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EGYPT OIL&GAS NEWSPAPER

Ramadan Kareem

WINTERSHALL DEA:
EUROPE'S LEADING INDEPENDENT GAS AND OIL COMPANY

Under the High Patronage of **HE. Eng. Tarek El Molla**
Minister of Petroleum & Mineral Resources - Arab Republic of Egypt

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EDITOR'S **LETTER**

In the oil and gas sector's journey towards safer and more cost-efficient operations, asset integrity is a constant concern. As technologies and systems to manage asset integrity are numerous and in constant evolution, Egypt Oil & Gas has dedicated this issue to discuss some of the approaches directed to asset integrity. You can find information on Pipelines Integrity Management Systems (PIMS), Structural Integrity Management (SIM), Managed Pressure Drilling (MPD), and corrosion management.

In April, Egypt Oil & Gas also covered a series of events. You can read in our pages about the workshops delivered by Wild Well, which promoted the newest technologies in well control to the Egyptian market. We were also the media partner for the Ministry of Petroleum's second edition of the Egyptian Petroleum Sector Energy Efficiency Conference (EPEEC 2019), and we bring you a detailed coverage with all the topics discussed during the event's presentations.

Finally, you can read about the inauguration of the Weatherford's new Kattameya Facility, which Egypt Oil & Gas has the pleasure to organize in partnership with Weatherford. During the inauguration, we exclusively spoke to Mark McCollum, Weatherford CEO; Walid Yassin, Weatherford Vice President for North Africa; Eng. Mohamed Moanes, First Undersecretary for Gas Affairs at the Ministry of Petroleum; and Eng. Abed Ezz El Regal, EGPC CEO.

On our Interview section, we spoke to Jotun's representatives to discuss about the world-class solutions offered by the company to the oil and gas sector.

As this is my last issue as Editor in Chief at Egypt Oil & Gas Newspaper – a role that I have played since February 2018, after working in different positions starting in November 2016 – I would like to express my most sincere gratitude for all the support received from our readers and partners, and from the whole Egypt Oil & Gas team.

I hope you enjoy this issue and I wish you all a happy Ramadan!

Editor in Chief

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EGYPT TO DOUBLE LNG EXPORTS BY YEAR-END: EL MOLLA

Egypt plans to double its liquefied natural gas (LNG) exports by the end of 2019 to 2 billion cubic feet per day (bcf/d), according to the Minister of Petroleum, Tarek El Molla. Egypt also wants to cooperate with Saudi Arabia to explore hydrocarbon reserves in the Red Sea through a number of projects.

"We are currently exporting around 1.1 bcf/d and we expect that by the end of the year this figure will go up to reach 2 bcf/d, when we resume the operation of the Damietta plant. The second liquefaction plant is expected to operate within the year," El Molla explained.

PETROLEUM MINISTRY DENIES RAISING FUEL PRICES IN JUNE

The Ministry of Petroleum has negated an alleged fuel price hike will take place next June, according to the ministry's spokesman, Hamdy Abd El Aziz. The ministry also stated that any price changes would only be announced in official statements from the Egyptian Cabinet. The ministry's spokesman stressed that news published by the media were just assumptions, urging caution in dealing with news that affects citizens' daily lives. Abd El Aziz also called upon the general public not to believe any rumors. The Egyptian government maintained the price of 95-octane gasoline unchanged at EGP 7.75 per liter in Q2 2019. The decision came after the pricing committee met on March 31.

EL SISI APPROVES GAS MARKET LAW AMENDMENTS

President Abdel Fattah El Sisi approved amendments to the law regulating natural gas market activities, which were passed by the Egyptian parliament.The amendments involve the part of the law dealing with collecting fines due to violations. Collected fines will be directed to the public treasury, instead of the Gas Regulatory Authority, as the authority gets sufficient funds from other sources. Moreover, the amendments were made to ensure transparency, as the regulatory authority was responsible for both issuing and collecting violation fines.

OIL TRADE BALANCE RECORDS 1ST SURPLUS IN 4 YEARS

Egypt's oil trade balance recorded a surplus, for the first time in four years, at $150.8 in H1 of fiscal year (FY) 2018/19, according to the Central Bank of Egypt (CBE). Oil exports grew by 18.4%, recording $14.3 billion in H1 FY 2018/19 compared to $12.1 billion in H1 FY 2017/18, which contributed to decreasing the deficit in the balance of trade. Moreover, expenditure on oil importing decreased by 2.1% reaching $5.8 billion as Egypt reduced its oil imports. Egypt had a $2.2 billion deficit in oil trade balance during the same period of FY 2017/18.

EGYPT ESTABLISHES HR DATABASE FOR PETROLEUM SECTOR

Egypt recently established a single database that connects all employees in the oil and gas sector to the Ministry of Petroleum. The database will provide a clear vision that supports decision making, said Tarek El Molla, the Minister of Petroleum, during a meeting with the team of the human resources development program, a part of the ministry's Modernization Project. The team analyzed the sector's human resources data in order to identify the strengths and weaknesses, as well as to recognize opportunities and risks to prepare efficient plans for all companies in order to boost the performance of their staffs accordingly.

EL SISI APPROVES $200 M LOAN FOR SOPC

President Abdel Fattah El Sisi has approved a $200 million loan agreement to finance the energy efficiency program at the Suez Oil Processing Company (SOPC). The agreement was signed by Egypt and the European Bank for Reconstruction and Development (EBRD) in May 2018. The president recently issued a republican decree approving a loan agreement to the Egyptian Natural Gas Holding Company (EGAS)' to support its energy efficiency projects.

IDKU PLANT TO REACH FULL CAPACITY IN JUNE: EL MOLLA

Egypt plans to raise exports from the Idku natural gas liquefaction plant to 1.13 billion cubic feet per day (bcf/d) in June, according to the Minister of Petroleum, Tarek El Molla. The plant is set to start operating in full capacity by mid-2019, as natural gas from neighboring Mediterranean fields reaches the plant while local production capacity increases. Idku's gas exports brought Egypt back to the global market after achieving self-sufficiency, the minister added. The Egyptian General Petroleum Corporation (EGPC) owns a 12% stake in the Idku plant, another 12% is owned by the Egyptian Natural Gas Holding Company (EGAS), 35.5% by Royal Dutch Shell, and 5% by Gaz de France (GDF).

ZOHR PRODUCTION TO EXCEED 3 BCF/D BY THE END OF 2019

The production of the Zohr natural gas mega field will exceed 3 billion cubic feet per day (bcf/d) by the end of 2019, according to a source at Belayim Petroleum Company (Petrobel). The field's current production rate is over 2 bcf/d, which directly contributes to help Egypt achieve natural gas self-sufficiency last year. The remaining drilling work at the field is ongoing as per the timeframe set by Eni and the Ministry of Petroleum. In addition, progress is in line with the ministry's preparation to export gas during 2019 after meeting the local market demands and achieving a surplus.

GASCO'S DISTRIBUTION RISES 6% IN 2018

Egyptian Natural Gas Company (GASCO) received and distributed around 61.5 billion cubic meters (bcm) of natural gas to market sectors in 2018, an increase of 6% year-on-year (YOY), according to Yasser Salah, the company's Chairman and Managing Director. The announcement came during the general assembly meeting of GASCO to review its 2018 financial results, which was chaired by the Minister of Petroleum, Tarek El Molla. The minister stressed the importance of the ministry's strategy to improve energy efficiency and the capacity of the national natural gas grid, with an increased production resulting from recent discoveries, in order to sustain energy supplies across the country.

POWER PLANTS ACCOUNT FOR 65% OF LOCAL GAS CONSUMPTION

Electricity-generating stations in Egypt dominate almost 65% of the country's total natural gas consumption. Power plants are followed by households and factories. Egypt is expanding the use of alternative energy sources like solar and wind, which will directly reduce the use of conventional fuels in electricity generation. By 2022, Egypt will decrease dependency on natural gas to around 45%, as the country plans to produce around 20% of its electricity from renewable resources. The transformation will allow Egypt to direct natural gas to other industries and increase the value added.

EGYPT TO INVEST $1.5 B IN PETROCHEMICAL PROJECTS

The Ministry of Petroleum plans to allocate $1.5 billion over four years to expand the petrochemical industry through four new petrochemical projects, said Minister Tarek El Molla. The minister's comments came during the general assembly of the Egyptian Ethylene and Derivatives Company (Ethydco) to review the financial results for 2018. El Molla, who chaired the general assembly meeting, urged the completion of new expansions and projects as the new Mediterranean natural gas projects have a great economic return and provide the optimum benefit of natural gas.

EGYPT TO INCREASE NATURAL GAS PRODUCTION TO 8 BCF/D

Egypt is implementing a number of natural gas development projects to increase natural gas output to 8 billion cubic feet per (bcf/d) by the end of fiscal year (FY) 2019/20, from the current level of 6.5 bc f/d. Egypt is currently producing 6.5 bcf/d, some of which are directed to cover the local demand. Meanwhile, another part is being directed to the petrochemical industries. Egypt is also establishing 19 projects to produce around 55,000 barrels of condensates. the Egyptian Natural Gas Holding Company (EGAS) offered four liquefied natural gas (LNG) shipments to be loaded through the Idku liquefaction plant between May 6 and June 1.

EGYPT CONVERTS 270,000 VEHICLES TO NATURAL GAS

Egypt has converted a total of 270,000 vehicles to natural gas since the beginning of conversion activities until March 2019, according to a source at the Natural Gas Vehicles Company (Car Gas). Around 2,600 vehicles have been transformed per month. There are now 200 natural gas supply stations across the country, he noted. The number of conversion stations is planned to reach 80 during fiscal year (FY) 2019/20.

EGYPTIAN BANKS TO FINANCE 70% OF SIDPEC PROPYLENE FACTORY

Sidi Kerir Petrochemicals' (Sidpec) board of directors decided to self-finance 30% of the company's propylene and polypropylene factory through a rights issue, and secure the remaining 70% via bank loans. The company's management has explained that it will take the necessary procedures to negotiate with financing institutions to obtain loans with the best possible terms and conditions in order to decrease the equities' share in financing. Sidpec earlier obtained a license from W.R. Grace & Co. to use its UNIPOL PP Process Technology in its 450 kilotons-per-annum (kTA) facility to produce polypropylene products.

PETROLEUM INVESTMENTS RECORD EGP 540 B IN FIVE YEARS

Egypt saw a total of EGP 819 billion of investments between 2014 and 2020, of which 66% have been invested prior to December 2018 in 79 projects that cost EGP 540 billion, according to the Egyptian Cabinet's book 'Egypt: Achievement Route', which highlights the achievements of President Abdel Fattah El Sisi's administration since June 2014. Egypt has had 30 oil and gas development projects operating in the aforementioned period, which added 6.3 billion cubic feet per day (bcf/d) of natural gas, and 53,600 barrels per day (b/d) of condensates.

DIESEL PRODUCTION DROPS BY 6.5% YOY

Egypt's diesel production decreased by 6.5% year-on-year (YOY) in January 2019, recording 518,000 tons, down from the 554,000 a year earlier, according to data of the Central Agency for Public Mobilization and Statistics (CAPMAS). Diesel consumption fell by 4.37% in January to 1.115 million tons compared with 1.166 million tons consumed in the same month of the previous year. Meanwhile, Abed Ezz El Regal, the head of the Egyptian General Petroleum Corporation (EGPC) revealed that Egypt consumes around 1.18 million tons of diesel on a monthly basis. Egypt imports around 50% of its diesel needs.

BUTANE IMPORTS FALL BY 8.4% YOY

Egyptian butane imports decreased by 8.36% year-on-year (YOY) to 239,000 tons last January, compared to the 260,800 tons in January 2018, according to the Central Agency for Public Mobilization and Statistics (CAPMAS). During the same period, local production grew by 5.66% YOY reaching 168,000 tons, while consumption fell by 4.46% to 387,500 tons. The CEO of the Egyptian General Petroleum Corporation (EGPC), Abed Ezz El Regal, said that Egyptian butane imports during the first three months in 2019 covered nearly 60% of the local demand. Egypt consumes around 388,000 tons of butane per month, produces around 170,000 tons, and imports roughly 240,000 tons.

EGYPT'S NATURAL GAS OUTPUT INCREASES BY 19% YOY

Egypt's natural gas output increased by 18.99% year-on-year (YOY), reaching 4.278 million tons in January 2019, up from 3.595 million tons in the same period last year, according to the Central Agency for Public Mobilization and Statistics (CAPMAS). Egypt's consumption of natural gas grew by 2.1% YOY to 3.731 million tons in January 2019, up from 3.654 million tons a year earlier. Monthly figures show that Egypt's natural gas output grew by 2.39% in January 2019, from 4.178 million tons in December 2018.

PETROLEUM PRODUCTS CONSUMPTION DECLINES BY 8.3% YOY

Egypt's consumption of petroleum products decreased by around 8.3% year-on-year (YOY) in January 2019 to 2.649 million tons, compared to 2.896 million tons in the same month last year, according to data of the Central Agency for Public Mobilization and Statistics (CAPMAS). CAPMAS data also showed that petroleum product's production slightly grew by 1.39% from 2.805 million tons in January 2018 to 2.844 million tons in January 2019. On the other hand, Egypt's consumption of petroleum products increased by around 2.04% month-on-month, down from the 2.596 million tons in December 2018.

EGYPT TO CUT PETROLEUM SUBSIDIES BY 42% IN FY 2019/20

The Egyptian government decided to decrease petroleum subsidies by 42% in the planned budget for fiscal year (FY) 2019/20. Egypt allocated around EGP 52 billion to subsidize petroleum products, which will be mainly directed to butane and other products, down from EGP 89 billion in FY 2018/19. Meanwhile, the International Monetary Fund (IMF) announced that Egypt's reform of fuel subsidies is on track and that it will be completed in fiscal year (FY) 2018/19. The reform is materializing as the IMF issued the complete fourth review of the Egyptian economic reform program

PETROJET REVENUES HIT NEW RECORD HIGH

Petrojet achieved a new record in revenues exceeding EGP 26.5 billion in 2018, with a 12% year-on-year (YOY) growth. The surge in revenues is mainly attributed to the unprecedented volume of contracts that were signed last year, which totaled EGP 40 billion, according to Chairman and Managing Director Waleed Lotfy. The company's contracts in Egypt totaled EGP 25.5 billion, while contracts abroad were valued at EGP 14.5 billion. Lotfy also stressed that applying health, safety, and environmental standards (HSE) helped the company become one of the best 250 construction firms in the world.

ENPPI SIGNS EGP 16.4 B CONTRACTS IN 2018

Engineering for the Petroleum and Process Industries (Enppi) has signed contracts worth EGP 16.4 billion in 2018, of which EGP 8.9 billion were directed to operations in Egypt and EGP 7.5 billion abroad, said Alaa Hegazy, head of the company. Last year, Enppi worked on the second phase of Zohr onshore facilities and developed the South West Baltim field. Hegazy remarks were made during the company's general assembly meeting, chaired by Minister of Petroleum Tarek El Molla, to review the company's 2018 results. Enppi also worked on the Nooros – Al Gameel pipeline project, Middle East Oil Refinery (MIDOR) expansion project, the two phases of Assiut hydrocracking complex, Assiut naphtha complex and Suez Oil Company's (SUCO) coking plant rehabilitation.

MIDOR REFINES 43.8 M BARRELS OF OIL IN 2018

Middle East Oil Refinery (MIDOR) refined a total of 43.8 million barrels of crude oil in 2018, said CEO Gamal ElKareish, during the company's general assembly meeting, chaired by Minister of Petroleum Tarek El Molla, to review the company's annual results. The company produced 5 million tons of different high quality petroleum products that meet global standards. MIDOR also secured over 3 million tons of petroleum products including diesel, gasoline, butane, naphtha, and sulfur, thus covering 62% of the refinery's production with $1.7 billion. The company exported 1.8 million tons of petroleum products with around 38% of its production going to global markets.

EDC BECOMES 100% EGYPTIAN

The Egyptian Drilling Company (EDC) became 100% Egyptian, as declared by the Minister of Petroleum, Tarek El Molla, during the company's general assembly to review the financial results for 2018. EDC expanded its scope of work, as it currently owns 40 onshore drilling rigs, four offshore rigs, 21 wells maintenance rigs, two lifting units, and one offshore device, according to the company's head, Osama El Husseiny. EDC dominates 53% of the Egyptian onshore drilling market, 36% in maintenance, and 15% in offshore drilling. Making EDC 100% Egyptian is considered a leap that prepares all employees to bear the responsibility of preserving the standards of the company's performance, the minister indicated.

SHELL EGYPT APPOINTS KHALED KACEM AS NEW COUNTRY CHAIRMAN

Royal Dutch Shell has appointed Khaled Kacem as the new Country Chairman and Managing Director in Egypt, replacing Gasser Hanter. Kacem was appointed in 2017 as the Director of Shell Hasdrubal Limited. He was previously the Director of Shell Tunisia Upstream Limited in 2016, and the President of BG Egypt in 2015.

ENI ANNOUNCES NEW OFFSHORE GAS DISCOVERY

Eni revealed a new gas discovery under evaluation in the Nour exploration prospect in the Eastern Mediterranean near North Sinai. The discovery was made through drilling operations at the Nour-1 New Field Wildcat (NFW), which was drilled by the Scarabeo-9 semi-sub in a water depth of 295 meters and reached a total depth of 5,914 meters.

INPECTOR CAPITAL ACQUIRES SCIMITAR PRODUCTION

Inpector Capital BV has acquired Scimitar Production Egypt Ltd. Erik Vollebregt has been appointed as the Executive Chairman of Scimitar Production Egypt. Vollebregt previously served as the Commercial and Finance Director of Shell Nigeria.

ENI TO ADD 3 ZOHR WELLS TO PRODUCTION

Eni plans to connect three new wells in the Shorouk concession to Zohr natural gas field in order to increase the field's production. The company announced it will complete drilling the field's 15th well in April.

ERC SUPPLIES 100,000 TONS OF PETROLEUM PRODUCTS

Egyptian Refining Company (ERC) supplied 100,000 tons of low-sulfur petroleum products, according to Qalaa Holdings. Operational trials of the catalytic reforming unit (CCR) and the vacuum distillation unit (VDU) in ERC succeeded and the company began delivering products such as diesel, naphtha, and high-octane gasoline. Operational trials are set to be completed by the end of Q2 2019, and commercial operations are scheduled to begin in Q3 2019.

DELEK DRILLING TO INVEST IN EGYPTIAN LNG PLANTS

Delek Drilling is seeking to invest in one of Egypt's natural gas liquefaction plants. The Israeli company wants to buy stakes in either Idku or Damietta liquefied natural gas (LNG) facilities or purchase capacities instead of acquiring equity. Delek agreed in July to invest in the East Mediterranean Gas Company (EMG), the owner of the pipeline linking gas fields in Israel to Egyptian export terminals.

ROVCO PARTNERS WITH DREXEL

Rovco has formed a partnership with Drexel Marine Petroleum in order to expand in Egypt. Rovco will offer advanced subsea services, as well as innovative 3D and artificial intelligence (AI) technologies to the Egyptian oil and gas sector, as well as to offshore contractors operating in Egypt, Northeast Africa, and the Middle East. This comes in line with the company's plans to grow its business in the region over the next five years.

SOCO INTERNATIONAL ACQUIRES MERLON

SOCO International has completed the acquisition of Merlon Petroleum El Fayum from Merlon International. The acquisition deal was agreed in exchange of around $136 million in cash, as well as issuing 65,561,041 new ordinary shares of SOCO to Merlon International.

BP TO BOOST PRODUCTION FROM GIZA, FAYOUM FIELDS

BP plans to add 300 million standard cubic feet per day (mmscf/d) to production from Giza and Fayoum natural gas fields. The aim is to raise total production from both fields to reach 700 mmscf/d in April.

ENI STARTS 7TH PROCESSING PLANT AT ZOHR

Eni began the seventh natural gas processing plant at Zohr field with a capacity of 400 million standard cubic feet per day (mmscf/d). The plant is set to boost the field's production capacity to 2.7 billion cubic feet per day (bcf/d) by the end of July 2019.

CARBON HOLDINGS TO ESTABLISH NAPHTHA CRACKER IN EGYPT

Carbon Holdings plans to build a world-scale naphtha cracker in the Suez Canal Economic Zone (SCZone), encouraged by its Tahrir Petrochemical Complex (TPC). Construction is expected to begin early next year, according to Karim Hefzy, the company's Managing Director of Project Development.

DANA GAS PRODUCTION RISES BY 5% IN Q1 2019

Dana Gas announced an increase in production by 5% year-on-year (YOY) in Q1 2019, reaching 68,700 barrels of oil equivalent per day (boe/d) thanks to adding Egypt's Balsam-8 well to production in Q4 2018, and the debottlenecking project in the Kurdistan Region of Iraq (KRI) last October.

DRAGON OIL TO ACQUIRE NEW ASSET IN EGYPT

Dragon Oil will complete an acquisition in Egypt within the next three to four months, according to CEO Ali Al Jarwan. More details were not revealed, however, the Al Jarwan indicated that the acquired asset would add around 70,000 barrels per day (b/d) to the company's production capacity.

SDX EXPECTS DELAY IN SOUTH DISOUQ PROJECT

The start-up date for South Disouq gas production might be delayed until Q4 2019, according to SDX Energy Corporation. The actual targeted start-up date is planned for mid-2019, upon the completion of an early production facility (EPF). However, the EPF commercial terms have not been agreed yet.

EGYPT PAYS $10 M TO DANA GAS

Dana Gas received $10 million from the Egyptian government, as well as $9 million from El Wasatani field's condensates. The government's payment comes in line with plans to repay all arrears in 2019. Dana Gas signed an exploration agreement in March 2019 with ADES for drilling services in the Egyptian Mediterranean Sea.

EL SEWEDY ELECTRIC TO BUILD SUBSTATIONS IN PORT SAID

El Sewedy Electric for Trading & Distribution (T&D), a subsidiary of El Sewedy Electric, signed an agreement for constructing the industrial district substation of Port Said. The EGP 550 million turnkey contract is an engineering, procurement and construction (EPC) agreement.

EGYPT OIL&GAS RESEARCH & ANALYSIS

EGYPT

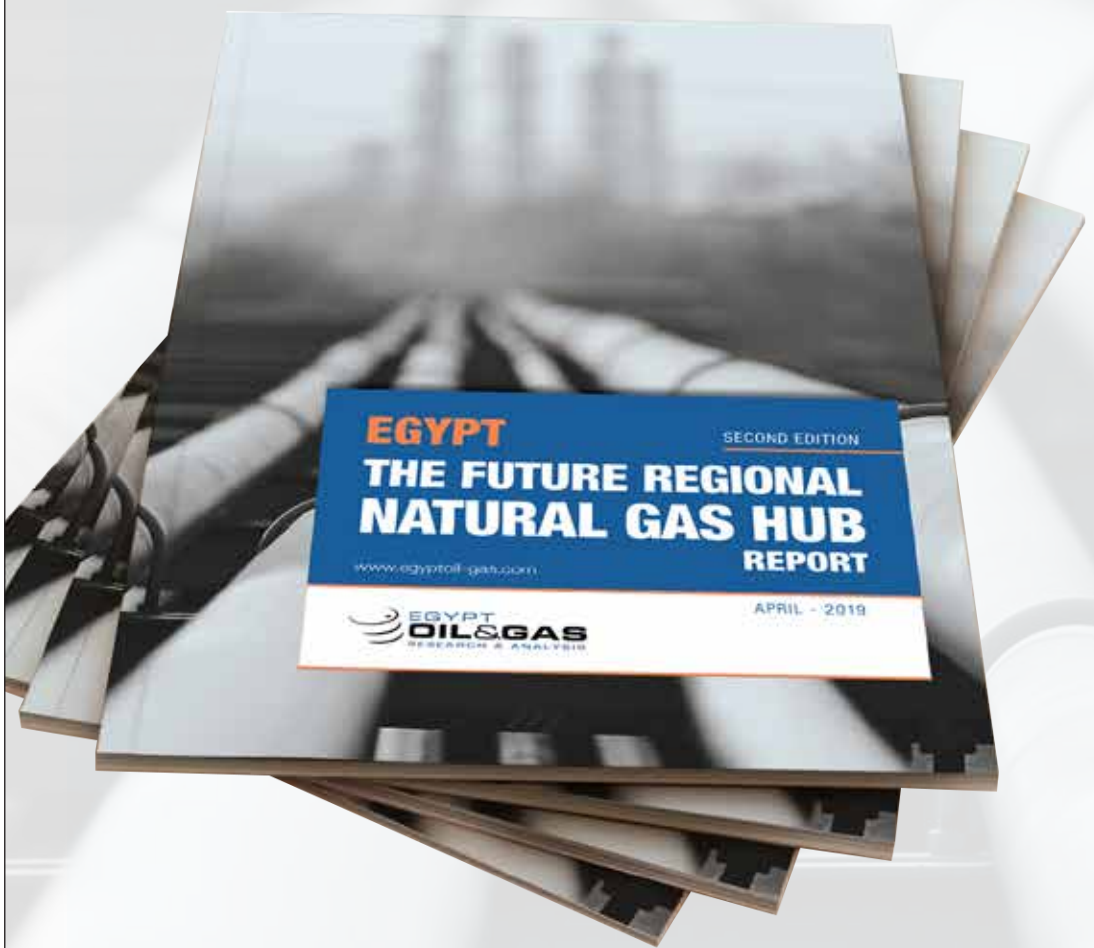
SECOND EDITION

THE FUTURE REGIONAL NATURAL GAS HUB

REPORT

APRIL - 2019

Egypt is closer than ever to becoming the Eastern Mediterranean's natural gas energy hub. Ahead of this historic milestone, Egypt Oil & Gas Research & Analysis has dug deeper into the available natural gas data from 2010-2018. This comprehensive analysis of the domestic gas market will enable our clients to track even the smallest changes in the sector, and help forecast its future prospects. It will enable them to make more precise decisions, placing them in the best possible position to take advantage of future developments in the sector. This second edition is an updated version of the report published in November 2018.



