fully-equipped mobile operating theatres, medical staffing and medevac to occupational health services and health and environmental risk assessment consultancy.

From this central Mediterranean base in strategic proximity to mainland Europe, Africa, and the Middle East, Medilink operates through satellite offices and regional hubs to coordinate and deploy services efficiently across the globe. Its corporate mission and story began though in North Africa, and it is no coincidence that the Medilink has chosen Egypt as the location for its latest country office.

Medilink in North Africa: An Ongoing Corporate Story

The opening in autumn 2017 of its office in Cairo sees Medilink deepen its commitment further in North Africa; a region in which it has gained immense experience and local knowledge. Situated in the modern Nasr district of Cairo, Medilink Egypt extends the company's capabilities in North Africa, complementing its established operations in Algeria and Libya.

Having three bases in North Africa gives Medilink immediate insights into, and first-hand experience of public health issues that may affect their clients operating in the region. A key part of Medlink's country services is to assess the acuteness of on-the-ground health situations, drawing on local and international data and resources. This helps Medilink provide clients with up-to-the minute, reliable advice on public health issues as well as input into planning effective medical assistance supplies and services and health risk assessment and advice.

Medlink's Cairo office helps the company engage better with its growing client base headquartered in the capital, enabling it to provide greater immediacy of service. From this central location, Medilink supports clients throughout the country, coordinating medical assistance services in all regions apart from Sinai.

Medilink's dedicated clinics in Hassi Messaoud, Algeria, as well as in the Libyan capital Tripoli, both provide a full complement of emergency medical services as well as a range of occupational health services and consultancy in both those countries.

Medilink Algerie operates a state-of-the-art full service clinic providing emergency care, occupational health services, medical evacuations, topside support, and training. From Hassi Messaoud, Medilink runs an effective hub supporting its activities and providing services to remote sites all over Algeria.

Libya was where Medilink first set up international operations, and it remains committed to serving its clients there. Organising first-class medical support in Libya, especially in the interior, is a highly demanding task requiring expert assistance. Thanks to the company's medical capabilities and a deep cultural understanding of the country, Medilink has been able to provide services uninterrupted for over 20 years to its clients in Libya.

Growth with Responsibility

As the opening of the Cairo office demonstrates, greater on the ground presence opens up opportunities in different sectors and across national borders. However, Medlink has been strategic in managing that growth, and has never lost sight of its mission to be a trusted partner for its clients. Medilink's strength lies, in fact, in its size as a flexible, highly responsive medium-sized service provider in a market dominated by a few larger players.

It has been able to retain the human face of accountability - both to clients and the staff it hires. Medilink sees its roles as that of a pro-active, engaged partner who truly understands the specific demands and challenges facing the oil and gas industry.

Driving Competition in Remote Site Medical Services

The shakedown in the extraction industry sector in recent years has the seen oil and gas industry face shorter project cycles and the uncertainty of shorter contracts. This has had a knock-on effect on all companies in their supply chain - medical assistance services included.

Remote site medical services firms need to be highly competitive in terms of budget, without compromising professionalism in service delivery, whether of personnel or supplies. Given the current market exigencies, medical services providers must not only fulfill their contracts professionally but also do so with far greater levels of flexibility and openness.

It is precisely this kind of environment in which mid-sized medical services players like Medilink flourish. Medilink has been at the fore in showcasing this need for greater accountability and shown it is able to work efficiently, and yet still highly effectively, unperturbed by shorter-term contracts.

Precision Auditing of Remote Site Medical Services

Medilink audits operations rigorously, adhering to strict criteria in clinical governance and project management, ensuring complete transparency from client proposal to service delivery in the field. The extraction industries' new norm is to scrutinise medical assistance service contracts, assessing them on the basis of performance and cost at the end of each cycle rather than let them run on almost in perpetuity.

To assist in this process, Medilink conducts ongoing audits throughout the project life cycle. It not only looks at budgetary aspects but also delves into the qualitative aspects by holding regular face-to-face meetings with its field staff, supporting them and clients in a transparent manner. This regular in-the-field feedback enables Medilink to evaluate the service during the contract and, importantly, pre-empt any issues arising in the field.

Global Reach with Local Knowledge

Medilink gives important to harnessing local talent and developing skills in the countries in which it works. This has a two-fold benefit for both the host country and Medilink clients. Each project sees Medilink invest in training and run skills transfer programmes to ensure client projects leave a positive legacy behind. In doing so, it creates on-the-ground teams comprising both fully-qualified, specialist personnel and a staff corps with specific local skills as well as the flexibility to take on further roles and responsibilities.

