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EGYPT OIL&GAS NEWSPAPER

SERVICE CONTRACTS FOR MATURE FIELDS REDEVELOPMENT: A NEW WAY OUT

ENHANCING PRODUCTION RECOVERY IN BROWNFIELDS USING **4D SEISMIC SURVEYS**

PRE-STACK, POST-STACK INVERSION IN BROWNFIELDS

LOOKING AT BROWNFIELDS FROM AN **ECONOMIC PERSPECTIVE**

EDITOR'S **LETTER**

The need to redevelop Egypt's brownfields in order to optimize crude oil production and revenues is old news. Yet, technologies and approaches for brownfield redevelopment are still a constant subject of discussion as challenges are still far from being easily solved. For this issue, we aimed at highlighting available alternatives to help Egypt and its international partners to extract the maximum value from the country's mature fields.

In our Industry Insight section, you can have a close look into service contracts applied to brownfields, with pros and cons as well as successful stories from companies operating Egyptian fields. We also bring you information on 4D seismic surveys and pre-stack and pro-stack inversion surveys, in addition to the economics of brownfields.

In our Interview section, Liv Hovem, CEO of DNV GL – Oil & Gas, commented on the company's Energy Transition Outlook and on Egypt's role as a catalyst in the Middle East and North Africa's (MENA) energy transition. Hovem also told us about the company's plans in the country and gave her opinion on ways of enhancing Egypt's oil and gas sector.

Throughout March, we covered a series of events. You can find in this issue the full coverage of the Petroleum Arabian Conference and Exhibition (PACE 2019), of which Egypt Oil & Gas was proudly a media sponsor and the official publication, in addition to the coverage of Schlumberger's women empowerment workshop, which we were happy to attend as guests. Our Research & Analysis department also contributed to this issue with an updated report on Egypt's subsidy cuts.

As always, thank you for your readership and support. We hope you enjoy reading this issue.

Editor in Chief

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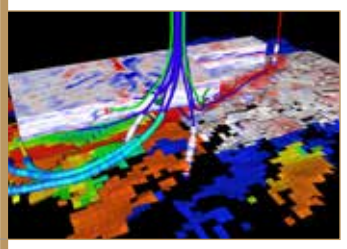

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EGYPT COOPERATES WITH ARAB REGION STATES

Egypt has been keen to invest in the Arab region in order to boost international cooperation between the region's countries. Two seismic surveys in the Red Sea and southern Egypt have been carried out, which encourage the Ministry of Petroleum to submit tenders to international oil companies (IOCs) and promote exploration and production (E&P) in the region, said Tarek El Molla, Egyptian Minister of Petroleum. To promote international cooperation, Petrojet has been developing the second phase of Iraq's al-Zubair gas project. Furthermore, the company signed a partnership agreement with Iraqi Genera Company for Heavy Engineering, El Molla noted.

EGYPT TO BE MUST-HAVE PETROLEUM INVESTMENT DESTINATION

Petroleum Intelligence Weekly announced Egypt as a must-have petroleum investment destination for international oil companies (IOCs) due to the Zohr giant gas discovery made by Eni in 2015. Egypt's attractive geology, along with financial system reforms and flexible measures in natural gas pricing, led IOCs like Shell, BP, and Eni to double their shares and ExxonMobil to enter the Egyptian natural gas market for the first time. The North African country has recently paid $5.1 billion to IOCs in arrears, which has attracted foreign investments, along with the country's infrastructure.

MIDOR REACHES FINANCIAL CLOSURE FOR EXPANSION UPGRADES

Middle East Oil Refinery (Midor) reached financial closure for the $2.2 billion expansion and upgrade program for its Alexandria refinery. The project includes "a series of agreements with an Italian contractor supported by an Italian export credit agency," legal advisors Zaki Hashem & Partners said. In October, Midor finalized contracts for a $1.2 billion funding facility with BNP Paribas, Crédit Agricole, and Italy's CDP. Midor is ready to use the funds and start the project's implementation phase, which will set it as a "major regional hub for producing and exporting petroleum products," according to Zaki Hashem & Partners.

EGYPT'S NATURAL GAS OUTPUT INCREASES BY 20.99% YOY

Egypt's natural gas output increased by 20.99% year-on-year (YOY), reaching 4.178 million tons in December 2018, up from the 3.453 million tons produced in December 2017. The monthly bulletin published by the Central Agency for Public Mobilization and Statistics (CAPMAS) reveals that Egypt's consumption of natural gas grew by 1.9% YOY to reach 3.705 million tons in December 2018, up from the 3.636 million tons consumed in the same month a year earlier. Monthly figures show that Egypt's natural gas output grew by 2.73% in December 2018, up from the 4.067 million tons produced in November 2018.

EL MOLLA REVIEWS ABU TARTUR PHOSPHATE PROJECT

El Molla visited El Wadi El Gedid (New Valley) governorate to review the $800 million Abu Tartur Phosphate project. The project has the capacity to produce 500,000 tons of phosphoric acid per year using phosphate ore from Abu Tartur area reserves in El Wadi El Gedid. The project will use 2 million tons of phosphate ore per year, which will be the main input of production, said Khaled al-Ghazaly Harb, head of El Wady for Phosphate Industries and Fertilizers Company. Egypt will produce phosphoric acid in order to cover the country's needs, Harb noted.

PETROLEUM PRODUCTS CONSUMPTION FALLS BY 11.19% YOY

Egypt's consumption of petroleum products dropped by around 11.19% year-on-year (YOY) in December 2018 to 2.596 million tons, compared to 2.923 million tons in December 2017. Statistics published by the Central Agency for Public Mobilization and Statistics (CAPMAS) show that petroleum product's output slightly increased by 1.67% from 2.811 million tons in December 2017 to 2.858 million tons in the same month in 2018. Egypt's consumption of petroleum products grew by around 2.12% month-on-month, down from the 2.542 million tons consumed in November 2018.

EL MOLLA LAUNCHES PMRD 22ND CONFERENCE, EXHIBITION

El Molla launched the 22nd International Conference and Exhibition on Petroleum, Mineral Resources, and Development (PMRD) on February 26, under the theme 'Egypt- Africa Towards Development'. El Molla said during the opening ceremony that state-of-the-art technology is important for the Egyptian oil and gas industry as it plays a vital role in securing energy and achieving targeted growth levels for the Egyptian economy. The minister pointed out the importance of adopting scientific approaches and analyzing the changes in the petroleum industry in order to cope with the recent developments.

EGYPTIAN BUTANE IMPORTS DROP BY 23.17% YOY

Egyptian butane imports fell by 23.17% year-on-year (YOY), reaching 181,000 tons in December 2018 compared to the 235,600 tons imported in December 2017. Statistics published by the Central Agency for Public Mobilization and Statistics (CAPMAS) reveal that butane output increased by 6.59% YOY, growing to 165,000 tons in December 2018 from the 154,800 tons in the same month of 2017. Meanwhile, the country's butane consumption dropped by 4.42%, using 359,200 tons in December 2018 compared to the 375,800 tons in the December a year earlier. Egypt's monthly butane imports decreased by 9.95% from the 201,000 tons of butane imported in November.

ERC COMMERCIAL OPERATIONS TO START IN Q3 2019

Qalaa Holdings Company announced that its Egyptian Refining Company (ERC) is going to start commercial operations in Q3 2019. ERC is 99.28% complete, and the diesel producing unit has been successfully tested, Qalaa Holdings said in an EGX disclosure. The refinery is planned to complete trial operations for all its units by the end of Q2 2019. ERC is a $4.3 billion refinery with an annual capacity of 4.7 million tons of refined products and high-quality oil derivatives, which include over 2.3 million tons of Euro V diesel.

EGYPT INCREASES GAS EXPORTS VIA IDKU TO 800 MMSCF/D

The Ministry of Petroleum increased amounts of exported gas through Shell's Idku liquefaction plant to 800 million standard cubic feet per day (mmscf/d), compared to 500 mmscf/d at the beginning of 2019. The amounts of gas exported via Idku plant increased, giving Egypt a strong return to the global market after achieving natural gas self-sufficiency, Minister of Petroleum Tarek El Molla said. Egypt increased gas exports via Idku plant as the local consumption decreased in winter and the production grew, El Molla pointed out, adding that Egypt covered the needs of industrial sector, electricity power plants, vehicles, and households.

EGYPT DIESEL CONSUMPTION DROPS BY 4.1% YOY

Egypt's diesel consumption decreased by 4.095% year-on-year (YOY) in December 2018, recording 1.171 million tons down from the 1.221 million tons in December 2017. Statistics published by the Central Agency for Public Mobilization and Statistics (CAPMAS) revealed that the country's diesel output slightly fell by 0.366% in December 2018, reaching 544,000 tons compared to the 546,000 tons produced in the same month of the previous year. Monthly figures indicated that diesel consumption increased by 12.7% from the 1.039 million tons consumed during November 2018. Meanwhile, production dropped by 1.63% from 553,000 tons of the previous months.

INAUGURAL MEETING OF EAST MED SEVEN TAKES PLACE IN CAIRO

A high committee of East Mediterranean Gas Forum (EMGF) representatives held the inaugural meeting in Cairo to follow up on the ministerial decrees that took place on January 14 and prepare for the completion of the EMGF establishment. The meeting included representatives from the seven countries of EMGF, namely Egypt, Cyprus, Greece, Jordan, Italy, Palestine, and Israel along with the European Union (EU). The attendees agreed on the criteria of the forum's work until it is completely established. Moreover, attendees discussed work priorities related to the establishment's completion, in preparation and to raise recommendations for the ministerial meeting that will be held in April.

LNG IMPORTS DROP BY 4% YOY

Egypt's net imports of liquefied natural gas (LNG) decreased by 4% year-on-year (YOY) in 2018. Royal Dutch Shell said in its LNG Outlook 2019 that global demand for LNG will increase in the upcoming few decades. The company expects natural gas to have a 41% growth in the global energy demand by 2035. The report indicates that global LNG trade grew by 10% in 2018, reaching 319 million tons due to the growing demands in Asia, especially in South Korea and China. Egypt stopped its LNG imports after receiving a final shipment in late September 2018.

ROMANIA WELCOMES EGYPTIAN PETROLEUM FIRMS

Egyptian oil and gas companies were invited to work in Romania and benefit from the experience of its companies, said Ştefan-Radu Oprea, Minister of Business Environment, Commerce and Entrepreneurship. Oprea expressed the Romanian support to enhance cooperation with Egypt in different economic fields. The minister's comments came during his meeting with El Molla, the Romanian Ambassador, and accompanying delegation. During the meeting, heads of Romanian companies presented their activities and discussed the opportunities available in the Egyptian markets. Moreover, heads of Egyptian firms reviewed available opportunities to promote cooperation between companies from both countries.

EGYPT EXPORTS 350 MMSCF/D OF NATURAL GAS TO JORDAN

Egyptian natural gas exports to Jordan reached 350 million standard cubic feet per day (mmscf/d) compared to the 100 mmscf/d in January 2019, Minister of Petroleum Tarek El Molla said. The North African country exports natural gas to cover Jordanian electric power plants' needs, El Molla noted. Egypt's agreement with Jordan is dynamic as it is modified based on the demands of Jordan's electric plants and the available natural gas surplus that meets the local market's demands. El Molla explained that Egypt resumed exporting natural gas to Jordan in September 2018, which plays a role in turning Egypt into a regional energy hub.

EGYPT, AUSTRALIA DISCUSS PETROLEUM COOPERATION

Minister of Petroleum Tarek El Molla met with the Australian Ambassador to Egypt, Glenn Miles, to discuss new cooperation scopes, especially in the field of mining, between the two countries. During the meeting, El Molla reviewed the recent positive changes in the Egyptian oil and gas sector in light of the country's attractive investment opportunities and its economic and legislative reforms that encouraged international oil companies (IOCs) to increase their activities in different petroleum fields. Meanwhile, Miles praised the Egyptian oil and gas sector's success and efforts in turning Egypt into a regional oil and gas trading hub.

ENPPI'S IPO TO TAKE EFFECT BEFORE JUNE

Engineering for Petroleum and Process Industries (ENPPI)'s initial public offering (IPO) on the Egyptian Exchange (EGX) is expected to take place before the end of H1 2019, Minister of Petroleum Tarek El Molla said. The minister pointed out that the government plans to launch a mining bid round in Egypt after the recent mining law amendments. If the oil and gas sector had the opportunities to partner with foreign companies abroad like Iraq, they will definitely seize it, El Molla stated, highlighting that Enppi and Petrojet made partnerships abroad, along with a number of state-owned firms that signed partnership deals with Italian companies.

ENNPI, PETROJET SIGN TRAINING PROTOCOLS WITH AASTMT

Enppi signed a cooperation protocol with the Arab Academy for Science, Technology and Maritime Transport (AASTMT) for training, scientific research, higher education and consultancy. AASTMT signed another cooperation protocol in the same fields with Petrojet. The two protocols were signed in attendance of El Molla; Walid Lotfy, head of Petrojet; Alaa Khashab, Vice Chairman and CEO of Enppi; and Ismail Abdel Ghafar, president of AASTMT. The signed protocols have several cooperation benefits, including leveraging scientific and technical experience of the parties from their joint training programs and technical training for university students.

EGYPT ISSUES 18 LICENSES FOR GAS DISTRIBUTION

Egypt's Gas Regulatory Authority issued licenses for 18 private and state-owned firms to ship, deliver, and distribute natural gas across the local market. The Gas Regulatory Authority issued two licenses for the Egyptian Natural Gas Holding Company (EGAS) and three licenses for the Egyptian Natural Gas Company (GASCO). The remaining 16 companies are working on establishing a minor natural gas grid to deliver gas to consumers. The Gas Regulatory Authority issues licenses for activities related to natural gas grids as well as trade, including shipping and distributing natural gas.

EGYPT TO LAUNCH 3 E&P BID ROUNDS IN 2019

The Egyptian Ministry of Petroleum and Mineral Resources aims to launch three exploration and production (E&P) bid rounds in 2019 in order to boost exploration activities in different concessions and increase local oil and gas output. EGAS will launch an E&P bid round to search for natural gas in the West Mediterranean, El Molla said. Meanwhile, the Egyptian General Petroleum Corporation (EGPC) will launch an E&P bid round to explore the Western Desert, Gulf of Suez, and Eastern Desert, El Molla noted.

EGYPT, EBRD DISCUSS PETROLEUM FUND COOPERATION PROJECTS

El Molla met with the First Vice President and Head of Client Services Group at the European Bank for Reconstruction and Development (EBRD), Jürgen Rigterink, to discuss cooperation opportunities in financial and operational support for a number of ongoing petroleum projects. The projects include a new diesel treatment unit at the Alexandria Petroleum Company and another project for gas utilization in petroleum fields, all of which aim to achieve the best economic benefits. This comes in line with the ministry's strategy to boost operational efficiency in oil and gas projects. The two officials further discussed funding the carbonization complex in Suez.

EGYPT LNG EXPORTS JUMP 44% IN A MONTH: PLATTS

Egypt's liquefied natural gas (LNG) exports from the Idku liquefaction plant grew 44% in one month, reaching 391.3 million cubic meters (mcm) of LNG in February 2019, a report from Platts revealed. The main country receiving Egyptian LNG in February was Turkey, the report said, pointing out that February exports level was the highest since 2013. The LNG was exported through four cargoes, two of which were headed to Turkey, while the other two went to France and Singapore. Egypt is expected to boost its LNG exports to over 810 mcm by the end of 2019, the report showed.

EGYPT'S PETROLEUM TRANSPORTS REACH 147,131 TONS IN FY 2016/17

Egypt transported a total of 147,131.3 tons of petroleum products through different transportation means in fiscal year (FY) 2016/17, compared to 150,384.1 tons in FY 2015/16. Data from the Central Agency for Public Mobilization and Statistics (CAPMAS) revealed in its annual FY 2016/17 report that around 414.3 tons of petroleum products were transported via railway tankers, compared to 446.1 tons in FY 2015/16. Meanwhile, 18,143 tons were transported via trucks in FY 2016/17, compared to 17,588 tons a year earlier. Egypt's petroleum products' transports via pipelines recorded 56,888 tons during the same year, down from 61,131 tons of transports in the previous year.

EL SISI APPROVES EBRD $200 M LOAN TO EGAS

President Abdel Fattah El Sisi issued a decree of law no. 37 for 2018, approving a loan agreement for EGAS' energy efficiency projects. The loan agreement was signed on December 27, 2017 by Egypt and the European Bank for Reconstruction and Development (EBRD) to grant EGAS a $200 million loan. The loan is aimed at funding the modernization of certain gas infrastructure facilities in order to improve energy efficiency and to decrease environmental impacts, EBRD said.

SAUDI ARABIA SIGNS A $2 B DEAL WITH SUMED

Saudi Arabia's Aramco and Saudi Basic Industries Corporation (SABIC) signed agreements with the Arab Petroleum Pipelines Company (SUMED) worth $2 billion to establish petrochemical projects in the Mediterranean region, said Abdullah bin Mahfouz, Vice Chairman of Saudi-Egyptian Business Council. Both countries agreed during a business forum held on February 23 that Egypt will be the gate from Saudi Arabia to the African continent through projects in the Suez Canal region, bin Mahfouz noted.

ARAMCO TO PUMP CRUDE OIL INTO EGYPTIAN REFINERIES

Egypt has renewed the agreement with Saudi Aramco to provide Egyptian refineries with crude oil for six months starting from January 2019, said Tarek El Molla, Minister of Petroleum. The Saudi company will provide over 500,000 barrels of crude oil per month to Egypt from January until June 2019, El Molla said, without including any further financial details. Aramco started pumping crude oil into Egyptian refineries for trial in November and December 2017, and then started actual regular pumping in 2018. Saudi Arabia agreed in 2016 to provide Egypt with 700,000 tons of refined petroleum products each month for five years.

EKH ANNOUNCES GAS RESERVES IN OFFSHORE NORTH SINAI

Seismic surveys showed that the offshore North Sinai concession has 2.352 trillion cubic feet (tcf) of natural gas and 112 million barrels of condensates, Egyptian Kuwait Holding Company (EKH) announced. The company achieved 40% growth in profit during 2018, recording $95.1 million due to the operational strong performance in offshore North Sinai. In 2018, the company had $480.2 million in revenues, $163.5 million in gross profit, $175 million in earnings, and $133 million in attributable profit. Moreover, EKH achieved $129.9 million in operational income, $125.2 million in net income, and $95.1 million in attributable net income.

SHELL GAS PRODUCTION FROM BURULLUS, RASHID DROPS BY 37.5%

Royal Dutch Shell natural gas production from Burullus and Rashid fields declined by 37.5%, reaching 250 million standard cubic feet per day (mmscf/d) compared to the 400 mmscf/d a year ago. Shell seeks to connect 100 mmscf/d of natural gas from phase 1 of 9B project in Burullus to boost production during H1 2019. This is set to boost the Burullus and Rashid fields' production to 350 mmscf/d by the end of fiscal year (FY) 2018/19. The project includes eight production wells and two exploratory wells.

DMWA RESOURCES BACKS-OFF ACQUIRING LAGIA OIL IN EGYPT

DMWA Resources Company withdrew its bids for acquiring the Lagia Oil Egyptian asset located in Sinai. The African-focused resources and trading company decided to seek acquiring other marginal oil and gas field across the continent. Lagia Oil field is owned and operated by the subsidiary company of South Africa's Efora Energy. Canadian-based MENA Hydrocarbons used to own the Lagia asset and sold it to SacOil Holdings, the predecessor to Efora, in 2014. However, MENA Hydrocarbons claims the share purchase agreement terms with SacOil has been violated, which still gives MENA a claim to Lagia Oil.

CARBON HOLDINGS APPOINTS HALA EL-MOHANDES DEPUTY CEO

Carbon Holdings Company appointed Hala El-Mohandes as the new Deputy CEO for Project and Export Finance. The company announced that El-Mohandes joined them from the Export-Import Bank of the United States to work on securing sustainable streams of funds for the company to meet its strategy and be among the leading integrated petrochemical producers around the globe. "During this critical point in Carbon Holdings' growth story, we can think of no better person than Hala to join the Carbon Holdings team," said Basil El-Baz, Chairman and CEO of Carbon Holdings.