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SAUDI ARABIA

Saudi Aramco is acquiring a 70% stake in the Saudi Basic Industries Corporation (SABIC) for $69.1 billion, after months of negotiations between Aramco and the kingdom's Public Investment Fund (PIF). The petrochemicals production capacity of both companies combined is estimated near 79 million tons per year.

Saudi Aramco has priced its first international bond issuance at $12 billion. The issuance is comprised of five tranches of senior unsecured notes, which have maturities ranging from three to 30 years.

Ghawar field, the largest oil field in the world, has reached a production capacity of around 58 billion barrels of oil equivalent (boe) in combined reserves, and 48.3 billion in liquid reserves.

Russia's Novatek and Saudi Aramco are closing a deal for the Arctic LNG 2 project. Leonid Mikhelson, Novatek's CEO, and Khalid Al-Falih, the Saudi Minister of Energy, Industry and Mineral Resources recently held talks, during which Mikhelson said he did not think global liquefied natural gas (LNG) prices would change after launching the project.

Saudi Aramco inked a land lease agreement with Mcdermott Arabia to build an engineering, procurement, construction and installation (EPCI) facility in Saudi Arabia, at the King Salman International Complex for Maritime Industries in Ras Al-Khair. The facility will be used for large-scale manufacturing of offshore platforms and onshore/offshore modules.

A consortium of Arkad Engineering and a Milan-based Arkad-ABB joint venture (JV) offered the lowest bid in the tender to build a gas pipeline in Bulgaria. The consortium plans to finalize the 474-kilometer pipeline by 2020 for $1.24 billion or within eight months for $1.45 billion.

IRAQ

The US has extended the waiver that allows Iraq to import oil and gas from Iran, despite the imposed sanctions. Iraq imports around 1.5 billion standard cubic feet per day (bscf/d) of natural gas through pipelines in Iran's south to supply power stations.

Lukoil and Inpex have successfully finalized testing the fifth well at Eridu field's Block 10 in southern Iraq. The well has a production capacity of around 1,500 cubic meters of oil per day.

Sonangol announced that its production from Iraq's Qaiyarah oilfield has reached around 40,000 barrels per day (b/d). Sonangol targets to increase production capacity to 230,000 b/d. The company holds around 75% stake in the Najmah and Qayyarah oilfields, which have estimated reserves of around one billion barrels of oil.

OPEC

The Organization of the Petroleum Exporting Countries (OPEC)'s oil output declined in February, mainly due to the decreased production in Venezuela, Saudi Arabia, and Iraq. The decline was balanced out by a rising output from Libya and Angola. OPEC members produced around 30.55 million barrels per day (b/d) in February, down by 221,000 b/d from a month earlier.

UAE's Energy Minister, Suhail Al-Mazroui said that Russia is committed to the OPEC-led output agreement. Russia cannot increase oil output unless the country coordinates with other members of the organization, he noted.

ALGERIA

Petrofac was awarded a $1 billion deal from Algerian government-owned Sonatrach, Petroceltic, and Enel's Groupment Isarene for the Ain Tsila development project, through a 42-month contract. Petrofac has many engineering, procurement, and construction (EPC) activities in Algeria including the Sonatrach's Tinrhert Field development, the Alrar, and Reggane projects.

Talks between ExxonMobil and Sonatrach to develop a field in the southwestern Ahnet basin in Algeria were halted due to political unrest. Nationwide protests led to the resignation of President Abdelaziz Bouteflika. Last year, Sonatrach acquired ExxonMobil's Augusta refinery in Sicily, Italy.

Algerian production of crude oil and natural gas seems unaffected by the political turmoil, according to the International Energy Agency (IEA).

MOROCCO

Eni agreed to a 30% interest in Tarfaya Offshore Shallow Petroleum Agreement. The agreement is subject to the approval of Moroccan authorities. Eni Maroc and Office National des Hydrocarbures et des Mines (ONHYM) are currently the operators and hold a participating interest of 75% and 25%, respectively. The agreement will see Eni hold a 45% interest, while ONHYM will have a 25% interest, and a Gulf state company will hold the remaining 30%.

Chariot Oil & Gas, in partnership with ONHYM, was awarded a 75% stake in Morocco's offshore license. The license will provide a technical program of 3D seismic reprocessing and evaluation, to access the additional exploration potential of Lixus. The license covers an area of around 2,390 km2, 30 km north of Chariot's existing Moroccan acreage, with water depths ranging from the coastline to 850 meters.

UAE

Abu Dhabi National Oil Company (ADNOC) awarded onshore Block 4 to Japan's Inpex Corporation. The 35-year agreement gives Inpex exploration rights through its subsidiary, JODCO Exploration Limited, which will run the concession. Inpex will own a 100% stake during the exploration phase and will invest around $176 million.

Al Gharbia Pipe Company's plant, a joint venture (JV) between Senaat General Holding Corporation and two Japanese steel companies, will be operational in Q2 2019, according to Jamal Salem Al Dhaheri, Senaat CEO. Al Gharbia will be the UAE's first manufacturer of large-diameter thick-wall longitudinally welded steel pipes to primarily serve midstream activities.

Mubadala Petroleum has agreed to sell a 30-40% stake in Cepsa to Carlyle Group, a US-based global investment firm. The deal is worth around $12 billion and is expected to be closed by the end of 2019, and is subject to regulatory approvals.

EGA announced that its Al Taweelah alumina refinery commenced operations. The $3.3 billion refinery will have a production capacity of around 2 million tonnes of alumina per year when it is fully operated. The facility is located in the Khalifa Industrial Zone.

OMAN

The Omani Ministry of Oil and Gas signed a $3.85 billion deal with India's Accord Group to establish an oil refinery in Sri Lanka. The refinery will have a production capacity of 200,000 barrels per day (b/d) and is expected to produce 9 million metric tonnes of refined products.

Oman Oil and Orpic group plans to launch the Sohar Refinery Improvement Project (SRIP). The $2.7 billion project will be inaugurated under the patronage of the Omani Minister of Oil and Gas, Mohamed Al Rumhi.

BP Oman has renewed its five-year contract with Veolia Middle East for a reverse osmosis raw water treatment plant in Oman's Khazzan tight gas field. The facility has a production capacity of 6,000 cubic meters per day (m3/d), and 4,000 m3/d of processed water and 2,000 m3/d of drinking water. Veolia plans to increase local participation in the workforce to reach 80% within the contract's first six months.

Total inked an agreement with Oman for Block 12 exploration license. The agreement will enable Total to acquire a 100% operatorship of the exploration block. The company plans to conduct seismic acquisition and drilling commitments, and aims to start drilling the first well in 2020.

WINTERSHALL DEA: EUROPE'S LEADING INDEPENDENT GAS AND OIL COMPANY

BY: **DINA EL-BEHIRY**

As the global oil and gas market grows, exploration and production (E&P) companies tend to merge to be more competitive. One of the most prominent mergers that occurred recently is by two leading German based firms, Wintershall Holding GmbH (Wintershall) and DEA Deutsche Erdoel AG (DEA). The merger was completed on May 1,2019 after granting the needed approvals from all relevant authorities, shareholders BASF and LetterOne.

In September 2018, BASF and LetterOne signed an agreement to merge their oil and gas E&P business branches, Wintershall and DEA, to establish a new joint venture under the name of Wintershall Dea, headquartered in Kassel and Hamburg, that explores for and produces oil and gas in 13 countries around the world.

Wintershall Dea will be managed by an Executive Board, consisting of five members: Mario Mehren, Chairman and CEO; Maria Moraeus Hanssen, Deputy CEO and COO, responsible for Europe and MENA; Thilo Wieland, Member of the Executive Board responsible for Russia, Latin America and Midstream; Hugo Dijkgraaf, CTO; and Paul Smith, CFO.

In 2018, pro-forma hydrocarbon production of Wintershall and DEA together was 215 million barrels of oil equivalent (boe), equivalent to around 590,000 boe per day (boe/d). At the end of 2018, proven reserves on a pro-forma basis stood at 2.4 billion boe, which led to a reserve to production ratio of 11 years.

As a result of the merger, Wintershall Dea has established a regionally balanced footprint with superior growth opportunities in its core regions. Based on existing E&P projects, the company is on track to reach a daily production of around 750,000 to 800,000 boe between 2021 and 2023, which is equivalent to an annual production growth rate of 6% to 8%, in which growth is expected to come from both the existing portfolio and new production regions.

"We are a European champion and are making an important contribution to Europe's energy security," said Mehren.

GROWING PROFITABLY TOGETHER AND EXPLOITING SYNERGIES

Wintershall and DEA have established their business relation for decades, including at Mittelplate, Germany's largest oil field. According to Mehren, the newly created company has the ideal size to meet the challenges of the oil and gas market, stating that "we are large enough to be a relevant partner for the state-owned oil and gas companies, and at the same time independent and flexible enough for complex tasks where we apply our engineering skills."

Wintershall Dea expects to realize synergies of at least €200 million per year as of the third year following the closing of the transaction, in particular from operating and capital expenditure savings. According to the current plans, around 1,000 of the total 4,200 full-time positions are expected to be reduced worldwide. The social partners are currently working on socially compatible solutions regarding the necessary personnel adjustments.

According to the merger agreement, LetterOne will offer all of its shares in DEA into Wintershall in exchange for the issuance of new shares of the company to LetterOne. The merger will have BASF holding 67% and LetterOne 33% of Wintershall Dea's ordinary shares, representing the value of the respective E&P businesses of both Wintershall and DEA. Meanwhile, BASF will take additional preference shares, representing Wintershall's gas transportation business.

STRONG PORTFOLIO WITH FOUR CORE REGIONS

Wintershall Dea produces oil and gas in four core regions: Europe, Russia, Latin America and the Middle East and North Africa (MENA) region.

"As an energy company, we know that we are merely stewards of the country's natural resources. We recognize our responsibility and work with all stakeholders to ensure that our presence improves people's lives. In the countries where we are active, we are well positioned and often even a leader," said Hanssen.

This applies, for example, to domestic production in Germany, as well as the Norwegian continental shelf and production in Russia. "Our portfolio is well balanced both regionally and operationally, and 70% of our production is gas. And that is a good thing for Europe with a growing demand for natural gas. Europe does not need less, but more gas, in order to achieve its own climate goals," Hanssen added. "Our roots are in Germany, our home is Europe and our work is global."

The upstream activities of the company are supplemented by investments in natural gas infrastructure and midstream services. Together with its partners, Wintershall Dea operates a natural gas pipeline network in Germany of approximately 2,400 kilometers. The company is also a shareholder of Nord Stream AG and provides financing to Nord Stream 2 AG.

SHARED VALUES AND SHARED RESPONSIBILITY

"One of the greatest challenges of our time is to protect the climate while meeting the growing global demand for energy. We want to make a contribution to both. We want to produce gas and oil economically and, at the same time, to the highest environmental and safety standards. And it is just as important that these resources are produced and consumed in the most energy- and climate-efficient way as possible," Mehren explained.

"Greater digitalization will help us do this, as it enables us to deliver enhanced [health, safety,environment and quality] HSEQ performance, improved efficiency, and new ways of working. It will be a matter of strategic importance for Wintershall Dea," he continued.

Mehren emphasized that Wintershall and DEA fit together not only in terms of their portfolio, but also in terms of their values and their team spirit. The new company is based on these shared values. "We are a reliable partner.... We are reliable in our dealings, in our expertise and in our performance."

NEW CORPORATE STRUCTURE AND PERSPECTIVE: INITIAL PUBLIC OFFERING

"Exactly 50 years ago, in 1969, Wintershall became part of the BASF Group," Mehren said, adding that "this created the necessary leeway for Wintershall to significantly expand its production abroad. It was also an important step for DEA to gain additional financial strength through LetterOne's commitment in 2015. Now is the right time for Wintershall and DEA to join forces so that the new company has the scale and clout to compete in today's environment."

Following the closing of the merger, the company will have no shareholder loans outstanding with BASF or LetterOne. Wintershall Dea targets an investment grade credit rating.

The integration of Wintershall and DEA is expected to be completed in approximately one year. BASF and LetterOne expect to offer shares in Wintershall Dea through an initial public offering (IPO) in H2 2020, subject to market conditions.

"We want to start preparing for a listing by the end of this year. The actual listing will probably be in 2020," a senior source in one of the merging companies stated.

The formation of Wintershall Dea represents a cornerstone for a new leading European independent oil and gas company with a global upstream portfolio and participation in natural gas transport and in midstream business.

TRACKING PETROLEUM PRODUCTS TRANSPORTATION:

A COMPARATIVE ANALYSIS (2016/17 - 2017/18)

BY **AMINA HUSSEIN, REHAM GAMAL & TASNEEM MADI**

Transporting petroleum products represents a major pillar in the oil and gas industry, locally and globally. It plays a vital role in upstream and downstream activities. Railway tanks, pipelines, marine vessels, tankers, trucks are used to transport hydrocarbon products, including oil, compressed and liquefied gas, fuels, and other chemicals from refineries and distribution points to the end consumers.

In oil importing countries, transportation secures the link connecting importing locations and consumption points. Meanwhile, Egypt depends on a variety of tools and channels to transport petroleum products on both domestic and international levels.

Transportation services help strengthen the performance of the petroleum sector and its contribution on the Egyptian economy growth. This indicates the importance of tracking the changes in Egypt's petroleum transportation performance. In the following lines, we will monitor the developments that took place between fiscal year (FY) 2017/18 and FY 2016/17.

MAIN TRANSPORTATION CHANNELS

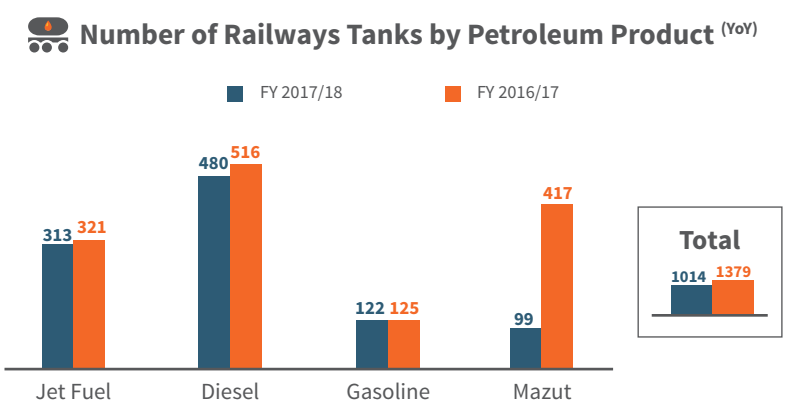
In Egypt, there are four main routes to transport petroleum products which are railways, pipelines, trucks, and maritime transport.

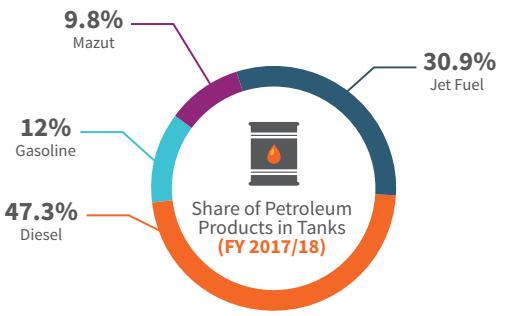
1. RAILWAY TANKERS

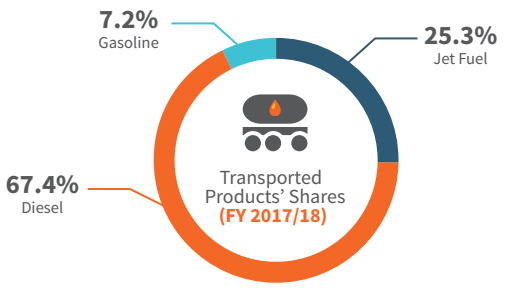
Railway tankers are a special means of transportation, transporting petroleum products through a various numbers of lines that cover most governorates through railway stations. The Egyptian railways are used to transport mainly four different petroleum products, namely; gasoline, mazut, diesel, and jet fuel

In FY 2017/18, the total number of active railway tankers reached 1,014, registering a decline of 26% compared to FY 2016/17, when the number of tankers stood at 1,379.

Diesel had the highest share of the total number of railways tankers in FY 2017/18, which accounted for 47.3% of the total number of tankers compared to 37.4% in the previous year.

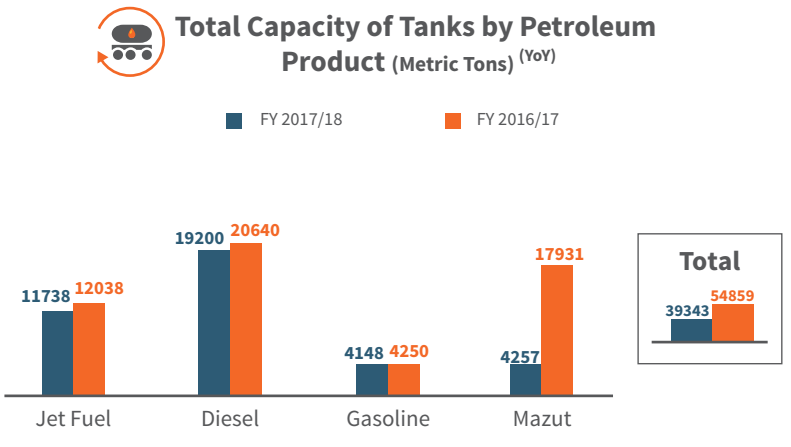


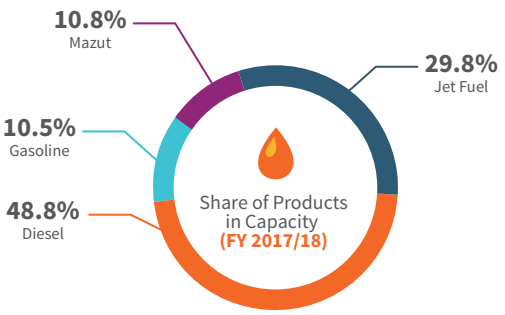




Additionally, in FY 2017/18, the capacity of these tankers declined by 28% to record 39,343 metric tons, compared to a total 54,859 metric tons in FY 2016/17.

Diesel also had the highest share in the tankers capacity in FY 2017/18, as it represented approximately 49% of the total capacity.

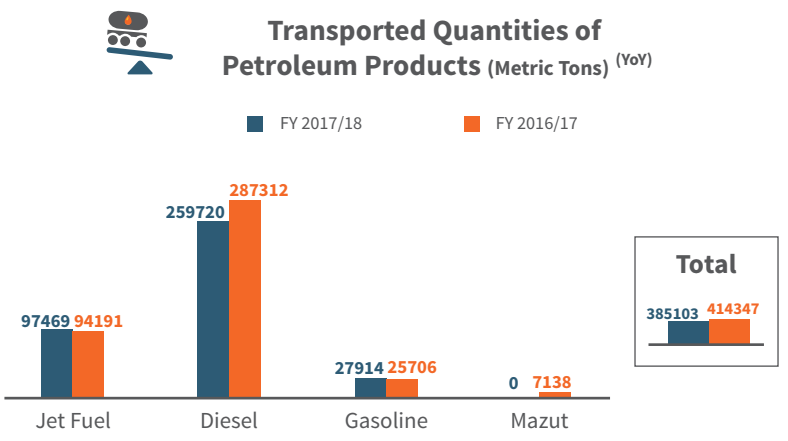




The Egyptian railways transported a total of 38,510 MT of petroleum products in FY 2017/18, which was 7% less than the quantity transported in FY 2016/17.

Thus, diesel was the product with the highest quantity transported, amounting to 259,720 metric tons, which represented 67.4% of the total transported quantity.

It is worth noting that railway tankers did not transport any quantities of mazut during FY 2017/18, versus 7,138 MT in FY 2016/17.



2. PETROLEUM PIPELINES

The general rationale for transporting crude oil, natural gas, and petroleum products is to flow these products through pipelines. The pipelines transfer petroleum products from wells to refineries or gas plants, and then to terminals, and eventually to the end consumers. Pipelines are considered the best transportation in some cases, as they could be the most efficient option from an economic perspective, especially if transportation is over long distances.

Aboveground, underwater and underground pipelines are three types of pipelines that vary in size from several centimeters to more than a meter in diameter. Generally, there are four types of pipelines including flow lines, gathering and feeder lines, crude trunk pipelines and petroleum product pipelines.

In Egypt, there are three types of petroleum pipelines. First, there are the main pipelines that mostly have large diameters. Main transmission pipelines are usually underground or undersea and are used to transfer crude oil or natural gas through high-pressure techniques. These pipeline networks include several compressing stations in gas lines or pump stations for crude and multi product pipelines.

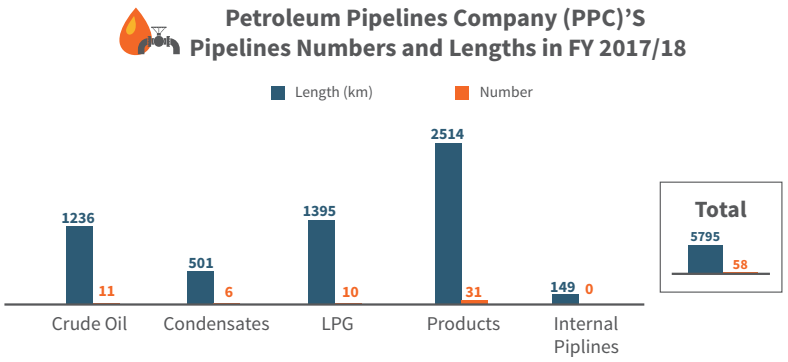
The second type is gathering pipelines. Smaller, interconnected, and form complex networks that bring crude oil or natural gas from several nearby wells to a treatment or processing facility. In this category, lines are usually short and with small diameters. Subsea pipelines used to collect products from deep-water production platforms are considered gathering pipelines.

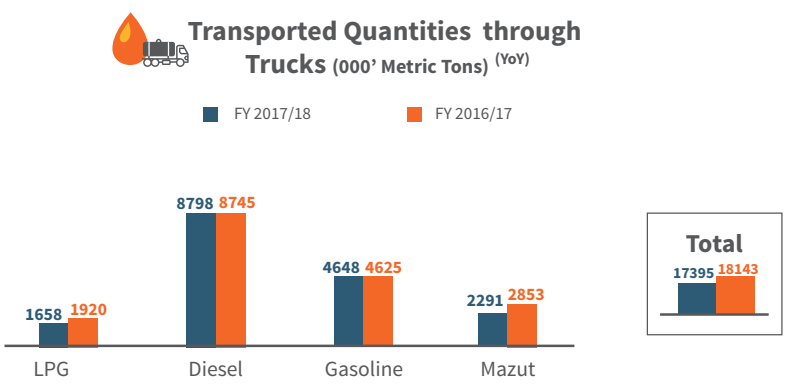
Finally, the third type is distribution pipelines, which are composed of several interconnected pipelines with small diameters. Distribution networks are mainly used to move the products to the final consumer. This type of pipelines includes feeder lines, as in the natural gas grid that distributes to homes and businesses downstream, in addition to pipelines at terminals to distribute products to tankers and storage facilities.

The Arab Petroleum Pipelines Company's (SUMED) pipeline is the main pipeline in Egypt as it is one of the most important developments in the field of pipeline transportation. The SUMED line is a global center for crude oil storage and marketing, where crude is transferred from oil producing countries to consuming markets through the shortest way and lowest expenses. It is 320 kilometers (km) long, with a 42-inch (106.68 centimeters) in diameter, and a capacity of 117 million metric tons per year (mmt/y).

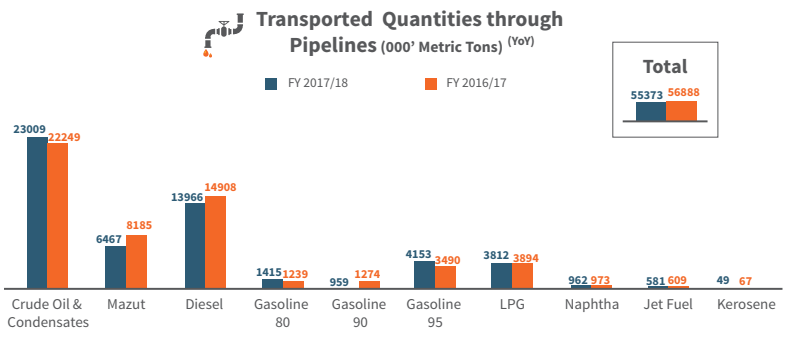
Although the number of pipelines remained constant at 58, the total length increased by 4% to reach 5,795 km in FY 2017/18 compared to 5,590 km in FY 2016/17. This increase was due to the 117 km extension in the lengths of liquefied petroleum gas (LPG) pipelines and an extension of 88 km in the products pipeline.