Medilink combines first-class medical assistance services backed by invaluable local insights to serve and safeguard its clients' health and wellbeing in the challenging field of remote site working. The company's overriding mission is to operate sensitively and to high standards in host countries, carrying out its work ethically and sustainably and with the utmost integrity. Its further expansion in North Africa is a sign that this strategy is paying off.

For more information logon to: www.medilinkint.com

Safety Stand Down:
Safety and Health as the Ministry's Pillar

By Mariana Somensi

The Ministry of Petroleum and Mineral Resources' modernization program is a bold strategy to transform the Egyptian oil and gas industry in the next five years. In parallel with the country's economic reform, the plan aims to enhance the petroleum sector and turn Egypt into a strategic energy hub.

Increasing safety value by 2021 is a core concern within the program. "The safety and health of our employees, assets, and environment across the petroleum sector entities and operations is a number one business value," according to the Minister of Petroleum and Mineral Resources, Tarek El Molla. In line with the government's vision to consolidate all safety performance in the oil and gas industry, the Ministry hosted the Safety Stand Down event on November 28, sponsored by BP, to spread awareness and stir up important discussions on the subject.

The Event

The Ministry invited all sector companies, at the same time, to engage in a two-hour discussion. The stand down reached as much as 575 participants from 138 sector companies, from which four were holding companies, four were international oil companies (IOCs), while the remaining were joint ventures and service companies.

In the first part of the stand down, the participating petroleum firms stopped all activities at its offices and fields to listen to a broadcasted speech from the minister. Subsequently, the participants engaged on a debate on each company's safety procedures. Considering reviewing the safety aspect of the modernization program, the debate employees aimed to spot what aspects of the company need improvement and if they meet the program's goals. The discussion further tackled evaluating the trainings provided to employees and what points must be prioritized after the stand down. The two-hour mobilization included all firms' staff, from senior positions to office boys.

In the second part of the event, the heads of private and national petroleum firms, as well as participating companies' Health and Safety managers, jointed the minister for deeper discussions. Additionally, four petroleum fields were chosen for a special two-way interaction experience, in which the event was broadcasted with a further 15-minute exchange with the minister. The chosen fields are operated by Bapetco, Petroject, Gasco, and Ethydco.

The stand down brought up important presentations and activities providing key information about hazards, protective methods, and each company's safety policies, goals, and expectations. Although not directly, the event further counted with the participation of the downstream sector through the distribution of flyers to regular citizens at certain fueling stations.

The Ministry's Goal

The event encouraged senior managers to demonstrate high accountability, commitment, and strive in improving overall safety performance by identifying and controlling unsafe work practices and conditions, as well as communicating awareness through ownership and employee involvement.

"We proactively strive to integrate workplace safety fully into all our daily business operations," El Molla stated. "Management and all employees must take a proactive approach to safety, demonstrating leadership and direction to ensure the safest possible working conditions. Our ultimate goal is zero accidents," he added.

In order to continuously unlock the sector's full value chain as a growth and development engine for Egypt, as well as achieve financial sustainability, safety, innovation, transparency, efficiency, and ethics were highlighted as core values to be enhanced. The Ministry will provide a Safety Excellence Award to the company that complies with these important steps to turn the sector into a role model for the future of modernized Egypt.

People Development:
STI'S AWARD & APPRECIATION CEREMONY

By Mariana Somensi

Sahara Technical Institute (STI) is a successful oil and gas professional education and practical training excellence institute. It is part of Sapesco's shareholders and sister companies, and works on strategic solutions to solve the oil and gas industry dilemmas. STI's main philosophy consists on building a bridge between theoretical classroom instructions and integrated practical training.

Looking at people development as one of the pillars for the oil and gas industry's progress, STI proudly concluded a series of advanced international courses that brought Egyptian, Chadian, and Libyan petroleum technicians and engineers together in Cairo. On December 21st, the company received delegates representing the petroleum industry from the three participating countries for an Award & Appreciation Ceremony celebrating the closing day of the program. The certificates were presented by Eng. Islam Kortam, Vice President – SPIC; Eng. Atef Sadek, Chairman – SAPESCO; H.E. Ambassador of Chad to Cairo; and Eng. Essam Abdel Fattah, Chairman – Midco.

"We are celebrating our success," Mostafa M. Shabana, Chief Business Development Officer (CBDO) at Sapesco, told Egypt Oil & Gas. "STI has been running local courses since 2013. As of October or November 2017, we started changing our way of approaching customers and we started running these international courses; this strategic change has been reviewed and agreed upon with our CEO, Said Riad. We began building up a very strong team of Sapesco engineers, who are very knowledgeable and experienced. It was successful, with very intense and advanced material. We got instructors from all over the world," he added.