EGYPT, DEA SIGN E&P AGREEMENT IN THE GULF OF SUEZ

The Ministry of Petroleum signed an exploration and production (E&P) agreement with DEA for the Ras Budran and El Zeit Bay oil fields in the Gulf of Suez. The agreement was signed by Minister of Petroleum, Tarek El Molla; head of the Egyptian Petroleum Corporation (EGPC), Abed Ezz El Regal; and DEA Egypt's General Manager, Sameh Sabry, who aim to conduct development programs with minimum investments of $20 million to boost oil production. "The new agreement extends the concession for five years ending mid-2022. It includes an optional extension of another five years until 2027, subject to mutual agreement," the company said in a statement.

DANA GAS, ADES-VATAGE SIGN DEEPWATER AGREEMENT

Dana Gas signed an exploration agreement with ADES International Holding for drilling services in Egypt's Mediterranean Sea. According to the agreement, Vantage's Tungsten Explorer drillship will be responsible for drilling a firm well, with an option to drill three more wells. The drilling program is planned to be completed in 77 days. "We are delighted to put the Tungsten Explorer back to work so soon after it completed certain upgrades as well as finishing its five-year campaign for Total in Congo," said Ihab Toma, CEO of Vantage Drilling International. According to a planned subcontract, ADVantage, the joint venture between ADES and Vantage Drilling International Company, will be responsible for providing services.

TECHNIPFMC TO PROVIDE EPC WORK IN MIDOR EXPANSION PROJECT

TechnipFMC PLC has finished the requirements to start working on the previously awarded engineering; procurement and construction (EPC) contract for the rehabilitation and expansion of Egypt's Middle East Oil Refinery (Midor). The EPC services contract is worth over $1 billion and is set to be a part of TechnipFMC's Q1 inbound orders in the onshore-offshore segment. The company will be doing EPC services for the expansion of Midor, which will include the delivery of new units and the debottlenecking of existing ones. The new units will include vacuum distillation unit, crude distillation unit, proprietary steam reforming based hydrogen producing plant, and a number of process units.

EGYPT, HALLIBURTON SIGN HR DEVELOPMENT MOU

Egypt signed a memorandum of understanding (MoU), in the attendance of Minister of Petroleum Tarek El Molla, with Halliburton for the development of the oil and gas sector's employees. According to the MoU, Halliburton will invest in the young and middle-management development programs as a part of the ministry's Modernization Project. The practical training programs aim to develop the skills and efficiency of employees in the oil and gas sector and prepare them to take up leading position in the future. The Modernization Project aims to create an attractive investment climate as it builds potential talents, El Molla said, pointing out to the mutual trust between the sector and its strategic partners in all fields.

SAUDI ARABIA

Saudi Arabia's Crown Prince, Mohammed bin Salman, was in talks with Chinese President Xi Jinping about a deal for a refining and petrochemical complex in China. The deal was a part of the Asian tour by the Saudi delegation and included top executives from state-owned oil company Saudi Aramco. According to the Saudi crown prince, bilateral trade increased by 32% last year.

Saudi Arabia's oil exports increased in December 2018 by 12.7%, reaching around $18.66 billion. The value of the Kingdom's imports dropped by 2.2% in December 2018 from a year earlier.

Saudi Aramco reopened the Safaniyah oilfield after finishing all needed repairs, allowing full output to resume. Aramco had closed part of the offshore oilfield because of a power cable cut caused by a vessel's anchor. The company mentioned that the damages were minor and are now resolved. Safaniyah is the largest offshore oilfield in the world, with a capacity of more than 1 million barrels per day (b/d) that includes heavy crude oil.

ADES International, a Middle East drilling and production services company, has renewed its six onshore operating rigs contracts with Saudi Arabia for three years. The contracts' renewal term for all six rigs start in February 2019 as existing contracts expire. The renewals are expected to add up to $228 million of backlog with daily rates in line with the terms of the existing contracts.

Saudi Aramco gave two contracts of engineering, procurement, construction and installation (EPCI) services in the Saudi offshore Marjan field as an award to McDermott International. The first contract is worth around $500-700 million and includes the design, procurement, fabrication, installation, testing, and pre-commissioning of the TP-10 tie-in platform; six gas lift topside modules; associated pipeline; and subsea cables. The other contract is valued between $50-250 million and includes the full suite of EPCI services for the upgrade of two existing platforms related to the installation of associated equipment for electrical submersible pumps (ESPs) and space for a future high integrity pressure protection system (HIPPS); subsea composite cable lay; and topside cable tie-ins.

Saudi Arabia plans to increase its gas exports from conventional and non-conventional resources to reach 3 billion cubic feet per day (bcf/d) before 2030. Future gas exports will include pipelined gas and liquefied natural gas (LNG).

IRAQ

Iraq and Jordan have agreed on many mechanisms to strengthen the economic cooperation between the two countries, including the study of establishing an Iraqi oil pipeline to deliver oil to Jordan. The talks came during the Jordanian-Iraqi Business Forum, which was held at the Jordan Chamber of Industry in Amman. The forum was attended by Jordan's Minister of Industry, Trade and Supply, Tariq Al-Hammouri, and his Iraqi counterpart Saleh Al-Jubouri to follow up on the implementation of the recent agreements between the two countries.

The oil exports from Iraq's Southern ports at the Gulf has reached around 3.565 million barrels per day (b/d) in February 2019. The exports from the Iraqi Basra ports dropped to 3.556 million b/d in January 2019 from 3.63 million b/d in December 2018. In addition, exports from the country's southern terminals are expected to remain 3.55 million b/d in February, according to the Organization of Petroleum Exporting Countries' (OPEC) agreement supply pact. Iraq has begun rehabilitation work on the 1.5 million b/d Rumaila oilfield from February 17 to improve crude processing operations. Moreover, Iraq is producing below its maximum production capacity by nearly 5 million b/d due to the agreement between OPEC and other producers to restrict the global oil supply and support oil prices.

Iraq's Genel Energy announced it is acquiring Chevron's stakes in Sarta and Qara Dagh blocks after getting an approval from the Kurdistan Regional Government (KRG). Once the acquisition is closed, Genel will acquire 30% in the Sarta PSC, Chevron holding will aquire 50% and KRG holding the remaining 20%. Genel is now the operator in the Qara Dagh and holds a 40% equity, while Chevron holds 40% and the KRG holds the remaining 20%. Sarta Phase 1A's first two wells will start producing oil in 2020, while work will be ongoing to choose the optimal location for the Qara Dagh-2 well, which is also set to be drilled in 2020.

Intertek inaugurated a laboratory for crude oil, fuel testing and petroleum products in Iraq's Khor Al Zubair port, offering quality assurance solutions in the petroleum industry. The new hydrocarbon laboratory will introduce engine fuel testing of gasoline in Iraq for the first time. The laboratory represents a significant investment in the Iraq oil and gas industry, which offers a wide range of services for the petroleum industry.

KUWAIT

Kuwait National Petroleum Company (KNPC) plans to export 120,000 barrels of oil per day (b/d) to Asian countries by signing new contracts. The company's marketing division spares no effort to grab many investment opportunities on the global market despite the severe competition.

Kuwait Petroleum Corporation (KPC) seeks a liquefied natural gas (LNG) cargo to be delivered in April 12 or 13. The tender closed on March 6, with same-day validity.

KPC has inked a memorandum of understanding (MoU) with the UK for up to $3 billion in loans and credit facilities. The UK credit agency, UK Export Finance, will provide loans and credit facilities for British goods exports used in projects carried out by KPC and its subsidiaries.

Kuwait plans to increase the natural gas production capacity to reach 3.5 billion cubic feet per day (bcf/d) by 2031-2032, Hashim Hashim, the CEO of Kuwait Petroleum Corporation (KPC), said. The country's current production level of natural gas has reached 1.9 bcf/d. The production capacity is expected to reach 3 bcf/d after Kuwait's Jurassic gas fields start fully operating by 2023-2024, Hashim told an industry event in Kuwait City. The $2.9 billion project will have a net production capacity of around 225,000 cubic meters, he added.

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Minister of Petroleum & Mineral Resources - Arab Republic of Egypt

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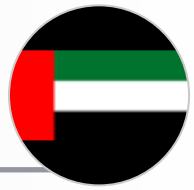
UAE



The Abu Dhabi National Oil Company (ADNOC) Refining awarded a Pre-Front End Engineering and Designing (Pre-FEED) contract to the Wood Group, a global leader in engineering, project and technical services, for a new refinery in Ruwais. The award is for a state-of-the-art refinery with a production capacity of 600,000 barrels of crude oil per day, which will be designed to have full conversion capability and will allow integration with petrochemicals. The $45 billion expansionary downstream strategy will provide the company with the chance to increase the range and volume of its high-value downstream products.

The oil products' stock at Fujairah port increased by 2.4%, reaching 22.008 million barrels, according to data exclusively obtained by S&P Global Platts. The distillate stocks increased as well by 0.8%, recording 11.394 million barrels. In addition, gasoline and other light distillate stocks reached 11.975 million barrels, which is considered their highest level since stock reporting began in Fujairah. The middle distillate stocks were boosted by 1.5%, reaching 2.398 million barrels. Moreover, inventories of heavy residues rose by 5.1% to 8.216 million barrels.

ADNOC announced entering a landmark of a multi-billion-dollar midstream pipeline infrastructure partnership with KKR and BlackRock. Under the transaction, a new entity called Sole Proprietorship LLC (ADNOC Oil Pipelines) will be established and managed by BlackRock and KKR, who will collectively hold a 40% interest of the entity, while ADNOC will hold the remaining 60% stake. The partnership will result in around $4 billion to ADNOC and is expected to end in Q3 2019. In addition, it is subjected to customary closing conditions and regulatory approvals.

The UAE will host a meeting with Libya to discuss the reopening of El Sharara oilfield.. The Libyan National Army (LNA) requested Libya's National Oil Company (NOC) to reopen the 315,000 barrels per day (b/d) field, but NOC rejected the demands as the field is not secured yet. The UAE supports Khalifa Haftar, commander of the LNA, which has taken control of two oilfields in Libya's south that include El Sharara and the nearby El Feel facility.

OPEC

The Organization of Petroleum Exporting Countries (OPEC) and its allies will not determine their output policy in April to reconsider the full impacts of their production cuts on the market. OPEC and other non-OPEC major producers are expected to agree on production policies in June, depending on the extent of the US-imposed sanctions on Iran and Venezuela. OPEC and its allies will meet in Vienna on April 17-18 and delegates say that another summit is scheduled for June 25-26.

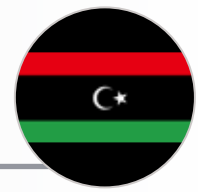
OMAN

Shell Oman Marketing Company has won a two-year contract to provide up to 50% of Oman Air's aviation fuel needs at Muscat International Airport. The company used to provide 20% of Oman Air's fuel needs. The increase will affect the company's profits positively during the upcoming two years.

Oman's government has inked an exploration and production sharing agreement (EPSA) with Occidental of Oman, a wholly-owned subsidiary of Occidental Petroleum Corporation. The EPSA agreement aims to explore, appraise, develop and produce oil and gas in Block 72 and in Occidental's operated Block 53, in Mukhaizna Field. Occidental average gross production reached 246,100 barrels of oil equivalent per day (boe/d) in Q4 2018. The company plans to exploit more oil and gas exploration opportunities in Block 72.

Oman's natural gas production is expected to exceed crude oil in 2030 due to the Sultanate's natural gas field developments, according to Rystad Energy. Oman's oil production declined in 2018, reaching 870,000 barrels per day (b/d), down from its peak in 2016 at 900,000 b/d. Rystad expects that by 2025 oil production will further decrease by 200,000 b/d. However, efforts to increase oil output were not enough to stabilize production levels. That is why Oman is more focused on natural gas developments to achieve a production capacity of 130 million cubic meters per day (mcm/d) by 2025.

LIBYA



The Libyan National Oil Company (NOC) announced on March 4 lifting force majeure at El Sharara oilfield. The 315,000-barrels-per-day (b/d) oilfield was restarted with an expected regular output for the subsequent days. Closing the oilfield caused production losses of $1.8 billion. Additionally, resuming the field work ends the conflict between the NOC and the Libyan national army (LNA) as the NOC's CEO Mustafa Sanalla refused to reopen it until the armed groups leave the field.

Libya's El Sharara oilfield has increased its production capacity, reaching around 180,000 barrels per day (b/d), according to a field engineer. The 315,000 b/d field has been restarted as the Libyan National Oil Company (NOC) announced on March 4, lifting force majeure at El Sharara oilfield after it was closed in December 2018.

A CATALYST IN THE MENA ENERGY TRANSITION:

AN INTERVIEW WITH LIV HOVEM, CEO, DNV GL - OIL & GAS

BY **MARIANA SOMENSI**

As part of DNV GL's recent Energy Transition Outlook 2018, a global and regional forecast for 2050 that is based on DNV GL's annually updated independent model of the World's Energy System, DNV GL underpins the Middle East and North Africa (MENA) region's unique disposition in the global energy transition. Egypt Oil & Gas spoke to Liv Hovem, CEO of DNV GL - Oil & Gas, about her insights on Egypt's role in this transition and learned more about the company's activities.

Could you tell us about DNV GL's activities in the oil and gas sector?

DNV GL is a global quality assurance and risk management company providing classification, technical assurance, software and independent expert advisory services to the maritime, oil and gas, power and renewables industries, as well as management system certification services, digital assurance and digital solutions across industries. We have operations in more than 100 countries. In Egypt, DNV GL has been operational for more than 60 years. We are a global organization, but with a local presence and an understanding of local market challenges that support us to find the best solutions for our customers.

Understanding the energy transition and its consequences for the oil and gas industry in the Middle East is critical for businesses, investors, and authorities. DNV GL is a trusted partner in supporting safe and efficient solutions for a more sustainable energy mix. From project initiation to decommissioning, we help customers around the world to enhance safety, increase efficiency and manage risk in projects and operations.

What is unique about DNV GL is that we draw on more than 150 years of deep technical experience and our position as the industry's partner for setting standards in helping our customers face the challenges in their energy transition journey.

What makes Egypt an attractive market for DNV GL?

Egypt's oil and gas sector has been undergoing an active transformation in the past few years. The country is expected to witness a significant growth and attract new investments in the medium to long-term future. In essence, Egypt is getting prepared to become a regional energy hub as its oil and gas industry shows comprehensive development in the upstream, midstream and downstream segments.

DNV GL is proud to be a strong partner in this journey by building trust and confidence throughout the projects and operations in Egypt, combining the best global expertise and the latest technologies the industry has to offer with our role as an independent assurance and advisory provider.

After the natural gas boom in the region, what are the company's plans for the East Mediterranean and MENA regions?

DNV GL has a proven track record in the region, not only in the upstream segment, but also in the downstream and midstream. DNV GL's research shows that the role of gas will require new pipelines including those for cross-border transmission as well as liquefied natural gas (LNG) terminals of varying scale. We see many opportunities to support the industry across the whole gas value chain, ensuring that the development and operations of new infrastructure is as safe and efficient as possible.

According to our latest Energy Transition Outlook report, gas demand is set to persist until at least 2050, and there will be increased costs for replacement and refurbishment of older pipeline systems in the MENA region. We also expect that more LNG terminals and pipelines will need to be built while regulations will become increasingly important in these developments. DNV GL is well positioned to help customers overcome these challenges.

DNV GL's Energy Transition Outlook showed that the world's energy system is going through a transition. How do you see Egypt and the MENA region contributing and being affected by this energy transition?

In our outlook, the energy world we forecast in 2050 is split almost exactly in two between fossil and non-fossil energy sources. The future seems to be a very different situation from today, where fossil fuels provide 81% of the world's energy. Nonetheless, the region is taking serious steps to fulfil its renewable energy potential and diversify its energy sources. On one hand, Jordan, Morocco, and Tunisia have set targets to transform their energy mixes. On the other hand, Egypt, Iran, and Turkey, which are the most populous nations in the region, have streamlined their policies to progress clean energy across multiple sectors and invest in renewable power generation, all of which attracts foreign investments.

Energy consumption within the MENA region is expected to increase by 36% in 2050, driven by economic growth and heightened demand from the manufacturing, construction, and transport segments in the run-up to 2040.

As the regional population grows, domestic energy demands will change and the use of electricity will grow rapidly. Our ETO forecast predicts that much of this increase will be fulfilled by renewables. This means that even though oil and gas production will continue to play a significant role for decades to come, the shift to renewables will change the locations where energy is produced, which in return impacts the region's economies and politics. Our forecast reaffirms that the oil and gas industry has a vital role to play in the energy transition, as more than half of conventional onshore oil production will come from the MENA region in 2050.

What are the key drivers for the oil and gas industry that, in your opinion, Egypt should start embracing more?

Digitalization is comfortably the leading research and development (R&D) priority for the oil and gas industry in 2019 in the MENA region, with 34% of the respondents to our industry outlook survey in MENA investing in it, compared to the second-ranked priority, subsea technology (23%). The value that can be created by applying digital technologies to projects and operations has become increasingly tangible in recent years as increased investment in digitally-enabled technologies is needed to support faster and more cost-effective production in the coming decades. Within the MENA region, efforts to reduce costs and bring decarbonization of operations into full focus are already being made today and will only continue to flourish.

Next to optimizing existing operations through digitalization, Egypt's appetite for natural gas will ensure its role as gas importer in the next six to seven years. Meanwhile, Egypt holds a central position in East Mediterranean gas developments and is aiming to become a regional gas export 'hub' to monetize its own natural gas resources and

to re-export gas from existing and potential sources of gas supply in neighbouring East Mediterranean countries. Egypt's future vision includes reaching natural gas self-sufficiency and adding value to its robust petrochemical industry. The vision further includes turning Egypt into a regional energy hub on several levels that comprise electricity, gas, and other energy resources. DNV GL is thrilled to be a part of this exciting development.

How can the oil and gas sector be sustainable amidst the increasing necessity for more environment-friendly energy sources?

Until recently, the oil and gas industry regarded the energy transition as a transformation on the horizon. However, it has become clear that this significant change is already upon us and it is influencing the entire oil and gas value chain. In 2017, more gigawatts of renewable energy were added in new power generation than those from fossil fuels, which is reflected in where lenders are putting their money.

Thus, industry leaders should be fixed on the dramatic energy transition that is unfolding. There are so many fascinating things going on in the industry right now and I see the oil and gas industry needing to look at digitalization, automation, energy efficiency, electrification and carbon capture - these technologies are causing rapid changes for oil and gas companies and their suppliers.

It is our sector's responsibility to maintain a sharp focus on decarbonization, sustainable production, cost management, and the need to embrace innovative technologies to secure long-term supply of sustainable and affordable energy. Consequently, oil and gas operations will become faster, leaner and cleaner towards the mid-century as gas fuels the energy transition.

The oil and gas industry cannot work in silos anymore. These technological leaps mean industries that were previously separate must work more closely together and learn from each other. We have to think differently about collaboration and system integration to ensure a more sustainable industry to achieve climate goals. It is our sector's responsibility to maintain a sharp focus on decarbonization, sustainable production, cost management, and the need to embrace innovative technologies to secure long-term supply of sutainable and affordable energy.

How does DNV GL Oil & Gas ensure the health and safety of its people?

I have always emphasized to DNV GL employees that our work is never so important that we cannot take the time to do it in a safe way and without jeopardizing our health.

In practice, this means taking the time to ensure our teams understand the health and safety risks associated with their work and what precautions need to be taken. This may involve taking time to thoroughly assess risks and draft plans, taking time to revaluate significant changes or uncertainties, and ultimately stopping work altogether if you think you are being exposed to, or could be exposed to, danger. Finally, it also means taking time to report incidents, especially near misses, which provide us with valuable learning opportunities.

DNV GL's culture and business is built on managing risks, and we have established systems and routines in place for that. But it all starts with health, safety and environment (HSE) leadership - this includes ensuring an awareness of HSE risks and precautions/ safe working procedures, formal training for higher risk activities and the potential consequences of not following safe working measurements. Field workers are issued with a personal copy of the Oil & Gas HSE Handbook and are required to complete an e-learning module.

The staff is involved in the development of work procedures to help develop ownership and ensure they are practical to implement, and managers are required to set a personal example. The employees' awareness is reinforced through tool box talks, pre-job discussion, routine observation/supervision and workplace inspection.

HSE behaviors are monitored through the informal observation of staff and contractors where practical.

How does the company promote diversity and develop its human resources?