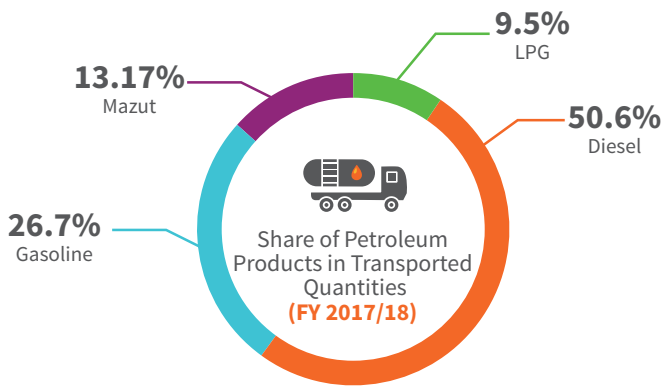
According to the Central Agency for Public Mobilization and Statistics (CAPMAS) figures, product pipelines came on top, with a total of 31 lines and 2,514 km length.

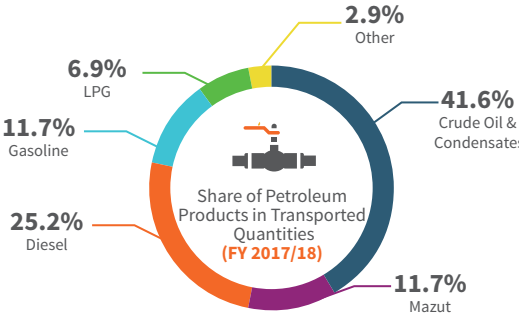




Despite the increase in the lengths of pipeline networks in FY 2017/18, transporting petroleum products fell by 3% on a yearly basis to record 55,373 metric tons in FY 2017/18. Crude oil and condensates represented around 42% of the transfered quantities in FY 2017/18 with 23,009 MT leading the total quantity of petroleum product transports.







3. TRUCKS

In the Egyptian market, trucks remain the main means of petroleum transportation that are used for transferring gasoline, diesel, mazut, and liquefied petroleum gas (LPG).

The total quantities transferred by trucks declined in FY 2017/18 by 4.12%, recording around 17,395 MT down from 18,143 MT in FY 2016/17. According to CAPMAS's figures, diesel accounted for 50.6% of the transported quantities by trucks in FY2017/18.

Gasoline, mazut and LPG followed diesel in the share of total quantities transported by trucks. In FY 2017/18, 4,648 metric tons of gasoline were transferred by trucks, which represented 26.7%. LPG had the least transported amount at 1,658 MT, accounting for 9.5% of the total quantities transported by trucks.

It is worth noting that diesel and gasoline quantities transported by trucks between FY 2016/17 and FY 2017/18 remained almost unchanged with slight differences. For instance, the diesel quantities that were transported increased by 0.006%, while the gasoline quantities rose by 0.005% in FY 2017/18. Diesel transportation reached 50.6% in FY 2017/18 compared to 48.2% in FY 2016/17.

Mazut and LPG were the products transported the least, as transported mazut quantities fell by 19.6% in FY 2017/18 and the LPG quantities shrank by 13.6% in comparison to FY 2016/17. Accordingly, LPG was the product with the smallest share at 9.5% in FY 2017/18.

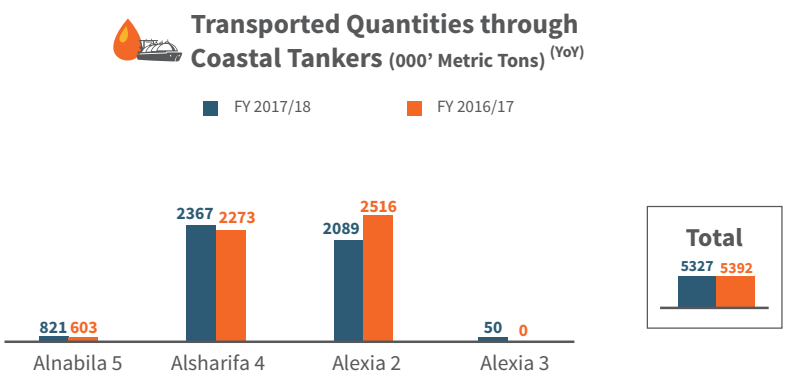
4. WATER TRANSPORT UNIT

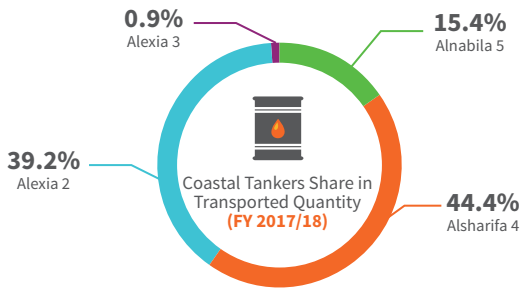
Egypt had four running coastal tankers in FY 2017/18. Namely, Alnabila 5, Alsharifa 4, Alexia 2 and Alexia 3. Those tankers were capable of transporting 5,327 MT in FY 2017/18. CAPMAS's figures show that Alsharifa 4 transported 2,367 MT, which is the largest amount transported by these tankers, representing 44.4% of the total quantities transported by coastal tankers.

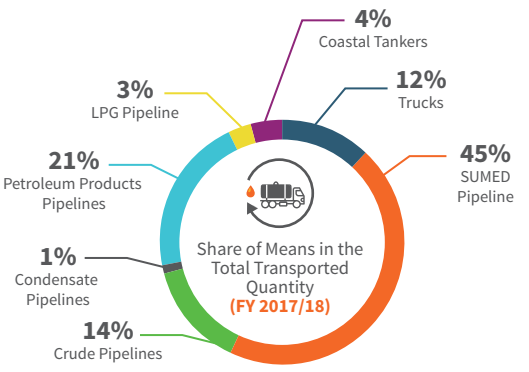
However, coastal tankers witnessed the smallest change in the percentage rate among other coastal tankers in two years, as it increased in FY 2017/18 by 4.13% more than FY 2016/17. Alexia 3 transported the fewest amount among other tankers, with only 50,000 MT; which represented 0.93% of the total quantities transported by coastal tankers. Alnabila 5's transports increased by 36.15% in FY 2017/18 in comparison to FY 2016/17. Moreover, Alexia 2 was the only tanker that witnessed a decrease of nearly 17% in FY 2017/18 in comparison to FY 2016/17. However, Alexia 2 was not used before as it was decommissioned.

On the other hand, Alsharifa 4 represented the tanker with the highest share in transporting oil among all other tankers in FY 2017/18.

These tankers differ in their characteristics. For instance, Al Nabila 5 has the highest maximum recorded-speed among other tankers, which is 13.4 Knot, while Alexia 3 has the biggest size (in length and breadth), (248m*43m). Furthermore, Alexia 2 is the smallest, slowest in speed, but enjoys the highest capacity. It is worth noting that all these tankers are Egyptian crude oil tankers except Al Nabila 5, which is an oil products tanker.







LEADING INDICATORS

The cost and quantities of the petroleum transportion means are two leading indicators to be considered for an efficient transportation process. The total petroleum transportation costs in Egypt increased by 3%, reaching EGP 19.9 billion in FY 2017/18, up from EGP 19.3 billion in FY 2016/17. As a result, the quantity of the petroleum products that were transported decreased by 7%, reaching 136,897 MT in FY 2017/18, down from 147,131 MTin FY 2016/17.

The SUMED pipeline, which is one of the successful joint Arab-Egyptian projects, has been expanding since 1970s. It transferred 58,417 MT in FY 2017/18, compared to 66,294 MT in FY 2016/17 at a cost of EGP 2.45 billion, down by 12%.

Nonetheless, the SUMED pipeline has represented the means of transportation that transferred the highest quantity of petroleum products in FY 2017/18 with a 45% share. On the other hand, the remaining 55% of petroleum products were transferred by various means including railways tankers, trucks, and coastal tankers, as well as crude, condensate, LPG, and petroleum pipeline.

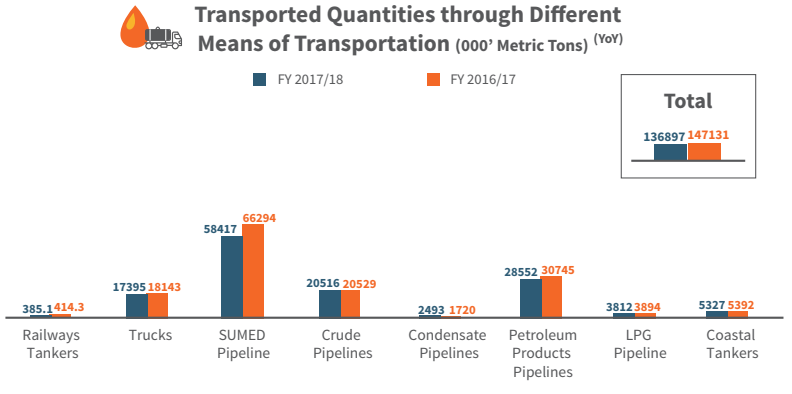
Railways tankers in Egypt have not been upgraded since 1960s. In 2014, the Ministry of Petroleum and Mineral Resources took an initiative to upgrade 100 tankers. A contract was signed between the Egyptian General Petroleum Corporation (EGPC) and the Egyptian National Railways (ENR) to increase the petroleum products quantities transferred to Upper Egypt from 1,000 tons per day (t/d) to 1,500 t/d. In addition, another contract was signed to purchase 250 tankers that would transfer petroleum products of some petroleum companies to different regions in Egypt, the Minister of Petroleum, Tarek El Molla, said in an interview with el Mogez Newspaper in April, 2014.

However, railway tankers have represented the means of transportation with the lowest quantity transferred of petroleum products. Tankers transferred only 385,100 MT in FY 2017/18 at a cost of EGP 50 million, down from 414,300 MT in FY 2016/17 at a cost of EGP 36 million, declining by 711%.

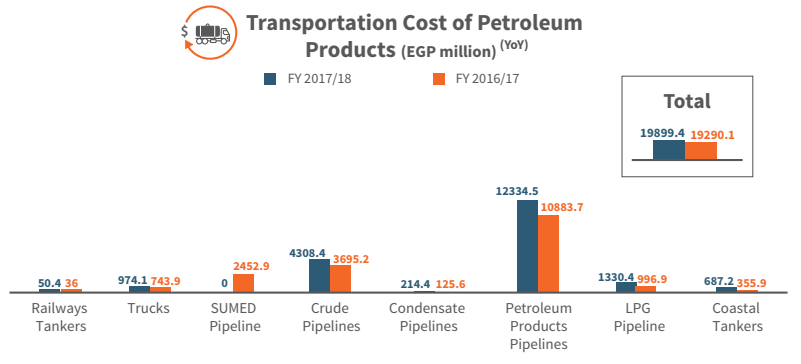
Additionally, the total quantities of crude oil, condensates, LPG, and other petroleum products that were transferred through pipelines declined by 3% to reach 55,373 MT in FY 2017/18 at a cost of EGP 18.2 billion, down from 56,888 MT at a cost of EGP 15.7 billion.

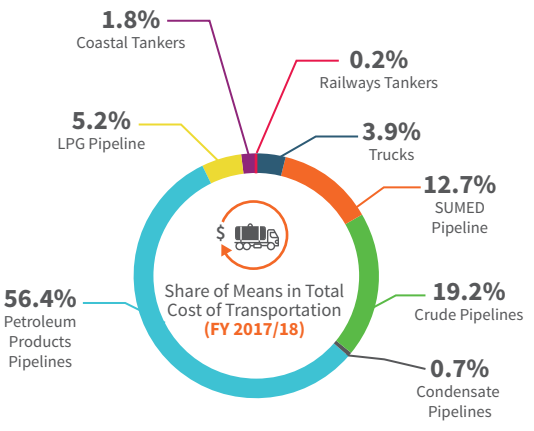
For the trucks, it is evident that the total quantities transferred by this means decreased by 4%, reaching 17,395 MT in FY 2017/18 at a cost of EGP 0.97 billion, down from 18,143 MT in FY 2016/17 at a cost of EGP 0.74 billion.

On the other hand, there are coastal tankers, which represent the containers that have been designed for carrying fuel to vessels offshore. The transferred crude oil and other petroleum products by coastal tankers slightly decreased from 5,392 MT in FY 2016/17 at a cost of EGP 0.4 billion, reaching 5,327 MT in FY 2017/18 at a cost of EGP 0.7 billion.



Costs have greatly affected the quantity of petroleum products that were transported. It is clear that when the total transportation cost increased by 3% year-on-year (YOY) in FY 2017/18, the quantity of transports decreased by 7%. However, over the past few years, the transportation and distribution system of petroleum products in Egypt has witnessed a significant leap nationwide. This progress has highly contributed to the market stability.





Additionally, new measurements have been implemented by the Ministry of Petroleum and Mineral Resources in 2018 to improve the efficiency of the transportation and distribution system of petroleum products. Consequently, the domestic needs of these products will be met. Security, safety, and environmental protection policies must be considered while transporting and uploading fuels to ensure the adequacy of any future plans, El Molla stated in an interview with Reuters in March 2019.

STRUCTURAL INTEGRITY MANAGEMENT: A PILLAR FOR HAVING A SUSTAINABLE SECTOR

BY **SARAH SAMIR**

Structural integrity management (SIM) is one of the main pillars of asset integrity management (AIM) in the oil and gas sector. SIM focuses on ensuring the asset's structural integrity and its continuous fitness-for-purpose, allowing owners to achieve their business objectives flexibly and to ensure operations sustainability. Maintaining structural integrity guarantees that different structures of the sector will have the ability to bear any loads, including their own weight. Therefore, enhancing the integrity of oil and gas structures represents a cornerstone for guaranteeing the success of the ongoing operations.

APPLYING SIM IN THE OIL AND GAS SECTOR

The oil and gas industry could be costly and risky when it is not handled properly. Therefore, there is a great need for applying SIM to help operators decrease failures, costs and downtime in any hydrocarbon process.

"SIM fitness for service is a critical part within the AIM system," Mohamed ElHabbal, AIM Program Manager and Principal Offshore Structures Engineer, told Egypt Oil & Gas, adding that "SIM system has the same principals of other AIM pillars which sets an efficient management system for the assets in a way that ensures safety, preserves the environment, minimizes operational risks and optimizes operating expenditures (OPEX)."

Most of the facilities in the oil and gas sector are "mature assets on mature fields," according to an article by Oil & Gas IQ on Structural Integrity Management. This is because most of the facilities around the world have a planned cycle of 20 years starting from commission, and an expected operational lifespan between 20 and 40 years. Therefore, SIM is used to make sure that "the people, systems, processes and resources that deliver integrity are in place, in use and will perform when required over the whole lifecycle of the structure," according to Health and Safety Executive's research report, entitled 'Structural integrity management framework for fixed jacket structures' definition of SIM'.

During structural evaluations, companies assess the structures' current condition and compare it to the last assessment, taking into consideration other parameters that affect the integrity and risk levels and confirm if the acceptance criteria for structural integrity are met, according to the report.

Additionally, managing structural integrity can help maintain structures throughout different levels. "Properly implemented, SIM can provide structural integrity assurance from design to decommissioning," stated Mohammad Nabavian of Wood Group PSN in article published by Offshore Engineer (OE Digital).

Therefore, SIM implementation becomes a necessity to guarantee the reliability of ever-aging infrastructure, coping with the demands of complex life extension projects, and providing safe and successful decommissioning, Nabavian said in the article.

Therefore, SIM is used by operators to ensure long term asset integrity considering decommissioning phases, life extension and operation of an asset. Moreover, SIM systems can ensure continued production, safety, environment protection, best practices and legislative compliance, according to the article.

BPM IN SIM

In order to maintain efficient structural integrity, oil and gas operators can apply Business Process Management (BPM). BPM is "a discipline that leverages software and services to provide total visibility" in organizations. BPM has several goals including documenting, discovering, automating and continuously enhancing business processes with an aim to boost efficiency and decrease cost, according to Saurangshu Chakrabaty's article entitled 'BPM for Structural Integrity Management in Oil and Gas Industry'.

"Business process is the heart of any management system as long as such processes are smooth, clear and well defined, which will lead to an efficient integrity management system. Usually, when you design an integrity management system, part of the design is how to develop an efficient business process to enable asset stakeholders to execute, document, measure and control the system to meet the business objectives," ElHabbal explained.

"SIM system is part of a whole, so, as long as business stakeholders are committed to designed business process, the integrity system will be sustained, and the strategic business goals will be achieved, translating the structural integrity philosophy into plan and actions, i.e. inspections, maintenance and repair (IMR) activities and documenting each single incident, action and activity in a way that builds the asset's DNA, which will enhance the monitoring and control added to that decision making process, considering asset life extension, upgrades or even transferring the ownership of such assets," ElHabbal added.

The oil and gas industry has a lot to do with the services provided for operators. It is important to use BPM in the industry as it is the responsibility of every company to ensure the orchestration of business process in order to deliver the business commitments and to operate safely, especially for a complex world that is mainly concerned with services, according to the article entitled 'Is Business Process Management obsolete in a world of Everything as a Service?' published by Accenture.

BPM mainly focuses on ensuring process efficiency, especially under the low oil process. Therefore, the sector needs to shift to a risk-focused management approach, where the efficiency and transactional aspects are indeed covered by the as-a-service concept, according to the article's explanation on how BPM can develop to better serve the present oil and gas industry.

Additionally, BPM can be used in oil and gas industry in order to reach several aims. It is used in supporting the situations in which processes should adapt unpredictable new ways to work on certain tasks in the industry while keeping high-level structure with a defined goal, Chakrabaty's article said.

Moreover, the BPM approach could be used in order to have a real-time decision as it enables oil and gas companies to achieve tangible benefits through opening unseen insights. It provides adaptive analytics to be used in self-learning. These analytics "can dynamically incorporate new information and insights and automatically apply them to the next applicable situation in the system," according to the article.

Also, the BPM helps oil and gas operators to avoid disasters as it supports them with "timely alerts from predictive models which get built," the article further stated.

SIM FOR OFFSHORE FACILITIES

Oil and gas is a high-risk industry, especially in its offshore operations. When failures happen in marine structures, they might lead to property loss, fatalities or pollution, according to Torgeir Moan's article entitled 'Life Cycle Structural Integrity Management of Offshore Structures'.

"Structural integrity of offshore facilities is more important due to the high risks accompanied by lack of integrity in the offshore fields, which add to the high costs of IMR activities," ElHabbal said.

"Structures supported on the seafloor can experience failure of the structure, foundation or soil, while buoyant structures can experience capsizing or sinking, hull or mooring system failure," Moan's noted. Hence, maintaining the integrity of offshore structure comes among the top priorities of oil and gas leaders.

Henceforth, the American Petroleum Institute (API) issued its first SIM standard for fixed offshore platforms in December 2014, Francis Guédé's said in the article entitled 'Risk-based Structural Integrity Management for Offshore Jacket Platforms'. The API standard highlights the importance of using risk-based approach in the development of an effective inspection strategy. The standard provides guidelines that help operators develop strategies and programs for risk-based inspection. "However, only general guidelines are given for the risk assessment and for the pre-selection of survey locations," the article said.

Moreover, the API standard assesses platform risks based on the exposure category, which is "defined with respect to life safety exposure and consequence of failure including the environmental and the economic impact;" and based on the likelihood of failure, in which the API standards "allow qualitative, semi-quantitative, or fully quantitative methods to be used" to assess its levels, according to the article.

API uses risk-based inspection strategy, which is related to the underwater inspections routine. Yet, it needs a baseline inspection to be conducted "and it should use findings from the above-water inspections and the eventual post-event inspections," Guédé noted in the article.

"Operators can ensure structural integrity by developing within its organization an integrity team or even rely on service providers to develop such system," ElHabbal noted, adding that "the objective of such system is to minimize the costs of periodic inspections and repairs in a way that never compromises the safety of the offshore facility and preserve environmental resources to the maximum. Not to mention, relying on technology and digital solutions may enhance the efficiency of managing the integrity system and ensure its sustainability."

"It is recommended that operators shall plan for integrity during early design stages of the new offshore assets which will eventually have a huge positive impact on operators welfare," ElHabbal pointed out.

However, the oil and gas offshore industry bases initial designs on uncertainties, which leaves a room for failure and risks. Therefore, SIM further requires reassessment of the design during operation phases. "Basically, the reassessment involves the same assessments as carried out during initial design. However, depending upon the inherent damage tolerance ensured by the initial design, the measures that have to be implemented to improve the strength of an existing structure may be much more expensive than for a new structure. This fact commonly justifies using more advanced methods than those applied in the initial design," Moan's article explained.

RCM FOR REFINERIES AND PROCESSING PLANT

As countries extend their use of refineries and processing plants, operators have to force shutdown periods. In many countries, the excessive use of refineries can lead to "tremendous strain on most equipment and also on the reliability assurance of these equipment," according to the article entitled 'A New Model For Reliability Centered Maintenance In Petroleum Refineries,' published by the International Journal of Scientific & Technology Research.

Hence, it is not enough to use normal reliability assurance methods, such as predictive maintenance, preventive maintenance and condition based maintenance. Instead, operators choose to implement the reliability centered maintenance (RCM), the article proposed.

A simplified approach of RCM implementation was put forth. The Streamlined RCM (SRCM) "consists of identifying the failure mode that each existing maintenance task is supposed to be preventing and then work forward again through the last three steps of the RCM decision process to re-examine the consequences of each failure and identify a more cost-effective failure management policy," John Moubray said in the article 'the Case Against Streamlined RCM '.

Moreover, RCM is used in optimizing the assets of any projects. Hence, "RCM is the best method to use for optimizing the operational reliability of plant equipment," Drew Troyer said in the article entitled 'Optimizing your Assets through Reliability-centered Maintenance'.

The RCM process helps operators optimize reliability, as well as associated maintenance tactics, while keeping in mind the operational requirements, Troyer explained, adding that the primary objective of any RCM process is the "economic optimization of machine reliability relative to organizational goals."

RCM could be used in batch manufacturing plant, where the process usually includes huge parts of predictive maintenance and proactive maintenance. Yet, the oil analysis technician handling the RCM process should have some technical precisions in the lubricant-specific failure mode, effects and criticality analysis (FMECA); the deployment of proactive lubrication management measures; and the effective utilization of predictive oil analysis techniques, according to Troyer.

It is of great importance for operators to study any project over the design phase and while operating in order to decide on the most suitable integrity maintenance approach and to ensure the integrity of this project.

"RCM usually relates to rotating equipment while risk-based approaches are more convenient when dealing with structures. Risk Based Inspection intervals lead to exquisite cost savings when dealing with structures especially offshore structures," ElHabbal explained. Hence, referring to risk-based inspection like the API standards helps operators maintain the integrity of the structure of any oil and gas project.

PIPELINE INTEGRITY MANAGEMENT SYSTEMS:

STRETCHING A PIPELINE THROUGH ITS LIFECYCLE

BY **MAI EL GHANDOUR**

Savvy pipeline operators are well aware that they must enforce a dynamic and effective Pipeline Integrity Management System (PIMS) to be able to run operations smoothly. Amr Saleh, Corrosion Engineer at DNV.GL told Egypt Oil & Gas that a PIMS is initiated and implemented by oil and gas companies for managing the integrity of their onshore oil and gas pipelines. Through PIMS, the minimum acceptable practices for an ongoing configuration as well as future modifications and application of PIMS to all pipelines are defined.

Saleh further explained that the primary goal of pipeline inspection and maintenance is to enable an assessment and attainment of technical integrity in order to achieve maximum pipeline availability at the lowest possible cost.

This goal implies the control and management of the risk of pipeline failure to as low as reasonably practicable (ALARP) levels to achieve maximum production through maximum pipeline availability.

THE LIFECYCLE OF PIMS

PIMS evaluates a pipeline's integrity across its lifecycle, from identifying risks and hazards to managing testing and mitigations to streamlining safe operations. Through proper assessment methods, PIMS identify, validate, and utilize pipeline data in order to optimize the pipeline's integrity.

In transporting natural gas, PIMS is concerned with the pipelines' technical and organizational integrity, as well as that of data and information. In order to provide full-scope technical system support that determine the condition of a pipeline, PIMS further entails sub-processes and tools for integrity evaluation. According to a study published by Inspectioneering Journal, the Pipeline Integrity Management (PIM) lifecycle is composed of 13 separate yet intertwined areas of integrity, all of which are constantly monitored and reevaluated.