The program offered by STI was divided in four two-week courses running simultaneously. Two of the courses were offered for technicians and engineers from Chad, the third one was an international course done by an international instructor, and the fourth was reserved to Libya. "The four courses were organized by the STI team aiming to enhance technical education and improve technicians and engineers' skills, as well as to arrange many protocols with Africa," Bader El Din Gamal, Business Development Manager at STI, disclosed to Egypt Oil & Gas.

As Shabana further explained, the advanced courses covered different areas of the petroleum industry. According to him, the company's objective is to close the gap between theory education and practice. "Once students go to the real practice, they find it difficult, they are not fully prepared; so we try to close this gap by providing the theoretical and practical aspects of education at the same time," the CBDO highlighted.

During the Award & Appreciation Ceremony, oil and gas experts congratulated STI's commitment with the future of the industry by improving the skills of the new generation of technicians and engineers, which brings outstanding prospects to the development of the petroleum sector. "We are satisfied with the results of the courses. It enables us to improve drilling operations and any other petroleum operation in our country," Abderaman Barkai Chaha, Chief Service Drilling at the Ministry of Petroleum and Energy of Chad, stated to Egypt Oil & Gas on the sidelines of the event. "This is the first STI course that we [Chad] participate and we can say that it opens the door for further courses and partnerships between Egypt and Chad in the oil and gas field," he added.

Schlumberger: Empowering Egyptian Technicians

By Sarah Samir

Schlumberger continues to demonstrate its commitment to corporate social responsibility (CSR) through its program to train young technicians. On December 17th, it hosted a celebration to honor 72 young people who graduated from its Technician Development Training Program Protocol. The program is a result of a protocol the company signed with the Ministry of Manpower. Per the protocol, Schlumberger agreed to train 300 young people a year with the technical skills necessary to meet market needs for three consecutive years with the total of 900 technicians.

The event celebrated the graduation of the second group of trainees, as well as welcoming the third group of trainees. The training program was launched initially in March 2017.

The graduation ceremony was attended by prominent figures, including the Minister of Manpower, Mohamed Safaan; First Under Secretary of the Ministry of Petroleum and Mineral Resources, Mohamed Safaan; Qarun Petroleum Chairman, Ashraf Abdel Gawad; Ganoub El Wadi Petroleum Company (Ganope) Chairman, Mohamed Shimy; and Royal Resources Chairman, Sameh Fahmy.

Youth Empowerment Program

Schlumberger's training program and Education for Employment (EFE) have been empowering youth to express themselves and pursue their goals.

"I joined Schlumberger as a trainee as a part of the agreement between the company and the Ministry of Manpower, and I went to the fields, which added a lot to me and my character," Shaimaa Mohamed Allam El Sayed Omran from Beni Mazar, El Minya Governorate, told Egypt Oil & Gas

"Today is my graduation from [the training program] and I will [continue] fighting for my dreams as the training and graduation are just the start of my career. I will achieve my goals and will show all the world that Upper Egyptian woman in capable of success," Shaimaa declared. She enthusiastically noted that the training program will help her as it taught her "that I need to fight for my dreams, prove myself, and start from the bottom to be able to rise. [I need] to fight any restraints that are keeping me tamed and keeping me away from [achieving] my dreams. A part of the training course taught us things like business writing and interview skills, which will help us in the path for achieving our goals."

A documentary of the training process was shown during the ceremony. Some of the young people interviewed indicated that they had felt lost but had learnt a lot in the past few months—more than they have learned their entire lives. The graduates encouraged their peers to keep trying to find a job and achieve their dreams.

Schlumberger's training program ensured that women comprised at least 30% of the trainees. "I felt that I can work like a man and do the same tasks he does. All over the training program, I never felt gender discrimination as we were treated equally," Shaimaa said, adding that she wants to join the Schlumberger team.

"We never expected to find women working proudly [in the oil and gas field] as much as men," the Chair of EFE, Anise Aclimandos, said, adding that "the trained youth will be ambassadors for the third batch and for ambassadors [to] Egypt's youth as they will encourage their colleagues to have the same experience."

Aclimandos said that Egypt's greatest asset is its young people and that wasting this potential would be the biggest mistake that Egypt could make.

Training is not the End

The training program will not be the end for the recent graduates. Out of the 87 trainees who graduated from the first round, Schlumberger "hired 14 graduates," the Vice President & Managing Director of Schlumberger Egypt & East Mediterranean, Hussein El Ghazzawy, stated during his speech, adding that ten graduates had the honor to work in a huge national project in Mediterranean

Discussing the program, El Ghazzawy told Egypt Oil & Gas that the company plans to increase the number of trainees.