As a global business, it is a priority for DNV GL to secure sustainable diversity in terms of gender and nationality in customer services and operational roles. We strive for the diversity of our workforce to be reflected at all management levels. We conduct mentoring programs, including the reverse mentoring of senior leaders by 'next generation' colleagues. We also hold an annual global summit for up-and-coming talent. We also offer 'knowledge booster' programs to enable people to experience and work with other colleagues in different territories to learn and exchange ideas.

REFORMING ENERGY SUBSIDIES: RENOVATING EGYPT'S FUEL PRICING MECHANISM

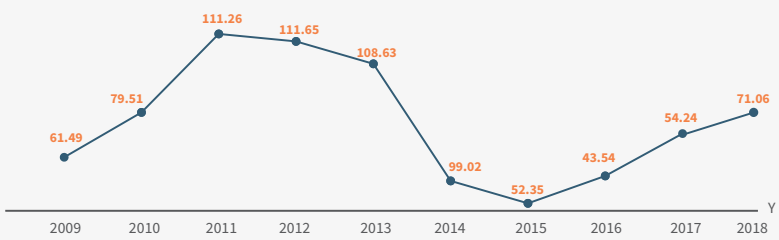
BY AMINA HUSSEIN, REHAM GAMAL & TASNEEM MADI

For decades, Egyptians have relished subsidies targeting specific social and economic objectives. Subsidizing energy plays an important role in making fuel and electricity prices affordable, however, this governmental policy could be considered unsustainable.

Fuel subsidies are a burden on the public budget, as a major contributor to fiscal deficit. In addition, it has negatively impacted the Balance of Payments (BOP),with huge local energy demand resulting in a need for more imports ,hence, energy subsidies reform was a priority for the government.

Although, phasing out subsidies significantly affects the main indicators of the Egyptian economy, such as the parameters of welfare and income distribution. Nevertheless, delaying that reform would further complicate the issues that will in return hinder economic development plans. Since the turn of the century, petroleum products and electricity prices witnessed many reforms. On the other hand, an increase in global oil prices meant that fuel subsidies increased as well.

Europe Brent Spot Price FOB (Dollars per Barrel)



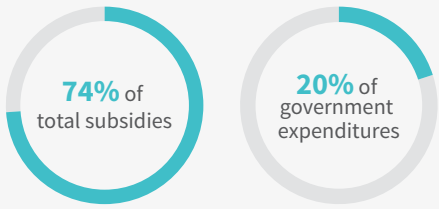
Source: EIA

ENERGY SUBSIDIES REFORM

Countries follow various approaches in implementing subsidy reform programs, as it differs in terms of the time frame and the outcomes. For instance, countries like Iran followed a radical approach, in which the reform was fully-implemented at one point. On the other hand, Morocco and Tunisia follow the gradual approach as many steps have already been taken with more reforms in plan. For example, Tunisia depends on simpler reforms accompanied with gradual hikes in prices and tariffs every quarter. A third approach was followed by Egypt and Yemen, as the two countries stepped up the process in 2014 after a period of gradual reforms.

Egypt started implementing minor reforms before engaging in the current energy subsidies reform program. In 2012, the government rose the price of gasoline. In 2013, household electricity and gasoline prices were increased. This increase was linked to consumption across multiple sectors, as was announced by the Ministry of Electricity and Renewable Energy. Before reform was first introduced, energy subsidies totaled EGP 139.5 billion, accounting for 74% of the total subsidies, and 20% of public expenditure in fiscal year (FY) 2013/14, according to the Ministry of Finance (MoF).

In FY 2013/14, Energy subsidies accounted for **EGP 139.5 billion**



Source: MoF

PETROLEUM PRODUCTS SUBSIDIES REFORM AND ITS DEVALUATION IN EGYPT

In July 2014, the Egyptian government launched a reform program to gradually phase-out energy subsidies that particularly targets fuel pricing. Therefore, in FY 2014/15, fuel subsidies significantly declined to EGP 74 billion, representing 76% of energy subsidies, 49% of the total government subsidies, and only 10% of public expenditure, according to MoF.

It is obvious that between FY 2013/14 and FY 2017/18 fuel subsidies witnessed a significant reduction. Dropping from EGP 126 billion in FY 2013/14 to reach EGP 110 billion in FY 2017/18. It is worth mentioning that fuel subsidies reached its lowest level in 2015/16, recording only EGP 51 billion, due to lower global oil prices that averaged $43.26 per barrel, according to United States Energy Information Administration (EIA).

On November3, 2016, the Central Bank of Egypt (CBE) radically freed the exchange rate of the Egyptian pound, as part of a commitment to the International Monetary Fund (IMF) to obtain a $12 billion loan, which the government viewed as a necessity to recover the crippling foreign exchange reserves and control the rise of the currency black market. This led to controlling the rising currency manipulation and speculations, but it also left a toll on the local currency. Consequently, the value of the pound noticeably depreciated. Only one day after the flotation, the Egyptian

pound went down against the US dollar by about 67%, as shown by the CBE's data. This led to another increase in fuel subsidies in FY 2016/17.

FY 2016/17 witnessed two cuts in fuel subsidies. The first was in November 2016, followed by another one in June 2017. Fuel subsidies were decreased from EGP 115 billion, which represented 81% of the energy subsidies, 57% of the total subsidies

Fuel Subsidy Reform

Launched → FY 2014/15

First Round of Subsidy Cuts → November 2016

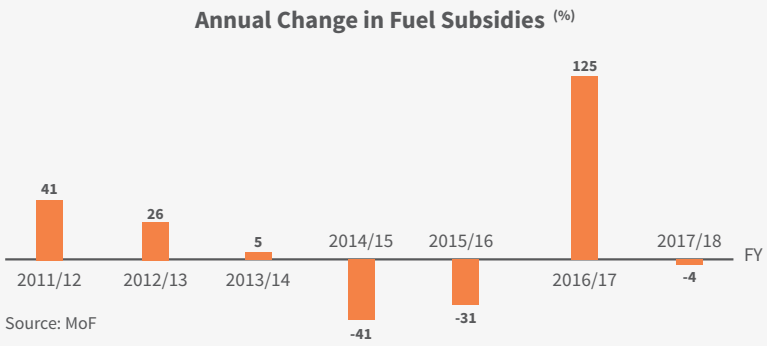
Second Round of Subsidy Cuts → June 2017

Third Round of Subsidy Cuts → June 2018

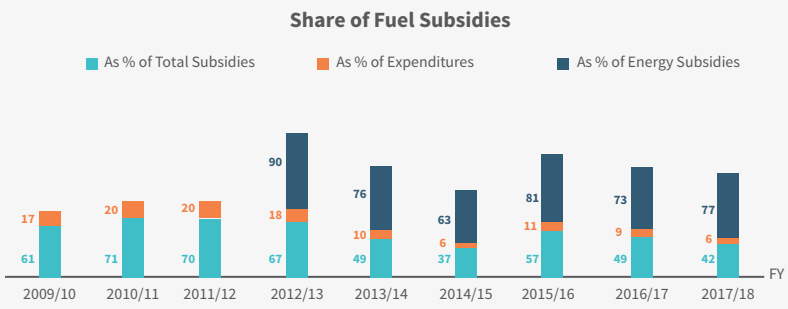
Source: MoF & MoP

and 11% of public expenditure in FY 2016/17, to EGP 110 billion in FY 2017/18, accounting for 73% of the energy subsidies, 49% of the total subsidies, and 9% of the total government expenditure. Furthermore, a third cut to fuel subsidies took place in June 2018, explained by MoF.

FUEL SUBSIDIES REFORM IMPACT ON THE EGYPTIAN ECONOMY



Source: MoF



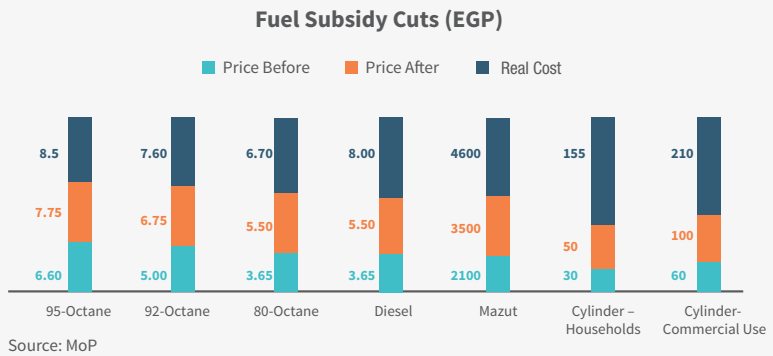
Source: MoF

1. FUEL PRICES AND INFLATION

Fuel subsidy cuts usually result in significant inflationary pressures. In 2014, fuel prices noticeably increased with the new government starting to introduce measures. Thus, households and businesses saw an increase in energy costs. For instance, subsidy cuts vividly affected the prices of mazut, as well as commercial and household butane cylinders, rising by nearly the same percentage at 66.67%. In addition, the prices of diesel, 80 octane gasoline and 92 octane gasoline increased by 64%, 78%, and 40%, respectively, according to the data of the Ministry of Petroleum and Mineral Resources.

In 2016, the government took further steps towards reforming energy prices. Accordingly, diesel prices increased by 31%, 80 octane gasoline rose by 47%, while 92 octane gasoline price was increased by 35%. However, it is worth noting that the prices increased in a decreasing rate. The year 2017 witnessed another hike in fuel prices, as diesel, 80 octane gasoline and 92 octane gasoline went up by 55%, 55%, and 43%, respectively. Accordingly, the prices differed before and after implementing the reform as per the Ministry of Petroleum and Mineral Resources.

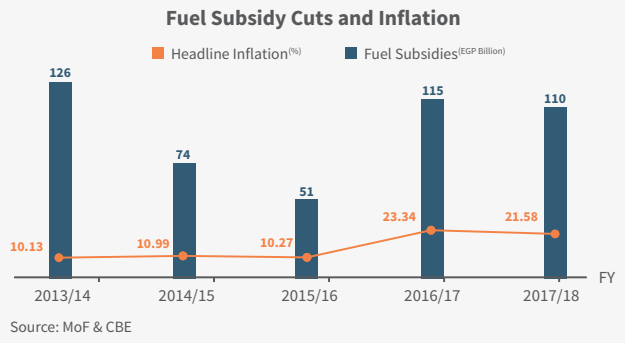
Accordingly, there were slight changes in consumer prices (inflation rate) over the period from FY 2013/14 to FY 2015/16, ranging from 10.13% to 10.27%. After the huge cuts to fuel subsidies in FY 2015/16, the following year witnessed a remarkable surge



Source: MoP

with inflation rate reaching 23.34%. Fuel subsidies then ranged between EGP 115 billion and EGP 110 billion in FY 2016/17 and FY 2017/18, respectively. Consequently, inflationary pressures cooled, with headline inflation rate gradually decreasing from nearly 33% in July 2017, to 13.5% in July 2018, according to CBE.

2. FUEL SUBSIDY CUTS AND BUDGET DEFICIT



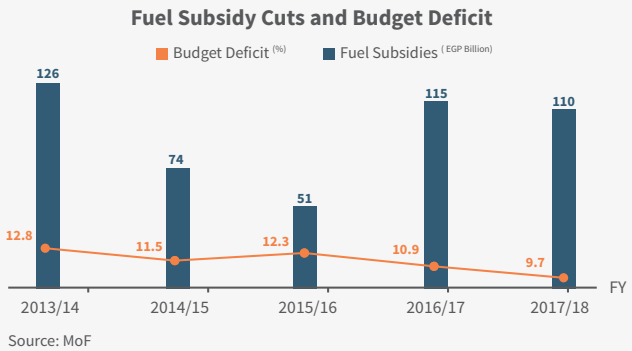
Source: MoF & CBE

Egypt's budget deficit witnessed several fluctuations over the period from FY 2013/14 to FY 2015/16, followed by a downwards trend until FY 2017/18.

According to MoF, the general budget deficit reached 12.8% of Gross Domestic Product (GDP) in FY 2013/14, decreasing to 11.5% in FY 2014/15,as fuel subsidies were decreased to EGP 74 billion. Despite the huge cuts in the fuel subsidies in FY 2015/16, the deficit increased to 12.3%, which is attributed to the existence of exogenous factors.

Budget deficit was at its peak in FY 2015/16, at the early beginning of the subsidy reform program, it then started to decrease gradually along the mentioned period. It is obvious that any action taken concerning subsidy cuts do not affect the budget deficit immediately during its implementation. Budget deficit takes time to respond back towards any changes in fiscal or monetary policies.

From FY 2015/16 to FY 2017/18, budget deficit decreased along with fuel subsidies. It is worth noting that as fuel subsidy cuts decrease, so does the budget deficit, relatively. The FY 2018/19 budget estimates an average oil price of $67 per barrel. Moreover, deficit between July 2018 and January 2019 recorded 4.2%, according to the MoF.



Source: MoF

THE NEW FUEL PRICING INDEXATION MECHANISM

In June 2018, Egypt's Prime Minister approved a new pricing mechanism to efficiently regulate fuel market. This step was encouraged by the IMF in their third review, in July 2018, under the $12 billion finance agreement. The IMF mentioned that once the automatic fuel price indexation mechanism is implemented it would help relief the pubic budget from the unexpected fluctuations in exchange rates and global oil prices. Moreover, the automatic mechanism will ensure that resources are directed to support the most vulnerable categories.

The automatic fuel **pricing indexation mechanism** was approved in June 2018.

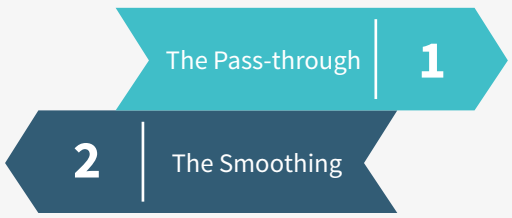
The mechanism targets adjusting fuel prices including diesel, gasoline, kerosene, and fuel oil. This process is based on the movements of global prices, exchange rates, and domestic consumption.

Emerging countries tend to adopt this price adjustment mechanism when they are on their way to eliminate fuel price subsidies. Moreover, the mechanism helps countries to protect their fuel tax revenues.

In 2012, the IMF published a technical note titled "Automatic Fuel Pricing Mechanisms with Price Smoothing: Design, Implementation, and Fiscal Implications" in which the fund explained that the mechanism is applicable through two methods. First, the pass-through method, based on which the effect of changes in global oil prices is passed to the local market, either fully or partially. Secondly, the smoothing mechanism, where local fuel prices are not highly vulnerable to global fluctuations.

The smoothing mechanism is applied through two main alternatives. The first depends on setting price bands, while the second depends on calculating moving average prices for imported fuel.

The automatic fuel pricing indexation mechanism has two methods



The Smoothing Mechanism has two Alternatives

The process of shifting to an automatic price mechanism starts with determining the automatic pricing equation. After that, comes the part of defining the targeted tax revenue from each fuel product, followed by setting the guiding prices, the applied smoothing mechanism, and the timing of applying the mechanism.

It is argued that despite the positive impact of this mechanism on budget deficit, it can hurt lower-income households. Accordingly, the IMF technical note recommended that the application of such a mechanism needs to be followed by an increase in the government expenditure. The note mentioned that the government needs to follow with expansionary policies to relief the social impact of the mechanism on the most vulnerable groups.

Several countries applied the gradual fuel subsidy cuts process combined with social safety measures. For example, in 2005, Jordan started a gradual cut in fuel subsidies. In return, the minimum wage was increased and a bonus was given to low-income public employees and pensioners.

As a start point to execute the new mechanism, the Egyptian government preferred to choose the 10% price band for the 95-octane gasoline. In January 2019, the Egyptian cabinet approved introducing the automatic pricing indexation mechanism by the beginning of Aprilon 95-octane gasoline.

According to the new system, the price of 95-octane gasoline will fluctuate along with global prices. However, the price changes will be kept at ±10% band. Currently, the price of 95-octane gasoline is EGP 7.75 per liter. With the implementation of the mechanism, it will be amended.

To apply the new system, a committee made up of representatives from the ministries of finance and petroleum, in addition to members from the Egyptian General Petroleum Corporation (EGPC), will re-price 95-octane gasoline on a quarterly basis. The price will be set according to the global price of Brent crude, the US dollar exchange rate, and other relevant costs including transportation costs.

95-octane Automatic Pricing

- The price will fluctuate with changes bands at **±10%.**
- 95-octane represents around **4%** of Egypt's total benzene consumption.

Subsidies are intended to fix the market deficiencies and help the poor pursue a better standard of living. However, these subsidies have dragged Egypt into a troubling situation, which will be hard to tolerate by any means. Energy subsidies reform is considered challenging, however, it could be a crucial step towards a more sustainable and stronger economy. Accordingly, the Egyptian government targets reducing fuel subsidies to EGP 89 billion in FY 2018/19.In Q1 2018/19, fuel subsidies stood at EGP 22.5 billion. In addition, the fuel bill is expected to reach EGP 43.5 billion during the first half of the same year. Hence, the new pricing mechanism, adopted by the government, needs to be implemented in the light of full transparency and disclosure of various steps and a thorough a comprehensive study of different fuels cost structuring.

SERVICE CONTRACTS FOR MATURE FIELDS REDEVELOPMENT: **A NEW WAY OUT**

BY **DINA EL-BEHIRY**

Service contracts are long-term frameworks used by the host governments or state-owned oil companies to organize their working relationship with international oil companies (IOCs) and benefit from their expertise, capital and know-how. This is applied without the government's need to hand over the field, allowing it to preserve its ownership rights.

Although still uncommon in Egypt, applying service contracts for brownfield operations have been subject of debate to enhance production prospects and the profitability of Egypt's mature fields. One of the main motivations behind the move towards applying service contracts is the sovereignty concerns that is solved by using this type of agreement.

WHY ARE SERVICE CONTRACTS AN OPTION?

There are many contract types used for production recovery in mature fields; one of them is the production-sharing contract (PSC), under which IOCs have the decision-making power over the field, in addition to handling the redevelopment operations needed.

Working under PSCs has been proved to be inefficient in certain cases, as host governments have a lower potential for having proper supervisory, regulatory and operating roles over the IOCs, bringing, therefore, sovereignty concerns, in addition to the tax code or some institutional deficiencies that could prevent the host governments from getting rents from IOCs.

The absence of political willpower and public support have also increased the difficulty of applying PSCs. "The cost of mature fields in terms of dollars per barrel is significantly higher than new fields, so it requires a tailored model to adopt and consider this condition," Mahmoud Wazery, Bed-1 Production Manager at WEPCO said. Due to this cost, working under PSCs, although beneficial in certain aspects, is not the best approach to address the difficulties of redeveloping the mature fields.

On the other hand, working under service contracts represents a key incentive for companies to invest in the late-stage sites, where IOCs agree to a pre-determined return in lieu for sharing the profits, and the host government remains the true owner of the field and its production.

> "THIS TYPE OF CONTRACT IS A SIMPLIFIED TOOL FOR PURCHASING AND CONSTRUCTING ACTIVITIES. THE IOCS DO NOT NEED TO COMPLY WITH THE NORMAL APPROVAL CYCLE TO PURCHASE MATERIALS AND EQUIPMENT WHICH SHALL BE USED FOR PRODUCTION."
>
> **MAHMOUD WAZERY**
> BED-1 PRODUCTION MANAGER AT WEPCO

"This type of contract is a simplified tool for purchasing and constructing activities. IOCs do not need to comply with the normal approval cycle to purchase materials and equipment which shall be used for production," Wazery added. Therefore, IOCs can rapidly order and purchase the required materials to avoid wasting time and to achieve high production levels.

AN ALTERNATIVE TO ADJUST SERVICE CONTRACTS IN A WAY THAT OVERCOMES OR MITIGATES DRAWBACKS IS BY APPLYING BUNDLED SERVICES CONTRACTS.

"Adding to that, IOCs are prone to apply their worldwide approved techniques, so they will be capable of using such a valid contract with the service company rather than waiting for signing new contracts with different parties," Wazery added.

Considering this, the main driving factor attracting both governments and IOCs to adopt this model is the ability of not handing field ownership and the produced crude oil to foreign countries. At the same time, it regulates their responsibilities to be only focused on exploration and production (E&P) operations while allowing IOCs to benefit from their expertise and technologies in operating these field types, which subsequently enables IOCs to bring new technologies into the sector, as they have the freedom to experiment innovative technologies.