"AS A MECHANISM TO MAINTAIN AND IMPROVE SAFETY LEVELS IN A PIPELINE AND/OR A PIPELINE SYSTEM, THE USE OF RISK MANAGEMENT METHODS AND PROCESSES HAS BECOME THE WIDESPREAD INDUSTRY STANDARD AND PRACTICE."

AMR SALEH
CORROSION ENGINEER AT DNV.GL

Encompassing the complete life cycle of a pipeline, PIMS utilizes key tools that can be identified as; responsibilities and resources, risk management, integrity verification, maintenance reference plan, emergency response procedure, management of change, performance standards, data management, and auditing and reviews. Through these practices, PIMS are able to manage safe pipeline operations.

Furthermore, PIMS support the complete plan, do, check, and act (PDCA) cycle. According to Saleh, to optimize the integrity of BAPETCO pipelines, the system is designed based on the Integrity Management Cycle "Plan – Do – Check – Act". These plans drive the PIM activities at various frequencies, quarterly, semiannually, annually, biennially, sexennially, etc. "These integrity activities for pipelines may take the form of preventative or corrective maintenance that may deem necessary after analyzing data from monitoring, inspection and testing," Saleh noted.

FUELING PIMS WITH DATA

As data is the driving force behind PIMS, having accurate and credible information is imperative. Records such as the maximum allowable operating pressure (MAOP) are necessary to validate pipeline data and whether or not an operation can be carried out. Thus, data should never be compromised.

The more information is collected from several source systems, the more robust PIMS is to construct a proper pipeline status assessment. The integrity evaluation is completed and the status of a pipeline is determined only after inspections are performed during operations. Involving a bigger team and a wider network of engineers and experts can help identify any peculiarities of a pipeline easier. Garnering information throughout the inspections build a dynamic segmentation for the integrity evaluation.

The full set of results that are reviewed and assessed on an annual basis for each pipeline ensure the pipeline's health. Accordingly, a regular analysis takes place to address a reference plan with all the relevant items. After an evaluation proposal, required corrective actions for any significant anomalies are included in the pipeline integrity report. When integrity assessments and reviews are complete, a pipeline integrity lead convenes a peer review of the pipeline integrity assessment results and the pipeline integrity status reports, Saleh explained.

This is achieved when the risk of pipeline failure is controlled and managed to a level that is deemed as ALARP. Saleh regards this as an inherent trait that any company should have to satisfy its corporate and legal compliance and any other statutory and regulatory obligations.

"As a mechanism to maintain and improve safety levels in a pipeline and/or a pipeline system, the use of risk management methods and processes has become the widespread industry standard and practice," Saleh further added. That is why, risk management system plays an integral part of PIMS, setting an effective and efficient plan to prioritize pipelines inspection and maintenance routines that are based on a risk analysis routine. It is a method that allows resources to be employed in an optimum manner, Saleh further said.

CHALLENGES AND IMPLEMENTATIONS IN EGYPT

Failures in pipelines around the world often make headlines. At the end of the day, there is not a single PIMS that could be successfully implemented on all assets. PIMS tend to sketch out the fundamental basics of an effective management system that have been successfully integrated in companies across the world. However, the codes, standards, and regulations that govern the pipeline industry continue to change in response to lessons learned from the industry's failures.

As some data could be missing due to limited access, this directly affects PIMS implementation and thus, the whole integrity evaluation. There are technologies that are designed to reach estimates in case of any missing data, however, not all technologies are available to every market.

For instance, Saleh noted that there is another challenge to implement ILI (in line inspection) using intelligent pigging, which requires pressure reduction then decreased production during the pig travel inside the pipeline. Nonetheless, some pipelines are so critical and have strategic significance that end-user companies will not allow any reduction in production.

To overcome this challenge, we follow another approach to know the integrity status of the pipeline by applying Internal Corrosion Direct Assessment (ICDA). This is a good methodology to know the internal condition of a pipeline, Saleh elaborated.

Since 2006, the Egyptian Natural Gas Company (GASCO) and General Electric have initiated a Pipeline Integrity Management Centre of Excellence (PIMCOE), which is the first of its kind in the Middle East. PIMCOE provides best practices in inspection, pigging proficiency and rehabilitation services with cost-efficient solutions and the latest technologies. Over the years, the center has proven its proficiency with its work for the national gas grid inside and outside Egypt, in addition to pipelines of sister companies in the petroleum sector. From its inception in 2017, the center completed inspection for 4,400 kilometers (km) of the national grid pipelines and inspected of 2,790 km for sister companies.

INTEGRAL ROLE

Egypt is transforming into a regional natural gas hub, supported by developmental plans, and massive offshore discoveries. Egypt is set to double its liquefied natural gas (LNG) exports to 2 billion cubic feet per day (bcf/d) by the end of 2019. The country is also reviving its liquefaction plants, with the Idku plant alone exporting around 800 bcf of LNG in February, which is more than twice of the total exports recorded in 2018. This further enhances the importance of pipelines to the Egyptian the oil and gas sector. The Egyptian Ministry of Petroleum has recently signed an infrastructure memorandum of understanding (MoU) with the International Finance Corporation (IFC), a member of the World Bank (WB), to finance oil and gas infrastructure projects. It also aims at revamping and developing the pipeline systems to support the expansion of the refining and petrochemical industries.

MAINTAINING ASSET INTEGRITY AND RELIABILITY IN MANAGED PRESSURE DRILLING

BY **MOSLEM ALI**

The importance of capitalizing on every asset in the oil and gas industry is fundamental. Therefore, oil and gas companies continuously aim at utilizing unused reserves, as well as ensuring that major assets are safe, well maintained, and efficiently operating. Drilling technologies have an integral role in enhancing efficiency, which drove the rising worldwide use of Managed Pressure Drilling (MPD) to drill challenging wells, taking into consideration reducing fluid losses and non-productive time (NPT).

MPD is an adaptive drilling process used to precisely control the annular pressure profile throughout the wellbore. The MPD objectives are to ascertain the downhole pressure environment limits and manage the annular hydraulic pressure profile accordingly, as defined by the International Association of Drilling Contractors (IADC).

TYPES OF MPD

There are different types of MPD, including Pressurized Mud Cap Drilling (PMCD), Constant Bottom Hole Pressure (CBHP), Return Flow Control Drilling (RFCD), and Dual Gradient Drilling (DGD).

Generally, MPD technology is often applied when conventional techniques are not effective, this helps in capitalizing on reserves, as well as ensuring the intergrity and safety standards during the drilling process, by eliminating major risk factors.

RISK AVOIDANCE AND BENEFITS

"It is the intention of MPD to avoid continuous influx of formation fluids to the surface. Any influx incidental to the operation will be safely contained using an appropriate process," according to the IADC.

Many tools and techniques are used in order to overcome risks associated with drilling wells with narrow downhole environmental limits "by proactively managing the annular hydraulic pressure, control of back pressure, fluid density, fluid rheology, annular fluid level, circulating friction, and hole geometry, or combinations… MPD may allow faster corrective action to deal with observed pressure variations. The ability to dynamically control annular pressures facilitates drilling of what might otherwise be economically unattainable prospects," the IADC explained.

Meanwhile, a report by MarketsandMarkets notes that the use of MPD also helps reduce potential damage to the reservoir, improves the rate of penetration (ROP), detects loss situations early, and reduces the number of casing strings.

"The implementation of MPD techniques, including continuous circulation methods, can significantly contribute to increasing operational efficiency, improving well control measures, enhancing safety, and allowing operators to reach reservoir targets. Otherwise, it is impossible to achieve [the targets] using conventional drilling methods. MPD is a technique that takes reservoir understanding and follows a process executed by trained and experienced personnel with a focus on [Health, Safety, and the Environment] (HSE) to help ensure successful job execution," Mohamed Okasha, Country Manager, Testing and Subsea at Halliburton Egypt, told Egypt Oil & Gas.

THE CHALLENGES

Drilling challenges in Egypt are recognized in depleted, mature, and deep-water exploration wells, and some high pressure high temperature (HPHT) reserves remain undeveloped in mature fields due to the pressure related drilling challenges. Moreover, deep-water HPHT wells with overpressure zones, where pore pressure is near frac pressure, create narrow pressure windows, as Okasha explained.

Applying MPD is growing in the market, with more companies realizing its efficiency and reliability benefits. MPD technology could take drilling to the next level, with precision and automated hydraulics management across the entire well construction process, thus helping operators drill challenging wells. "We see that once operators recognize that MPD is not only considered as a risk mitigation tool, but also as a performance improvement tool, the adoption increases," said Okasha, who stressed that Halliburton holds safety as a core value when working for all clients.

The drilling challenges faced by operators differ, depending on a number of factors, however, it is understood that MPD is proven to limit not only technical challenges but also financial risks, thus enhancing asset integrity and economic feasibility in drilling operations.

Nonetheless, the technology requires adequate front-end engineering to be completed prior to each major project to help find the best possible solution. The Country Manager, Testing and Subsea at Halliburton Egypt explained by saying, "MPD solutions range from a rotating control device (RCD) with a single choke, to continuous circulation technology, and highly automated multiple choke systems with advanced early kick detection and response and

surface separation systems for handling produced formation fluids."

"The value created by early collaboration with our customers, specific project designs and strong execution will help us deliver better performing wells," commented Colby Fuser, Halliburton Vice President for Egypt and Libya. "We remain focused on applying the right technologies and expertise to make a lasting impact on Egypt's growing oil and gas market," Fuser added.

POSITIVE OUTLOOK FOR CBHP

Constant bottom hole pressure (CBHP) remains the most common form of MPD that customers ask for, but with different applications, according to Okasha, with recent studies showing the advantages of using continuous circulation along with CBHP in order to achieve success in some very challenging environments. "Ultimately, we see these two techniques being able to cover many of the applications worldwide," he noted.

"PMCD is often part of a contingency plan, especially in offshore operations where sacrificial fluid is readily available, provided the formation is capable of accepting the flow. These technologies have already brought value in the offshore Egyptian market and Halliburton has demonstrated similar success across the globe. The key is to work with subject matter

experts to choose the most appropriate solution for each challenge, whether onshore or offshore," Okasha further explained.

Meanwhile, Ahmed Samy, an Associate Technical Professional at BGS Energy Services (BGSES) told Egypt Oil & Gas that Modern MPD solutions reduces the associated risk to the drilling process when compared to conventional drilling techniques, especially when it comes to asset integrity. MPD provides a cost-saving alternative as a technique, and helps to drill undrillable wells by eliminating the associated risk of the drilling process.

"PMCD is one of the oldest MPD techniques and for sure, the most applied in Egypt due to the presence of fractured formations. Old and conventional MPD techniques faced many challenges, especially in the Gulf of Suez. However, the BGS/Stasis CBHP technique with a cutting-edge rotating control device (RCD) and its advanced quad monitored seal mechanism provides an efficient, time saving, and safer alternative. This ensures predictability of uncontrolled events, such as blowouts, which assures zero NPT, setting the safety and integrity of assets at an unequalled level," Samy noted.

ASSET VERIFICATION AND RISK INSPECTION

There are necessary procedures of rig condition verification and risk inspection to help ensure that drilling equipment are well maintained during operations.

"This process includes yearly certifications, pipe inspections, mobilization checklists, maintenance intervals, operational processes and many others. We use our established process and work with the rig providers to promote a safe and effective MPD solution," said Okasha, referring to the Halliburton Management System (HMS) process for MPD operations.

"A critical function for every backpressure, MPD system is a fingerprinting exercise and pressure test of the system. When we put the well on a closed loop system, we can strive to contain and maintain pressure applied to the wellbore. With a continual real-time system running, we are able to digitally monitor the integrity of the system including the rotating control device, to help keep operations safe," Okasha pointed out. He also explained that a closed loop system supports dynamic flow monitoring from high accuracy Coriolis flow meters and significantly improved well control versus conventional operations, where influx or loss detection is primarily related to tank volume monitoring or changes in flow pad reading. It also helps prevent wellbore stability challenges.

"Technological advances in automating MPD also delivers a complete picture of the well by seamlessly integrating multiple data streams and providing intelligent analytics for well bore pressure control and hydrocarbon influx management. This helps remove the traditional MPD restrictions associated with connections, tripping, casing running and cementing operations. Additionally, continuous circulation allows constant hole cleaning, reduced ballooning effects, more homogenous properties in mud systems and a stable fixed equivalent mud density (ECD)," Okasha elaborated.

	TEMSAH 4-13	TEMSAH 4-11	TEMSAH 4-11	TEMSAH 4-11
Phase	8 1/2" phase	8 1/2" phase	8 1/2" ST#1 phase	6" ST#1 phase
Year of drilling	2009	2006		
Drilling Intervals, m	3827-3942 MD 3739-3853 TVD	4212-4425 MD 3729-3908 TVD	4109-4311 MD 3644-3805 TVD	4311-4467 MD 3805- 3909 TVD
Geological column	-Part of SIDI SALIM from 3758 m	- Part of SIDI SALIM	- Part of SIDI SALIM	- Part of SIDI SALIM
Drilled MD, m	115	213	202	156
Drilled TVD, m	114	179	161	104
Phase Days	17	15	18	29
Mud type	WBM	WBM	WBM	WBM
Mud weight (KG/L)	1.64	1.64	1.82	1.64
Problems	-Tight spot	-Losses problem -Hole instability	-Losses problem -Hole instability	-Losses problem -Hole instability
Phase Cost	5,338,823	5,320,832	3,888,817	6,833,297
E-CD™ cost	224,230	Not used		

SUCCESS STORY

It is worth mentioning that CBHP is not new to the Egyptian market, as shown by a Cairo University research paper entitled 'A Successful Application of MPD With CBHP Technique in Temsah Field - A Case History,' presented by Abdallah Farahat et al. The paper discussed MPD as a technology and presented a successful case of applying CBHP in Egypt in the Temsah Gas Field through a comparison highlighting the difference in time and cost when the technique was applied, using Eni's patented circulating device (e-cd).

In an economic analysis, the paper showed a comparison between the drilling phase of conventional wells that took 24 days with a cost of $7,288,260 in TEMSAH 4-10, and in TEMSAH 4-11, where it took 34 days and cost $8,462,774. On the other hand, in TEMSAH 4-13, it took 21 days and cost $7,235,908.

"The e-cd™ system decreased the number of casing and hence, the operations time. The neglected 11-3/4" liner and its cement job cost $401,244 in TEMSAH 4-10 and $446,075 in TEMSAH 4-11. The conventional wells face loss problems, especially while landing the casing and [during] the cement job, which indicates a bad hole condition. Using the e-cd system dropped the 11-3/4" liner and its cement, which cost an average of $420,000. It saved an average of eight days of operations, and an average of $639,609 of the phase cost. It also reduced losses with around 605-barrel loss of mud while running the casing, and 473-barrel loss while performing the cement job. The cost of the e-cd™ system totaled 463,191, accounting for 6.4% of the phase cost," the paper concluded.

CONCLUSION

North America is considered the dominant market in applying MPD, with a large number of deep-water offshore wells, especially in the Gulf of Mexico. "Growing sub-sea construction activities is a major factor expected to create high revenue potential opportunities for existing as well as new players in the global market," MarketsandMarkets indicated in its 2016 report. The research firm previously estimated MPD services market to grow at a compound annual growth rate (CAGR) of 3.8% between 2016 and 2021, exceeding $4.6 billion.

Egypt is one of the ten countries with the largest remaining natural gas ultra-deepwater reserves, according to an analysis by GlobalData. Consequently, MPD could play a bigger role in exploration and production (E&P) activities in the coming period, especially in the Mediterranean and the Red Sea, where 10 exploration blocks were announced last March in a bid round by the South Valley Egyptian Petroleum Holding Company (Ganope). This could evidently allow for a better utilization of reservoirs, achieving higher returns, and increasing technical capacities and capabilities.

CORROSION MANAGEMENT: EFFECTIVELY ENHANCING ASSET INTEGRITY

BY **DINA EL-BEHIRY**

The oil and gas industry is an asset-intensive business with many capital assets, ranging from drilling rigs to upstream offshore platforms and wells, pipelines, liquefied natural gas (LNG) terminals and refineries in the midstream and downstream segments. These assets require huge investments; therefore, oil and gas companies are often under pressure as they need comprehensive strategies to reduce cost and improve asset reliability.

Given the global increase in oil and gas demand, companies are heading towards developing new technologies to advance their current assets and acquire new ones to be able to fulfill that growing demand. Yet, the companies' way is hindered by many hazards that arise from technical failures. One of the major reasons behind failures is corrosion.

According to a research published by Chinedu Ossai, corrosion cost in the United States was more than $1 trillion in 2012, which represented around 6.2% of the gross domestic product (GDP). Moreover, in many oil and gas companies, corrosion accounts for more than 25% of asset failure incidents as it is faced in each stage of the production cycle. In drilling operations, mud can corrode the well casing, while drilling equipment, pipelines, and the environment could also be affected. Hence, operators have become more concerned about corrosion management policies at all production phases to control the increasing cost.

Considering this, corrosion becomes a crucial risk factor that needs to be controlled during the whole production cycle to enhance asset integrity through a framework enriched by good policies for inspection, data collection, and interpretation for controlling corrosion. In order to make this possible, industry experts began to work on these needed strategies to eliminate corrosion incidents and identify effective measures to avoid the issue's occurrence.

CORROSION AS A CRUCIAL PROBLEM

The international standard definition refers to corrosion as a "physicochemical interaction between a metal and its environment which results in changing the properties of the metal and which may often lead to impairment of the function of the metal, the environment, or the technical system of which these form a part," according to the European Federation of Corrosion (EFC).

For metals, almost all environments can cause this destructive unintentional degradation to some degree, since the corroded state is more stable, on the molecular level. A common type of corrosion is

"A CLEAR COMPANY POLICY STATEMENT THAT PROVIDES GUIDANCE TO THE CORROSION STRATEGIES TO BE ADOPTED TO ENSURE INTEGRITY, INDICATES COMMITMENT FROM SENIOR MANAGEMENT AND ENSURES THAT THE CONCEPT IS WELL ESTABLISHED IN CORPORATE CULTURE.."

MOHAMED MAGDY
MECHANICAL CONSTRUCTION MANAGER AT EGYPT GAS COMPANY

rust, which is found on iron and steel structures. In this type of corrosion, the iron is reacting with oxygen, from air or water, to form iron oxide compounds, as explained by the University of New South Wales (UNSW).

Corrosion has two types: it is either internal or external, according to Ossai's paper. Internal corrosion represents one of the main reasons behind failure in oil and gas facilities, because water cuts increase and previously oil wet pipe surfaces becomes water wet, leading to an increased bacterial activity in the production system.

Internal corrosion can take many shapes, including erosion-corrosion mechanism, in which the corrosion reaction rate increases by removing the corrosion passive layer from the wall of the pipe. This type is always experienced where there is a high turbulence flow regime with significantly higher corrosion rate than just corrosion or erosion in pipeline; under-deposit mechanism in which the corrosion reaction rate can rise by causing a localized chemical concentration that results in pitting of the metal surface under solid deposits. These deposits appear to be composed of a corrosion product matrix with entrapment of formation solids, sand, and iron sulphide. The rate of corrosion under this mechanism is significantly lower than the rate under the erosion-corrosion mechanism.

Additionally, Microbiologically Induced Corrosion (MIC) is a type of corrosion caused by bacterial activities, in which the bacteria produce waste products like CO2, H2S and organic acids that corrode pipes by increasing the toxicity of the flowing fluid in the pipeline. Pitting corrosion can be categorized as a part of the internal corrosion as it represents a localized attack that lead to rapid removal of metal at small distinct areas. This type occurs where there is an environmental disparity comparing to the metal surface. Crevice corrosion results when a portion of a metal surface is shielded in a way that the covered portion has limited access to the surrounding environment.

Stress Corrosion Cracking (SCC) is a form of localized corrosion that produces cracks in metals by simultaneous action of a corrodent and tensile stress. Top of the Line Corrosion (TLC) occurs because of the inability of corrosion inhibitors to reach the top of the pipeline, which exposes the top part to be corroded with a subsequent failure at some point.

The second type of corrosion is the external corrosion, which results from water penetrating the insulation system and being trapped between the insulation and the external wall of the pipe. This type of corrosion always occurs at any location where the galvanized insulation jacket has been punctured or torn, also it is found at the fields applying weld insulation packs. Moreover, high temperature is essential to drive the corrosion mechanism. The longer the mechanism has been active, the worst the damage will be. Therefore, the hottest and the coldest lines in the field will have the highest possibility for external corrosion problems.

GLOBAL CORROSION COST

Corrosion cost is an issue that the whole oil and gas industry should take into consideration. According to the National Association of Corrosion Engineers (NACE) 2016 International Measures of Prevention, Application, and Economics of Corrosion Technologies (IMPACT) study, corrosion cost has its impact on the global economy. It was estimated in 2013 that corrosion cost accounts for 3.4% of the global GDP, and it was proven that managing corrosion could save between 15 to 35% from its cost, taking into consideration that corrosion cost does not include neither individuals' safety nor environmental consequences.

Therefore, industry leaders have realized that poor corrosion management is costly and has its bad impact on the oil and gas industry specifically, and on the country as a whole. Thus, proper management policies are vital to control such an issue and help extend the lifetime of valuable assets.

CORROSION MANAGEMENT SYSTEM

The oil and gas industry sometimes suffers from a lack of an effective corrosion management system, which can lead to many problems including decreased safety, increased risk exposure, increased duration of unplanned shutdowns, and inefficient use of resources. Consequently, the sector's leaders are truly aware of the severe costs of having a poor corrosion management system.

"Corrosion management is that part of the overall management system which is concerned with the development, implementation, review and maintenance of the corrosion policy," Mohamed Magdy, Mechanical Construction Manager at Egypt Gas Company, told Egypt Oil & Gas.

One major approach to develop an effective corrosion strategy is the link step approach that depends on inputs from a corrosion risk analysis, which then results in a corrosion control matrix, roles, and responsibilities for implementation, according to Magdy. Moreover, "it should be noted that a clear company policy statement that provides guidance to the corrosion strategies to be adopted to ensure integrity, indicates commitment from senior management and ensures that the concept is well established in corporate culture," he explained.

For this, establishing a successful corrosion management faces two issues. The first one is having a system for the existing facilities, in which the shareholders often do not understand the requirements of the needed system to apply it successfully. The second one is developing a system that is suitable for new constructions where companies require engineering firms to include the system in their front-end engineering design (FEED); however, firms sometimes do not understand the right way to operate the system either.

Across the oil and gas sector, developing and implementing an effective corrosion management system varies according to the applying organizations. The sector consists of different types of organizations that could be international oil companies (IOC), national oil companies (NOCs), intermediate companies, or unconventional oil companies. Therefore, the industry needs to consider a system that is consistent with the nature of the organizations and the type of policies and philosophies adopted inside it. Moreover, the local regulations, the financial position of the companies and their scope of work either onshore or offshore have to be considered to be able to select an efficient management system.

According to Magdy, companies have to "ensure that roles and responsibilities match the required competency and integrate corrosion management and asset management with safety, inspection, maintenance, and operations strategies; and that risk assessment procedures are updated on a regular basis, and guarantee receiving feedback from field experiences [to be used] into new designs."

The main goal of applying a successful corrosion management system that it is consistent with the organizational policy to reach the desired level of efficiency while providing services at the lowest cost possible. That is why, finding the system with the greatest net benefits is a puzzle that requires an accurate analysis for all direct and indirect factors within the sector.

ACROSS THE OIL AND GAS SECTOR, DEVELOPING AND IMPLEMENTING AN EFFECTIVE CORROSION MANAGEMENT SYSTEM VARIES ACCORDING TO THE APPLYING ORGANIZATIONS.

IT WAS ESTIMATED IN 2013 THAT CORROSION COST ACCOUNTS FOR 3.4% OF THE GLOBAL GDP.

WILD WELL HIGHLIGHTS
WELL CONTROL AND SAFETY SOLUTIONS

BY **MAI EL-GHANDOUR**

Workshops presented well control engineering solutions to Apache, Eni, Shell; and their respective affiliates.

Wild Well Control aims at promoting the newest technologies in well control to the Egyptian market, as evident by a series of workshops that were held on April 8, 10, and 11, to bring and share their experience with key operators in the petroleum sector, Egypt Oil & Gas reports.

The three-day Lunch and Learn Workshop was held at JW Marriott's Castle Club Ballroom, and gathered three of the market's biggest companies and their respective affiliates. The first day was convened with Apache Egypt, followed by Eni and Shell Egypt on the second and third day, respectively.

"This is all under the scheme of sharing to be better. We want to share our well control experience with our operators to achieve better, safer, and more efficient operations to become attractive for investments," Engineer Mohamed Amer, General Manager of Wild Well Control told Egypt Oil & Gas.

According to Amer, Wild Well is encouraging everyone in the industry to operate and implement a well-control risk management program, which helps identify, analyze, and mitigate the well control risk throughout the well lifecycle.

Meanwhile, Andre Abbasi, Wild Well Director and International Business Development MENA, kicked off the workshop with an overview of the company's core services, from blowout and well control responses, to engineering solutions, unconventional interventions, subsea technology, risk prevention, and preparedness, all of which equip customers with the knowledge to deal with blowouts.