"As the first batch had only 87 graduates and the second batch has just 72 graduates, [Schlumberger] has increased the number of trainees in the third batch to be 155 trainees in order to see at least 100 trainees graduating," El Ghazzawy said. He added that the company "will study increasing the number especially with the opening of our new training facility," in6th of October City.

El Ghazzaawy pointed out that a company in the oil and gas sector had asked to hire five of the new graduates. It's not part of the protocol to

ensure the hiring of the graduates, he noted, but "it's very important to make the idea successful and not to lose the youth's power and hope." Schlumberger is therefore having "discussions with the Ministry of Petroleum so [it] can [agree] with the sector's companies to hire from the graduates."

Schlumberger has further reached agreements with some of Egypt's neighboring countries, allowing it "to send some of the graduates to work there. So, Schlumberger will export the skilled workforce to teach the world, like the Egyptian civilization was teaching the world for thousands of years."

Egypt to Have More Training Initiatives

Schlumberger's training initiative will encourage other companies to take the same steps to empower young people with the tools they need to climb the career ladder.

"Schlumberger's training program is a model for other companies to follow," Safaan stated. He noted that the oil and gas sector always takes the lead and said that he hopes the other sectors will join the training initiative.

The minister announced that Egypt aims to adopt a program to train and graduate 30,000 youth per year. He urged all businessmen to cooperate with the ministry to make this initiative a reality and asked Egypt's young people to keep trying and never to give up. Echoing the president, he quoted President Abdel Fattah El Sisi as saying: "No one will build Egypt, but Egypt's youth."

"We are so proud that we are the first company to adopt the idea of the training program," El Ghazzawy noted, adding that the company has "no problem to share its experience with other companies, even if that will make them better than [Schlumberger]."

Furthermore, Schlumberger is launching a "new training facility in the company's new base in the 6th of October City," El Ghazzawy highlighted.

"The company's new training facility contains lectures rooms. In addition, the company plans to get a drilling rig in the new training facility in order to train people on the equipment and to turn the training facility [into] a leading training center in North Africa and the Middle East, which will enable [Schlumberger] to help others," El Ghazzawy said.

Schlumberger has gone further than just preparing young people for the petroleum sector. El Ghazzawy said that the company has "communicated with different firms outside the petroleum field in big fields like the iron and steel industry" to hire technicians who graduated from the training program. In addition, El Ghazzawy noted that Schlumberger will hire graduates from the program if the company needs any technicians in the future.

Successful Talents

The second batch of trainees in the program proved successful and creative. Safaan noted that "Egypt's youth is capable, and [Egypt] would be able to face the impossible with these youth."

Young people graduating from the program presented creative projects to help the economy prosper and preserve the environment at the same time.

The first project focused on a virtual company, Green Fiber Company. The company's main work would include using banana stalks in several industries, such as the textile industry. The trainees noted that Egypt produces around 33 million banana stalks per year. Out of these stalks, 15% are left in the fields, 30% are thrown in the Nile, and 55% are burnt. The young people that were trained by Schlumberger on health, safety, and environment (HSE) standards refused to let this pass easily. They thought of establishing a company that would collect banana stalks, establish factories in the banana-producing villages, recycle the stalks, and sell the product to textile and handicraft factories. The youth thought the company could produce around 600 kilograms per day.

The second project proposed by the graduates was Golden Oil Company, a company that would recycle used oils in Egypt. The idea of the company was inspired by Egypt's use of 500 million liters of engine oils per year. The virtual company's main scope would be to recycle used oils to produce engine oil and grease. The graduates said in their presentation that they plan to import a CMM/R12 machine from Germany to recycle used oils. The project's operation would go through four phases: the first phase would be the purification process; the second phase would be the retail operations; the third phase would be the blending process; and the last phase would be the packing process.

Golden Oil Company would collect used oils from filling stations, car maintenance stations, and factories and companies. The resultant recycled oil would be used to fuel car, ship, and plane engines. It would also be used in technical workshops, electricity generating equipment, and melting furnaces.

The company's proposed target would be to cover 12% of the market's demands with 20% lower prices with the goal of increasing market coverage to 40% within three years.

"Any success is assessed by a number of factors, of which development and continuity are main keys," El Ghazzawy stated. The Technicians Development Training Program has two main keys to success. Schlumberger is continuing to develop the program and is creating "one database for graduates and trainees," El Ghazzawy noted, adding that the company's new training facility will pave the way for further development and will provide multiple training workshops.