SERVICE CONTRACTS DRAWBACKS

Although working under service contracts represents an efficient method to deal with the redevelopment dilemma, its framework is adjusted for potential losses in profits. Service contracts have terms and conditions that establish that if a company succeeds in increasing production from the field, it takes a percentage of the production profit; but if it does not succeed, it does not receive any share, not even from what the company has spent on the process.

Therefore, adopting the profit maximization policy is highly recommended for reducing losses when production increase fails or do not achieve the expected results. In order to apply profit maximization, operators are required to review and update decisions over time depending on the ideal needed quantity and new drilling plans based on oil market price forecasts, estimated reserves, required capital and operation cost, as well as other determinant factors.

However, IOCs' remuneration is predetermined to the production profile for the whole lifetime of the service contract, disregarding the dynamic profit maximization policy, which will still cause profit losses and make the contract framework economically inefficient if one of the variables considerably decline.

Another issue related to applying service contracts is "the lack of vision or the long-term plan [needed while applying this contract type] as the [main] priority [for IOCs] was signing oil sharing contracts to get advanced cash money to support economic deficiency," Wazery said.

"So, we need to standardize different models of service contract to adopt different and variable cases of oilfields to encourage the IOCs to invest [in these late-stage site]," he added. An alternative to adjust service contracts in a way that overcomes or mitigates drawbacks is by applying bundled services contracts. In this case, the contract model is not entirely opposed to PSCs, but complementary.

SUCCESSFUL EXPERIENCES

Mediterra is one of the companies that have proven the positive prospects of service contracts in mature fields. The company entered into a service contract in 2017 for the Sudr Matarma and Asl mature fields in the Gulf of Suez.

Since it took over the fields, the company drilled 11 appraisal and development wells, one exploration well, and completed 38 workover, recompletion and testing projects. Production has increased rapidly from around 1,750 barrels of oil per day (b/d) in August 2018 to more than 4,500 b/d in the end of November 2018.

Under the contract, Mediterra had to pay a signing bonus and make a work commitment for the first three years. The company succeeded in optimizing production within only nine to ten months after signing the contract. The Egyptian General Petroleum Corporation (EGPC) agreed to pay the company a small fee after the fields reach baseline production. Any amount above the baseline is shared between EGPC and Mediterra according to the agreed upon terms in the contract.

Kuwait Energy Egypt is another company with a successful story to tell. In the past 10 years, the company managed to produce 27 million barrels of oil from its concession in the Gulf of Suez and drill 15 wells, five of which were producible.

It is worth noting that, in many cases, production optimization through service contracts comes with the autonomy given to IOCs to choose best practices and new technologies without having to go through bureaucratic and time-consuming processes for governmental approval. Additionally, it gives the contractors the freedom to manage the brownfield in their own way to control the overheads and introduce any method needed by the company to operate the field. In a larger scale, this practice can help, in the long-term, to enrich the country's oil and gas sector with new engineering and geological technologies and know-how.

"WE HAVE TO CONSIDER THE GLOBAL EXPERIENCES AND FIND THE SPECIALIZED COMPANIES TO IMPLEMENT LONG AND SHORT-TERM PLANS FOR BROWNFIELD DEVELOPMENT."

MOHAMED TAHA
PROJECT GENERAL MANAGER AT PETROSANNAN

HOW TO EXPAND SERVICE CONTRACTS?

In order to amplify the benefits of applying service contracts and expanding its usage, Taha believes companies should not start from scratch. "We have to consider the global experiences and find the specialized companies to implement long and short-term plans for brownfield development," he said. For this, "the information availability and analysis for development must be carried out by qualified teams and in a professional way," in order to increase transparency and encourage companies to invest.

In addition, the government can cooperate with IOCs to maximize production from these fields; this cooperation can happen through bundled service contracts. "Incentive fees for each produced barrel and integrated facility networks with different companies is crucial to avoid the need to construct new facilities for each field," consequently reducing costs and increasing revenues, Wazery pointed out.

Considering the collected benefits, looking at services contracts as an alternative to redevelop Egypt's brownfields also permits the country to gradually improve the sector's expertise. In order to avoid profit losses, however, Egypt must consider the necessary incentives to encourage companies to invest, especially from the government side.

ENHANCING PRODUCTION RECOVERY IN BROWNFIELDS USING 4D SEISMIC SURVEYS

BY **MOSLEM ALI**

Conventional brownfields account for roughly 65% of global crude oil production, a percentage that is even higher in Egypt at 77%. The majority of these old fields are in the Gulf of Suez and the Western Desert, from which more than half of Egypt crude oil production comes.

Until now, new discoveries are not matching the declining production in Egypt's mature oil fields. Egyptian production of crude oil peaked in 1993, when it exceeded the level of 910,000 barrels per day (b/d); however, it has been declining since then, and it is expected to further decline and bottom out by 2029, according to Wood Mackenzie's "Egypt Upstream Summary" report.

Meanwhile, exploration and production (E&P) witnessed a number of technological breakthroughs in recent decades, one of which is four-dimensional (4D) seismic survey. 4D seismic survey is an advanced well-established data acquisition technique, which uses multiple seismic surveys of a producing field during a certain period in order to determine changes in reservoirs over time.

"In general, 4D seismic aims at visualizing the movement of fluids within the reservoir and help design the optimal production strategy with the final objective of maximizing the recovery of hydrocarbons from the subsurface. Although reservoir engineers have a very clear picture of the status at the well locations, they can only assume, or infer what happens in between wells," Panos Doulgeris, Co-founder of Delft Inversion, told Egypt Oil & Gas.

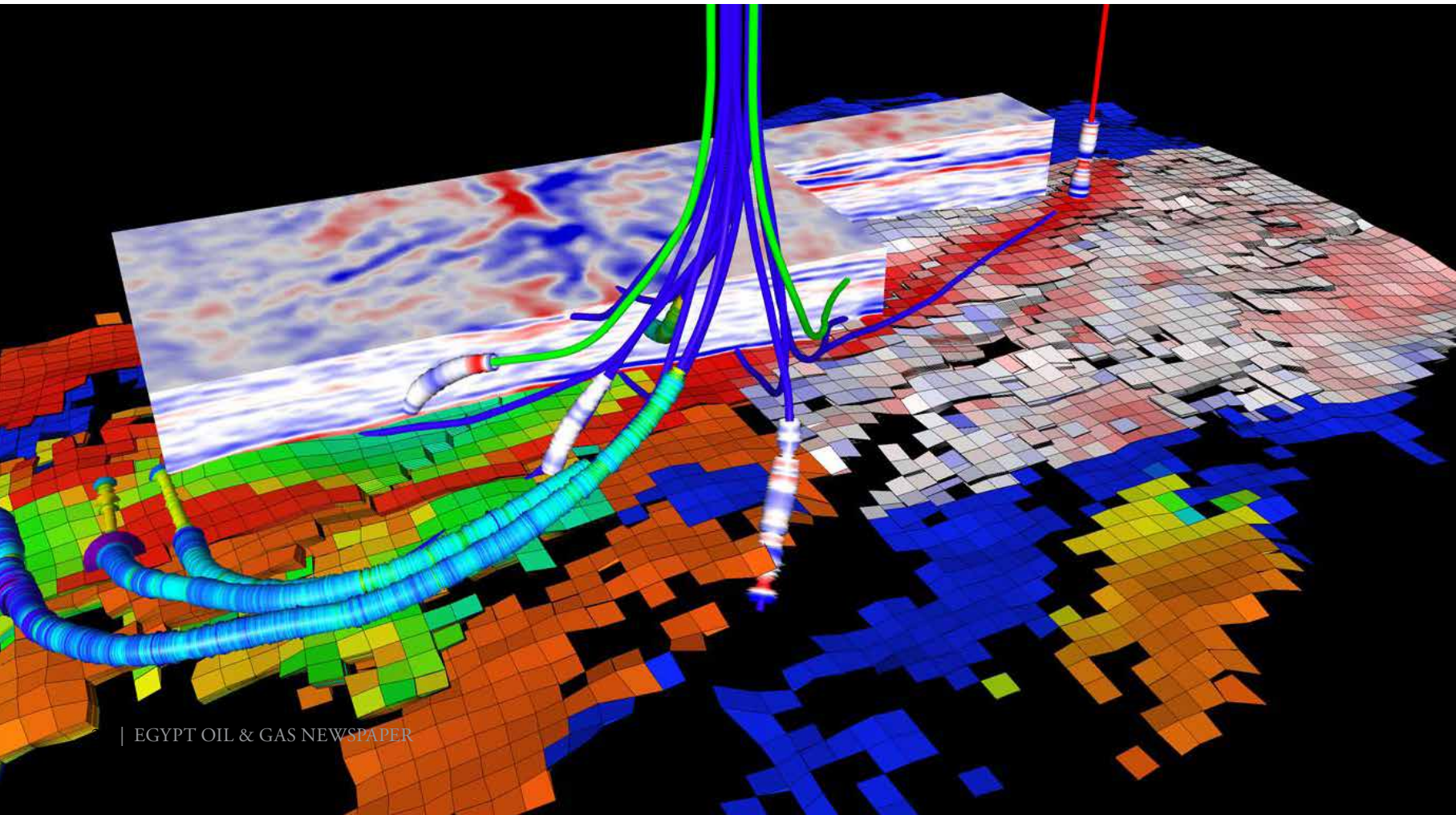
"4D seismic data have the potential to provide information on production effects away from the wells," he added. "I am always amazed by the accuracy achieved in predicting time-lapse effects within a reservoir that may lie more than 4,000 meters below our feet, just by measuring information at the surface."

Schlumberger defines the technique as 3D seismic data acquired at different times over the same area, in order to assess changes in a producing hydrocarbon reservoir over time. Changes may be observed in fluid location and saturation, pressure and temperature. It is one of the several forms of time-lapse seismic data that can be acquired on the surface or in a borehole. It is worth noting that it can also be conducted via repeated 2D surveys.

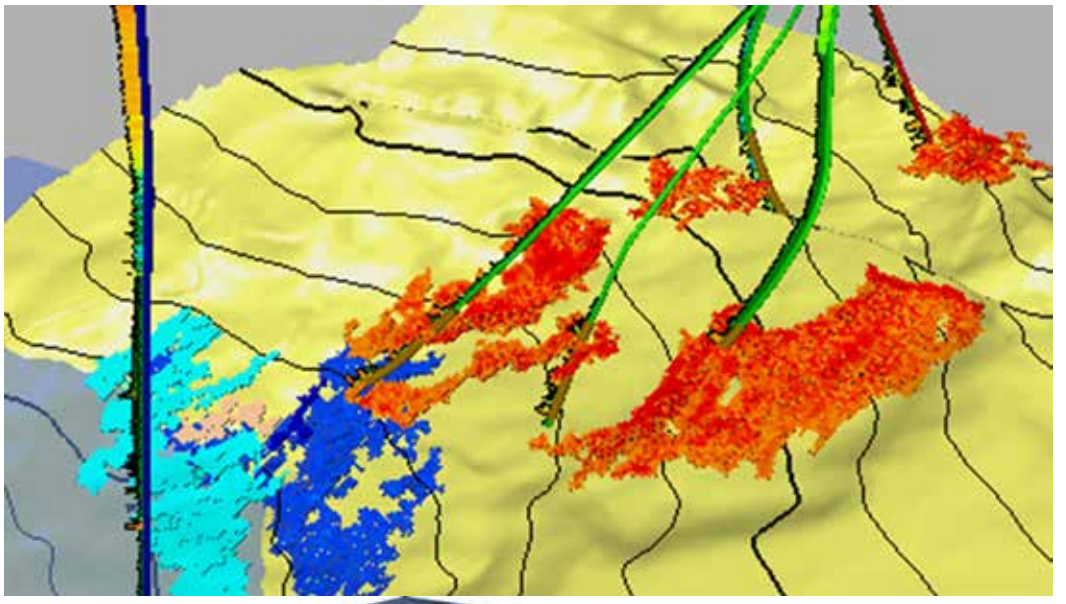
"A more precise term is repeated seismic… a seismic survey over a given area [such as an oil or natural gas field] is repeated in order to monitor production changes. Time-lapse seismic is another term used for this," according to Knut Bjørlykke and Martin Landro's paper published in Petroleum Geoscience.

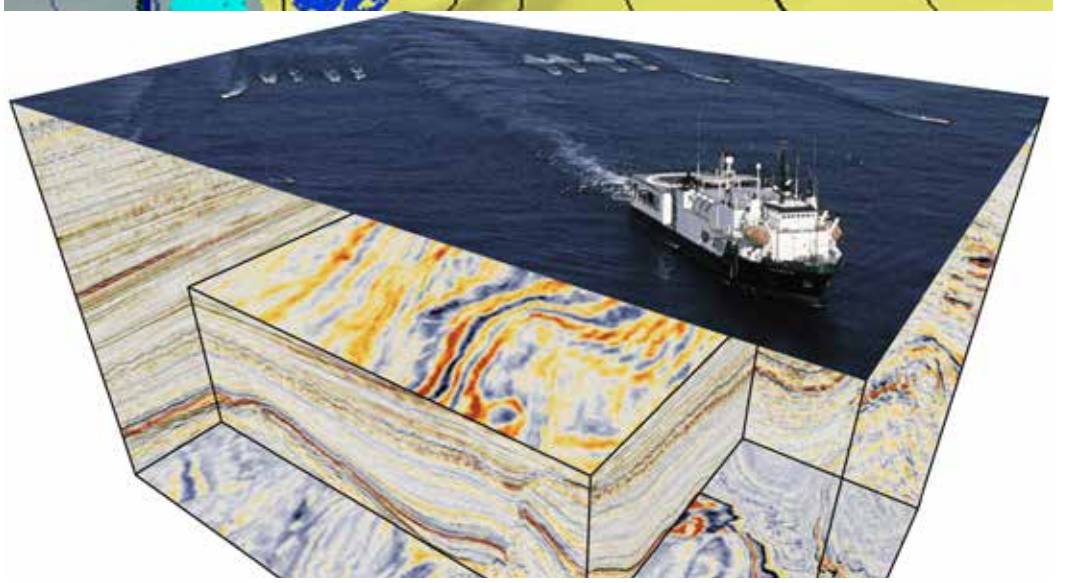
4D or time-lapse seismic survey is applied in monitoring three major things, namely the changes in a producing hydrocarbon reservoir, underground storage of carbon dioxide (CO_2), and geohazards, such as landslides and volcanoes, according to Bjørlykke and Landro.

> FROM A TECHNICAL POINT OF VIEW, THE MONITORING OF FLUID CHANGES IN THE RESERVOIR IS GENERALLY MORE CHALLENGING IN CARBONATE THAN IN SANDSTONE RESERVOIRS. THIS LIMITS THE APPLICABILITY OF THE METHOD IN EGYPT, AS MANY OF THE RESERVOIRS ARE CARBONATES..
>
> **PANOS DOULGERIS**
> CO-FOUNDER OF DELFT INVERSION



Time-lapse seismic survey could play an essential role in brownfield development, especially in terms of decision making and determining the best ways that could be used to capitalize on reserves in mature hydrocarbon fields, as it assists in reservoir characterization, identifying movement of fluid interfaces and locating reserves. It has also become a worldwide-recognized technique, as it provides higher accuracy and a clearer understanding of reservoirs, as well as guiding the selection of the best possible technique that could be applied in production, as different circumstances require different techniques.





4D SEISMIC SURVEY IN EGYPT

"The deployment of time-lapse seismic as a tool to enhance production of hydrocarbons hinges on both the commercial and the technical feasibility of the method in Egypt. On the commercial side, the profit margins of natural gas-producing assets are typically not high enough, especially offshore, to justify the cost of acquiring a time-lapse seismic survey," Doulgeris explained.

When it comes to natural gas, in specific, given Egypt's strong position in proven natural gas reserves and its rising daily production, exceeding 6.5 billion cubic feet per day (bcf/d), the limited use of time-lapse seismic in gas fields can be explained. However, with the move towards ultra-deep water in Eastern Mediterranean, a paradigm shift towards the use of more 4D seismic can occur, as the information derived from such processes can prove very valuable when drilling very expensive ultra-deep-water wells, he further noted.

"From a technical point of view, the monitoring of fluid changes in the reservoir is generally more challenging in carbonate than in sandstone reservoirs. This limits the applicability of the method in Egypt, as many of the reservoirs are carbonates. We also need to keep in mind that 4D seismic requests high-fidelity repetition of all the conditions regarding the acquisition and processing of the data in order to explore the very subtle differences between two datasets that have been acquired at a different point in time," Doulgeris indicated.

"Land data, especially from the Western Desert, often exhibit low quality that may act as an impediment for the further deployment of 4D seismic surveys. However, technological advances in the processing of time-lapse data, such as joint seismic inversion, can increase the value of information extracted and help in this way build the required business cases around the use of 4D seismic in Egypt," he added.

[4D SEISMIC SURVEY] ASSISTS IN RESERVOIR CHARACTERIZATION, IDENTIFYING MOVEMENT OF FLUID INTERFACES AND LOCATING RESERVES.

Speaking of how Egypt can boost the use of modern technologies in the petroleum sector, the Co-founder of Delft Inversion stressed his belief that innovation in the sector is not only driven by major service and operating companies, but also smaller technology companies.

"A major hurdle these companies could face to extend their services to Egypt is the long registration and verification time required to start doing business. The simplification of the process along with fiscal motives for operators to test new methodologies would certainly grow the influx of new modern technologies into the country," he noted.

BUSINESS ASPECTS

The acquisition, processing and interpretation of data collected in 4D seismic surveys have budgetary consequences. Increasing the recovery factor of a reservoir, even by a small rate, significantly impacts revenues, which is a determining factor in brownfield development, according to CGGVeritas, a Paris-based geoscience company that has been using 4D seismic for more than 20 years now.

"With maturing basins and even deeper and more complex frontiers, the importance of extending the life of and maximizing recovery from producing fields has never been greater," the French company explained.

The technique clearly provides economic and business advantages, as it facilitates the detection and extraction of oil trapped below complex surfaces. "Since 4D seismic can be used to identify [oil] pockets, it is easy to understand the commercial value of such a tool. However, if the reservoir geometry is simpler, the number of untapped hydrocarbon pockets will be less and the business benefit correspondingly lower," Bjørlykke and Landro wrote.

Although the accuracy of the technique was originally limited to being a qualitative indicator of production effects, advances in technology, especially 4D processing, have allowed the production of more precise 4D seismic data that is transformed into the context of reservoir engineering.

The technique also witnessed a shift from being a purely geophysical interpretation tool to a reservoir management tool, which can be used to assess the remaining hydrocarbon volumes and optimize the recovery strategy through quantitative estimates of changes in reservoir properties such as fluid saturation and pressure, according to CGGVeritas.

As Egypt aims at meeting the rising local demand and ensuring energy security, 4D seismic survey could be a key technology to help in capitalizing on mature oil and natural gas fields, thus increasing brownfield production alongside that of new discoveries, while introducing state-of-the-art technologies, modernizing production recovery practices, as well as training the needed technical expertise to apply modern techniques.

PRE-STACK, POST-STACK INVERSION IN BROWNFIELDS

BY **SARAH SAMIR**

In order to reactivate the production from mature fields, it is important to conduct an accurate assessment for wells in oil and natural gas brownfields to enable best results. For this, conducting seismic surveys and ensuring that the data is collected and correctly interpreted is essential.

Seismic inversion techniques have been used for a long time to estimate and model the physical characteristics of both fluids and rocks in oil and gas fields. After collecting seismic data, operators use the seismic inversion in order to transfer the collected data about "rock physical properties to obtain an earth model," using both pre-stack and post-stack inversion methods, according to a study published by the International Scholarly and Scientific Research and Innovation.

Before beginning the seismic inversion, a feasibility study should be conducted using Rock-physics cross plots to determine the suitable inversion type to separate gas sand, water sand, and shale. “The Cross-plot is to create two dimensional cross plots between 2D/3D seismic data (attributes) and any other attributes or well data. The data can be analyzed in multiple manners, using different kinds of color coding and data selection tools," Ali Maher, Senior Geophysicist (Seismic Interpreter & Analyst) for Area Evaluation and Promotion, Agreements and Exploration Department at the Egyptian Natural Gas Holding Company (EGAS), told Egypt Oil & Gas.

PRE-STACK INVERSION

Pre-stack inversion is called AVO inversion, as it deals with pre-stack seismic data; near, mid and far angle-stacks. It is also known as simultaneous inversion as it maintains the physical relationships between P-impedance (Ip), S-impedance (Is) and density (ᵖ), Maher explained.