Whilst tapping into the past experiences of Wild Well Control, Abbasi offered an in-depth review on other product lines with visuals of offshore and onshore processes. Both Amer and Abbasi presented live demos and simulations for a blowout broached to surface, first experiments of subsea plume, and world-class well control engineering solutions such as FiFi equipment and debris removal.

"When you look at each of these services, they are not really complex they are actually very technically straight forward. It is all about understanding the ramifications of what you are doing and the big picture of what you are trying to achieve," the General Manager noted.

Moreover, Abbasi highlighted the essentiality of having a well control team or blowout contingency to avoid making hasty decisions. These notification protocols streamline smoother operations, as having an active team that is well trained to take responsibility and respond in a timely manner puts everything under control, adding that it is always better not to leave anything to chance, as everything has to be systematic.

"Our workshop provides our clients with an opportunity to hear about Wild Well services and learn how we can support them in the region. It also offers an open venue to discuss issues and concerns they may have," Abbasi indicated.

Wild Well is the only well control company that besides delivering top-notch equipment, has well control technical personnel, which is important to customers in Egypt, according to Amer.

Establishing a fundamental level of familiarization with well control related activities can allow operators to work in a safer environment. Amer further added that the reputation of events that boosts the exposure of Wild Well makes the company better positioned to help its clients in the Egyptian market.

According to Dalia Tawfeek, Egypt Sales and Business Development Manager, the new mega projects in Egypt require an effective risk management approach. As prevention and response experts, Wild Well Control wants to share its vision to cover and support the Egyptian offshore and onshore operations.

"We are very committed to the Egyptian market because we can see very clearly that this is the start of a new era of massive expansion after the downturn in Egypt's oil and gas upstream industry. It was obvious with the results of the latest bid rounds, and we try to customize our solutions for customers in order to really tap on their daily operations, and how we can help them doing their jobs in a safer manner with better risks avoidance," Tawfeek added.

Amer concluded the workshop with one special advice for everyone. He said that the essence of any safe operation, and the reason why Wild Well Control aims to share their experience, is to make sure that everyone follows an engineering practice to prevent blowouts. He also urged everyone in the room to never compromise their well control safety or jeopardize their personnel as any danger could be avoidable with a proper process in place and training.

"Our take is that all of the operators we work with achieve a well control barrier envelope that preserves the company's people, environment, assets, and reputation in that order. So throughout the well operations from planning to execution, to the end of well life, we have expertise that we can help pass along to these operators," Amer told Egypt Oil & Gas.

JOTUN CONTINUES TO LEAD THE MEIA REGION WITH THE BIGGEST PAINTS FACTORY IN EGYPT

BY **MARIANA SOMENSI AND MAI EL GHANDOUR**

Jotun Protects Property

For more than 90 years, Jotun has been a pioneer in developing new products which have changed how the world perceives paint. Today, Jotun provides coating solutions across seven regions with 9,872 employees all over the world. In Egypt, Jotun has started its business more than 30 years ago and has been migrating from being a product-based to solution-based business in response to the market demands and industrial dynamics. As more consumers and businesses are turning to paints and coatings to help solve different challenges, Jotun has expanded its service offering in every segment to meet specific end user needs. Egypt Oil & Gas had the opportunity to talk to three of Jotun's pioneers about the world-class solutions they offer to the oil and gas sector.

EXCEEDING CUSTOMER EXPECTATIONS

According to Yasser Emam, Protective and Marine Sales Manager at Jotun, being distinctive is one way to exceed customers' expectations, and to achieve this, a research and development (R&D) team work diligently across multiple areas to introduce high-quality products to customers. Jotun's Jotachar JF750 and 1709, which are Passive Fire Products, for instance, are designed specifically to work in a timely manner and a hassle-free environment.

"[Since] Jotun is a multinational supplier with local production facilities, we supply huge volumes of paints in a short delivery time. Jotun has a dedicated sales team for the different customers' group in Egypt including oil and gas, energy and infrastructure business units," Emam said. With a team that has the most qualified and certified coating advisors in the market, all projects are monitored and moderated thoroughly and instantaneously.

QUALITY COMES FIRST FOR THE MARKET LEADERS

Quality is the most important element when it comes to distinction, and according to Emam, it is often divided into two main parts. First, production quality, which is fully controlled by a qualified team who assure the right implementation of production procedure and then test it in the quality control lab. Second, testing the application quality, which is handled by coating advisors that support customers and assure a proper surface preparation and application.

PIONEERING SERVICE PROVIDER FOR THE OIL AND GAS INDUSTRY

Jotun has over 40 years of experience in the hydrocarbon processing industry with millions of square meters protected and hundreds of projects completed around the world. Mohamd Refaei, HPI and Offshore Concept Manager, said that Jotun aims to constantly develop its coating services to meet every hydrocarbon processing industry's challenge. This is done through longer protection, faster operations, and diversified specialist areas (ex: corrosion under insulation, tank-linings, passive fire protection PFP, etc.).

"Our offshore experience has provided us with valuable knowledge, as well as insights into our customer needs and requirements, Refaei said. As a result, Jotun has developed solutions to satisfy customer needs and provide perceived customer values In the Hydrocarbon Processing Industry (HPI), Jotun innovated the Thermosafe range, a collection of five coating solutions optimized for temperature that ranges between –196o C and 1,000o C. Thermosafe products provide protection from cryogenic spills and thermal exposure to corrosion under insulation, serving as a "Single Source Solution" for project owners, purchasers, contractors and engineers seeking to solve critical challenges and add value to their business, Refaei further said. Jotun's maintenance solutions for offshore units place the company in a strong position to best meet the customers' needs for extended maintenance intervals, optimizing cost and time efficiency.

According to Refaei, Jotun's PFP breakthrough, Jotachar, has been lunched four years ago in Egypt, introducing the first Meshfree passive fire protection epoxy intumescent in the market. "This innovation guarantees maintenance time saving, cost saving and faster completion of projects for customers; which enables Jotun to cope with the fast growing oil and gas projects in Egypt," Refaei noted.

EXPANDING IN THE EGYPTIAN MARKET WITH THE REGION'S BIGGEST FACTORY

Korkut Kulbul, Jotun's General Manager, said that the aim of the company is to serve other markets in Africa in addition to expanding in the Egyptian market. Jotun is following up with the steady growth in Egypt according to Kulbul, and to cope with this potential, Jotun has decided to invest in a new factory, which will be the biggest in the Middle East, India and North Africa (MEIA) region, with a production capacity of more than 80 million liters in one shift, in addition to the old factory in Ismailia with a capacity of about more than 40 million liters.

According to Kulbul, 450 employees are working in Jotun Egypt as of today and the current factory is serving more than 32 years. "[as] the company is focusing more on developing the competency of their people whom are their most valuable asset," he said. These promising investments are set to improve the company's health, safety, and environment (HSE) conditions in the country to a very high level.

KORKUT KULBUL
GENERAL MANAGER

YASSER EMAM
PROTECTIVE & MARINE SALES MANAGER

MOHAMED REFAEI
HPI & OFFSHORE CONCEPT MANAGER

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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WEATHERFORD INAUGURATES NEW FACILITY IN EGYPT WITH KEY INDUSTRY LEADERS

BY **MAI EL GHANDOUR – MOSLEM ALI**

Weatherford officially inaugurated its new facility and office space in Cairo in a ceremony held on April 30 that gathered the company's global top management and key leaders of the Egyptian petroleum sector.

The inauguration ceremony was attended by Mark McCollum, Weatherford President and CEO; Eng. Mohamed Moanes, the Egyptian Ministry of Petroleum's First Undersecretary for Gas Affairs; Eng. Abed Ezz El Regal, CEO of the Egyptian General Petroleum Corporation (EGPC); and Eng. Osama El Bakly, CEO of the Egyptian Natural Gas Holding Company (EGAS). In addition to other important figures from national and international oil companies operating in Egypt.

The event started with the ribbon cutting ceremony at the facility's main entrance, followed by welcome remarks. "We are working better together. It will save us money, but in the end, it is all about better serving our customers and being more effective here in Egypt. We think there are a lot of good days to come as we work in this facility. We hope to be a leading service provider in Egypt. We have been here in Egypt for 42 years, and we will be here for many decades to come. Thank you all," said Mark McCollum, commencing the ribbon-cutting ceremony.

Attending on behalf of the Minister of Petroleum H.E Eng. Tarek El Molla, Eng. Mohamed Moanes congratulated Weatherford on launching its new facility that will contribute to the development of the oil and gas sector in the country. "Egypt is rapidly becoming a key regional center for energy and a global player in the oil and gas industry. We have made a great progress in discovering and developing new sources. The Zohr gas field serves as a prime example, as it is the largest discovery ever made in the Mediterranean Sea. As we open the new facility, I wish Weatherford all the best." Moanes added.

"We are excited to show you what we have been working on to better serve our customers, as we open this base today. Our company is a multinational service provider in the global oilfield service market. We are in 90 countries around the world, we have around 30,000 employees, and we serve operators in the most important oil and gas markets across the world," McCollum said in his speech.

The CEO stressed that Weatherford adapts to modern technologies with its competitive portfolio and reputation for collaborative customer relationships. "We have a broad global infrastructure that enables us to respond rapidly to our customers. We have a high-caliber and diverse workforce, including some of the top engineering minds in our industry. We are an adaptable and nimble organization, as evident by our transformation."

"We are used to change, and now we are creating more discipline in our organizational structure, so that we can take full advantage of our strengths. Part of that is optimizing our global footprint and consolidating facilities like this one to provide best-in-class service for our customers," McCollum added.

"Our portfolio features many market-leading technologies across all of our business segments. As for the production segment, Weatherford is the only company to provide complete production solutions for every form of artificial-lift in every environment. First, we offer all forms of lifts, so we can devise true lift-agnostic solutions. Second, we are all for everything needed to optimize each form, from downhole components to service equipment, to intelligent production optimization systems, to the cloud. No other company has the capability to do what Weatherford does," McCollum pointed out.

Highlighting the company's leadership in the well construction segment, McCollum said, "We are the world leaders in everything we do, tubular running services, fishing and reentry, and drilling tools. We have a long history of driving innovation for safer and efficient operations with the best service quality performance this year in all our product lines."

"We were the first company to add mechanization to the tubular running space, and now we are the first to introduce automation. Doing so results in a step-changing safety for what used to be one of the most dangerous jobs in the oilfield," he added.

Weatherford drilling and evaluation segment and technologies deliver the advantage at the beginning of the oil and gas value chain, according to McCollum. "We obtain real-time information for our customers during drilling, even in extreme temperatures, using our logging and mud drilling tool sweep. We are also efficiently acquiring data after drilling, using truly differentiating wireline tools," the CEO further explained.

SUCCESS STORIES AND FUTURE INVESTMENTS

"As an industry leader in managed pressure drilling (MPD), Weatherford has capabilities ranging from basic pressure management to fully automated pressure response. We were the first company to offer the rotating control device (RCD), and we continue to set ourselves apart with the only pressure control system that can automatically control influxes to minimize their size from barrels to gallons," McCollum said.

Furthermore, McCollum discussed the company's well completion portfolio, "we provide an industry-leading sweep of products. We offer the oilfield leading safety valves, with a reliable record that includes zero failures attributed to the design in 20,000 cumulative years of service life."

> "WE HAVE MADE GREAT PROGRESS IN DISCOVERING AND DEVELOPING NEW SOURCES. THE ZOHR GAS FIELD SERVES AS A PRIME EXAMPLE, AS IT IS THE LARGEST DISCOVERY EVER MADE IN THE MEDITERRANEAN SEA. AS WE OPEN THE NEW FACILITY, I WISH WEATHERFORD ALL THE BEST."
>
> **ENG. MOHAMED MOANES**
> FIRST UNDERSECRETARY FOR GAS AFFAIRS, MINISTRY OF PETROLEUM

"WEATHERFORD DEEPLY BELIEVES IN THE EGYPTIAN MARKET AND THE FACILITY DOES HAVE ALL WHAT IS REQUIRED TO EXPAND IN EGYPT. THIS INVESTMENT IS BASICALLY A PROOF OF THAT."

WALID YASSIN VICE PRESIDENT - NORTH AFRICA, WEATHERFORD

"OUR PORTFOLIO FEATURES MANY MARKET-LEADING TECHNOLOGIES ACROSS ALL OF OUR BUSINESS SEGMENTS."

MARK MCCOLLUM
PRESIDENT AND CEO, WEATHERFORD

Referring to the Single-Trip Completion System (TR1P), McCollum pointed out that "as a pioneer in radio-frequency identification (RFID) in downhole oil and gas equipment, we have developed an unprecedented system that enables installing the upper and lower completion in one trip that saves millions of dollars in offshore operations."

However, McCollum stressed the importance of other leading technologies offered by Weatherford. "We still believe it is important to improve on the legacy technologies proven for delivering customer value, case in point is our Magnus™ Push-the-Bit Rotary Steerable System (RSS)."

The CEO then elaborated on how the company recently launched the Vero Automated Connection Integrity System, which replaces error-prone human judgment with artificial intelligence (AI), while enhancing personal safety and eliminating the risk of catastrophic well failures.

"With Vero, tubulars are installed with the industry's first integrated system for precise makeup in software evaluation to ensure absolute consistency… Today, we run Vero in four countries with more than 10,000 connections, and I understand that we are in conversations with our customers here in Egypt for employing Vero as they progress in their offshore campaigns," McCollum pointed out.

Last year, Weatherford released its CygNet® and ForeSite® software platforms on Google Cloud to reduce costs and infrastructure requirements, providing a virtual network that allows operators to easily deploy and access the software and maximize uptime. Weatherford aims at bringing the Internet of Things (IoT), cloud computing, and advanced-edge analytics to the oilfield production space, according to McCollum.

"We decreased non-productive time (NPT) by 22% between 2017 and 2018," said McCollum, noting that consolidation activities in comprehensive facilities is part of the efforts aimed at increasing efficiency. "Optimization requires investment, and we are honoring that today with the investment that we made in Egypt. During 2019, we plan $200-250 million in capital with a focus on new infrastructure and technology," the CEO concluded.

Following McCollum's speech, a short video was presented to highlight the company's successes in recent years.

THE STORY BEHIND THE NEW FACILITY

Walid Yassin, Weatherford Vice President for North Africa, followed with a speech that began by recounting the company's milestones in Egypt. Yassin explained that before creating the base, Weatherford had five different locations in Cairo. However, that did not seem like the most practical solution just as it posed several challenges. In the grand scheme of things, the distance between each base left room for the company's goals to be scattered. Eventually, the need for a single base was clear, and the best option was consolidation.

Yassin further discussed the obstacles that came along with having multiple locations for a single company including big administration issues, security issues, and service quality issues arising from controlling five different locations simultaneously. In addition, running different facilities requires an entirely different budget that could become an administrative burden and lead to many limitations. Yassin said that from here the idea of having one consolidated base was born. That way, Weatherford can finally concentrate on doing their business the way they should.

"We
came up with a plan to have a purpose-built facility following the highest environmental standards in the market today with the best service quality possible, and while doing this, we are also saving money. This is a very ambitious project, with the support of everyone in the top management, we managed to do it in a record time," Yassin noted, adding that this achievement is significant for the company's growth and success.

The land area of the previous five unconsolidated locations was around 30,900 square meters, however, now it is 41,000 square meters. Yassin clarified that as a result of expanding the area , more services, workshops and product lines are allowed to be brought into Egypt, as well as bringing all employees in the same place. With consolidation, all the processes are being streamlined from a single place, ensuring that the facility proposes value added propositions. According to Yassin, the entire building from scratch adapts to Weatherford's global policy and standards.

"Weatherford deeply believes in the Egyptian market and the facility does have all what is required to expand in Egypt," Yassin stated. The investment is basically a proof of that, since it built one of the largest warehouses in the country with numerous rooms, several training facilities, and an in-house catering facility that caters for everybody's needs.

After delivering his speech, Yassin hosted a tour around the facility, introducing attendees to what Weatherford is offering through its new facility.

WEATHERFORD TRANSFORMATION SEES NEW COMPREHENSIVE BASE IN EGYPT

BY **MAI EL GHANDOUR, MARIANA SOMENSI, MOSLEM ALI**

The new facility in Kattameya is part of a transformation process by Weatherford that started two years ago. Spanning across 40,800 square meters and employing approximately 230 people, the cost-effective initiative is estimated to save approximately $1.5 million per year for one of the biggest international oil and natural gas service companies operating in the Egyptian petroleum sector.

The facility delivers various life-of-well technologies, such as drilling rental tools, tubular running equipment, liner hangers, cementing products, completion systems, managed pressure drilling, fishing tools, and a fully loaded and certified machine shop.

Weatherford presented the new facility to the guests of the opening ceremony, led by Eng. Mohamed Moanes, the Egyptian Ministry of Petroleum's First Undersecretary for Gas Affairs; Eng. Abed Ezz El Regal, CEO of the Egyptian General Petroleum Corporation (EGPC); and Eng. Osama El Bakly, CEO of the Egyptian Natural Gas Holding Company (EGAS).

"We had world-class machine shops everywhere, but getting them together creates more efficiency," said Mark McCollum, Weatheford President and CEO.

"The key thing for machine shop services is having the correct license, and it has to meet global standards, to renew it yearly, after going through strict auditing requirements. We are the only ones in Egypt to have all those multiple variations of licenses here in Egypt," commented Walid Yassin, Weatherford Vice President - North Africa.

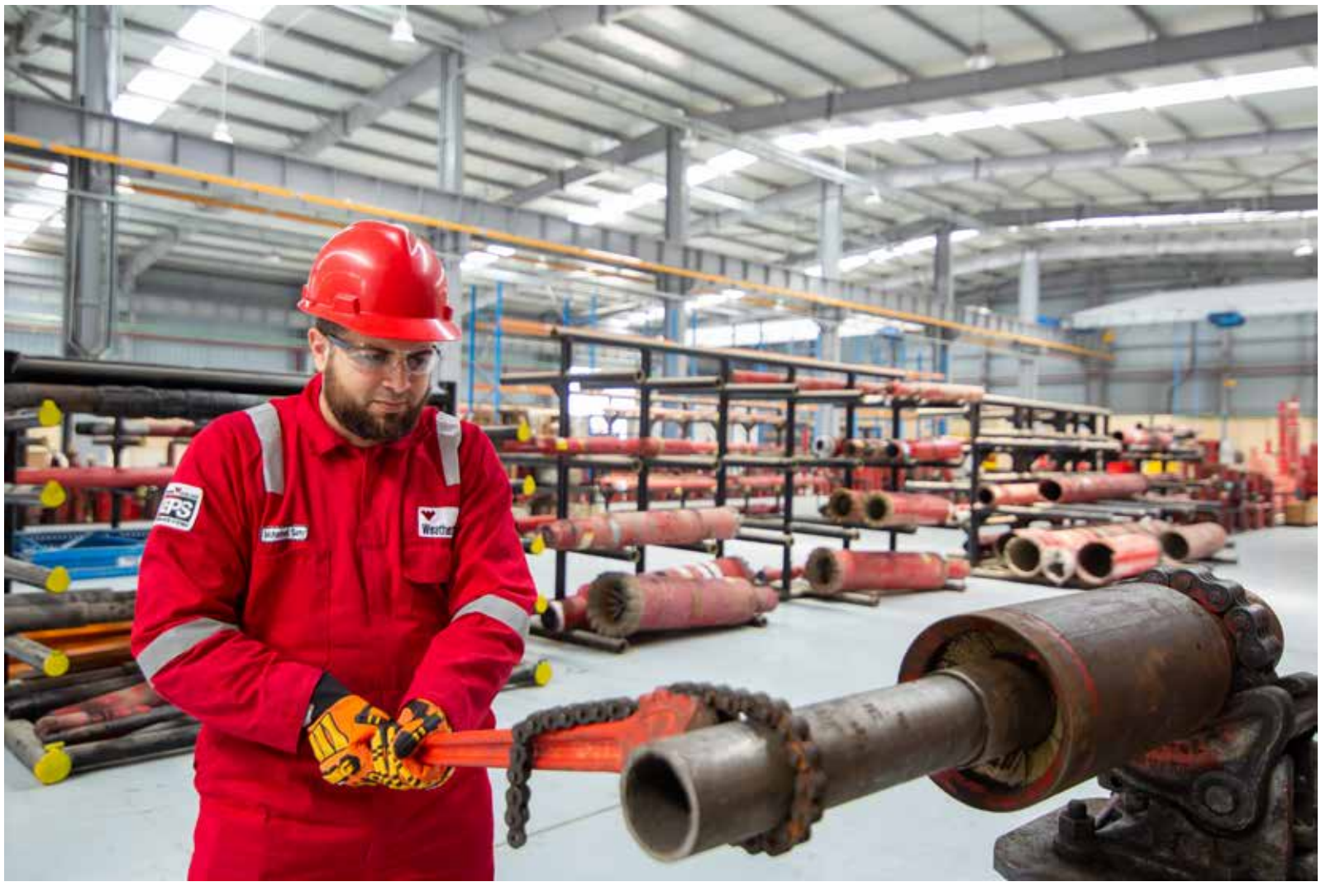
Eng. Mohamed Moanes, the Egyptian Ministry of Petroleum's First Undersecretary for Gas Affairs spoke to Egypt Oil & Gas on the sidelines of the tour, and explained that the new facility plays a part in sector's modernization. "Once we have everything collected together, we are going to save time and do something better in order to make the production more efficient. This is going to work the most with the exploration and production (E&P) companies and drilling and completion (D&C) companies," Moanes added.

Moving to the liner hanger department, Bassem Nour Eldin, Liner Hanger Operations Manager, explained that last year, "Weatherford ran the first 13 3/8-in liner in a well in the Noor gas field. It was the first that has ever been run in deep water here, and this due to our transformation and the availability of the equipment at all times, and we successfully ran it without any issues." Moreover, the company's staff explained that the Vero Automated Connection Integrity System is being applied in the Zohr gas field, in cooperation with the Balaeim Petroleum Company (PETROBEL), allowing for automation to increase operations efficiency.

Meanwhile, Saeed Abdel Moniem, Operations General Manager at Khalda Petroleum Company, told Egypt Oil & Gas that the artificial lift presented in the new facility has been successfully tried before in Egypt, noting that, "The new facility is excellent because it has everything in one place, everything is here."

Presenting the completion department, Weatherford's staff explained that it serves customers in the areas of completion, gas lift, and thru-tubing services, through the new and more fit-for-purpose area than what they had before. It gathers bucking machines, pressure test, and inspection in one area, before sending the equipment out to customers. "The pressure test facility is ready and working with 360-degree camera, cranes also cover the entire facility. In the past it took time to move to the machine shops, but now it is all here," added Yassin.

When asked by the CEO of EGPC about the safety measurements and precautions at the new building,



Weatherford Vice President for North Africa said, "the facility itself is built in a way that allows it to stand in one single structure, so there are not much pillars as you can see. Of course, we also have all the safety standards in regards to escape routes and signs. By using overhead cranes in the right place, we are also avoiding many problems."

"The entire facility is regularly tested for ISO certificates, [the American Petroleum Institute] API standards, and the Lean Six Sigma standards as well. There are also fire detectors everywhere with a central automatic alarm and extinguishing system, plus the portable system, and H2S detectors," according to Yassin.

Abed Ezz El Regal, CEO of the Egyptian General Petroleum Corporation (EGPC), told Egypt Oil & Gas that expanding the presence of international oil companies (IOCs) and their activities in Egypt reflect their trust and the environment for investing in Egypt. Secondly, they are expanding the activities in the market with IOCs as well. They are advancing and improving their existence and they are willing to invest and stay in Egypt. They have an optimistic vision regarding the upcoming bid.