The Challenges Impeding Nanotechnology in Egypt

Various disciplines in the petroleum industry are taking benefits from the development of nanotechnology. These phases include exploration, drilling, completion, production, processing and refining.

There is no doubt that nanotechnology applications in oil fields today are facing little commercial success. In terms of Egypt's oil and gas sector, however, things have always been reactive more than proactive. In other words, we are good users of technologies after they are born and well-raised. I believe the structure of the Production Sharing Agreement (PSA) system and the regulations in Egypt make the oil and gas sector way more conservative than it should be.

I pride myself on being one of the first researchers in Egypt to start working on nanotechnology applications in the industry back in 2010. It has been 7 years now, and I have been witnessing the pace with which this area of research is invading the industry with solutions to almost every challenge.

Nevertheless, there are many challenges facing research in this field. Firstly, the facilities of the petroleum engineering schools in Egypt. There are very few schools in Egypt which are well-equipped to do such research and they are not accessible to everyone. Secondly, there is a huge gap between the industry and academia. It is really a tough task for any researcher in Egypt to figure out a new idea to solve a certain problem and do a market research to know what are the target companies that suffer most from the subject problem. This is because we don't have a dedicated institute or agency responsible for getting standardized, public and informative data.

Nano-EOR is one of the fast-growing areas for nanotechnology applications. While the industry is not very much willing to support this direction, the AUC has been funding research projects for the petroleum engineering department to investigate the applicability of using nano-assisted water flooding in Egyptian field.

Unfortunately, the public policies in Egypt don't impose any terms on the IOCs to invest in the R&D in Egypt. On the contrary, we see in all other countries with similar PSA systems, the governments force the IOCs to invest a certain percentage of the revenue in what they call "In-Country Value"; which includes training, and employing of local talents, furthermore, they invest in their technologies in-country, not only brining the back-end field application with no know-how delivered to the personnel.

The other point is that IOCs need to put more trust and support to the academia and try to provide them with the required information to identify the actual challenges and work with them on figuring out the solutions. The biggest obstacle of such new trendy technology is the fact that in many cases engineering these nanoparticles, or nanostructures, can be very costly. Even if it seems easy to do on a small scale, learning how to scale something up to the oil field is going to take a lot of effort which requires huge support. Finally, the IOCs should be more flexible and accepting the risk of new technologies trials. Nothing works from the first shot.

By Abdelrahman Ibrahim El-Diasty
Overseas Petroleum Engineer - Prime Rock Energy Capital, USA

Hydraulic fracture stimulation in exploration and production of hydrocarbons

Oil and gas production from tight formations or shales has become possible due to technological advancements in horizontal drilling and hydraulic fracturing. Hydraulic fracture stimulation techniques have enabled the industry world-wide to extract more from wells than would otherwise have been possible. The average cost of production of hydrocarbons is correspondingly less than it would otherwise have been.

Hydraulic fracture stimulation has been used around the world for the last 65 years or so in more than 2 million oil wells to facilitate the release of hydrocarbons from relatively impermeable reservoir formations. The technology, however, has naturally changed and developed significantly since the process was initiated –in response to declining production from formerly productive hydrocarbon reservoirs and formations. The process and its effects are continually managed, modified and improved, as well as monitored. The outcomes, by and large, have been more focused and effective exploration programs for hydrocarbon gases and liquids, increased production of hydrocarbons, and a low risk to the subsurface and surface environments. Increased production from wells, particularly as one well pad can be used for multiple wells using directional and/or horizontal drilling techniques.

The industry is making use of "S" shaped drilling techniques, whereby a well bore from a well pad is deviated away from the well pad and then brought back to the vertical direction once it enters the target hydrocarbon bearing formation.

This technique enables multiple wells to be drilled from the same pad and develop a much larger area 1000s of meters below the surface in the target reservoir formation. This actually means a smaller number of wells are required to meet production targets and there is correspondingly less competition for land use and less impact and disturbance on the land surface environment.

By Dr.Eng. Ahmed Abd El-Gawad Sultan
Petrophysics Department Manager at Tharwa Petroleum Company

Multi-client projects: What, Why, and Where?

Multi-client projects aim to collect geophysical data by Geophysical Service Companies. The Government owns the data, where it markets and licenses such data, through the Geophysical Company, to as many clients as possible on a non-exclusive basis.

The reasons behind Governments undertaking such projects are mainly due to their need to Lower barriers of entry for Exploration companies by providing technical data in areas where data is not fully available or where there is little or insufficient data for assessment and exploration thus promoting more active and competitive licensing rounds.