P-impedance is the product of P-wave velocity and density, while S-impedance is the product of S-wave velocity and density. The cross plot between the P-impedance and S-impedance can lead to lithology separation and pore fluid type identification to characterize the reservoir. According to Maher, “if the separation occurs regarding to S-impedance, so pre-stack inversion should be applied," because post-stack inversion will not be sufficient in this case.

"Seismic inversion attributes are normally derived from post-stack inversion and pre-stack inversion techniques," according to a paper written by Justin Obilo and Sofolabo Adekunle. Pre-stack inversion is usually used to discriminate fluid when the shear impedances (Zs), acoustic impedance (Zp), and the ᵖ information is available.

Most of seismic inversion attributes are post-stack seismic inversion. However, the attributes that use CMP gathers, including amplitude versus offset, should be studied before stacking, which makes it pre-stack seismic inversion, according to a thesis submitted to the Department of Physics, Kwame Nkrumah University of Science and Technology.

Additionally, pre-stack inversion is useful for redeveloping brownfield “as it gives more details about reservoir properties” through providing “multiple impedance attributes and more resolution about lithology, porosity, and the fluid filling the pores,” as Shady Negm, CEO of Earthtec, told Egypt Oil & Gas.

According to the International Scholarly and Scientific Research and Innovation’s study, pre-stack seismic data have amplitude variations, which reflects the existence of natural gas in the area tested.

It has an incident angle that is more than zero, and "a P-wave with incident angle θ, can be converted to transmitted and reflected P and S waves," whose amplitudes could be determined using Zoerppritz equations, which are a number of equations used to describe seismic wave energy at interfaces lying between two different rock layers, according to the study.

The use of pre-stack inversion comes from the operators' need to extract information from seismic data to solve the geological problems that cannot be answered by the post-stack inversion techniques. "The S wave velocity (Vs) information used in pre-stack seismic inversion can solve, e.g., the duality between porosity in carbonates and shales, in which Zp alone cannot solve," Rafael Amaral Cataldo and Emilson Pereira Leite explained in the article entitled, 'Simultaneous Pre-stack Seismic Inversion in a Carbonate Reservoir'.

WDDM CASE STUDY

Pre-stack seismic inversion testing was applied on a natural gas brownfield in Egypt’s offshore in the West Delta Deep Marine (WDDM) concession. The pre-stack was carried out on the Scarab Field in order to "evaluate the hydrocarbon potential of newly identified stratigraphic traps," according to an article published by the Leading Edge.

The deterministic pre-stack seismic inversion was conducted on the field's 3D seismic data in order to characterize the traps recognized in the field's slope canyon-channel system.

The field, which started production in March 2003, is believed to be declining in production. That is why conducting seismic inversion was expected to result into optimizing the development plans, characterizing bypassed traps, and boosting production.

"The pre-stack algorithm used in this work is constrained sparse spike inversion, which models the input seismic data as the convolution of the seismic wavelet with a reflection coefficient series and imposes additional constraints to limit non-uniqueness in the inverse problems," the article explained.

Seven horizontal wells got tied with a consistent correlation to the full-stack seismic. The operators estimated three wavelets from the field's seismic amplitude of the near, mid and far stacks as well as the adequate logging length wells, according to the article.

"Facies classification using the seismic inversion and Scarab interpreted formation micro-imager (FMI) logs delineated the thick-bedded and thin-bedded gas sand encased in the bypassed remnant levees (RML and RSL) and in lateral accretion packages (LAPs) traps," the article said. Seismically studying the field could identify the incompletely drained and untapped compartments in the Scarab brownfield.

POST-STACK INVERSION

Another technique used in seismic data analysis is post-stack seismic inversion. It is used to attain information about the acoustic impedance, which is commonly used in porosity modeling and lithology delineation, according to Obilo and Adekunle's paper.

The post-stack seismic inversion is used to develop the mature fields, to get more resolution of the reservoir and more details about the field's properties in order to increase the field's production, Negm explained.

Regarding Cross-plot, "if the separation occurs regarding to P-impedance, so post-stack inversion should be sufficient enough to discriminate between gas sand, water sand and shale (pre-stack inversion could be used also)," Maher said, but if there is no separation based on P-impedance or S-impedance, then both techniques will not be sufficient for separating fluid and lithology.

While conducting the post-stack seismic inversion, operators assume that the seismic traces in the field are zero offset, which means that these traces "hit interface and reflect with zero angle," according to the International Scholarly and Scientific Research and Innovation's article.

> IN 2017, EGYPT USED THE AID OF POST-STACK SEISMIC INVERSION TO PREDICT THE NET PAY THICKNESS FOR OUR DISCOVERY NOROOS IN THE OFFSHORE NILE DELTA.
>
> **AHMED KHAIRY**
> GEOPHYSICT AT PETROBEL

The article explained also that operators use post-stack inversion in order to transfer stacked seismic data into a P-impedance model. The post-stack seismic inversion technique is "mainly based on one-dimensional convolutional model."

"An equation for inversion of post-stack seismic data can be concluded: S=1/2WDLp, where S is stacked seismic trace, W is wavelet matrix, D is derivative matrix and Lp is logarithm of P-impedance," the article pointed out explaining how data is analyzed during post-stack seismic inversion.

Among the studied attributes during seismic inversion process is the mean amplitude, which is a post-stack attribute that "calculates the arithmetic average of the amplitudes of a trace within a specified window. It is applied in the detection of trace bias which could be indicative of a bright spot," according to Kwame Nkrumah University of Science and Technology's thesis.

Another post-stack attribute is the root mean square (RMS) amplitude, which assesses "the square root of the sum of squared amplitudes, divided by the number of samples within the specified window chosen." This post-stack amplitude gives room for reflectivity measurements and enables hydrocarbon indicators direct mapping, the thesis explained.

Post-stack attributes further include maximum amplitude, coherence, dip; azimuth, and curvature.

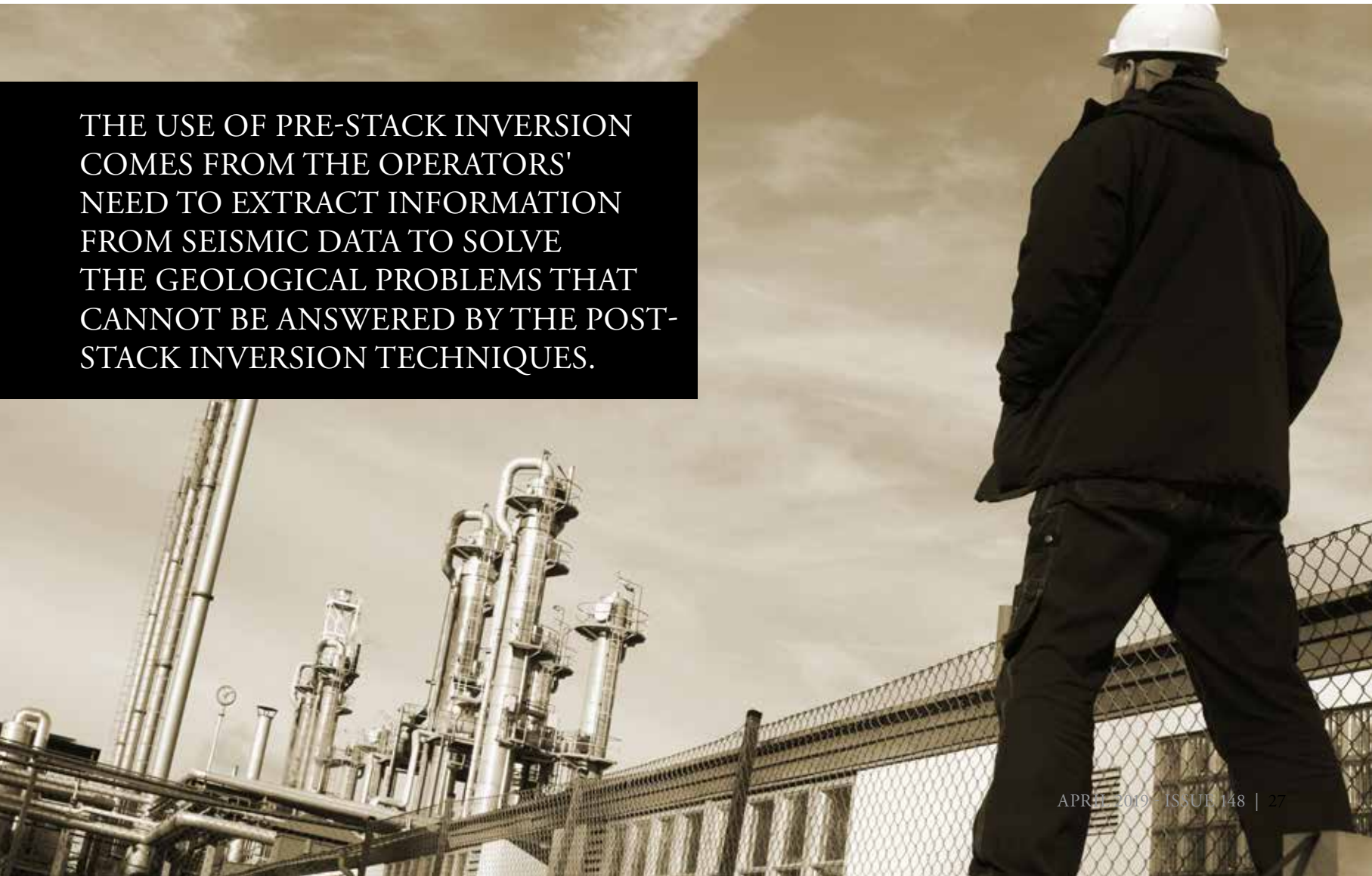
"In Egypt, we have many cases where the post and pre-stack inversion approaches are applied successfully especially in the Nile Delta and Mediterranean areas," Ahmed Khairy, Geophysict at Belayim Petroleum Company (Petrobel), told Egypt Oil & Gas. Meanwhile, Negm explained that post-stack seismic inversion is used on a wider scope as it is used in the case of stacked data, as in the Matrouh basin in the Western Desert.

The North African country used post-stack seismic survey in important projects. "In 2017, Egypt used the aid of post-stack seismic inversion to predict the net pay thickness for our discovery Noroos in the offshore Nile Delta," Khairy noted.

"Post-stack inversion provides only acoustic impedance, while pre-stack inversion provides us with acoustic impedance, shear impedance and density, and other quantitative inversion attributes. We can also then predict volumes of porosity, permeability and other petrophysical parameters. This can be very useful in the quantitative characterization for our reservoirs during the appraisal and development phases," Khairy said, adding that pre-stack inversion is more powerful but it is always limited to the pre-stack data availability.

When it comes to selecting a technique between pre-stack and post-stack inversion, operators should consider few things. Negm explained that companies select the appropriate technique based on the nature of the field they deal with and the results they want to accomplish. Moreover, Negm added that the two techniques can be used in the same project "in stage of porosity, lithology and fluid identification."

Therefore, whether it is pre-stack or post-stack inversion, brownfields will highly benefit from the seismic inversion on many levels, and Egypt has already recognized the importance of this approach in accessing many of its fields.



THE USE OF PRE-STACK INVERSION COMES FROM THE OPERATORS' NEED TO EXTRACT INFORMATION FROM SEISMIC DATA TO SOLVE THE GEOLOGICAL PROBLEMS THAT CANNOT BE ANSWERED BY THE POST-STACK INVERSION TECHNIQUES.

LOOKING AT **BROWNFIELDS** FROM AN ECONOMIC PERSPECTIVE

BY: **MAI EL GHANDOUR**

Redeveloping mature fields can have an incredible economic value, only if they are managed efficiently. For this reason, oil and gas industry leaders need to shift their focus to improving efficiency rather than achieving growth, which is often driven just for the sake of boosting profits and gaining competitive edge. With those schemes dominating today's oil and gas sector, oil majors are looking for ways to better manage their brownfield projects.

Recently, oil prices have been increasing after a harsh downturn that hit the market in 2014. Therefore, the economics of brownfields are totally changing in a way that will affect the entire agendas and strategies of oil companies around the world. In addition, oil producers are becoming increasingly anxious that governments will have to interfere and pump the prices even more. This spike will affect international oil companies (IOCs) from countries with stable economies that are heavily reliant on oil fields. Hence, IOCs are left with no options other than beginning to alter their plans to adjust to the reality of booming prices.

Consequently, to optimize the efficiency of brownfields, field experts, IOCs, national oil companies (NOCs), and government officials in Egypt have to revisit their strategies in order to cope with the common attributes and trends emerging globally.

CUTTING COSTS IN BROWNFIELDS

Exploration and production (E&P) is the heart of brownfields in Egypt and in the oil and gas industry as a whole. Due to its high investment, high profit, and high risk, brownfields' economic benefits become unstable, and thus, are subject to unpredictable factors.

According to an article published by Sheppard and Raval in the Financial Times in 2018, BP has once called off a project in the Gulf of Mexico that was scheduled to start producing oil in 2020 because its forecasted cost surged much more than expected, reaching more than $20 billion. However, after studying the situation carefully, BP returned with a more efficient plan, capping costs at $9 billion instead.

Hence, the oil and gas sector is trying its best to fulfill the persistent urge to cut costs while harnessing technology. However, the sector's trial might pose some conflict, leaving many to wonder if the industry is making miscalculations.

It is almost impossible to measure the expected reserves for oil and gas and its economic benefits. Therefore, it is very important to assess three aspects that will likely guarantee the success of brownfield projects. These aspects are: the project's scope, time, and cost, which simultaneously optimize brownfields' efficiency.

Discovering oil reserves is hard and bears a very high drilling cost. It is estimated that E&P companies may spend as much as 50% of their capital budgets on drilling. For this reason, investing in enhancing production from existing fields, although challenging, can still be more cost-effective.

Ahmed Hassan, Chief Reservoir Engineer at PICO International Petroleum, previously told Egypt Oil & Gas that one great advantage and an excellent opportunity for the development of brownfields in Egypt is the existing infrastructure. The infrastructure of brownfields in the country has a great impact on its efficiency, saving both time and money. Thus, the economics of the development of oil fields is enhanced at large because of its convenient infrastructure.

UTILIZING CONVENIENT INVESTMENTS

Most investors will choose to explore and develop oil and gas investments in the regions with the highest development value. Otherwise, the result could be a spike in prices and a shortage in supply which directly will affect the global economy as a whole. According to Sheppard and Ravel, how IOCs choose to invest in the oil and gas sector will determine the way the industry giants, such as Shell and BP, will look like in the future.

Currently, investors are driven by the need to allocate their costs efficiently after the oil prices have risen, leading them to drop mega projects altogether. Complex long-term investments are being shelved as emerging economies in Africa and Asia expand. From the Arctic exploration to the Canadian oil sands, which were once mega project's strong suit, the industry is now shifting towards a more efficient type of investment. Consequently, it is now easier to inject capital in short-term projects instead as they pay off faster. When a project takes up to 10 or more years to become profitable, then it is better to abandon it, although not so long ago, it was normal for project completion in the industry to take about 10 years. Nowadays, IOCs tend to focus more on maximizing returns to shareholders with a return on investments.

Some oil companies are often criticized for shelving complex long-term investments, but this is actually a smart strategy to keep up with the demand of a 100 million barrels per day (mb/d) that is the result of the expansion of emerging economies in Asia and Africa.

However, short-cycle projects are not the only ingredient when it comes to cost-efficiency optimization of brownfield projects. Bottlenecks and the quality of reserves also help determining how the economic feasibility of brownfield projects will be handled.

Egypt's oil and gas reserves are abundant, and here is where investments change everything. The investment climate in Egypt is attracting foreign capital more than ever. In most circumstances, and in Egypt's case specifically, turning a blind eye to investments would not really be a wise thing to do.

Although fluctuating prices remain a threat for IOCs, investing in energy companies is the way out from any long term risks. Investors should start thinking of ways that are not too wasteful and do not yield inadequate returns. Because after all, no one wants to invest their capital in multi-billion-dollar projects that is neither in demand nor has a return on investments (ROI).

IPR CELEBRATES USEBC 40TH ANNIVERSARY

IPR Energy Group is an international group of energy companies engaged in oil and gas exploration, production, acquisitions, infrastructure development, technical services and training. IPR has been a pioneer in the use of technology worldwide to improve petroleum recovery since 1981. Solutions recommended by the company's Technical Services Division, which have been implemented in oil producing regions around the world, even decades ago, are still used today in IPR's own exploration and production (E&P) portfolio with impressive results.

This year marks the 40th anniversary of the US – Egypt Business Council (USEBC), which has played a key role in strengthening the strategic and economic alliance between the two nations since 1979. The USEBC 40th anniversary celebrated the strong strategic, economic and commercial partnership between Cairo and Washington DC.

IPR is sponsoring the yearlong activities celebrating the anniversary, led by an event featuring H.E. President Abdel Fattah El-Sisi on the sidelines of the United Nations General Assembly in September, as well as a number of ministerial visits by Egyptian cabinet members to the US, such as the Minister of Petroleum, Eng. Tarek El Molla; in addition to the Minister of Investment and International Cooperation and the Central Bank of Egypt (CBE) Governor on the sidelines of the International Monetary Fund (IMF) and the World Bank meetings in April.

Events will also include the inauguration of USEBC-AmCham Egypt "Egypt Internship" program in February, the US-Egypt Strategic Dialogue in Cairo, the launch of USEBC-American University in Cairo (AUC) School of Business "Egypt Fellowship" in October, and a USEBC 40th Anniversary Event in Cairo that is expected in the next fall or winter.

Minister El Molla recently visited the US, where he met Bassam Mahmoud Dabbous, IPR Group CEO, and Kareem Mahmoud Dabbous, Director of Asset Management at IPR Group, on the sidelines of the American Chamber of Commerce and the USEBC meetings in Washington DC. The meeting was held after El Molla's successful participation at the Cambridge International Energy Research Week (CERAWeek) in Houston, Texas.

Mahmoud Dabbous, IPR Group President, affirmed that El Molla achieved unprecedented successes during his participation at the CERAWeek 2019, where major international oil companies, finance institutions and the World Bank expressed a strong confidence in the petroleum sector and the successes that it has achieved during the last few years.

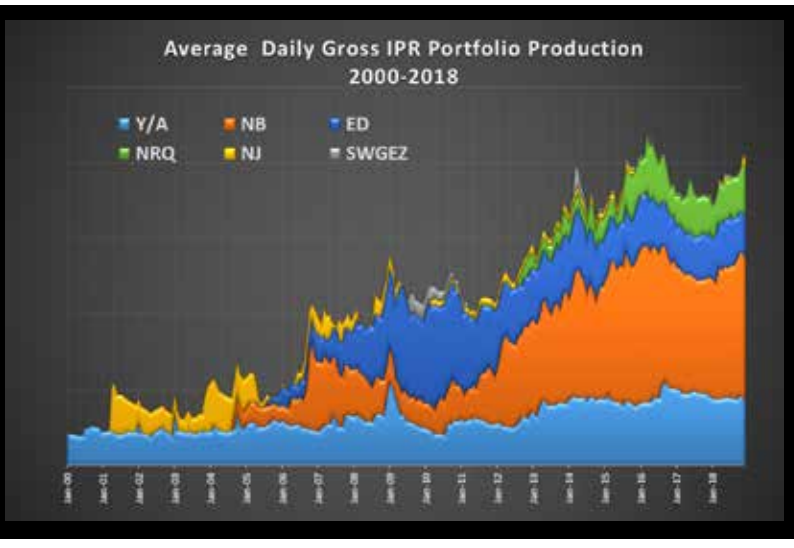
El Molla also met senior US administration officials, led by the US Energy Secretary Rick Perry, who appraised the Egyptian petroleum sector's continuous growth and its ability to attract many international companies, especially from the US, to increase their activities and investments in Egypt.

REDEFINING E&P TECHNOLOGY FOR 38 YEARS

Since 2013, IPR's E&P business has experienced strong growth in production and reserves averaging more than 180% in annual reserves replacement ratio. The Oilfield Services Division continues to grow and is now qualified in Egypt to deliver more than 30 services, including low-cost drilling and workover. IPR continues to demonstrate responsible growth, and has commissioned a pioneering water disposal well in Egypt's Western Desert, and uses available APG to power oilfield operations.