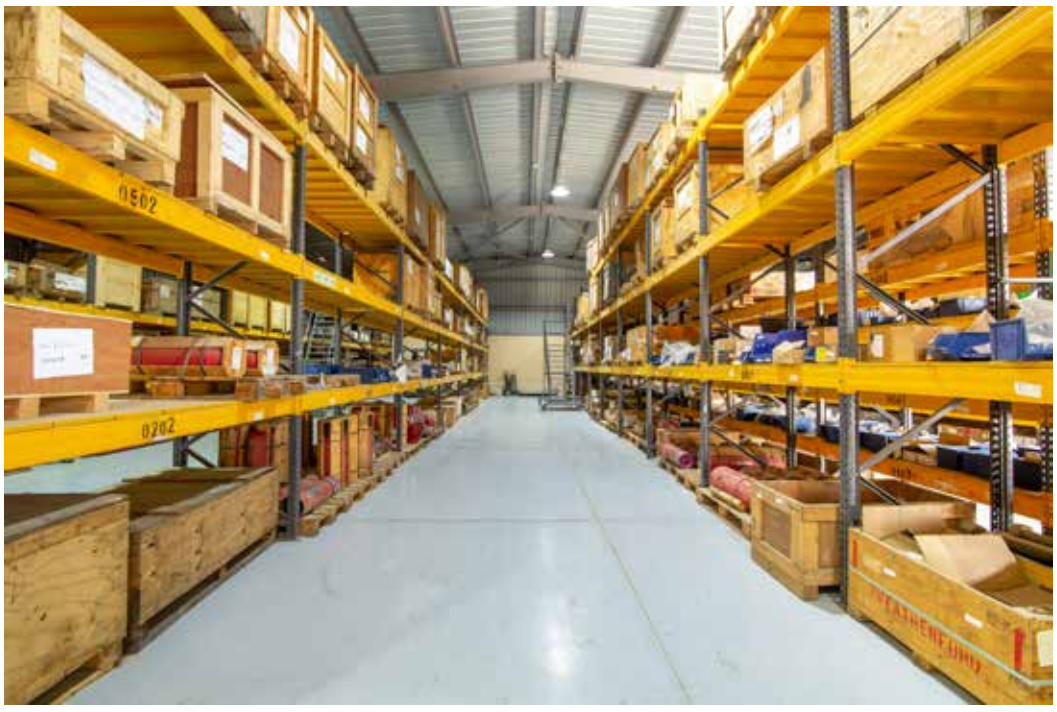
Weatherford has also invited partners to audit the facility, the company's staff explained, and throughout the tour, which included other departments and warehouses, the staff highlighted that the focus is shifting to efficiency, and that all records are being computerized and stored on the cloud, replacing paperwork, thus saving time and enhancing asset integrity.

INNOVATIVE TECHNOLOGIES

Egypt Oil & Gas then spoke to Mark McCollum, Weatherford President and CEO, on the sidelines of the event and asked about the prospects for the new technologies he mentioned in his presentation, led by Tr1P, the system Weatherford calls the world's first and only remote-activated, single-trip deep-water completion solution.

"The Single Tr1p Completion System is in its first stage gate of commercialization, where it has been running a series of wells under specific conditions. The new technology runs upper and lower completion in one a single trip, and it is designed for offshore environments. We are running more tests to use it in more broad applications," said McCollum.

"Tr1p has been run in the North Sea, where we were able to save Shell about $150 million on 20 wells, and in Nigeria and it has been highly successful, saving 72 hours of rig time." McCollum expects "it could achieve the same success here in Egypt."



"We already introduced the Magnus™ Rotary Steerable System (RSS) and there will be some trial runs for it. Magnus is a Push-the-Bit system replacing a different one that we previously had that is still used in some applications, but it is not necessarily cost-effective as many customers would like it to be. It had to be repaired quite a bit as it had multiple tools. The Magnus is a simpler system, which takes all the best technologies out there and combine them," McCollum told Egypt Oil & Gas.

When asked about the trial runs for the Magnus, the CEO of Weatherford said, "We have drilled several tests in the United States, in the Permian Basin and the Eagle Ford Basin where we did in fact drill an entire well with one tool.

"We also had successful tests in Saudi Arabia, where we have been able to steer through multiple challenging geologies with one single tool, and in Mexico, we used it offshore and drilled successful wells there as well.

"It is a highly adaptable system and is easy to repair, so the operating cost is significantly lower, and we are still trying to refine the edges. What we found is that from an efficiency standpoint, having to take tools on and off the rig, replacing any broken parts, wastes a lot of time, but using one tool that can drill the lateral sections, the curves and everything, saves all that time spent in switching tools. I believe the Magnus will be a game changer here in Egypt," McCollum affirmed.

Another system that was presented during the launching ceremony of the new facility that Weatherford is introducing and is in talks for using it in offshore rigs is the Vero Automated Connection Integrity System. "It uses auto-tongs. Previously, tongs would collapse and then the rig crew would spin a chain and twist the pipe that connects them, so instead of having this mechanical process, it is now automated. Laser is used to make sure that everything is perfect and pipes are symmetrical and sealed, to avoid any leak. This eliminates the risk of bad pipes and saves about 10% in time," said the CEO.

Another Weatherford system that uses automation and artificial intelligence is the ForeSite platform. "What the system does is that once the wells are producing, whether with mechanical rod lifts or electronic submersible pumps, it provides information that lets operators know how the equipment is performing, failing or out of balance, allowing for preventive maintenance. It can also, with the use of advanced technologies, monitor the flow in the oil and water cut, and know if it is producing too much, starting to scale, or if production is going down, McCollum added.

"Actually, it can automatically inject chemicals to the well, which enhances precision and efficiency. Because customers can monitor everything, they have the ability to plan. No well is on one lift for its entire life, users will know exactly when to shift to different forms and get it done before the well stops and halts production for a period of time," he further explained.

"Google and IBM are partners with us in that technology, and for our company, with lower global oil prices, more emphasis from investors in Wall Street is on returns and cash flows, and it is all about production. The biggest single thing that can be done to generate better returns is getting production up and

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> **MARK MCCOLLUM** PRESIDENT AND CEO, WEATHERFORD

> "ONCE WE HAVE EVERYTHING COLLECTED TOGETHER, WE ARE GOING TO SAVE TIME AND DO SOMETHING BETTER IN ORDER TO MAKE THE PRODUCTION MORE EFFICIENT."
> **ENG. MOHAMED MOANES** FIRST UNDERSECRETARY FOR GAS AFFAIRS, MINISTRY OF PETROLEUM

cheaper, and that is where we can help, and where Weatherford is leading from a technology point of view, and we are pretty excited about that," McCollum stated.

EGYPT AS AN INVESTMENT TARGET

Fredrico Justus, President of Eastern Hemisphere at Weatherford, told Egypt Oil & Gas that he first met the Egyptian Minister of Petroleum, Tarek El Molla, during the Abu Dhabi International Petroleum Exhibition and Conference (ADIPEC 2016), when the minister shed light on Egypt's extraordinary potential.

"I then came to Egypt for the first time for the first edition of the Egypt Petroleum Show (EGYPS 2017). At that time, our base was still fragmented and not yet efficient, so we decided to have integrated operations here in Egypt, and in two years, the facility is up and running," said Justus.

Justus told Egypt Oil & Gas about what he considers a very successful transformation process that the company has been going through ever since McCollum came on board as a CEO in March 2017. The transformation set the way Weatherford plans to operate in Egypt, as it began operating in a more efficient way. Being integrated into a single place with a single management, Justus sees the base brings efficiency and boosts competitiveness to the market, also offering a platform where anyone can grow their business in a sustainable way which is aligned with the current strategies towards the growth in the oil and gas activities.

> "WEATHERFORD WILL NOW BE BETTER POSITIONED TO BENEFIT FROM MORE ACTIVITIES AND INVESTMENTS IN THE EGYPTIAN MARKET."
>
> **FREDRICO JUSTUS** PRESIDENT - EASTERN HEMISPHERE, WEATHERFORD

> "THE KEY THING FOR MACHINE SHOP SERVICES IS HAVING THE CORRECT LICENSE, AND IT HAS TO MEET GLOBAL STANDARDS, TO RENEW IT YEARLY, AFTER GOING THROUGH STRICT AUDITING REQUIREMENTS. WE ARE THE ONLY ONES IN EGYPT TO HAVE ALL THOSE MULTIPLE VARIATIONS OF LICENSES HERE IN EGYPT."
>
> **WALID YASSIN** VICE PRESIDENT - NORTH AFRICA, WEATHERFORD

"We saw big discoveries in Egypt and we hope to see more operators coming to the country moving forward. Weatherford will now be better positioned to benefit from more activities and investments in the Egyptian market," Justus said.

Looking at the existing activities in the Egyptian petroleum sector, Justus believes that from a commercial viewpoint, being more competitive and having a lower cost basis for operations makes the company more attractive, which is ultimately helping to grow its market share, and increases its chances in obtaining more contracts.

Discussing the top solutions and technologies that the company has been working on over the last two years during the downturn in the oil market, Justus explained that Weatherford has introduced the Managed Pressure Drilling (MPD) to the Zohr gas field, and will now be introducing the Vero Automated Connection Integrity System. Afterwards, Tr1P is the most likely to make it to the Egypt market, as there are now negotiations to apply it.

Justus also emphasized that because Weatherford really values the Egyptian market, he expects all the technologies to be coming here soon, even the Maguns, although the company is yet to have contracts for logging-while-drilling (LWD) and rotary steerable systems (RSS) in Egypt.

EGYPT REVEALS PROGRESS IN ENERGY EFFICIENCY DURING EPEEC 2019

BY **DINA EL BEHIRY, MOSLEM ALI**

The Ministry of Petroleum and Mineral Resources launched on April 22, with the presence of H.E. Minister of Petroleum, Eng. Tarek El-Molla, the second edition of the Egyptian Petroleum Sector Energy Efficiency Conference (EPEEC 2019) under the theme 'From Success to Sustainability' at the Sky Resort in New Cairo. The two-day event discussed the ministry's energy efficiency program, the 4-B pillar of the petroleum sector's Modernization Project.

ROAD TO EPEEC

The Modernization Project resulted in the establishment of a complete database for rationalizing energy consumption, which identified 25 consumption-intensive companies, accounting for nearly 92% of the total consumption. Many procedures were taken to implement low-cost projects in 13 consumption-intensive companies, which decreased consumption levels by around EGP 350 million.

The European Bank for Reconstruction and Development (EBRD) has supported energy efficiency projects in Suez Oil Processing Company with investments of $250 million as well as granting a study for energy efficiency and value-added projects to be implemented in the Alexandria Petroleum Company (APC). Moreover, around 860 houses in the Egyptian countryside have successfully reduced energy consumption by around 3,000 Megawatt (MW) per year.

Earlier in February 2015, a higher committee was formed with the aim to achieve energy efficiency across the sector and meet the country's energy needs. The program was selected later in 2017 as a pillar to improve the efficiency levels under the ministry's supervision. In 2018, the General Committee for energy and climate was formed to settle on energy efficiency policies and strategies.

KEYNOTE SPEECH

The conference began with a short video highlighting the Modernization Project's efforts done in line with Egypt's 2030 Vision and the Egypt's 2035 Energy Strategy. In the video, the words of president Abdel Fattah El-Sisi and minister El Molla showed how Egypt can reshape its energy scene and invest in new projects to achieve efficiency.

El Molla subsequently delivered a speech in which he praised the sector's experts, international oil companies (IOCs), national oil companies (NOCs), and international financial organizations for participating in the conference.

El Molla stressed the importance of achieving energy efficiency as one of the main pillars to accomplish the sector's development as "people's lives depend mainly on the provision of the needed energy resources," he said

Furthermore, the government has exerted many efforts to achieve security, as well as political, economic, and legislative stability, which had a strong impact on enhancing the investment climate in Egypt. "Over the past two years, the petroleum sector has used a new strategy that comes in line with the country's comprehensive development plan to maximize outcomes and develop assets and natural resources," he noted.

"The 4-B pillar, under the umbrella of the Modernization Project, achieved several accomplishments during the past two years," El Molla added. The program has achieved energy-consumption savings of around EGP 348 million by applying low-cost measures in 13 companies, establishing a structural system through the ministry's General Committee for energy and climate efficiency.

"Many workshops were also organized by the program to spread awareness about energy efficiency, in cooperation with many international financial institutions like the World Bank (WB), the United Nations Industrial Development Organization (UNIDO), the EBRD, and Japan International Cooperation Agency (JICA)," said the minister.

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>
> **ENG. TAREK EL MOLLA**
> MINISTER OF PETROLEUM AND MINERAL RESOURCES

Additionally, a training plan containing 68 programs was prepared to be applied in five companies over a year and a half and it is expected that the number of trainees will reach 1,100. Moreover, many energy efficiency projects financed by the EBRD were executed in the Egyptian Natural Gas Company (GASCO) and the Suez Oil Processing Company with investments of around $450 million.

Concluding his speech, the minister pointed out the importance of establishing sustainable relations among IOCs, NOCs, and international financial organizations to achieve the targeted results of enhancing energy efficiency. "The conference, with all the experts participating, will have a great role in reaching promising results to achieve more growth and economic stability to build a brighter future. Therefore, efforts have to be concerted to agree on a program that includes all the sector's companies to achieve the targeted energy efficiency levels," El-Molla said.

HONORING SUCCESS IN ENERGY EFFICIENCY

The minister then awarded companies that exerted notable efforts to improve energy efficiency and achieve significant reduction in energy consumption through applying low-cost measures. The three winning companies were: firstly, Misr Fertilizers Production Companies (MOPCO), and its General Manager of Energy Development and Conservation, Mohamed El-Masry, received the award; secondly, ANRPC, and its Chairman, Mohamed Hassan, received the award; and thirdly, GASCO, and its Chairman, Yasser Salah El-Din, received the award.

Afterwards, Toshio Miuora, Executive Director of KBC Process Technology, said that his company is very proud of the partnership with the Egyptian petroleum sector. "Energy conservation was perhaps seen before as a business model, but it is a social responsibility for the world and the welfare of future generations. We are offering you a wealth of knowledge and experience that we have gained through our journey in supporting similar initiatives across the globe," he added.

"Japan, as an example, has started the energy conservation journey in the 1950s, with the enforcement of the heat management act in 1978… Since then, the petroleum industry in Japan made huge tries to increase their energy efficiency. KBC has played a major role in supporting the transition in Japan… Looking forward, we are hoping to add the same value in the Egyptian petroleum sector," said Miuora.

ORGANIZERS DISPLAY THEIR EXCELLENCE

Engineering for the Petroleum and Process Industries (Enppi) and Petrojet were the event organizers, and in the opening speeches, they presented their success in achieving efficiency targets. Enppi was one of the first companies that led energy efficiency efforts across all of its operations, obtaining the ISO 50001 in 2013, said Alaa Khashab, Enppi Chairman Deputy and Managing Director. "Our policy is to encourage customers and contractors to commit to energy saving. In April 2013, Enppi formed a specialized department for energy management systems, and established the energy department in November 2013, with representatives from all departments to monitor and follow up on energy policies," said Khashab.

Process simulation, increasing efficiency in operating cost management, and applying heating recovery systems in turbines are among the activities the company is undertaking to achieve its targets. Moreover, Enppi is working on enhancing energy saving in its buildings and operations by using solar panels and thermal insulation, providing trainings to engineers on modern energy-saving technologies, and applying these solutions based on their economic feasibility, noted the company's Chairman Deputy.

"For example, we are working on the Dahshour project with GASCO. Applying heat recovery system for four existing turbines, and adding three new turbines. All of our projects now take energy efficiency into consideration. We are now partners with the Suez Oil Processing Company and Alexandria Petroleum Company," Khashab added. He also said that Enppi have completed studies for technical and engineering services, project management, purchasing, and energy efficiency projects, and organized a number of training programs, in line with the 4-B pillar of the sector's Modernization Program.

Meanwhile, Motaaz Khalel, Petrojet Chairman Assistant for Business Development, pointed in his speech that the world is now witnessing the fourth industrial revolution, in which technology is an inseparable part of our lives, from robotics, to artificial intelligence (AI), nanotechnology, Internet of Things (IoT), and other technologies.

"Technological innovation and modern solutions can help achieve sustainability, and enhance the level of efficiencies in entities and businesses, through better asset management and renewing the natural environment. Energy efficiency is one of the focus points worldwide, as many international companies began to include the role of energy efficiency and conservation manager within its top management jobs, as it has become a necessity from economic and environmental perspectives, and a main pillar of sustainable development. This importance is even greater in Egypt due to the rising population and the ambitious development programs, to increase returns and optimize usage," Khalel added, noting that Egypt's Vision 2030 and the Egyptian Energy Strategy for 2035 focus on improving energy efficiency as the foundation for economic and social development and sustainability.

BUILDING ON PREVIOUS EFFORTS

The event celebrated the sector's energy efficiency achievements on the institutional structure front, from the establishment of the EECD in the Ministry of Petroleum in August 2018, to energy efficiency departments in the Egyptian General Petroleum Corporation (EGPC) and holding companies, 100 energy efficiency units across the sector's companies, and an energy database. On the culture-change front, the ministry launched the first Energy Efficiency Conference and Exhibition in May 2018,

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> EXECUTIVE DIRECTOR OF KBC PROCESS TECHNOLOGY

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>
> **ALAA KHASHAB**
> ENPPI CHAIRMAN DEPUTY AND MANAGING DIRECTOR

> *"ENERGY EFFICIENCY IS ONE OF THE FOCUS POINTS WORLDWIDE, AS MANY INTERNATIONAL COMPANIES BEGAN TO INCLUDE THE ROLE OF ENERGY EFFICIENCY AND CONSERVATION MANAGER WITHIN ITS TOP MANAGEMENT JOBS, AS IT HAS BECOME A NECESSITY FROM ECONOMIC AND ENVIRONMENTAL PERSPECTIVES, AND A MAIN PILLAR OF SUSTAINABLE DEVELOPMENT."*
>
> **MOTAAZ KHALEL**
> PETROJET CHAIRMAN ASSISTANT FOR BUSINESS DEVELOPMENT

which held eight energy-efficiency awareness sessions that were attended by 85 companies and around 234 employees and two energy efficiency workshops for the top management of the sector's companies, in cooperation with the EBRD. The Ministry of Petroleum also introduced a long-term training plan that saw the implementation of 29 out of 68 training programs since November 2018.

FINANCING ENERGY EFFICIENCY PROJECTS

Following the inauguration of the conference and exhibition, the event's first session was held under the title "Financing EE projects". Yoshifumi Omura, Chief Representative of Japan International Cooperation Agency (JICA) Egypt Office, delivered the first presentation, explaining that "JICA provides three tools to support the developing countries in achieving sustainable growth which are technical cooperation, soft loans, and grant aids."

Meanwhile, JICA's strategy in Egypt has three pillars, which are inclusive and sustainable growth, poverty reduction, and human resource development. "Renewable energy and energy efficiency have a high priority to JICA operations in Egypt, Omura noted.

"The energy sector represents the largest share of JICA's portfolio here in Egypt," according to Omura. The agency has supported 17 concessional projects with more than $2 billion as well as "adopting a comprehensive approach combining technical assistance and financial assistance to help achieve energy efficiency," Omura said.

In 2017 and 2018, JICA provided two knowledge-sharing programs in Japan, and during 2019 the agency has provided technical assistance. JICA is now studying providing financial assistance by 2020 to 2021. "During the last two years, we had many of exchanging programs with the Egyptian side," he added. Additionally, "the Japanese companies have high standards of adopted technologies, so that it can assist reaching the targeted level of energy efficiency," Omura pointed out.

The second presentation by Amr Salem, Associate Banker at EBRD, noted that investments since the bank's establishment in 1991 have reached EUR 130 billion in more than 5,200 projects. Investments last year amounted to EUR 9.5 billion across 395 projects.

Salem noted that the role of the EBRD is different from commercial banks, which is why they are not in competition. "In 2018, our top investee was Egypt, as we invested EUR 1.1 billion here. We expect that Egypt will remain our top investee in 2019," he added.

"In Egypt, we are already engaged with the private sector and we engage as well with the public sector in three aspects, which are policy dialogue, technical assistance, and direct project finance," Salem said.

EBRD has participated in implementing the new law regulating the gas market "to ensure that private sector will have access to the national transmission," Salem added. Moreover, the EBRD is cooperating in modernizing the petroleum sector, through technical assistance in redesigning processes. Additionally, it is investing in achieving energy efficiency in Egypt's refineries as it conducted a study from fiscal year (FY) 2016/17 to determine the required finance [to achieve efficiency goals]," Salem elaborated.

"The EBRD started to invest in the oil and gas sector in 2013, with investments of around $100 million, which reached $700 million in 2018 and we expect that our investments can reach $1 billion in the future," he noted.

A third presentation was delivered by Dr. Hafez El-Salmawy, Professor of Energy Engineering at Zagazig University, representing the European Union (EU). "Any energy efficiency program usually includes several components, including benchmarking and awareness, financial mechanism (which is a core component), and also capacity buildings programs... So, for energy efficiency finance, it should be tackled by all of these areas in order to facilitate the finance," he said.

El-Salmawy went on to describe the financial and legal challenges facing energy efficiency projects in Egypt. He explained that there is a lack of incentives for energy conservation projects and a shortage of alternative financial instruments for financing projects, as well as a lack of knowledge regarding the true risks of financing efficiency projects. Additionally, legal barriers could result from the absence of a legislation for energy efficiency, as the legal system suffers from complex and slow process for resolving legal disputes.

"Normally, we have several schemes for financing energy efficiency projects, including soft finance, third party finance, loan guarantees, financial derivatives, and regulatory measures," El-Salmawy noted, adding that these funds can be national, regional or international, and they can be for "energy efficiency, clean energy, green economy, or mitigation of climate change."

"Financing energy efficiency projects is subjected to the same rules for projects finance, yet enabling financial mechanisms is an essential component of a successful energy efficiency programs," El-Salmawy pointed out.

Jean-Louis Morcos, Investment Officer at the International Finance Corporation (IFC), then focused on providing solutions for private sector development. "We work on a range of instruments as we do straight loans, equities or anything in between depending on the project. We are here to bridge a gap," he explained.

For the upstream, midstream, and downstream in the oil and gas sector, the IFC has a very good experience across the whole value chain.. Yet, "since September 2017, our ability to finance upstream projects is limited because of the announced restrictions by the WB, but our projects worth $2 billion as we have 50 projects across 25 countries," Morcos pointed out.

Despite focusing on the private sector, IFC also deals with the public sector. "For Egypt, we have signed a memorandum of understanding (MoU) with the Ministry of Petroleum and Mineral Resources," he said. The MoU aimed to help Egypt be a regional hub, improve energy efficiency and environment type projects, and develop refineries.

Subsequently, Ahmed Taha, Manager of the Green Climate Fund (GCF) Egypt unit, presented the GCF objective to ensure national ownership of projects, achieving a balance between mitigation and adaptation to the impact of climate change, diversifying accredited entities, and reaching equal decision-making between developing and developed countries.

"In Egypt, we do not have any accredited entities. So, GCF encourages the public and private sector to be accredited entities to benefit from GCF grants and loans," Taha added.

"Egypt succeeded to get around $154.7 million from GCF for Benban project in Aswan that covers eight cities, which will reduce CO2 emissions by 16 million tons during the lifetime of the project," he pointed out. GCF has many future steps to support the government agencies and private sector to apply for accreditation from GCF and communicate with banks that are interested in financing projects with environmental benefits. Additionally, "we are preparing a workshop to show how different entities can benefit from GCF," Taha noted.

ENERGY EFFICIENCY OPTIMIZATION AND INTEGRATION

The second session focused on energy efficiency optimization and integration.

Discussing why energy efficiency matters, Stuart Shaw, Vice President Operations at BP Egypt, recalled how the perspective on efficiency has developed in the sector compared to the time when he started his career as a young engineer in BP 20 years ago. He then went on to present his company's achievements in the Egyptian

market for over 55 years. “In the last four years, BP has invested $12 billion, which is more than anywhere else in the company’s portfolio,” he noted, adding that in the past two years, production has begun in four new gas projects that BP is working on in Egypt.

The West Nile Delta, Atoll, and Zohr, in which BP is a partner, are among the top projects that the company is working on. BP has also made a series of discoveries in recent years, including Satis and Qattameya, according to the company’s vice president.

“In addition to starting new projects and operating new assets, one of our objectives as we look forward in the future is to grow our production. Our plan is to triple net production from Egypt, compared to 2016, by 2020,” said Shaw.

BP is also growing its footprint across the industry, as BP’s Castrol announced the formation of a joint venture (JV) with TAQA Arabia, while Lightsource BP’s JV with Hassan Allam is working to unlock opportunities from solar energy in Egypt.

According to Shaw, the energy efficiency challenge can be seen in two points. First, the dual industry challenge of satisfying the increasing demand for energy while significantly reducing emissions. The second is improving business competitiveness by increasing operating efficiency and reducing operation costs.

That is why BP is deploying new technology in existing operations to reduce emissions and improve efficiency, and designing future operations for lower carbon emissions. Agility, mindset, and digital technologies are the three keys for modernizing and transforming the industry, Shaw explained.

In the following presentation, Azhari Dafaalla, Senior Process Consultant at KBC Process Technology, focused on the innovative integrated process and utility modelling approach. Improving asset performance, cost optimization, maximizing asset profitability, as well as safety and environmental performance for operating assets are among the top focus points for energy companies. Companies also look to increase efficiency gains in engineering and operations, adapting operational excellence programs, and using simulation as a means to drive decision support in operations. “Simulation is important because it eases decision making,” he explained.

Dafaalla went on to highlight the importance of the technical modeling approach integrating process and utility, and presented a case study of improved cooling water temperature that achieved a relatively small difference in energy, valued at $80,000 per year, and a big difference in process yields at $10.4 million per year.

Subsequently, Sonny Llave, Global Director at Technical Consulting and Digital Tools, Wood Automation and Control, talked about energy efficiency in design and operations, stressing the need for solutions and services at various stages in asset development, in design, execution, and operating, and the role played by digital solutions such as digital twins. “A digital twin is a virtual representation of an asset, used from early design through building and operations, maintained and easily accessible through its lifecycle,” he explained.