Furthermore, these projects are costly. Therefore, the Geophysical Company bears all risks associated as well as the full cost of the project, before marketing for its services as a fraction of the cost to IOCs, allowing multiple E&P companies the opportunity to evaluate resource potential in particular area along geological trends that will facilitate higher exploration and development success rates.

It is worth mentioning that multi-client projects have developed over two decades in an unprecedented manner. The multi-client project on the U.S. Gulf of Mexico continental shelf, for example, is one of the best cases for the success of such projects globally. It is considered the largest and most beneficial multi-client project, as it has resulted in significant oil discoveries over the last two years.

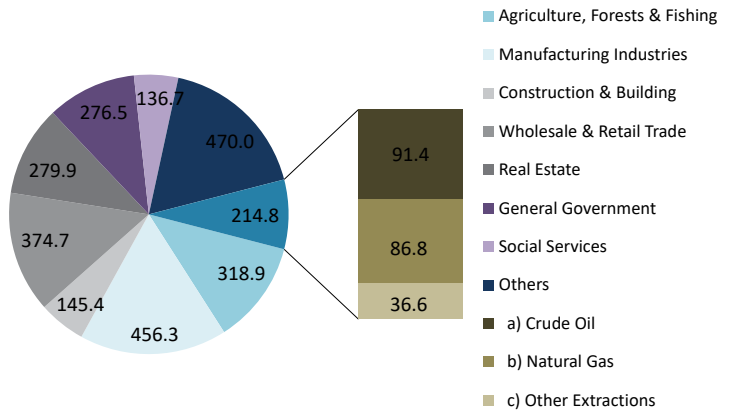
The Egyptian Ministry of Petroleum has started since the end of the nineties of the last century in implementing multi-client projects in parallel with the start of these projects globally. Moreover, in compliance with the Ministry's plan to attract more investments, South Valley Egyptian Petroleum Holding Company (Ganoupe) launched its multi-client project in offshore Egyptian Red Sea after Egypt and Saudi Arabia signed their maritime border demarcation agreement.

The Egyptian Ministry of Petroleum hopes from launching Ganope multi-client project to achieve discoveries similar to what has been achieved in the Mediterranean recently. Thus helps to secure Egypt's energy needs in the future and furthermore transfers Egypt to one of the top oil and gas producing countries.

By Mostafa AbdulGhaffar
Department Head for Exploration Studies - South Valley Egyptian Petroleum Holding Company

Economic Snapshot: Egypt's Oil & Gas Sector

Figure 1 Sectoral Breakdown of Egypt's GDP in FY 2015/16 (EGP bn)



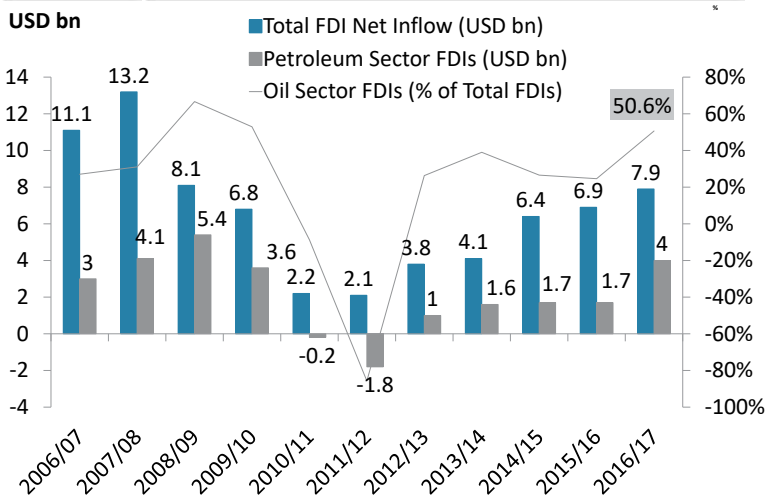
Source: Ministry of Planning.

Figure 2 Oil & Gas Share in GDP during FY 2015/16

Crude Oil	Natural Gas	Oil Refining
EGP 91.4 bn (3.4%)	EGP 86.8 bn (3.2%)	EGP 113.9 bn (4.3%)