IPR owns 10 concessions in Egypt with assets and production facilities, both onshore and offshore oilfields, as well as high-tech offshore oilfields. The company is building a global business that meets the energy needs of the present and the future, operating with the highest standards in a manner that promotes economic development, environmental protection and social responsibility where it operates.

El Molla has publicly acknowledged IPR as an example of experience and credibility, which is one of the seven pillars in the Modernization Project that aims to capitalize on the industry's strengths to improve the Egyptian oil and gas sector.



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PACE 2019 GATHERS OIL AND GAS LEADERS AND UNIVERSITY STUDENTS

BY **MOSLEM ALI**

The second edition of the Petroleum Arabian Conference and Exhibition (PACE) was held from March 21 to 23 at the American University in Cairo (AUC), aiming to achieve balance between theory and practice. The Society of Petroleum Engineers (SPE) Student Chapters in the AUC, Suez University and Cairo University, organized the event, which was attended by around 390 students.

The conference provided its attendees with panel discussions and around 20 technical sessions enabling field experts to share their knowledge and experiences.

Advanced Energy Systems (ADES), DEA Deutsch Erdoel AG, and Halliburton were the platinum, gold, and silver sponsors of the event, respectively. Other sponsors included Kuwait Energy Egypt; Shlumberger; Baker Hughes, a GE Company (BHGE); Chevron; Weatherford; BGS Energy Services (BGSES); BP; and Oil and Gas Skills (OGS). Egypt Oil & Gas was the event's media sponsor and official publication.

OPENING CEREMONY

The conference began with an opening ceremony that included a panel discussion. Panelists were Mohamed Farouk, ADES CEO; Colby Fuser, Halliburton Vice President - Egypt and Libya; Kamel Al-Sawi, President of Kuwait Energy Egypt; Karim Badawi, Schlumberger Managing Director Egypt and East Mediterranean; Hussam Abu Seif, Egypt General Manager at BHGE; and Mostafa Fouad, BGSES Global Director. Dr. Mohamed El Ahmady, Professor of Petroleum Engineering at the AUC, moderated the session.

The discussion focused on the youth's role in the oil and gas sector to develop the industry as well as the importance of spreading values such as resilience and team work.

> "WHAT WE NEED TO DO IN THE COMING YEARS AS AN INDUSTRY IS TO PROMOTE THE OIL AND GAS INDUSTRY TO THE NEW GENERATIONS. I DO NOT THINK THAT THE INDUSTRY HAS ADOPTED TO THE NEW CHANGES IN OTHER SECTORS THAT INTEREST THE NEW GENERATION. WE HAVE A DUTY IN THE OIL AND GAS SECTOR TO WORK FOR THE NEW GENERATION, TO MAKE A MORE ATTRACTIVE ENVIRONMENT FOR THEM."
>
> **HUSSAM ABU SEIF**
> EGYPT GENERAL MANAGER AT BHGE

Farouk was the first to speak. In his remarks, he told attendees about how he switched from academia to lead a regional drilling company. Farouk also indicated that despite the global oil crisis that hit the world in 2014, his company still achieved its highest growth rates when the prices dropped to $28 per barrel. That is why, as he noted, challenging market conditions are not an excuse for failure; they could be, in fact, an opportunity for success. Moreover, he stressed that university students must focus on efficiency and innovation to exploit their knowledge about modern technologies and incorporate robotics and artificial intelligence (AI) into the industry to reshape its future.

Fuser followed with a speech in which he focused on the importance of setting a target and a strategy that enable students to develop the industry. "Setting the right pace is extremely important, because that pace not only allows you to reach an end-result, but it also allows you to bring your peers to get to that final step. I can promise you that you do not get to the final step alone. You get there because you build a good network. You get there because you have not only the network that works for you, but it also works with you," said Fuser.

During the panel dicussion, El-Sawi stressed that the most important value that affects everyone in the industry is volatility. "Since 2013, we have seen many fluctuations hit the oil market globally. Therefore, it is necessary to acknowledge that the era of easy oil is diminishing with the rise of unconventional resources, which requires highly skilled and trained calibers," he said.

Abu Seif stated that the oil and gas sector has a challenging environment, which has increased the importance of knowing how to run companies under these challenging circumstances, especially after the turmoil affecting the oil market.

"What we need to do in the coming years as an industry is to promote the oil and gas industry to the new generations. I do not think that the industry has adopted the new changes in other sectors that interest the new generations. We have a duty in the oil and gas sector to work for the new generations, to make a more attractive environment for them," he added.

Building on this, Badawi stressed that the industry needs to be "positively motivated with the new advancements in technology, [which will make] this industry very strong." Mindsets and innovation are crucial to keep the students interested in the industry, as Badawi noted.

He also stated that, on the digitalization front, a new era for the sector is beginning, with many companies investing in research and development, and innovation, especially as "students come in with fresh perspectives, new ideas and solutions to engage in the industry."

Additionally, Fuser explained that despite the challenges in the sector, opportunities always arise to understand the industry components well. He also noted that the industry needs to focus more on its employees and to encourage the students to be creative.

"What we are missing on the last four to five years is that we had to focus on efficiency, cost and everything else. What we are going to see moving forward is a focus on employees. I see generations coming out of college into the workforce pushing companies into implementing digital solutions; so bring your best to the table," said Fuser.

Fouad advised the students to focus on how to reach their goals in the career they already chose, noting that although the sector witnessed two downturns in 2008 and 2014, only the best people had the ability to face these troubles and remain in the company.

Farouk further explained the challenges facing supply and demand in the global energy markets since the 1900s. He expects that by 2035 or 2040, energy will reach its peak due to modern technologies, noting that today the energy sector sees a competition between the cost of oil per barrel versus the cost of kilowatt-hour from renewable resources.

Additionally, he advised the students to focus on the factors that could help them succeed, such as emotional and social intelligence, and the ability to understand their colleagues and work together as a team, as well as assessing their own strengths and weaknesses through scientific tools.

Panelists shared their experience with the students in order to help them relate to their career paths in the industry. "It is not only the grades that matter, but also extracurricular activities," Badawi said, explaining how he began his career in Schlumberger after a recruitment event in the AUC, where he was studying mechanical engineering and not thinking of pursuing a career in oil and gas yet.

Moreover, Al-Sawi told students that he was a petroleum engineer just like them, as he graduated in 2002 from Suez University, and then obtained a master's degree in management. He advised students to be positive, proactive and productive, adapt to changes, be open to available opportunities all the time, and always learn from their mistakes.

Meanwhile, Fouad said that skills are either gifted or acquired, and, in both cases, one has to work on them, stressing that learning from history will help predict what could happen in the future.

Abu Seif advised the students to develop their ability to listen, process, and then take the right decision.

The discussion was well received by attendees. "What brought me to this event is the gathering of all these oil and gas companies as well as engineers and students from different universities," said Kur Akuien, a South Sudanese undergraduate student in Suez University, studying drilling at the Faculty of Petroleum Engineering. "I was surprised to see this diversity of the high-profile industry leaders attending on the first day," he added.

TECHNICAL SESSIONS: A PLATFORM FOR UNDERSTANDING INDUSTRY DYNAMICS

The conference provided attendees with 20 technical sessions. One of them was introduced by Ahmed Sami, Associate Technical Professional at BGSES, about managing pressure drilling (MPD), "which is a subject that students do not currently study in universities," Sami told Egypt Oil & Gas, adding that there was a positive interaction while explaining the topic.

"Introducing our solutions and new technologies to the students makes it easier for the company to recruit and train them when they graduate in a couple of years," Sami explained, when asked about the company's interest in being a technical sponsor of PACE 2019.

Another session about cementing was delivered by Reem Henri, Wireline and Perforating Reservoir Evaluation Engineer at Halliburton. "It is the policy of our company to invest in youth through internships and events like this, bringing market knowledge to academia," she also told Egypt Oil & Gas.

"We want university students to know what will happen after graduation and how the environment in the office or the field will look like, as they are our future assets. I was chosen to take part in this event as I was the first Halliburton female field engineer in North Africa to work on wireline, so we wanted to send a message to young ladies that there is an opportunity for them in technical roles on the field," Henri added.

"I was surprised with the level of knowledge the participants had, despite that most of them do not have logging courses in their curriculums, which reflects their efforts in research and teaching themselves. This shows how the new generation is investing in their own value," she added, advising students to engage in many activities alongside their studies and focus on enhancing their network.

> "WHAT WE ARE MISSING ON THE LAST FOUR TO FIVE YEARS IS THAT WE HAD TO FOCUS ON EFFICIENCY, COST AND EVERYTHING ELSE. WHAT WE ARE GOING TO SEE MOVING FORWARD IS A FOCUS ON EMPLOYEES. I SEE GENERATIONS COMING OUT OF COLLEGE INTO THE WORKFORCE PUSHING COMPANIES INTO IMPLEMENTING DIGITAL SOLUTIONS."
>
> **COLBY FUSER**
> HALLIBURTON VICE PRESIDENT
> EGYPT AND LIBYA

> INTRODUCING OUR SOLUTIONS AND NEW TECHNOLOGIES TO THE STUDENTS MAKES IT EASIER FOR THE COMPANY TO RECRUIT AND TRAIN THEM WHEN THEY GRADUATE IN A COUPLE OF YEARS.
>
> **AHMED SAMI**
> ASSOCIATE TECHNICAL PROFESSIONAL AT BGSES

EXHIBITION AND WOMEN PARTICIPATION

Schlumberger and Halliburton showcased prototypes of their drilling bits, with the later also representing its technologies through a screen at its booth. Moreover, BP allowed attendees to experience the company's works through virtual reality (VR) headsets.

Three girls studying in their first year of Chemical Engineering in the Canal High Institute of Engineering and Technology (CHI) in Suez University were among the relatively small number of females attending the event. In a conversation with Egypt Oil & Gas, they expressed their enthusiasm about PACE 2019 and mentioned points that could be enhanced in future editions. "I would have liked to see more non-technical topics, as the focus is mostly on subjects like drilling," said Ruqayyah Ateya.

Naira El Touny stressed on the importance of having more female speakers in technical sessions. "They can serve as role models for us," she said.

"Having most of the big companies here was the main motive for my participation, as I want to understand the market. It was also a nice opportunity to visit the AUC and know more about the student activities here. We are all seeking trainings and diplomas to be qualified, since I want to pursue a career in petrochemicals," El Touny revealed.

Marwa Magdy stressed the importance of chemical engineering as an essential component in the oil and gas industry worldwide, saying that she is looking for career guidance in the sector. Ateya also noted that one of her motives to pursue a career in the industry is carving out a bigger space for girls to change the current mindset.

> WE NEED STUDENTS TO KNOW MORE ABOUT OUR BUSINESS, AND THEY NEED THIS TYPE OF ADVICE AND CAREER COUNSELLING TO EASE THEIR PATH TO PROFESSIONAL LIFE.
>
> **NOHA SALAH**
> HR COORDINATOR AT ADES

Egypt Oil & Gas also took the opinion of other students and oil and gas employees. Mahmoud Essam, a second-year undergraduate in the petroleum department at the Faculty of Science in Zagazig University, said that attending the conference helped enhance his understanding of the industry.

"Having all of these companies gave me a positive energy although I am still worried about finding a suitable job in the oil and gas industry, but having young speakers from various companies greatly motivated me to be like them one day," he stated.

"We need students to know more about our business, and they need this type of advice and career counselling to ease their path to professional life. Being here will make it easier for undergraduates to pass the screening when they apply for job opportunities, as well as summer internships, and our Graduate Training Program (GTP)," said Noha Salah, Human Resources (HR) Coordinator at ADES, commenting on the resumé reviewing that took place in the company's booth.

Ahmed Farrag from Halliburton said that the company is exhibiting prototypes of drill bits and underreamers, which students showed great interest in knowing more about from a practical point of view. "We are happy to interact with interested students and teach them about new technologies through an opportunity that we mostly did not have when we were in university. Their part is to do more research and prepare themselves," he explained.

MORE THAN 20 INTERNSHIPS OFFERED THROUGH SIX COMPETITIONS

The event sponsors provided more than 20 internship opportunities for participating students through competitions that followed the conference's technical sessions across the three days of event.

A competition by Halliburton Egypt on "Well Completion and Cementing" had 10 two-member participating teams of which two teams were chosen for summer internships. Abdelrahman Saeed and Ahmed Abu Ewees in the first team, and Ahmed Kamal and Amr Atef in the second.

Meanwhile, DEA Egypt chose three undergraduate students, Zeinab Al-Araby, Raghda Ahmed, and Mohamed Ali, for summer internships, after a selection process that involved interviewing applicants.

Kuwait Energy Egypt also organized a competition for writing articles about the "Applications of Conventional Core Analysis". First place winner, Ahmed Haitham, will receive a summer internship with the company, while second and third place winners Mohamed Ali and Khaled Mohamed received special reward packs.

BHGE followed its technical sessions with a test on "Drilling Bits and Pressure Control". Out of eight contesting teams, two were selected for a summer internship. Eslam Abdelaal and Abdelhalim Ahmed were the members of the first team, while Ali Reda, Abdelaziz Mohamed, and Mohamed Fotouh were the second winning team.

Schlumberger conducted a competition on "Unconventional Solutions to Overcome Production

> I WAS CHOSEN TO TAKE PART IN THIS EVENT [AS A SPEAKER IN THE TECHNICAL SESSION] AS I WAS THE FIRST HALLIBURTON FEMALE FIELD ENGINEER IN NORTH AFRICA TO WORK ON WIRELINE, SO WE WANTED TO SEND A MESSAGE TO YOUNG LADIES THAT THERE IS AN OPPORTUNITY FOR THEM IN TECHNICAL ROLES ON THE FIELD.
>
> **REEM HENRI**
> WIRELINE AND PERFORATING RESERVOIR EVALUATION ENGINEER AT HALLIBURTON

Decline Challenges". Out of eight competing teams, with each comprising of three college seniors, two were chosen after presenting their ideas. Mohamed Sobhy, Ahmed Azab, and Ahmed Farhat, as well as Mostafa Gamal, Osama Radwan, and Mennatullah Lotfy, were granted summer internships. The third winning team of Mohamad El-Faramawy, Mohamad El-Falaky, and Mohamad Hesham will enjoy a visit to the company's yard.

Similarly, ADES Egypt's competition involved a test on "Drilling Operations". Seventy-five students were admitted to the competition. The top four will receive a four-week operation internship, two weeks at the company's office, and another two on an offshore rig.

NEW AT PACE 2019

This year witnessed the introduction of panel discussions as an addition to the conventional technical sessions with one speaker. "We are trying to mimic the Egypt Petroleum Show (EGYPS). The aim was to provide inspiration to students by giving them a hope for better opportunities in the market as well as sharing the success stories of the industry leaders," said Essam Mohamed, SPE Suez Student Chapter treasurer. "Other events range from covering the technical needs of university students to developing their soft skills," he added.

One of the student activities was the technical club, which provides an opportunity for students to share with each other their experience in training. Another one was the research school, sponsored by Kuwait Energy, to educate young people on how to develop their ideas and write a paper. The student-led activity has also organized many yard trips to the fields of many companies, such as Halliburton, PetroServices, and National Arabian Petroleum Services Company (NAPESCO).

"The event allowed me to know about the newest technologies, such as pressure control (PC) and a new development to rotating control (RC), which I would not have known about without attending this session," said Mazin Alaa, a third-year exploration and production (E&P) undergraduate in the Faculty of Petroleum Engineering at the University of Suez.

"Competitions are encouraging us to read and understand more topics thoroughly…. I think these events could help shape the mindsets of participants to make them ready to learn and develop, which is clearly what companies are looking for when they recruit fresh graduates," Alaa added.

"The topics discussed are more relevant to third- and fourth-year curriculums, especially when it comes to equipment, techniques, and field life. Overall, PACE has exceeded my expectations, and kept me updated with the newest market developments and trends," Alaa pointed out.

UNIVERSITY STUDENTS COLLABORATIVE EFFORTS TO ORGANIZE THE EVENT

The SPE Student Chapters in Suez University, Cairo University, and the AUC, who cooperated to organize the event, told Egypt Oil & Gas about their motives.

Omar Abaza, President of SPE-AUC, said that each student chapter contributed around 10 to 15 organizers. "Despite the challenges we faced, we were honored as panelists, who lead the market's biggest companies, were impressed with the event, which encourages us to do even more."

Mohamed Tharwat, SPE-Suez University President, said that there were times when they feared that the event could be cancelled, especially with challenges in bookings and obtaining authorizations.

Omar Abd El-Dayem, SPE-AUC Vice President, agreed, noting that they were able to overcome many challenges they faced last year, adding that the biggest challenge they face in the organization of the event is the fact that they are all students from different universities. Having a common goal, however, helped them overcome the difficulties.

Ahmed Mokhtar, SPE-Suez University Vice President, said that the event did not start from scratch this year as the first edition was a strong base that eased marketing the event to sponsors and participants.

Khaled Mostafa, SPE-Cairo University Vice President, said that they aim to be the first and biggest event organized by students in the oil and gas industry, providing a platform for students to have an opportunity to meet with company representatives and executives, and interact with them. "I also hope that we offer more diversity in our sessions with an increased number of covered subjects to include other specializations," he added.

"We hope to establish the name of this event on the calendar in March of each year, as everybody now anticipates EGYPS in February, and I also wish that next year we will have the Minister of Petroleum attending our opening ceremony," said Mohamed Sobhy, SPE-Cairo University President.

SCHLUMBERGER ENDORSING FEMALE TALENTS IN OIL AND GAS: CELEBRATORY WORKSHOP FOCUSES ON FEMALE EMPOWERMENT AND WORK-LIFE BALANCE

BY **MAI EL GHANDOUR**

Pictures of some of the most iconic women in the history of Egypt were seen at every corner of the room, as Schlumberger Egypt held a distinguished workshop promoting the empowerment of females working in the oil and gas sector on March 20 at the company's headquarter in 6th of October City.

The workshop, commemorating International Women's Day and Mother's Day in Egypt, brought together female employees from Schlumberger and its partners, who engaged in a thought-provoking session and shared their inspiring stories. Participants also had the opportunity to discuss relevant topics concerning time and career management, as well as ways to enhance their participation to the oil and gas industry.

The event kicked off with a speech from Karim Badawi, Managing Director for Egypt and East Mediterranean. "Do not put a glass ceiling for yourself or establish a perception that you cannot do something, because nothing is impossible. Our company is built on meritocracy and performance, and for this, there is no difference between a man and a woman," he said.

> "DO NOT PUT A GLASS CEILING FOR YOURSELF OR ESTABLISH A PERCEPTION THAT YOU CANNOT DO SOMETHING, BECAUSE NOTHING IS IMPOSSIBLE. OUR COMPANY IS BUILT ON MERITOCRACY AND PERFORMANCE, AND FOR THIS, THERE IS NO DIFFERENCE BETWEEN A MAN AND A WOMAN."
>
> **KARIM BADAWI**
> SCHLUMBERGER'S MANAGING DIRECTOR FOR EGYPT AND EAST MEDITERRANEAN

Badawi reinforced the idea that the industry continues to support and empower more women, with a special recognition for working mothers. He further shed light on misconceptions surrounding the oil and gas industry that he believes are entirely different from reality. "The reality is that the industry is actually equally fit for men and women because it is more based on the talents that people have, and on their innovation and creativity."

That is exactly why Badawi thinks that, if Schlumberger does not tap into the pool of talented women, it will miss out on extraordinary expertise. He further emphasized on the values that females bring forth to the community in order to ensure societies are operating well, saying that there is a strong correlation between the strong performance of companies and having female CEOs.

Yasser Amer, Schlumberger Human Resources (HR) Manager, then commenced the workshop with a call for the attendees' feedbacks on a pivotal matter. He asked them, "why is it important, from your opinions, to have women participate in the workplace, and why is it important for the economy? We never think why it is important for companies, governments, and countries to make sure that the employment rates of women are getting higher and higher every year."

Each participant had her opinion; nonetheless, there was a growing consensus that economies thrive upon talented women, in the same way it does with talented men. According to Amer, the workplace should represent society, which is 50% men and 50% women. If you are only utilizing half of the workforce, that means you are missing the other half. It is all about capturing talents, he indicated.

Schlumberger HR Manager concluded from the discussion that the productivity of nations and companies really goes down to and highly correlate with the employment rate of women. "There are more practical and pragmatic reasons to why women have to be involved in organizations and play a key role in economies. It is not a luxury anymore. It is not an option. The job for females is as important as for males," Amer added.