Onshore operations are becoming more receptive to the technology, as models utilized are more fit-for-purpose, with more openness for autopilot and control systems, according to to Llave. “The end goal is for reliable, repeatability, safe and optimized operations,” he concluded.

In the following presentation, Fred Kessler, Head of Ammonia and Urea Revamps at thyssenkrupp Industrial Solutions (UHDE), showcased revamp concepts for Egyptian ammonia plants, noting that fertilizer production consumes almost 1.5% of the world’s total energy, since it is a an extremely energy intensive industry. Approximately 25 to 40 million metric British thermal units (MMBTU) are required to produce one ton of ammonia, the basis of almost all fertilizers in the world, he explained, noting that natural gas is the main feedstock to ammonia.

The total capacity of ammonia plants in the Nile Delta is approximately 17,000 tons per day, consuming 550,000 MMBTU/day, or 200 million MMBTU per year. The consumed natural gas is valued at $850 million a year, based on the MMBTU price of $4.5. Meanwhile, the production is valued at about $2 billion per year, Kessler explained, referring to the benefits of using natural gas in producing fertilizers.

Revamping ammonia plants could focus on energy savings, increasing production capacities, or environmental issues, such as the reduction of NOx, CO2, and dust, as well as water consumption, according to Kessler, who presented a general optimization case study for an ammonia plant with a capacity of 1,200 tons per day.

Moderate revamps of ammonia plants are relatively inexpensive, and plants that have not been revamped yet offer the most potential for low cost capacity increase, making the cost per ton even cheaper than new plants, said Kessler.

“A 6% reduction of energy consumed by all ammonia plants would save approximately 12 million MMBTU/year for ammonia production, which is the equivalent to about half the natural gas [supplied] to one combined-cycle power generation block,” Kessler indicated.

Kessler argued for exporting Egyptian natural gas in the form of fertilizers with the new discoveries in the Mediterranean Sea. The direct sale of natural gas to global markets brings quick money to Egypt at around $4.5 per MMBTU, while exporting urea could allow three times more money to flow into the country at $15 per MMBTU, as producing one ton of urea requires about $100 per ton of gas, according to Kessler.

Nicolas Menet, Digital Applications and Consulting Sales Manager at Axens, then presented the strategy for solid energy intensity reduction, presenting the steps for achieving higher margins especially in refineries, from data collection and planning, followed by audits and process review and assessment, to plant optimization and management with advanced and near real-time solutions. Axens focuses on quick wins or projects with a return on investment (ROI) of less than two years, and works to transfer knowledge to energy efficiency teams, he added.

Finally, Moataz Ebeid, Senior Manager Egypt and UAE at OSIsoft, discussed operational excellence and real-time data infrastructure, stating that his company is dealing with 80% of the top oil and gas companies globally, as well as more than 1,000 utilities, and eight of the global Fortune Top 10 companies in metals and mining, among other clients.

Ebied also pointed out that OSIsoft is the only software that provides single source of truth of data, collecting it from all sources regardless of the manufacturer of vendor and allowing clients to fully-own their data at all times.

GLOBAL FIRMS SHOWCASE MODERN TECHNOLOGIES

On the event’s second day, four sessions were held, led by a discussion on “Energy Efficiency Technologies.” In the session’s first presentation, Joan Sanroma, the Sales Director of KBC Process Technology, said that his company focuses on data services, expressing the keenness of his KBC to be a digital partner to companies working in the Egyptian petroleum sector.

The presentation illustrated how to distribute the needed energy throughout the process. Sites that operate complex energy systems face many challenges including complexity, price volatility, lack of real time data and reliable information, as well as some other ignored constraints, “therefore, you need to respect these constraints to generate the energy you need," Sanorama explained.

“What we propose in KBC is a software called Visual MESA. We model your work-type and put it on real time basis, so that you will have a validated model about what is going on your system,” Sanroma pointed out. This technology defines specific set points and sends them to the operational system with the minimum cost, “so, the more optimization, the more energy saving can be achieved.”

Moreover, KBC has a co-pilot program. “Through this technology, we can digitalize your system and make your business more attractive,” Sanroma noted. As a result of the project, the information of the energy system

will be organized into one real-time model and a single environment with an access for everyone. “After the project, we do not leave you alone. We provide model performance monitoring to review reports, answer questions, and solve problems,” Sanroma clarified.

The second presentation was made by Rania Fawzi, Trading and Products Management Team Leader at Korra Energi. She began the presentation by explaining that “Korra Energi provides compression packages, power generation and cogeneration, condensate fractionation, and gas processing and treatment as we believe in long win-win partnership.”

Turboden, which is 72% owned by Mitsubishi Heavy Industries Group, presented a case study that aims to enable power production up to 20 megawatt (MW) per single turbine by recovering excess waste heats from hot stream in oil and gas sector. “The main idea is that we generate energy from waste. So, we have zero running cost, zero maintenance, and zero water as you improve sustainability from a waste source which increases efficiency levels,” she explained. Therefore, ORC technology can achieve flexibility, sustainability, and dependability.

Mohamed Bendary, Senior Process Engineer at Enppi, explained how distillation is the most widely used method for separating chemical components. “It is a very energy-intensive process in which the energy consumed represents 3% of the total world energy consumption... It represents around 40% of total energy consumption around the world in the process industries,” Bendary said.

Different studies were carried out for distillation separation to minimize energy consumption, one of them is the fully thermally coupled distillation column (FTCDC) which “proved to have the lowest energy consumption,” he added. FTCDC has been used by many contractors including BASF SE, Sasol, ExxonMobil and others in which “it was found that FTCDC managed to achieve energy saving by around 40%,” he further noted.

For the purpose of the economic evaluation, the equipment sizing has to be considered and it was performed using known sizing and rating software. “Any reduction in energy consumption not only provides economic benefits, but also reduces emissions associated with using fossil fuels,” he pointed out.

Ahmed Ali, Sales Manager of Pall Corporation, then focused on the importance of fluid cleanliness, as “it helps reduce operating and maintenance costs, which achieves energy saving,” Ali said. Fluid contamination control can minimize pressure drop consumption reduce pump power requirement, reduce steam/hot oil use, and prevent heat exchange fouling. That is why, “fluid contamination control can contribute to energy efficiency under Pall Corporation broad experience for improved equipment and asset protection.”

Finally, Ahmed Taha, Marketing Manager, Egypt and Levant Countries at Alfa Laval Middle East, presented the newest technologies in heat exchange systems. “We have a wide range of compact heat exchangers, which provide a solution for many customers’ problems, with a robust design built for tough conditions such in the oil and gas sector,” Taha said. Choosing the right heat exchanger will have a big impact on operating efficiency, according to him. Moreover, exchanging existing shell-and-tubes for compact heat exchangers is a good investment as it can increase the area’s performance, as well as maximize energy recovery and uptime with less maintenance.

“Since energy efficiency is a top priority for most plants, the compact exchange can save up to five times higher heat transfer in the exchanger and a higher heat recovery, compared to a shell-and-tube,” Taha explained. Accordingly, increasing heat recovery leads to saving fuel, debottlenecking, and increasing throughput. That is why, “using compact heat exchanger can minimize cost, improve reliability, and maximize production,” Taha noted.

CELEBRATING SUCCESS STORIES IN THE PETROLEUM SECTOR

In the following session, success stories achieved by leading national companies were presented by GASCO, MOPCO, ANRPC, ETHYDCO, APRC, AMOC, and ELAB.

“Egypt was one of the countries that entered the Paris Climate Agreement, expressing commitment to reducing carbon emissions, and the petroleum sector was one of the pioneering sectors in realizing this session, especially through the Modernization Project, which included energy efficiency and optimization in its targets,” said the session’s moderator, Mohamed Ibrahim.

Achieving energy efficiency has to come from a commitment from the top management, which is why the energy committee in the Ministry of Petroleum has held multiple sessions for the management of the sector companies to raise their awareness of energy efficiency, as a step on the right way. “Today, I have with me seven companies working in the sector that have already energy savings through no and low-cost techniques, except for GASCO that may have applied medium cost techniques, Ibrahim added.

Presenting GASCO’s path into sustainability, Mohamed Fathy Tash, the company's Energy Conservation Assistant Manager, said that his company has already established an energy management systems according to the ISO 50001 in nine sites, as well as environmental sustainability and energy conservation policy, noting that the policy will be applied in all of GASCO plants within two months. Saving around 19,114 megawatt-hour (MWh) by the company has resulted in reducing CO2 emissions by 3.4 million kilograms.

“GASCO’s policy is built on the United Nations Sustainable Development Goals (SDGs), Egypt’s Vision 2030, and the global standards to combat climate change,” according to the company’s Energy Conservation Assistant Manager. GASCO is also planning to start publishing a sustainability report in cooperation with the Egyptian Natural Gas Holding Company (EGAS).

Meanwhile, Ahmed Hussien, Energy Efficiency Optimization Section Head at Misr Fertilizers Production Company (MOPCO), explained that MOPCO’s vision is to focus on energy saving as a sustainable improvement approach to increase profitability, reduce greenhouse gas emissions and exposure to energy price fluctuations. MOPCO was the first company in the energy efficiency project and the Egyptian fertilizer sector to obtain the ISO 50001 certificate in 2011.

The company’s efficiency policies have already achieved more than 64.5 million kilowatt per hour (KWh) and EGP 26 million every year in energy and cost saving, according to Hussien.

In the following presentation, Essam Kabbary, Utility General Manager and Energy Management Manager at ANRPC, displayed the company's journey in implementing a SCADA system that helped efficiency goals, noting that ANRPC provides around 40% of Egypt’s gasoline production.

Similarly, Mohamed Hafez, Electric Department General Manager at Egyptian Ethylene and Derivatives Company (ETHYDCO), spoke about how implementing the energy saving project in the polyethylene plant led to ETHYDCO saving about 1,060 MW during Q4 2017, with an average saving of EGP 3.6 million per year.

Meanwhile, Mohamed Salem, R&D General Manager Assistant at Alexandria Mineral Oils Company (AMOC) told the story of how energy saving and power management led to an increase in production by 1% or 12,500 tons per year, increasing gross margin by $1 million annually.

Subsequently, Mohamed Abd Elmonem, Assistant General Manager at Amreya Petroleum Refining Company (APRC) showed through his presentation that APRC achieved sweet water saving worth EGP 16.6 million per year, demi-water saving at EGP 7.3 million, and fuel gas saving up to EGP 13.5 million, achieving a total of EGP 37.4 million per year in energy savings.

Mahmoud El Araby, Technology and Development General Manager at Egyptian Linear Alkyl Benzene (ELAB) also presented two case studies through which the company was able to reduce natural gas emissions by 450 normal meter cubed per hour (Nm^3/hr), and the equivalent of 5,910 MMBTU of natural gas or $26,600 per year. Since ELAB started the Energy Conservation Program, it was able to achieve electricity savings up to $30,000 in three years, and $1.1 million in natural gas savings during the same period.

ENERGY EFFICIENCY FRAMEWORK AND POLICIES

Azhari Dafaalla, Senior Process Consultant at KBC Process Technology, delivered a presentation about energy management in new projects design. “It is well-known that the cost of design is increasing during the project lifecycle and in KBC we always say that we need to avoid regretting investing in any equipment at any point of time,” Dafaalla said.

The new design management elements are to follow the project phases to ensure developing an energy efficient design, estimate the overall energy gap, and identify where and how this gap is generated. The new design management framework aims to “provide a framework for closing energy gaps through technical-economic evaluation during the design phases from project concept to plant operation,” Dafaalla explained. This framework will “generate an audit trail of the energy reviews undertaken during project development and operation, and clear corporate understanding of the new project’s energy performance,” he added.

Furthermore, Dafaalla mentioned the liquefied natural gas (LNG) Process New Projects Benchmarking that aims to “provide a tool to benchmark the energy performance of LNG plants.” This system helps determining targeted energy consumption during the conceptual phases and identify the gaps in subsequent phases.

Moreover, KBC has established Best Technology (BT) Energy Values that aim to “close the overall energy gap

with identifiable energy saving features which can help the owner's engineer to identify the energy causes and accept that some features of the proposed design deviate from the BT energy feature," Dafaalla explained.

Vagn Jorgensen, Team Leader, Human Dynamics at the European Union (EU) then presented energy efficiency efforts in the EU, which started in 2012. "The EU targets to reduce CO2 by 20% by 2020, and increase energy efficiency by 20%. Also, by 2030, it targets reducing emissions by 40%, comparing to 1990," Jorgensen said.

The EU has established an Emission Trading System (ETS) in 2005, which aims to "limit industries emissions, at first free credits issued, but being more limited and to be sold/ bought via auctions if ceiling are reached high fines," he explained.

From 2005 to 2007, it was the first trading period in which EU ETS was established as the world's biggest carbon market, but the number of allowances turned out to be excessive. The second trading period, from 2008 to 2012, was when the number of allowances were reduced by 6.5%, but the economic downturn depresses emission and thus demand. After that, from 2013 to 2020, which marks the third trading period, the biggest changes have been introduced of an EU-wide cap on emissions which were reduced by 1.74% each year.

Afterwards, Berend Van Den Berg, Advisor at GGFR World Bank delivered a presentation about the new approach to enhance flare-gas to the market. "We have around 141 billion cubic meters (bcm) of gas flared in 2017, which produce around 350 million tons of CO2 emissions annually," Berg said. From 2013 to 2017, "Egypt had been ranked at the 14th top flaring country," he added.

GGFR members worked on reducing flaring by around 45% reduction in flaring intensity since 1996. However, even if GGFR partner companies completely eliminate their flaring, "this would remove only around 20% of current global flaring," Berg noted. Therefore, new approaches are required to address the remaining 80% of gas flaring.

In order to produce associated gas, it has to be considered that cost of producing associated gas is factored into crude oil production cost. In addition, "a country with non-associated gas reserves, such as Egypt, associated gas has to compete with a large scale non-associated gas."

There are some hurdles in monetizing flare gas. In some countries, it is not clear who owns the associated gas that is flared or how to enter flare gas to the market. The price should be market-driven and not regulated. Additionally, there is a need to have accurate and relevant data to develop the baseline and identify the potential savings. That is why, "it is essential to implement a robust associated gas data management system for measuring associated gas volumes produced," Berg noted.

The session continued with a fourth presentation by Marco Morando, Energy and Resource Efficiency Manager at Rina Consulting. According to satellite analysis estimates, Egypt ranks 11th among the top gas-flaring countries. Therefore, "capturing the 2 bcm of gas flared in the country could cover 5% of the national energy needs and add $300 million to the national economy," Morando said.

Moreover, Egypt and the EBRD are part of the WB initiative 'Zero Routine Flaring by 2030'. Accordingly, developing methodologies, procedures and rules for the monitoring, reporting, and verification (MRV) for flared gas became

a necessity. "MRV provides information on quantities, energy content, and quality of flared gas," he noted.

"The MRV methodology will be the first step for useful exploitation of an untapped resource in the country, thus contributing to the country's economic benefit and mitigating climate change in the world," Morando pointed out.

In a different tone, the session was concluded with a final presentation by Heba Kadry, Instruments and Control Engineering Specialist at Enppi, on the blockchain technology, which grabbed the attention of the world after the rise of the cryptocurrencies, such as Bitcoin.

"The major contribution of Bitcoin is the solution of how to establish trust between unrelated parties to secure transactions that can be performed," Kadry said, going on to explain that blockchain is a database where various parties collect and circulate messages. "The data stored in blocks and each block is connected to the previous block using a distributed consensus algorithm," she added. Under blockchain mechanism, there is no centralized authority as the users trust only the mechanism.

Blockchain provides solutions across the energy trilemma as "it reduces costs by optimizing energy processes, improves energy security, promotes sustainability, and enhances efficiency by significant distribution and transmission losses reduction," Kadry explained.

Therefore, "blockchain is a foundational technology that will create foundations in the economic and financial system to revolutionize the business models," she noted, adding that "Egypt has to take on a key role in blockchain technology to accomplish the country's regional vision."

SERVICE COMPANIES ADDS TO THE SECTOR'S ACCOMPLISHMENTS

EPEEC's last session focused on energy services companies and institutes. "Basically we are an oil and gas company, but lately we started to explore the infrastructure market in Egypt and abroad," said Sherif Deknawy, Area Manager at Petrojet, noting that since the establishment of Petrojet in 1975, the company has grown into a one-stop-shop for the construction of hydrocarbon, industrial and infrastructure projects.

"We are proud to say that Petrojet is among the top 250 construction companies in the world," he added. Petrojet is highly committed to the standards of ISO 14001, aims at being certified with the ISO 50001, and has designed and built an innovative energy conserving headquarters building, according to Deknawy.

Likewise, Rami Ahmed, Process Engineer at Egyptian Projects Operation and Maintenance (EPROM) indicated that EPROM is the main EGPC consultant in the field of energy saving and assessment in Egypt, and has performed energy saving processes for APC and Cairo Oil Refining Company (CORC). EPROM introduced the first Egyptian energy-efficiency software for monitoring and troubleshooting performance of fired equipment.

The presentation then focused on the company's Power and Energy Monitoring System (PEMS), which is an effective, fast, and easy tool for the evaluation of units' energy consumption and usage, according to Ahmed.

Afterwards, Mohamed Swydan, Projects Manager at Korra-Energi discussed the approaches to flare gas recovery through transforming gas into power or into liquids, and then presented a case study of a BOO (build, own, operate) project carried out with Esh El Mallaha Petroleum Company (ESHPETCO), which helped the company meet its energy needs in time of crisis. The project, which was 15% financed by the EBRD, led to the reduction of CO2 emissions by 48,000 tons and decreased the company's energy bill by 66% and increasing production by 11%.

Mervat Mohamed Abdel Wahab, Assistant General Manager for Energy Saving and Electrical and Supervisor for Design Department at the Egyptian Company for Energy and Cooling Projects (GasCool) then exhibited its portfolio of district cooling and power generation through various technologies, as Mervat explained how the company has established a number of solar systems in petroleum companies, noting that another BOO project with the General Petroleum Company (GPC) for a solar system is in one of the company's pumps.

Gascool is also building a district cooling unit in the New Administrative Capital, which will be the biggest of its kind in Egypt with a 60,000 tons capacity, and the first in the country to use three different new technologies, namely absorption chillers, compression chillers and thermal storage tanks, as well as cooling towers. Finally, Ayman Abdelshafy, Electrical Engineering Specialist at Enppi, discussed the added value for integrating local power generation at petroleum facilities with the national grid, presenting a project that Enppi carried out with Ethydco, explaining that the advantages of grid connection vary from providing a backup source, to enhancing the stability of the power plant, and the ability to sell excess electricity.

CAPITAL PROJECT EFFICIENCY AND PERFORMANCE IMPROVEMENT STRATEGIES FOR THE OIL AND GAS INDUSTRY

BY **VINODKUMAR RAGHOTHAMARAO,** DIRECTOR CONSULTING, ENERGY WIDE PERSPECTIVES & STRATEGY, IHS MARKIT EMEA

Oil and Gas companies operate in dynamic and complex environments, where they face constant challenges especially in terms of budget and cost overruns for capital project execution. Post the 2014 oil price dip, across energy and process industries, about 55% of capital projects were negatively affected by either scaling back projects and postponing investments, or cancelling projects altogether.

With oil prices currently hovering around $65, capital expenditure bounced back as companies began to gradually invest, stimulated by the rising price of hydrocarbons and other raw materials. The need of the hour is to overcome the challenges faced in the past with respect to productivity and performance improvement related to capital projects' portfolio execution. In the current environment, it has become increasingly important for oil and gas companies to manage capital projects in the most efficient manner possible in order to sustain and improve margins. It is also important to design revamped or new facilities with advanced solutions for the same reason. To manage capital projects efficiently, companies should develop a strategy or roadmap for capital project efficiency and performance improvement, which will help save on schedule, costs and lead to higher margins.

Around 65% of capital projects have more than a 10% overrun on costs and schedules, and nearly a third have more than 25% overrun on costs. Oil and gas companies can adopt best in class project management and Industry 4.0 digitalization technologies to boost capital-project productivity. Value engineering, design standardization, digitizing processes, and advanced analytics can all yield significant improvements.

Imitating such practices really does not help as each oil and gas project is unique. No oil and gas project is the same as the one that preceded it, and lead times are extremely long. Moreover, the project teams are dynamic and often change. Consequently, each new project brings a new set of challenges and a new learning curve, thus limiting the potential for boosting performance.

If oil and gas companies can adapt these practices to meet the needs of their unique environment, considerable improvement is possible. By our estimates, reducing development time alone has the potential to deliver 12% to 25% in cost savings.

Design standardization provides one of the greatest savings opportunities in capital projects. There could potentially be a five-to-tenfold increase in construction productivity, if construction were to move to a manufacturing-like system of mass production, with more standardization and modularization.

Capital project designs are often bespoke, which may seemingly preclude the potential productivity gains of repeated manufacture and construction. However, projects, particularly major capital projects, consist of many separate elements and packages, and each of which can provide great opportunity for design standardization. Value engineering of large capital projects typically delivers cost savings of at least 10% versus previous projects or initial concept designs, and also presents opportunities for value enhancement through additional functionality.

In addition to savings, project owners who incorporate standard designs often benefit from reduced contractor pricing, as contractors can establish facilities tailored to providing standard products. One upstream petroleum major realized a seven-month improvement in time-to-market by abandoning its legacy of tendering projects that required unique execution approaches (bidding, fabrication, and construction) for each project in favor of a standardized and modularized design. This move to standardization was made possible through detailed interviews and problem solving with contractors, partners, suppliers, and owners to identify optimal solutions.

Industry 4.0 digitalization has immense potential to greatly improve a wide range of processes used in the oil and gas capital projects. Used in conjunction with automated engineering processes, five-dimensional building-information modeling (5-D BIM) will likely eliminate the manual execution of many repetitive tasks, reduce the effort required for contract management, and make it possible to automate some quality-control functions.

Digital technologies can make oil and gas capital projects more productive as well. Digital twins, real-time digital replicas of physical assets created by laser scanning of a construction site, make it possible to do site inspections and track progress in real time from the office. With the use of radio frequency identification (RFID) tags, the value chain workflow of parts can be automatically tracked from manufacturer to installation site, improving schedule predictability. Used in combination, 5-D BIM and digital twins will likely soon become the new norm for designing and monitoring construction projects.

Virtual-reality (VR) tools help users view designs and prototypes, allowing them to interact as if they had already been constructed, which means they can see the exact size of various components before physical assets are fabricated. Similarly, advanced surveying tools help users understand as-built conditions and compare them with designs.

Supply Chain and Procurement 4.0 can streamline and improve procurement processes. Automating and digitizing purchase-ordering processes and communications with suppliers can greatly reduce the amount of manual work required, accelerating the supply chain while giving it a whole new level of transparency. Cloud-based modeling, which evolves from project to project, is used sparingly in the oil and gas capital projects and same with e-auction and electronic-request tools. Digitizing the supply chain can reduce procurement costs for all purchases of goods and services by 20%, reduce supply chain process costs by 50%, and increase revenues by 10%.

Big Data offer a wealth of useful information for oil and gas capital-project teams. Project data can be used to determine the underlying drivers of better performance, while inspection data can be used to improve project quality. Data produced by tag-and-track technologies can help improve supplier performance measurement and monitoring, predictive site scheduling, and workforce management.

Using machine learning, data-ingestion engines and innovative pattern recognition, oil and gas companies can now rapidly sort through millions of data points. With this capability, oil and gas capital project owners can compare the impact of hundreds of performance drivers on project or business outcomes. They can also identify the obstacles that raise costs and timelines. In some areas, advanced analytics may produce savings up to 20%.

The time is right for oil and gas capital-project owners to innovate themselves and rethink the way they carry out these projects. Opportunities to improve productivity exist all along the development and construction cycle. Companies that seize them can complete construction projects faster, reduce costs, and improve schedule predictability.

To realize the true potential benefits that these new practices afford, oil and gas capital project owners in collaboration with the engineering, procurement and construction (EPC)/front end engineering design (FEED), and project management contract (PMC) contractors will need to rewrite the rules of the game related to policies, project management, engineering practices, information technology (IT), and supply-chain engagement. They will need to be willing to embrace new technologies. Moreover, they will need to instill collaborative practices not only among project owners, but also between internal engineering, procurement, and construction teams and external suppliers. Although deep collaborations based on trust are currently rare in the oil and gas industry, they will be critical in the future.

Forward thinking organizations are using similar practices to improve the value of their capital project performance in terms of budget and schedule. Increasing the use of standard designs, adopting greater modularization using low-cost country fabrication yards, where possible, as well as improving procurement contracting practices, and implementing industry 4.0 digitalization, and lean construction techniques. Linking project performance to contractors and project team remuneration paired with a deliberate strategy to retain key talent are considered pivotal practices for aligning incentives and project targets.

Oil and gas capital project owners who want to improve their capital project performance should focus on strengthening their portfolio management, reviewing and improving their project operating model, developing and embedding value-improvement practices in their project processes, and focusing on skill development and talent retention. It will be really interesting to see how oil and gas capital project owners can effectively manage their projects seamlessly, coupled with the adoption of best in class capital project performance practices in 2019.