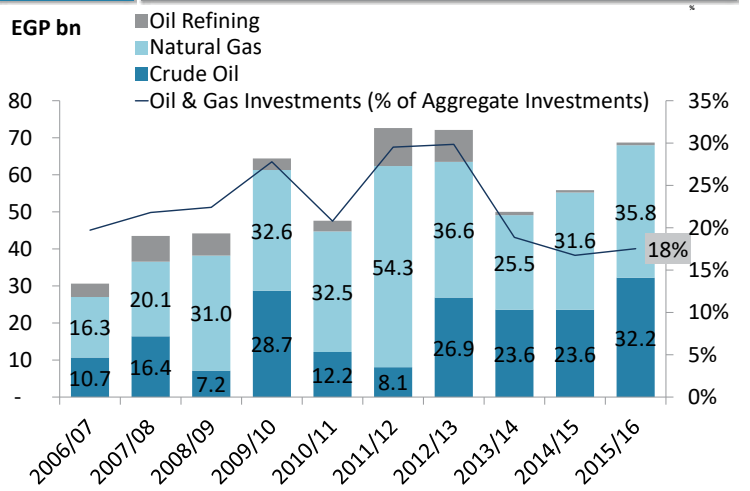
Source: Ministry of Planning.

Figure 3 Oil Sector Foreign Direct Investments (FDIs)



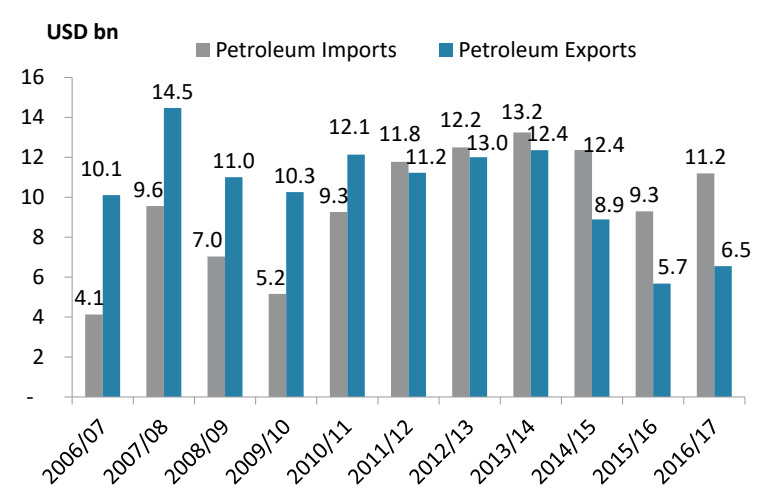
Source: Central Bank of Egypt.

Figure 4 Oil & Gas Investments



Source: Ministry of Planning.

Figure 5 Petroleum Imports & Exports (USD bn)



Source: Central Bank of Egypt.

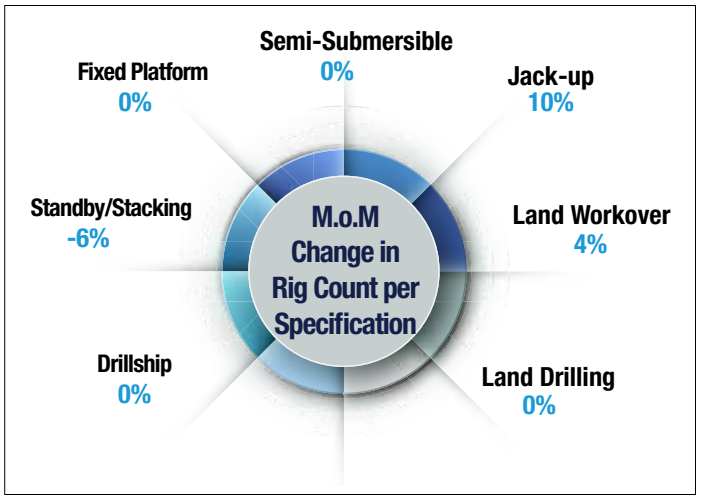
Figure 6 Oil & Gas Sector Total Employment in 2017

- A total of around **183 thousand** employees work in Egypt's Oil & Gas Sector; out of which **80%** work in oil refining; whereas **20%** work in extractive industries.
- This represents **1%** of the total number of employees in Egypt.

Source: CAPMAS.