This year's slogan for International Women's Day was "Balance for Better", so the workshop explored gender diversity and what it takes to have balanced equality between men and women in the workplace. However, it was not only a discussion on gender equality, as it rather tended to shift the participants' focus to work-life balance. The workshop took a step further to delve into personal balance and how to have an internal balance between one's work, children, social life, and activities, without missing out on life.

Additionally, participants engaged in a fun yet informative activity, where female attendees conducted a self-assessment exercise that measures the level of satisfaction in nine areas that represent everyone's life. Through the activity, participants were led to discover their weaknesses, strengths, and core values. Accordingly, every participating woman should be able to get a snapshot of her life and find out the career path that suits her best.

At the end of the day, attendees were enthralled with another fun activity in which they were divided into three groups, wore costumes, and shot a video to promote and celebrate female empowerment.

SCHLUMBERGER SUPPORTS EGYPT'S FUTURE TALENTS IN COOPERATION WITH SPE

Schlumberger's long-established values have always included a commitment to invest in existing and future talents and have a positive impact on the communities where the company operates. Over the past few years, in cooperation with the Society of Petroleum Engineers (SPE) Egypt Chapter, Schlumberger led a significant number of activities and workshops such as the SPE Monthly Technical Sessions, the SPE Young Professionals Yearly Educational Week, and the SPE Women Events.

Last September, Schlumberger agreed with the SPE Egypt Chapter to design the "Undergraduates Field Trips" program for engineers and geoscientists who represent the future talents of the Egyptian oil and gas Industry.

This program is part of the people development pillar in the Ministry of Petroleum's Modernization Project, which aims to better utilize the sector's human resources with a qualified and capable workforce.

The objective of the initiative is to give students the opportunity to explore different activities across Schlumberger operations and have hands-on training to experience the real world of the oil and gas sector. Another objective is to sponsor graduation projects for high profile students.

During the first semester of year 2018 - 2019, around 150 students had the chance to visit two Schlumberger facilities: the Egypt Center of Efficiency in 6 of October City and the Artificial Lift Workshops in Nasr City. Moreover, Schlumberger expanded this program to add a population from Suez Canal University in the second semester to reach a total number of more than 250 students.

These trips were a real success and generated positive feedback from both students and professors.

According to Dr. Ismail Mahgoub from the Future University in Egypt this practical training helped students get familiar with the main equipment used in oil and gas fields. As a result of the training, students showed much better interaction with lecturers and demonstrated higher performance in their classes than before the trainings.

> "WE AIM TO RAISE A GENERATION OF ENGINEERS AND GEOSCIENTISTS WHO CAN EFFECTIVELY PARTICIPATE IN SHAPING THE FUTURE OF THE OIL AND GAS INDUSTRY INSIDE AND OUTSIDE EGYPT BY BEING TRAINED ON THE LATEST TECHNOLOGIES AND HIGHEST STANDARDS OF SAFETY."
>
> **KARIM BADAWI**
> SCHLUMBERGER MANAGING DIRECTOR EGYPT AND EAST MEDITERRANEAN.

> "IT WAS AN OPPORTUNITY FOR ME TO EXPLORE MORE ABOUT SCHLUMBERGER NEW TECHNOLOGIES AND TOOLS AND UNDERSTAND WHY IT IS SUCH A LEADER IN THE INDUSTRY."
>
> **STUDENT: ZAKARIYA ABDEL FATTAH**
> CAIRO UNIVERSITY.

"The program is well organized, and the topics very attractive. I think this program adds strength to the current curriculum of Petroleum Engineering at Cairo University. The Schlumberger initiative is an excellent way to narrow the gap between academia and practice. It helps improve the performance of our undergraduate students and develop their skills and knowledge, and they also learn about the latest innovative technologies and tools," said Dr. Mahmoud Abu El Ela from Cairo University.

Meanwhile, Dr. Gehad Mohamed from the American University in Cairo (AUC) noted that the program "is considered as a new module which aims at strengthening the spirit of teamwork between students from different universities."

Feedback was just as positive from the participating students who noted that they appreciated the opportunity to meet with Schlumberger professionals and being exposed to a wide scope of technologies and domain expertise.

According to student Farah Ibrahim, from Cairo University, what is special about the program is that it consists of several sessions in different branches of Petroleum Engineering such as Drilling and Production. "Also, the program is an ideal gateway to expand our knowledge and increase our information base" she indicated.

Likewise, student Ahmed Negm from the AUC expressed his appreciation of the program. "My gains were numerous by being introduced to the new technologies used by Schlumberger in various jobs and how safe they operate," he explained.

Student Soha Mohamed El Rayes, also from the AUC, described the program as "a great way to get a head start on our job search and prepare us for a successful career in the oil and gas field."

Schlumberger is proud to be collaborating with the SPE Egypt chapter on this first of its kind program to help bring sustainable support and alignment between the oil and gas sector and the undergraduate students' curriculum.

Fostering an environment that exposes students to the latest technologies and a great teamwork spirit among peers and university professors, Schlumberger looks forward to another active year of the initiative. Through a strong collaboration with SPE and universities, Schlumberger is excited to expand this program to reach more students and universities across Egypt, supporting one of the key pillars of the Modernization Project of the oil and gas sector, led by H.E Eng. Tarek El Molla, the Minister of Petroleum and Mineral Resources.

On March 5, 2019, Schlumberger Egypt signed a memorandum of understanding with Egypt's SPE Student Chapters at Al-Azhar University, the American University in Cairo, Cairo University, the Future University in Egypt, and Suez Canal University to enhance the educational experience for students with practical sessions to minimize the gap between academia and real market needs.

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

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SCSR-04© FORMULA, one of our innovative solutions, is a blend of a group of carboxylic compounds used for de-scaling applications.

SCSR-04© can achieve 90% dissolution efficiency upon Barite scale.

As it is commonly known in the oilfield industry, Barite scale causes productivity losses in many oilfields and well abandonments. The only available solution in the industry around the globe is by mechanical means. However, **SCS** has discovered and implemented an efficient chemical treatment for Barite scale for the first time in the world. The implementation of the innovative approach was not only challenging due to the nature of the scale, but also due to the location of the scale depositions in the annulus between casing and tubing for the East Zeit Petroleum Company's (Zeitco) well A-12ST, offshore Egypt.

Before **SCS**'s intervention, the well was shut in for more than one year due to the existence of the Barite scale and it was found that it would not be efficient to implement a mechanical solution in such conditions. In this well, the scale formation was at ambient temperature and a shallow depth of 1,000 feet (ft.), another challenge where no physical parameters could be used to support the dissolving process.

SCSR-04© Key Attributes

- **Providing Optimum Scale Dissolution Under Alkaline Conditions**
- **Low Corrosion Potential**
- **Strong Ba Binding Properties**
- **Good HSE Aspects**

Handling & Storage

SCSR-04© should be handled in accordance with sound industrial practices. Detailed information can be found in the Material Safety Data Sheet. SCSR-04© has a three-year validity, beginning from the date of manufacturing, which is indicated on the container.

Annulus spool plugged with scale

Case Study: East Zeit Petroleum Company

CHALLENGE

Scale sample analysis showed the presence of a 100% Barite (BaSO4) scale.

Barite scale is one of the toughest oilfield scales all over the world, and its removal is considered a great challenge.

Scale formation was at ambient temperature and a maximum depth of 1000 ft. Therefore, there was not a single physical parameter that could be used to support the dissolving process and the difficult conditions of the technical handling due to the scale location in the annulus between the casing and tubing from the surface to a depth of 1000 ft.

The recent experience of Zeitco team with **SCS** witnessed the remarkable accomplishment of chemically dissolving "Iron Sulfide" scale. This was applied using **SCS** specialized chemical treatment SCSR-02© in well A-13. Zeitco grew more confident in **SCS** capabilities to solve any other complex case for the dissolution of the Barite scale in well A-12ST and restore its production after being shut in for more than one year.

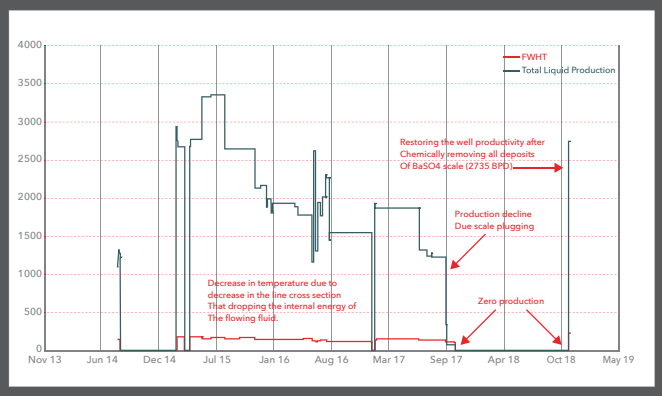
SCS and Zeitco formed a team to study well A-12ST and the nature of the scale. The results were exceptional. After the treatment by utilizing **SCS** breakthrough chemical formulation SCSR-04©, the well production was restored to a level that is even higher than its flow rate before the shut in. No one could envision that there is a chemical solution to dissolve the Barite scale. However, **SCS** is the only company that could reach this revolutionary chemical treatment without utilizing any mechanical means to dissolve this type of hard Barite scale.

A REVOLUTIONARY CHEMICAL TREATMENT SOLUTION

Semi-quantitative analysis obtained by X-Ray diffraction for whole rock sample.

Company Name	Sample No.	Mineralogical Composition (wt%)				Total (Wt%)
		Kaolinite	Quartz	Barite	Gypsum	
Zeitco	1	--	--	100.00	--	100.00

Case	Fluid Rate (BFPD)
Before Plugging (Feb, 2017)	1836
After Complete Plugging(Dec, 2017)	0
After Scale Removal (Jan, 2019)	2735



HISTORY:

WELL A-12ST: (Nubia Oil Producer - JP flowing well)

July 1990: Well was completed as Nubia producer. Depth: (11,520 to 11,640 feet MD). Reservoir pressure (PR) = 5127 psi at datum 11,500 ft. (Production rate was 3900 BFPD).

APRIL 1992: Conduction of pressure build-up test, SBHP = 4988 psi at datum 11,500 ft.

DEC 1994: Workover due to SCSSV stuck open. Replaced SCSSV and returned to production.

SEP 1995: Re-perforated 11,530 ft to 11,545 ft using Schlumberger's "Pivot Gun".

DEC 2016: It was noticed that pressure and temperature of the JP return were decreasing. A checkup was made for the flow line, which was found to be partially plugged by scale.

DEC 2017: Retrieved the existing failed jet pump; the following was found: X-lock packing was in good condition; lower seal packing had 2 ea. damaged. RIH 5 times with new redressed JP with memory gauges to optimize the JP design and figure out the problem.

Finally, it was found that the problem was in the annulus side. The annulus side was opened and it was found that scale was almost plugging the annulus, including the casing valve. After that, samples were taken from the scale for analysis, and the well was shut in.

SAPESCO®
SAHARA PETROLEUM SERVICES

SCS
SAHARA CHEMICAL SOLUTIONS

SOLUTION:

Solubility test was performed for the scale with **SCS** Chemical new formulation SCSR-04© in ambient conditions indicating an effective formulation with outstanding and remarkable dissolution of the scale.

The new **SCS** Chemical SCSR-04© provided a smart solution to totally remove Barite scale and restore the well productivity without the need for any mechanical solution.

The results indicated that the chemical dissolver SCSR-04© succeeded in removing the Barite scale completely.

HOW CAN SATELLITES RESHAPE **THE OIL INDUSTRY?**

BY **RAFFAELE PERFETTO**

Before talking about the future, it is always useful to take a look back into the past. In the mid-18th century, a two-wheeled wagon, attended by two men and drawn by eight horses, took about six weeks to carry four tons of goods between London and Edinburgh. At the same time, a ship navigated by six or eight men carried a load of about 200 tons between London and Leith, which is another city in Scotland near Edinburgh. Accordingly, we can argue that using a ship would allow for delivering a shipment that would need 50 wheeled wagons, 100 men and 400 hundred horses, during the same period of time, as Adam Smith argued in his book "Wealth of Nations".

The history of trading is linked to that of energy and vice versa. Trade requires the transfer of goods or services, which needs all sorts of energy. You can transport goods by galleys using human energy from rowing, or sailing ships using wind energy as well as steamships run by coal-generated thermomechanical energy.

The first coal mines were worth more if they were close to water or ports; however, these mines were also more prone to flooding risks. Steam engines were the first solution for this problem, since more or less the same engines were then used in marine transport.

People then tried to mimck the waterways, through the use of railroads, thus reducing time and saving energy - even war had its role. At the beginning of the 19th century, England was busy with Napoleon's imperial France, so horses were needed for millions of soldiers (yes millions!). This pushed the British even further towards the rails (trains), driven by steam engines.

At about the same time, on the other side of the Atlantic in North America, unionists and confederates gave it their best. The unionists blocked the ports of the south not allowing turpentine's trade. Turpentine, a fluid used for lighting, was a source of income for the southern landowners and was then refined in the northern refineries. Nevertheless, the confederates were not far behind with the whaling hunt, as they gave a blow to the whale oil's trade, which was concentrated mainly in northern ports. As a result, the use of kerosene, extracted from oil, further increased.

Another story could help us learn a history lesson. In 1912, the British Royal Navy started using oil for the first time instead of coal. Winston Churchill, then the First Lord of the Admiralty, was decisive in this turn, which changed everything in the British Navy.

THE RISING ROLE OF SATELLITES

With the increasing usage of oil along history, the need of monitoring its usage has also increased. Nowadays, the implementation of the Automatic Identification System (AIS) has allowed for more information on this matter. Although its use has been supposedly mandatory for years now, the technology is not always applied, as ships can deactivate the system. There are even ships that send false information, as indicated by a story that was recently published in the Wall Street Journal.

North Korea is smuggling coal and oil, as is the case with the Yuan Bao ship, which was raising the Panamanian flag. The Wall Street Journal said that the ship left the port in Taiwan and switched off its AIS system to plan a maritime rendez-vous with the North Korean Paek Ma. The meeting takes place off the East China Sea, and as the ships came closer, the oil was transferred.

The satellite industry, which is growing worldwide, could be used to prevent such cases of oil smuggling and illegal trading.

For high-resolution images, it is necessary for satellites to be in low orbit that is close to the Earth. Since satellites do not remain on a fixed distance from the Earth in its orbit, there is a need for a satellite constillation to cover the same area more frequently. One challenge to consider is that a traditional SAR satellite weighs over 1,200 kilograms and costs around $500 million. So, a constellation of SAR satellites would be expensive. What could be the solution then?

Capella Space, a San Francisco-based startup and a pioneering company in the field of microsat and nanosat, has succeeded in dramatically reducing dimensions and costs. From its sattelites' initial length of 5 meters, it has reached 60 centimeters; and from more than a ton of weight, it has reached less than 40 kilograms. The company plans to launch a constellation of 36 satellites, providing images with high resolution from every corner of the planet with hourly updates.

One of the main clients of the San Francisco startup is the American defense industry. The company will in fact be the only one to provide SAR images at a national level in the United States. In venture funding, the company previously won a $11 million contract from the Pentagon.

From commodities trading to urban development, infrastructure, shipping, and security, companies are demanding more data more frequently to feed their algorithms and create new ones in order to be up-to-date, considering that the economy moves rapidly in every aspect, with cash flows, labor movements, and even information that simply does not exist today yet.

Having time updates will allow for correlating SAR images with the AIS system, and analyzing the movements of the boats without AIS manipulation will definetely bring hard times for smugglers not only of raw materials and oil, but also for illegal fishing, drug smuggling, and human trafficking.

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WHO WILL WIN THE FIRST DISCOVERY IN THE EGYPTIAN RED SEA?

After the big news in the upstream world with the declaration of a gas discovery in the Red Sea by Saudi Aramco, GANOPE announced its 2019 international bid round for exploring oil and gas in the Egyptian waters in the Red Sea. This captivating frontier basin has been attracting the attention of exploration companies for decades. Therefore, it is essential to ask who will be the winner of the first oil and/or gas discovery in this giant basin.

Natural hydrocarbon seepage seen in many areas surrounding the Red Sea region gives a clear indication of a working hydrocarbon system, and it was the initial exploration concept to drill near the oil seepage areas during the early pioneering days of searching for oil. A combination of poor quality 2D seismic data plus a classical exploration concept approach of drilling the structural highs resulted in dry holes. Moreover, drilling only 12 wells in an offshore area of 70,000 km^2 came with subsurface information, which is not reflecting the intricate subsurface regional geology of the area. However, these dry holes together with seismic data portray the future exploration plan and can be turned into a success story. The logs are the most important piece because they bring information about lithology, reservoirs, source rocks, and seals.

The subsalt seismic imaging is still regarded as the biggest challenge to exploration in the Red Sea Basin, as well as in many world-class petroleum basins, e.g. the Gulf of Mexico, Persian Gulf, North Sea, Lower Congo Basin, Campos Basin, and Precaspian Basin. The new RS-2018 2D seismic data that was acquired by Western Geco and TGS in collaboration with GANOPE through a multi-client project would introduce significant exploration steps on the road of unlocking the unseen resources of the Egyptian Red Sea Basin.

In my opinion, viewing the discovery in this province should start by understanding the entire basin and looking at the big picture, not just one discovery or offset field. It is about understanding the evolution of the basin and what we need to know from a margin-to-margin approach. I also believe that integration between both margins of the Red Sea is extremely important to understand the petroleum system. Will the geoscientists from each side sit together and try the exchange the ideas and knowledge to understand the big picture? Is it possible to acquire new seismic lines crossing the entire Basin between Egypt and Saudi Arabia? It is worth mentioning that the maritime demarcation accord signed with Saudi Arabia in 2016 has allowed the country to embark on oil and gas exploration, and has paved the way for all of this significant progress in the Egyptian Red Sea.

AHMAD MOSTAFA
Exploration Section Head
GANOPE

OIL SECTOR EFFICIENCY AND COMMERCIAL ANALYTICS

The oil and gas industry is extremely competitive with a highly regulated environment. The sector's companies need to increase production, optimize costs and reduce the impact of environmental risks as they face various uncertainties characterized by the eternal necessity to renew reserves of natural resources, fluctuating demand, and price volatility.

Commercial Analytics is the kind that makes money; from data to dollars, insights to income, this is all about how to run the business better. It is about identifying opportunities and acting on them, it is about creating new opportunities and new demand. It is the present and the future.

The need to establish and embbed Commercial Effectiveness Analysis into the Egyptian petroleum sector is clear, given the potential value we knew we could generate from them. When it comes to generating value from analytics, following the right approach is just as important as having the right data. That is why the question we hear repeatedly is not, "Do we need analytics?", but rather "Why aren't our analytics delivering more value, and why is our Return on Investment (ROI) on data so low?"

This mainly depends on the ability to turn insights into action fast. Nevertheless, is it that easy? That's the question.

To find a right and convenient answer to this easy, yet complex question, we should deal with various types of analytics. Companies are free to choose how deep they need to dive in data analysis to satisfy their business needs best; while descriptive and diagnostic analytics offer a reactive approach, predictive and prescriptive analytics make users proactive.

Understanding and leveraging data in the upstream segment enables firms to remain competitive throughout planning, exploration, delineation, and field development. Upstream companies conduct advanced geophysics modeling and simulation to support operations where seismic generates significant data during exploration phases. They closely monitor the performance of their operational assets. To do this, they use thousands of sensors in subsurface wells and surface facilities to provide continuous and real-time monitoring of assets and environmental conditions. Unfortunately, this information comes in various and complex forms, making it a challenge to collect, interpret, and leverage.

These companies work simultaneously with both structured and unstructured data. They must capture and manage more data than ever and are struggling to store, analyze and get useful information from these huge volumes of data. Under these conditions, the traditional analysis tools would fail, but with the appropriate infrastructure and tools, oil and gas companies can get measurable value from these data.

To sum up, it is important to support the real-time decision-making using tools that integrate and synthesize diverse data sources into a unified whole. However, to unlock this value, oil and gas companies need access to the appropriate technology, tools, and expertise.