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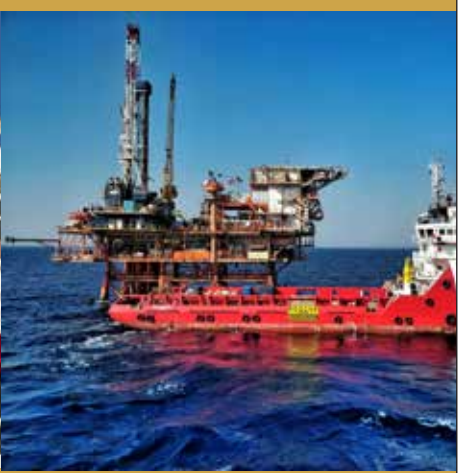

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OIL & GAS INDUSTRY ECONOMICS

Oil well drilling operations are a series of practices that depend on some basic and applied sciences in an integrated and organized system. Hence, all viable and reliable new techniques can be used for achieving the well construction in a safe way and within a minimum cost.

One of the major challenges of oil well drilling operations performance is the wasted time, which is called non-productive time (NPT). So, the implementation of well operations in minimum time is an important key Performance Indicator (KPI). To achieve this target, we should avoid the major open hole drilling problems which consume more time to be fixed.

The open hole drilling problems include well kick, pipe sticking and loss of circulation. The prevention or avoidance of these problems is the optimum solution that we want to achieve.

To reduce the risk during oil well drilling operations and minimize the wasted time, new drilling techniques or applications were created and developed as a new trend for dealing with the high potentiality drilling problems in a proactive step to avoid the risk and eliminate the time and cost required for fixing them.

Managed Pressure Drilling (MPD) is considered one of the most successful new drilling technologies/applications. This technique is used to continue drilling through high pressure and low -pressure zones in the same hole section without suffering from kick/loss cycle problems or using additional casing string which may lead to inaccessibility of optimized well design.

MPD has been proved to be reliable and applicable in many areas worldwide with great benefits, high well control and safety level. One of the successful MPD applications was in South Ramadan offshore field, in which MPD has overcome very problematic down hole formations (sequence of high- and low-pressure zones), and achieved the required goals with reducing time by nearly 20%.

Therefore, I believe in the necessity of forming a team from the oil and gas experts for studying these new technologies, following-up its applicability and evaluating its performance and benefits. Then, we can generalize these techniques as accredited drilling methodologies.

I am looking forward to seeing new orientation in the Egyptian oil and gas industry to cope with the new international trend of creating and innovating non-conventional flowcharts to deal with the challenges by using new technologies and highly automated equipment.

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

RENEWING EXPLORATION ACTIVITIES IN THE GULF OF SUEZ

The world-class tertiary rift basin of the Gulf of Suez has been the main petroliferous province in Egypt for decades. It contributed the biggest share to the country's energy supply, and remains challenging for petroleum companies. It is one of the oldest known hydrocarbon provinces in the world with reports of natural seeps going back to the times of Ancient Egypt. However, the first oil discovery in modern eras was by a French mining company digging for sulfur back in 1868.

The Gulf of Suez is characterized by thick Miocene salt and evaporite section, and the subsalt seismic imaging is regarded the biggest challenge to success in the Gulf of Suez. Since 1973, the great efforts of the Egyptian General Petroleum Corporation (EGPC) in encouraging exploration activity in the Gulf of Suez resulted in appreciable success.

In 1982, the first application of 3D seismic survey was conducted by the Gulf of Suez Petroleum Company (GUPCO). Despite this long exploration history in the Gulf of Suez, alongside the major discoveries of several giant fields and a large number of intermediate fields. The field distribution map still shows rooms for more new discoveries. For instance, the drilling activities in the northern sector of the Gulf of Suez are below expectations compared to the central and southern provinces.

The mindset of exploration activities in the Gulf of Suez region has changed and has been updated over time. The primitive exploration concept was to drill near the oil seepage and close to the shoreline. With the emergence of advanced gravity, magnetic and seismic technologies, companies drilled high structures and the four-way dip closure traps. This resulted in giant discoveries like Morgan, July, and Ramadan oil fields.

Recent drilling activities started to move toward the basin trough and flanks targeting the stratigraphic plays, which achieved additional discoveries. However, the creaming curve of the Gulf of Suez displays it as a relatively mature exploration province.

I believe that the deeper targets should also be considered in future plans. EGPC in collaboration with WesternGeco started a multi-client project to acquire new 3D seismic data over the offshore part of the Gulf of Suez; this would introduce significant exploration steps to add more discoveries in the Gulf of Suez.

AHMAD MOSTAFA
Exploration Section Head
Ganoub El Wadi Petroleum Company (Ganope)

EGYPT OIL&GAS RESEARCH & ANALYSIS

Annual Inflation Headline CPI

FEB 2019	MAR 2019
14.3%	14.2%

Net International Reserves ($ billion)

FEB 2019	MAR 2019
44.06	44.11

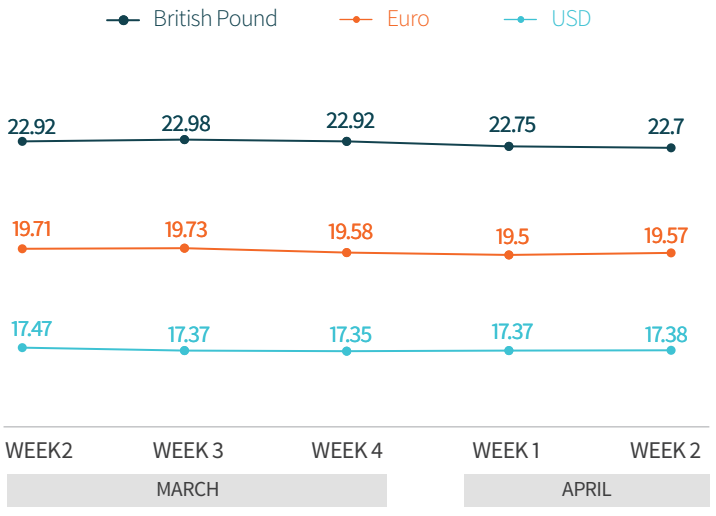
Fitch increased Egypt's credit rating for the **fifth time** since the economic reform program.

The rate rose from B to B+ with stable outlook.

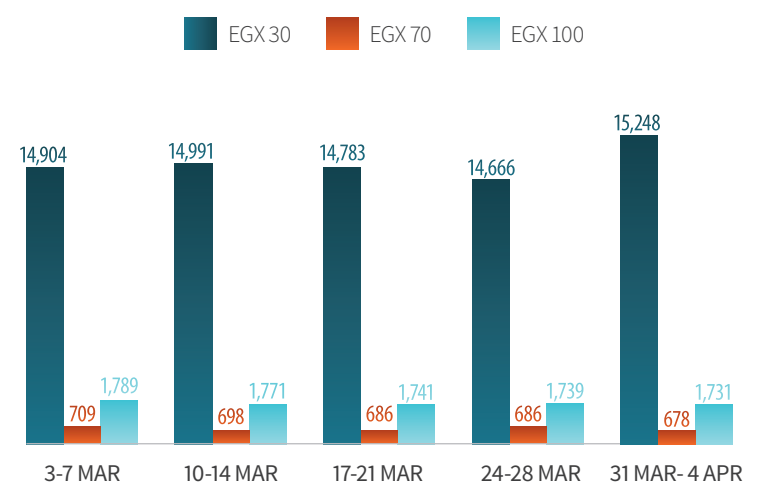
Egypt ranked the **4th** most-favored destination to outsource contact centers.

Egypt leaps **10** places to rank the **95th** in the 2018 Global Innovation Index

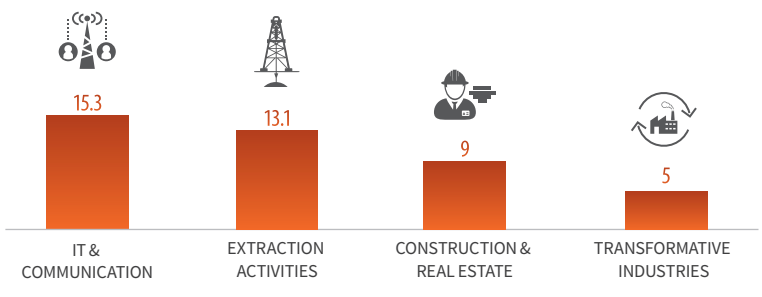
Exchange Rates



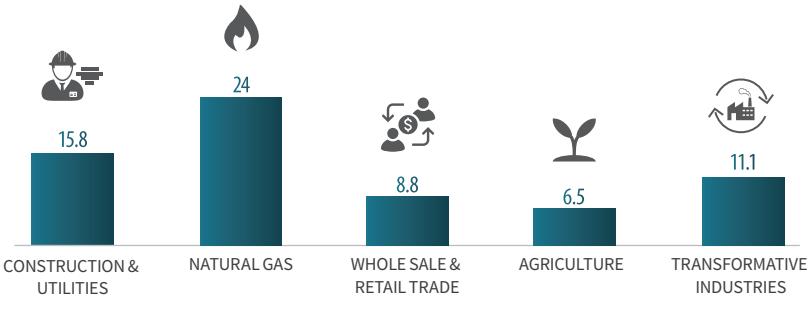
Capital Market Indicators



Sectors' Share in Investment and Exports in FY 2019/20 Budget (%)

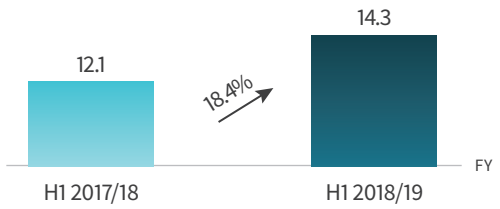


Estimated Sectors' Share in GDP Growth Rate in FY 2019/20 (%)

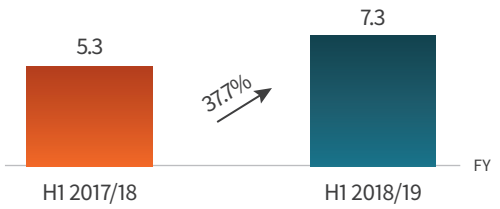


Source of Raw Data: Central Bank of Egypt and The Egyptian Exchange, MPMAR, Fitch Solutions and Global Innovation Index.

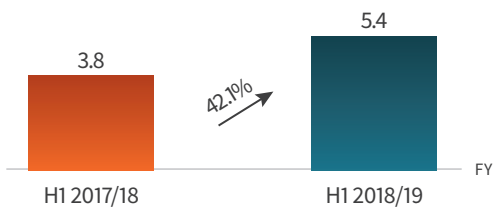
Merchandise Exports ($ billion) (YoY)



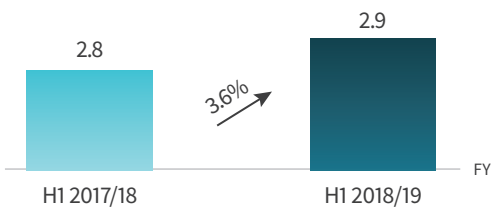
Services Balance ($ billion) (YoY)



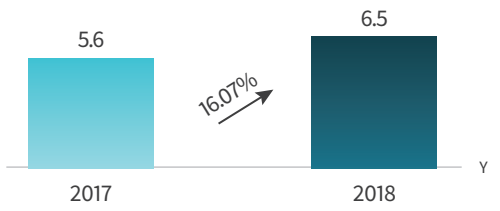
Transportation Balance ($ billion) (YoY)



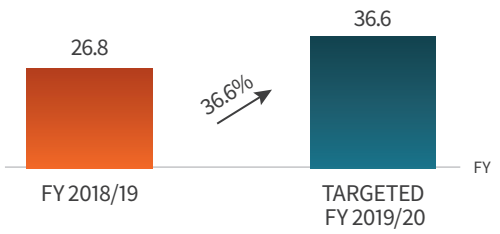
Suez Canal Receipts ($ billion) (YoY)



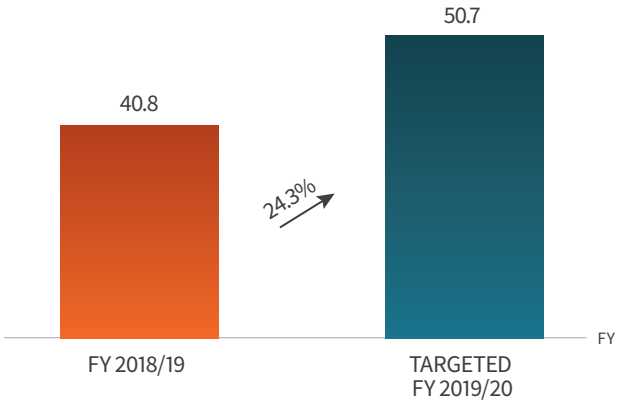
Trade Exchange with the US ($ billion) (YoY)



Human Development Index (EGP billion) (YoY)



Egyptian Citizen Standard of Living Improvement Index (EGP billion) (YoY)



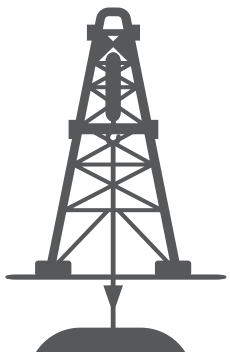
Source of Raw Data: MPMAR, Ministry of Finance and CBE.

The total cost of implementing **phase 1** of targeting development gaps in the most needy villages reached **EGP 1.3 billion**

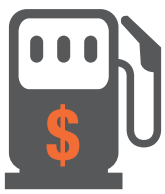
The total government revenues increased by **80%** from FY 2013/14 -FY 2017/18 to reach **EGP 821.1 billion** in FY 2018/19 budget, aiming to reach **EGP 1067 billion** in FY 2019/20.

Egypt is the **largest recipient** of US FDI in Africa, and the **second largest** in the Middle East.

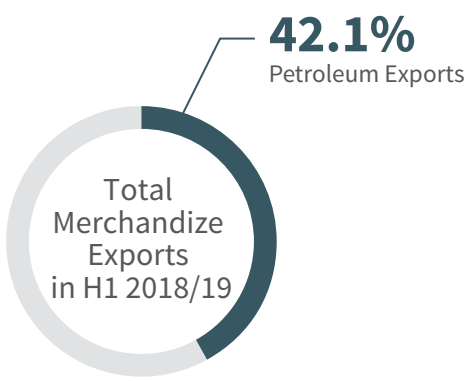
The Egyptian government paid further **$10 million** to Dana Gas.

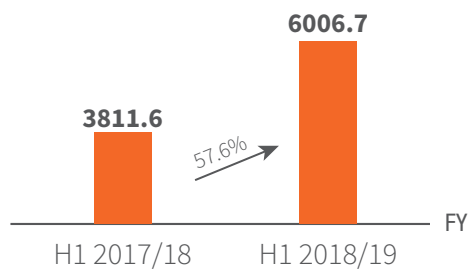


The Egyptian Drilling Company (EDC) became **100%** Egyptian, owning **40** onshore drilling rigs, **four** offshore rigs, **21** wells maintenance rigs, **two** lifting units, and **one** offshore device.



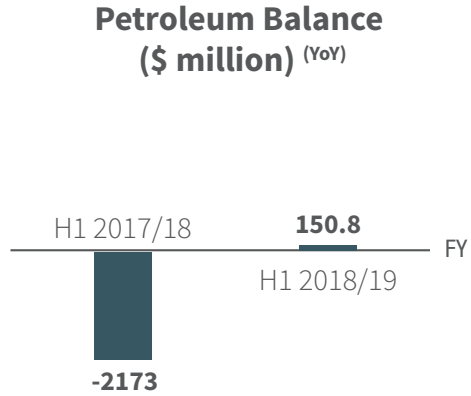
Egypt holds price of **95-octane** petrol at **7.75** Egyptian pounds per liter through Q2 of 2019, which will be revised within the next three months.





Net FDI to petroleum sector recorded **$1.5 billion** during **H1 2018/19**, which represented **53.6%** of total net FDI.

Crude oil exports increased by **39.7%** in **H1 2018/19** compared to the same period of the last year.



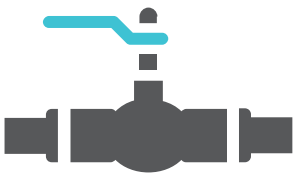
Petroleum products exports increased by **75.8%** in **H1 2018/19** compared to the same period of the last year.

MIDOR refined **43.8 mb** of crude oil in **2018** to produce **5 mt** of high-quality petroleum products.

Egypt will increase LNG export capacity from **1.1 bcf/d**, currently, to **2 bcf/d** by the end of **2019**.

Egypt produces a monthly average of **545,000 t** of **diesel**.

Qalaa Holdings has supplied **EGPC** with **51,000 t** of fuel and petroleum materials since the experimental operation of the **diesel** and **naphtha** units in the Egyptian Refining Project.



The national gas grid's total length reached **7,620 km** in **2018**, with a capacity of **240 mcm/d**.

GASCO secured **63%** of domestic demand by distributing around **61.5 bcm** of natural gas in **2018**, with annual increase of **6%**.

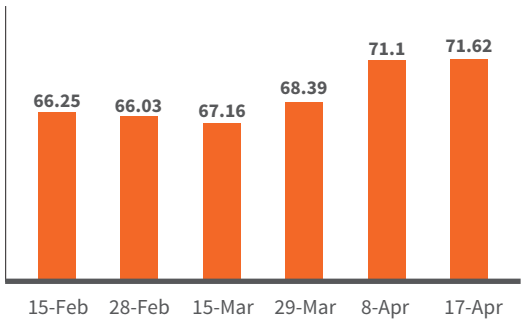
Ethydco will establish a poly-butadiene complex with **$100 million** investments and annual capacity of **36,000 t**.

Petroleum subsidies declined by **42%** in **FY 2019/20** budget plan.

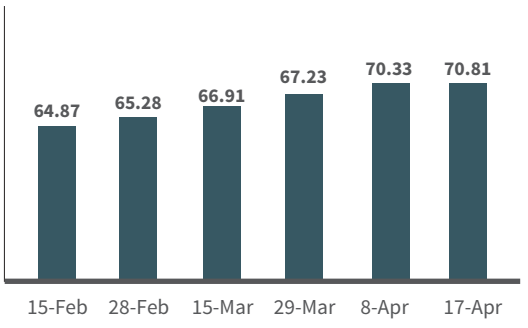
Enppi has signed contracts worth of EGP 16.4 billion in 2018 of which:

- **EGP 8.9 billion** for operations in Egypt
- **EGP 7.5 billion** for operations abroad

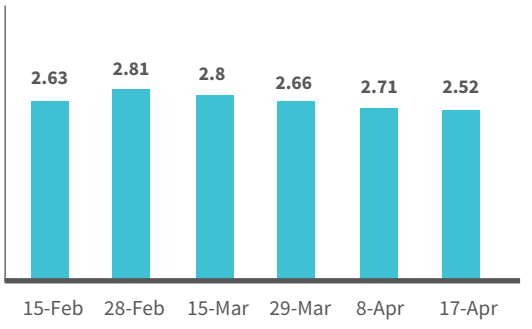
BRENT PRICES



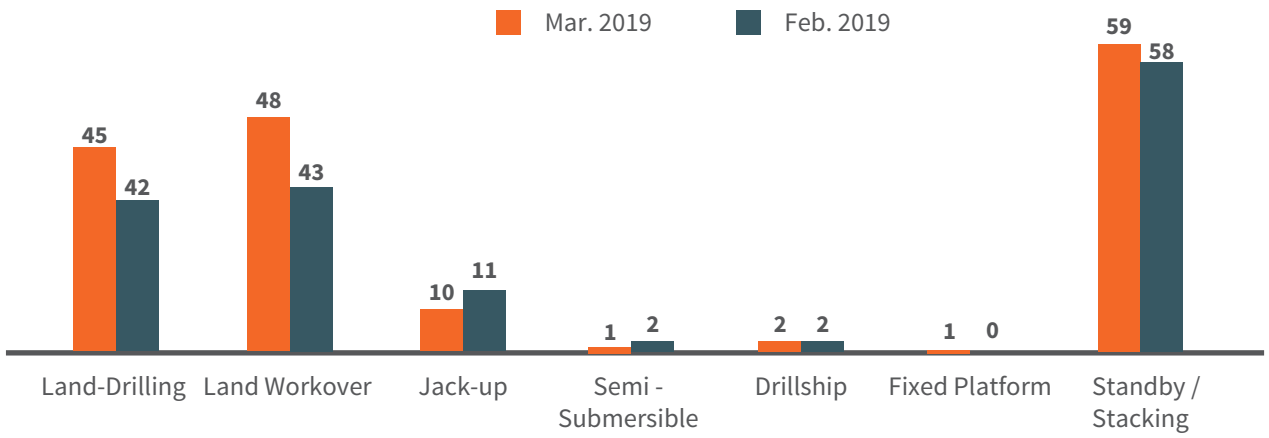
OPEC BASKET PRICES



NATURAL GAS PRICES



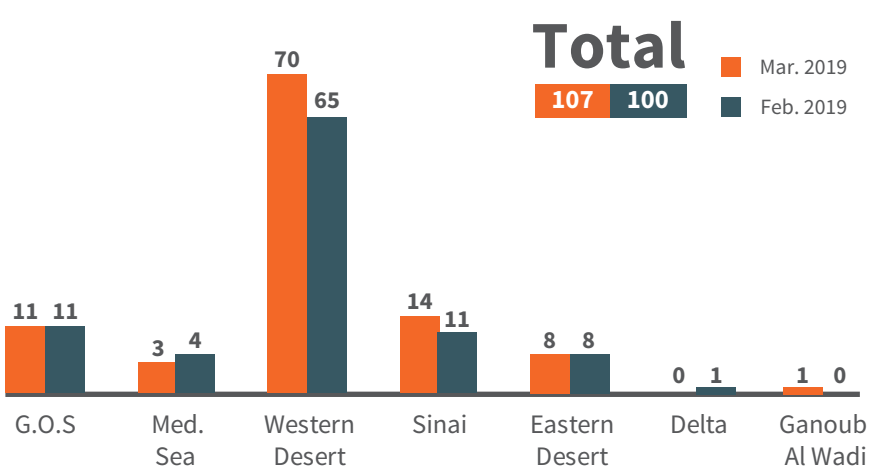
EGYPT RIG COUNT PER TYPE Mar. 2019



Total

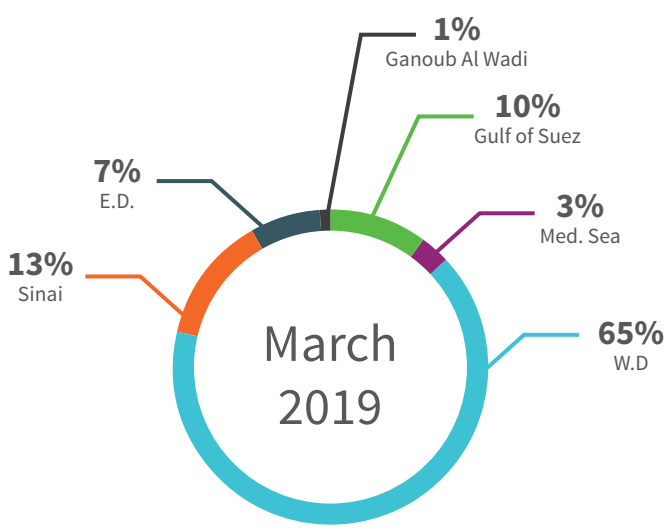
166	158

EGYPT RIG COUNT PER AREA Mar. 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 Mar. 2019

Total

542,276	B/D
6.8229	BCF/D
6655	MCF/D
84,885	B/D

Numbers are calculated per day on average.

	CRUDE OIL	GAS	SOLD GAS	CONDENSATES
MEDITERRANEAN SEA	491	4.2435	4139	30,817
EASTERN DESERT	66,082	0.0122	12	81
WESTERN DESERT	306,034	1.1194	1092	38,854
GULF OF SUEZ	117,227	0.0872	85	1,724
DELTA	156	1.3605	1327	12,986
SINAI	52,101	0	0	423
UPPER EGYPT	185	0	0	0

Drilling Update Mar. 2019

REGION	COMPANY	WELL	WELL TYPE	RIG	DEPTH	WELL INVESTMENTS
SINAI	WEST BAKR	M-10 TWIN	Development	EDC-66	4,478	1.700 M$
Western Desert	IEOC	SWA-A-1X	EXP	EDC-41	16,834	5.400 M$
	NORPETCO	SIDRA-10	Development	TANMIA-1	1,985	1.100 M$
	GPC	SES-1X	EXP	EDC-16	8,530	2.100 M$
	QARUN	BOLT 122-1X	EXP	EDC-47	15,000	1.100 M$
	KHALDA	BIRUNI - 1X	EXP	EDC- 58	15,654	3.482 M$
		NU - 5	Development	EDC- 11	11,900	1.615 M$
		MENES - 10	Development	EDC- 17	12,100	1.387 M$
		SIWA P-1X	EXP	EDC- 11	13,645	1.400 M$
		SALAM - 87	Development	EDC- 61	9,000	1.104 M$

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