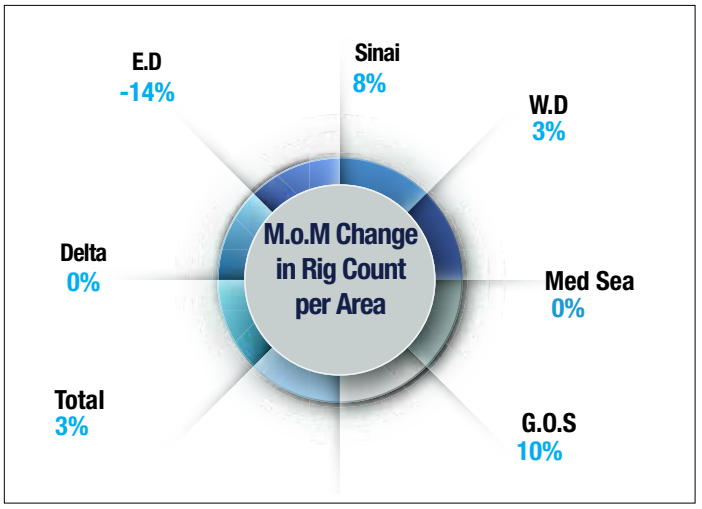
Rigs per Specification

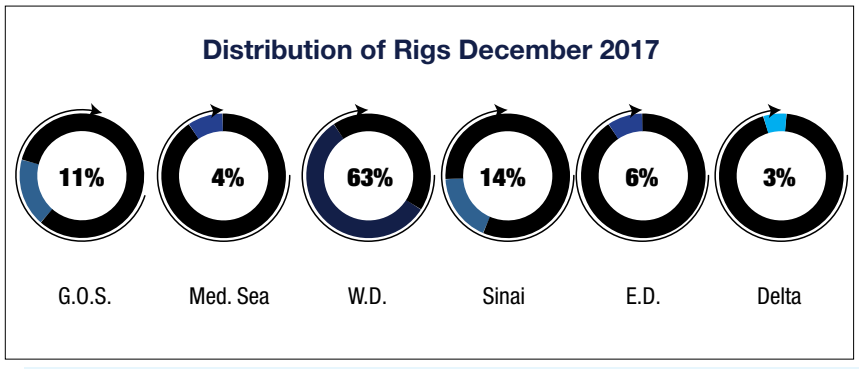
Date	Land-Drilling	Land Workover	Jack-Up	Semi Submersible	Fixed Platform	Standby/ Stacking	Drillship	Total
May-17	44	37	11	1	1	53	2	149
Jun-17	45	40	11	1	1	49	2	149
Jul-17	45	37	11	1	1	52	2	149
Aug-17	42	37	11	1	1	55	2	149
Sep-17	39	40	10	1	2	56	0	149
Oct-17	41	43	10	1	1	50	2	148
Nov-17	41	45	10	1	1	49	2	149
Dec-17	41	47	11	1	1	46	2	149



Rigs per Area

Month	G.O.S.	Med. Sea	W.D.	Sinai	E.D.	Delta	Total
May-17	9	6	58	12	6	5	96
Jun-17	9	6	61	13	6	5	100
Jul-17	9	6	59	14	6	3	97
Aug-17	9	5	59	13	5	3	94
Sep-17	9	5	61	11	5	2	93
Oct-17	10	4	64	12	6	2	98
Nov-17	10	4	63	13	7	3	100
Dec-17	11	4	65	14	6	3	103





PRODUCTION NOVEMBER 2017

	Crude Oil	Equivalent Gas	Liquified Gas	Condensate
Med. Sea	57,565	12,332,627	199,050	661,664
E.D.	1,775,815	29,145	15,030	15,030
W.D.	9,385,009	6,955,824	526,437	1,220,987
GOS	3,766,085	770,269	296,815	102,109
Delta	35,670	7,121,298	167,040	357,599
Sinai	1,486,424	34,800	35,815	20,706
Total	16,506,568	27,243,963	1,240,187	2,378,095

Unit: Barrel

*Natural Gas figures are in Boe. *Crude total excludes Upper Egypt production

DRILLING UPDATES

Region	Company	Well	Well Type	Rig	Depth	Well Investments
Eastern Desert	Dublin	SHF-2	Development	SNOS-5	4,289	$1M
Western Desert	PetroDara	NWG-38A-2	Development	EDC-66	5,315	600,000
	Qarun	MISEADA-20	Well Injection	EDC-65	8,500	$910,000
	Shell	NEO LILI-1 ST-1	Exploration	EDC-52	17,709	$5.87M
	Tharwa	EAS H-1X	Exploration	TANMIA-1	7,905	$1.203 M
	Tharwa	EAS A-1X	Exploration	TANMIA-1	7,600	$2 M
	NORPETCO	GANNA-11	Development	ECDC-2	8,227	$1.039 M
	PetroSilah	N.SILAH D1-5	Development	ECDC-1	8,844	$1.285M
	Qarun	WON X-16	Development	EDC-63	7,200	$1M
	Khalda	HYDRA E-1X	Exploration	EDC-17	14,265	$2.397 M
	Khalda	NU-1X	Exploration	EDC-61	12,500	$1.415 M
	Khalda	WKAL T-5	Developmnt	EDC-40	15,200	$2.2 M

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