MOHAMED EL HAYTHEM
Mphil., DBA, MBA, PMP
General Manager, Foreign Companies' Control
The Egyptian General Petroleum Corporation (EGPC)

EGYPT OIL&GAS RESEARCH & ANALYSIS

Annual Inflation Headline CPI

JAN 2019	FEB 2019
12.7%	**14.3%**

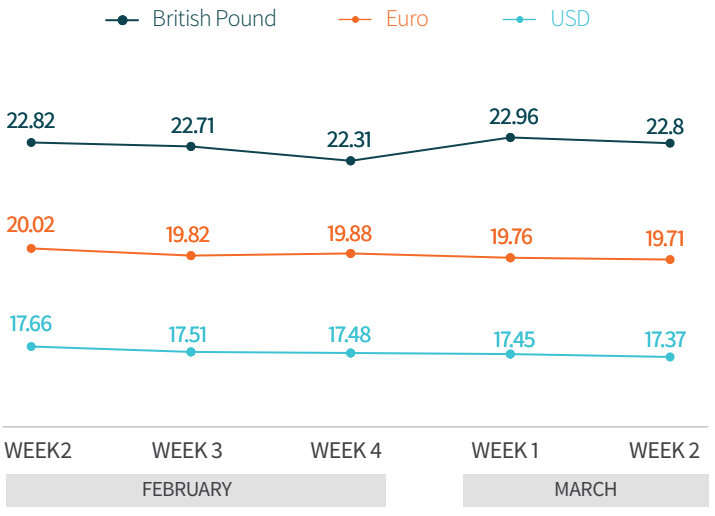
Net International Reserves ($ billion)

JAN 2019	FEB 2019
42.62	**44.06**

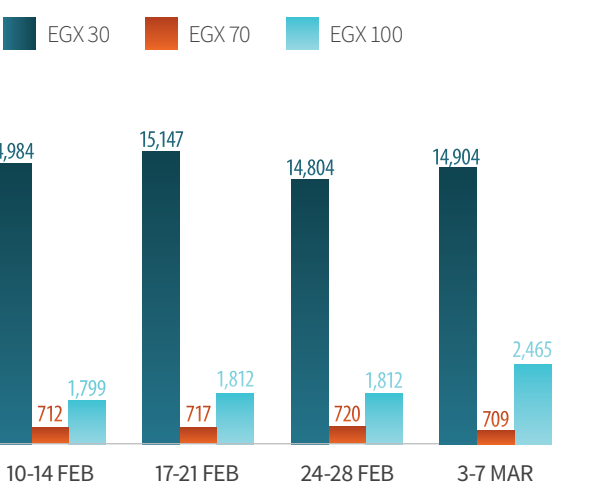
Tax Revenues (July 2018-Janauary 2019)

- Reached **EGP 356.6** billion
- Increased by **22.2%** year-on-year
- % Represented **78.1%** of total government revenues

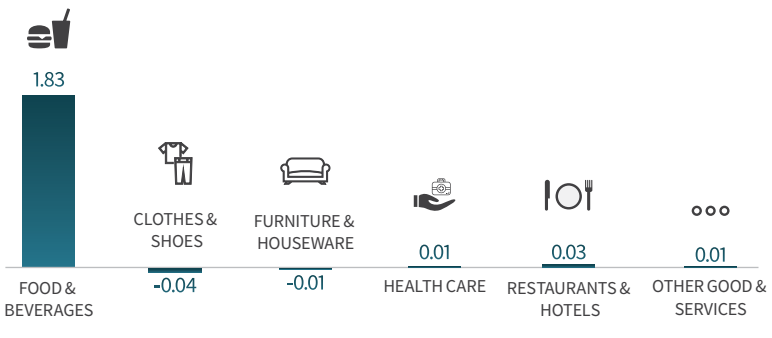
Exchange Rates



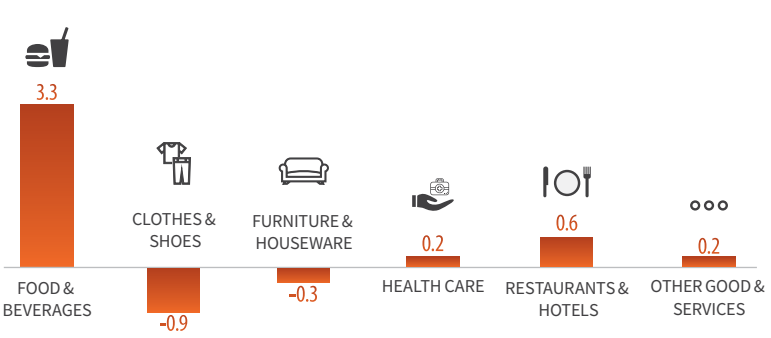
Capital Market Indicators



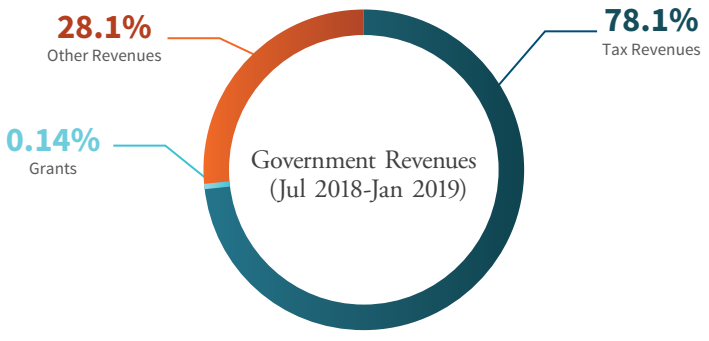
Groups' Share in the Increase in Annual Inflation Headline CPI in February 2019 (%)



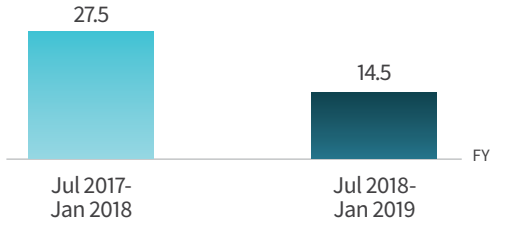
The Change in Groups' Annual Inflation Headline CPI in February 2019 (%)



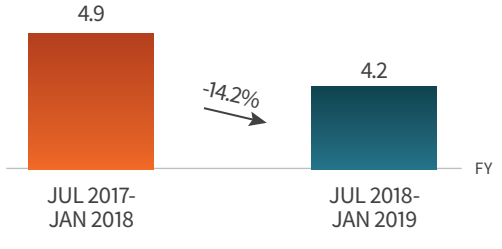
Sources of Raw Data: CBE, Egyptian Exchange, CAPMAS



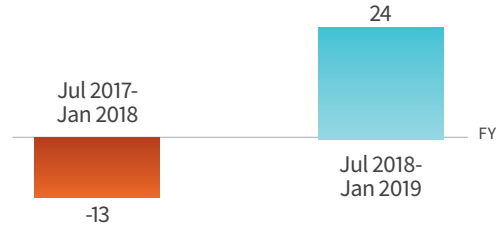
Average Inflation Rate (%) (YoY)



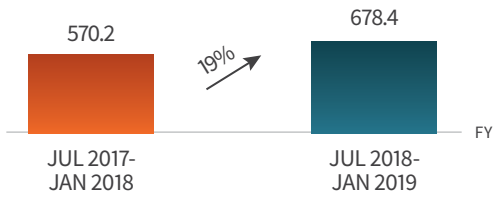
Budget Deficit (% of GDP) (YoY)



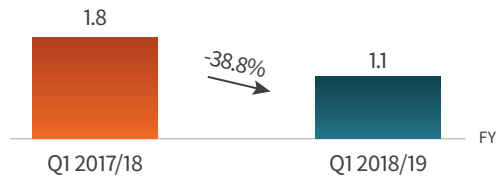
Primary Budget Surplus (EGP billion) (YoY)



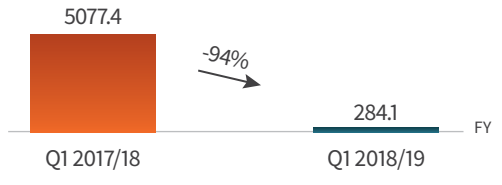
Government Expenditures (EGP billion) (YoY)



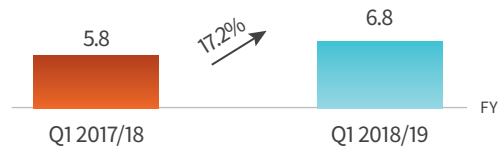
Net Foreign Direct Investment ($ billion) (YoY)



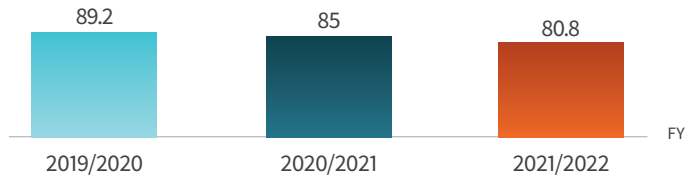
Balance of Payments ($ million) (YoY)



Total Exports ($ billion) (YoY)



Ministry of Finance Plans for Public Debt (% of GDP)

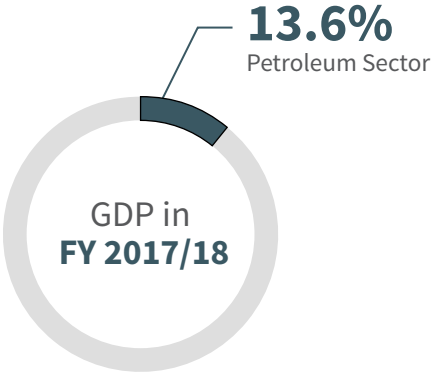


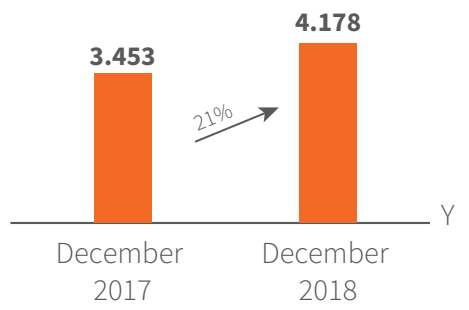
Sources: The Egyptian Cabinet, MPMAR, CAPMAS.

Three bid rounds will be launched in **2019** in the West Mediterranean, the Western Desert and the Red Sea.

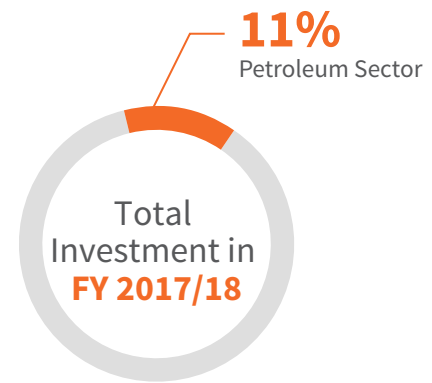
Ganope launched an international bid round to explore/exploit oil and gas in the **Red Sea**. It includes **10** offshore exploration blocks.

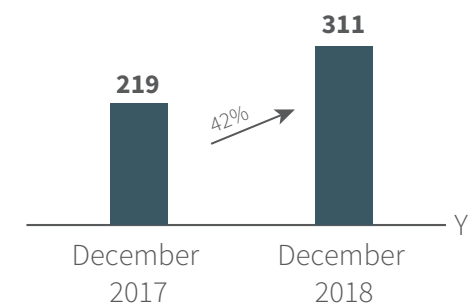
The Egyptian Refining Company (ERC) will start commercial operations in **Q3 2019** with annual capacity of **4.7 mt**.





Egypt's refinery production capacity ranged between **500,000** and **550,000 t** in February 2019.





ENOC signed a joint venture agreement with Proserv Egypt to establish ENOC Misr, the **first** on-ground operations in Egypt's lubricants sector.

Eni announced a new gas discovery under evaluation in the **Nour North Sinai Concession**. The **Nour-1** well which led to the discovery, reached a total depth of **5,914 meters**.

The **CBE** will offer **5%** interest loans to transform vehicles to natural gas or mixed-fuel.

DEA signed a **five -year** exploration agreement to develop the Ras Budran and Zeit Bay oil fields with **$20** million investments.

Egyptian natural gas **exports** to Jordan increased to **350 mmscf/d** in February **2019**.

LNG exports from Idku facility increased to **800 mcf/d** at the beginning of **2019**.

Petroleum Exports in Q1 2018/19

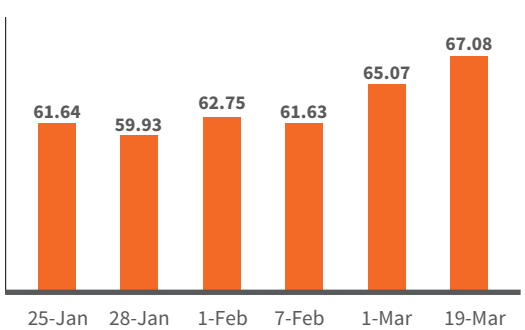
- Reached **EGP 2.8 billion**
- Increased by **57.6%** year-on-year
- Represented **41.4%** of total exports

Egypt's production of crude oil and natural gas recorded the highest level in its history reaching **1.8 mmboe/d** in February **2019**.

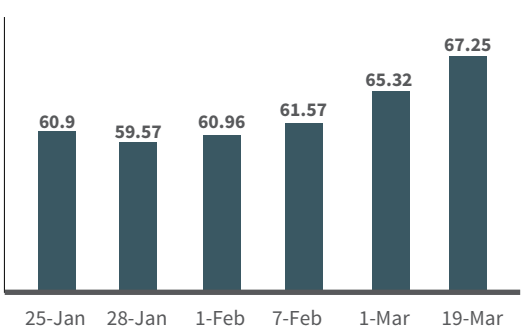
Saudi Aramco is providing Egypt's refineries with over **500,000** barrels of crude oil per month from **January-June 2019**.

Egyptian Kuwait Holding Company (EKH) announced that North Sinai offshore concession has **2.352 tcf** of natural gas and **112 mb** of condensates.

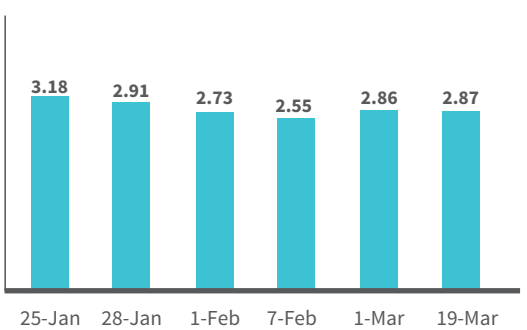
BRENT PRICES



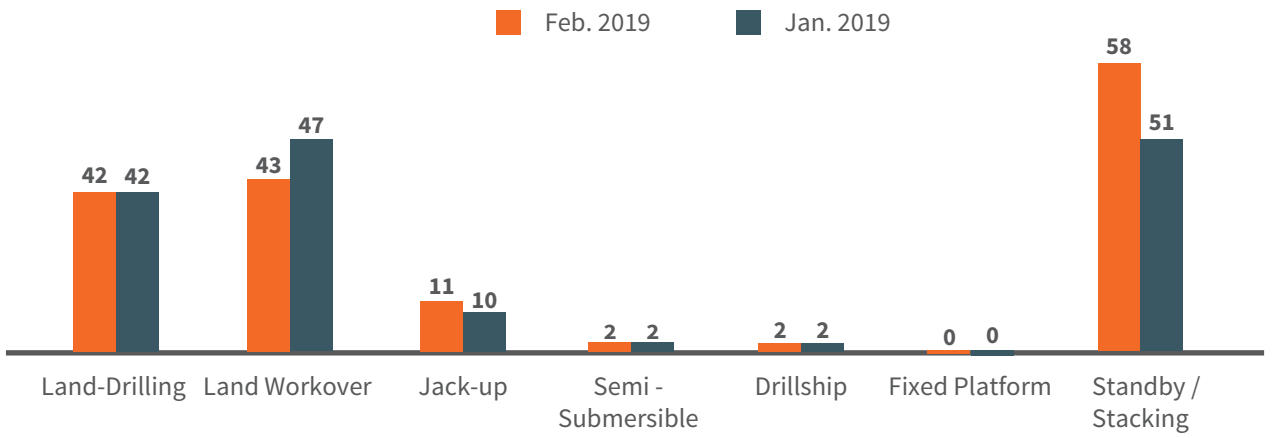
OPEC BASKET PRICES



NATURAL GAS PRICES



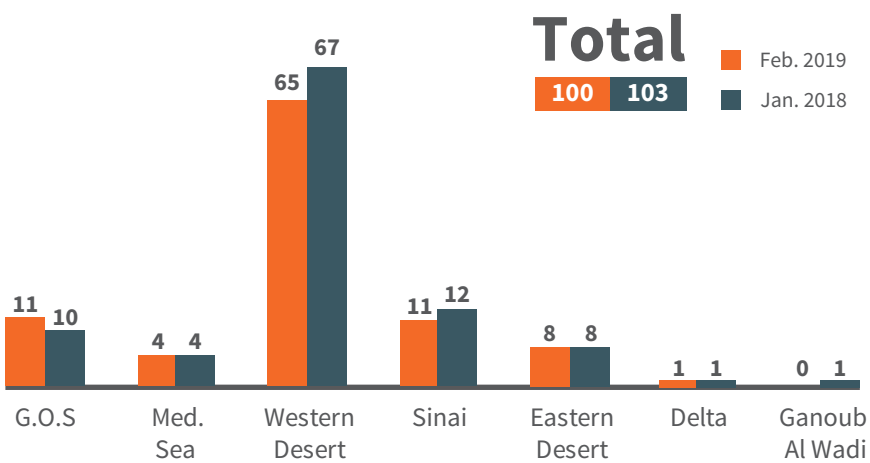
EGYPT RIG COUNT PER TYPE Feb. 2019



Total

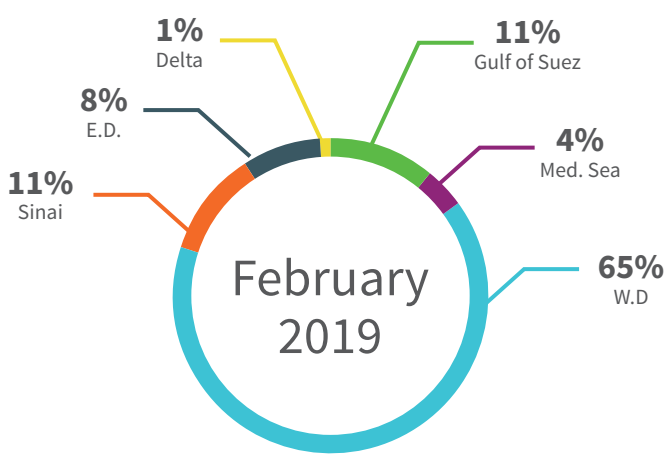
158	154

EGYPT RIG COUNT PER AREA Feb. 2019



The difference between the total of rigs per area and per type is due to the Stand By / Stacking number.

Distribution of Rigs



Egypt Production Feb. 2019

Total

556,763	B/D
6.8110	BCF/D
6645	MCF/D
88,487	B/D

Numbers are calculated per day on average.

	CRUDE OIL	GAS	SOLD GAS	CONDENSATES
MEDITERRANEAN SEA	510	4.0576	3959	29,527
EASTERN DESERT	67,130	0.0115	11	37
WESTERN DESERT	312,340	1.2915	1260	43,147
GULF OF SUEZ	125,013	0.0833	81	2,052
DELTA	199	1.3667	1333	13,274
SINAI	51,395	0	0	450
UPPER EGYPT	176	0	0	0

Egypt Drilling Update Feb. 2019

REGION	COMPANY	WELL	WELL TYPE	RIG	DEPTH	WELL INVESTMENTS
SINAI	PETROBEL	112-179	Development	ST-1	9,482	2.900 M$
Western Desert	PETROSILAH	SILAH 1-2 ST-1	Development	ECDC-1	7,000	1.100 M$
	AGIBA	BANAFSAG D-1X	EXP	ST-5	12,050	1.700 M$
	APACHE	WKAN-X S2-1X	EXP	EDC-57	13,882	3.300 M$
	QARUN	BOLT 118-1X	EXP	EDC-63	11,800	2.100 M$
	KHALDA	NRQ 12-2	Development	EDC-62	8,610	1.190 M$
		PTAH-28	Development	EDC-17	11,215	1.040 M$
		TANGO N-1X	EXP	EDC-58	4,780	602,957 $
		SIWA X-1X	EXP	EDC-54	2,505	500,795 $
		E RZK-199	Development	EDC-62	6,800	1.200 M$

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