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COVID-19 Outbreak: **A Black Swan Event for the Petroleum Industry**

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COVID-19 OUTBREAK: A BLACK SWAN EVENT FOR THE PETROLEUM INDUSTRY

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EDITOR'S LETTER

RAMADAN KAREEM!

It has been almost two months since Egypt Oil & Gas' team started working from home due to the COVID-19 outbreak. This is the case for many other companies in the industry as well. The future is still foggy and no one knows when life will get back to normal. There are even theories that life after COVID-19 will forever be changed.

That is why we are still covering the COVID-19 crisis and other related topics, especially the oil prices drop during April. We will most probably continue covering this crisis for some of our upcoming issues, too.

No one can deny that witnessing negative oil prices for the first time in history was shocking, not only for the people in the industry, but also for non-petroleum experts. Low oil prices have been fluctuating throughout the years; however, the prices have always been positive.

In this issue, we focus more on the industry's transformation and the increasing dependence on digital solutions.

Our industry insights section discusses different technologies, such as digital twin. It also includes a feature that analyzes the technological mediums to accelerate the digitalization shift in the industry.

In the research and analysis section, we provide our readers with an analytical report that is mainly based on an original survey. This survey was designed to measure the impact of COVID-19 on the Egyptian oil and gas industry. I strongly advise decision-makers and stakeholders to check this report in order to have a deeper look into the potential changes that will take place in the industry based on experts' opinions.

The issue also includes a collective interview with leading tech companies. The experts shared their opinion about digital transformation amid COVID-19 and how the virus could actually be a catalyst to a digitized world.

Please stay safe! Stay at Home!

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D O W N S T R E A M



EGYPT CUTS GASOLINE PRICES BY EGP 0.25/ LITER

Egypt's Fuel Automatic Pricing Committee announced that all types of gasoline will be cut by about 25 piasters per liter, effective as of April 11.

After the reduction, the price of octane 80 has reached EGP 6.25/liter, octane 92 reached EGP 7.50/liter, octane 95 was set at EGP 8.50/liter, and industrial mazut was set at EGP 3,900/ton.

This decision is driven by the value of the Egyptian pound against the US dollar which is currently valued

at EGP 15.79 for the US dollar, taking into consideration Brent prices in the international market which have reached \$31.48 on April 10, 2020; the lowest since 2004's \$30.11

The committee has been relying on an automatic pricing mechanism for some petroleum products, whereas the mechanism aims to adjust the selling prices of some petroleum products in the local market every quarter.

EGYPT PRODUCES 1 MM BUTANE CYLINDERS DAILY DESPITE COVID-19

The Head of the Liquefied Petroleum Gas (LPG) Investors Association, Mohamed Saad El Din, said that all the butane filling plants are working at full capacity to cover the citizen's needs,

producing more than one million butane cylinders per day despite the current crises of COVID 19 outbreak.

He elaborated that all the 50 manufactures are working with shifting system to secure this product for the people under the safety standards.

Saad El Din asked all the manufactures to take the needed precautions to

secure the employees against the new pandemic, noting that current crises time is a test for the Egyptian industry capability to provide the Egyptian needs locally.

PETROLEUM ARROWS TRANSPORTS 10 MM LITER OF PETROLEUM PRODUCTS DAILY

Petroleum Arrows has transported more than 10 million liters of petroleum products per day during 2019, with an increase of 24.5% compared to the previous year, the Chairman of the company, Ahmed Abdel Motaleb, said.

He said that this was accomplished by the company's fleet of 427 equipped vehicles and the high technical efficiency that was applied through protective maintenance programs that were carried out in accordance with specific timelines.

Moreover, he noted that the company transported around 961,000 tons of butane which is 66% of the transported butane all over the country during 2019. In addition, the company expanded its activity in collecting used oils and hydrocarbon wastes.

Abdel Motaleb referred to Petroleum Arrows' interest in improving health, safety and environment (HSE) activities and training the drivers in several approved centers for safe driving and handling of petroleum products.

I N V E S T M E N T S



ENERGY SECTOR COMPLETES 156 PROJECTS IN H1 2019/2020

The Ministry of Planning and Economic Development (MPED) has published a report of the H1 2019/20 outcomes of the Ministries of Electricity and Petroleum and Mineral Resources, indicating that the energy sector has completed 156 projects in the oil, electricity, and renewable energy sectors with a total investment of about EGP 28.7 billion.

The petroleum sector has implemented nine projects with investments of EGP 11.7 billion.

The report referred to the development of phase 2 of North Sinai fields, and the Baltim's South fields, which have an

estimated production capacity of 75 million cubic feet (mmcf) of natural gas.

The report showed that the natural gas sector achieved a growth rate of 4.5% during H1 2019/20, while the petrochemical sector achieved a 14.2% growth.

Additionally, the number of projects increased by 29%, compared to the same period in fiscal year (FY) 2018/19.

Meanwhile, the electricity and renewable energy sector completed 147 projects with a total investment of roughly EGP 17 billion.

QARUN TO SAVE \$12.6 MM BY REDUCTION OF PRODUCTION COSTS

Qarun Petroleum aims to save \$12.6 million by reducing production costs in its concession areas in Egypt during the H2 2019/20.

The company recently announced that they plan to drill eight new wells; six development and two exploration wells in H2 2019/20. It

should be noted that the company drilled eight wells in H1 2019/20, bringing the total to 16 wells overall.

In February 2020, the company announced that it plans to invest \$170 million to increase its crude production to 33,000 barrels per day (bbl/d).

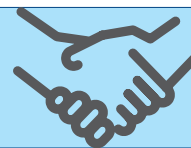
ETHYDCO, PETROJET, SAIPEM INK A \$150 MM POLYBUTADIENE PLANT DEAL

The Egyptian Ethylene and Derivatives Company (ETHYDCO) awarded a consortium of Saipem and Petrojet a contract for the first polybutadiene plant in Egypt valued at \$150 million.

The plant will comprise one production train of Low Cis Butadiene Rubber and related facilities and is expected to have

a production capacity of 36,000 tons per year. Both Saipem and Petrojet will be responsible for the detailed engineering design, procurement, the supply of equipment and materials, construction, pre-commissioning, commissioning up to successful start-up and performance testing.

A G R E E M E N T S



REGAS SIGNS PROTOCOL TO CONNECT NATURAL GAS WITH EGP 3 B

Gas Regions Company (Regas) announced that it has signed a protocol to connect natural gas to New Alamein with expected investment costs worth EGP 3 billion.

The statement said that the company has achieved the highest revenues which reached to EGP 728 million in comparison to EGP 441 million in 2018, elaborating that it conducted the highest rate contracts

for natural gas connection during 2019, reaching to 144,317 customers compared to 102,104 customers in 2018.

The company said that its gross profits increased to EGP 95 million and the net profits reached to 15.4 million.

The statement said that the company has connected natural gas to 534 commercial customers in addition to six fuel stations in the governorates of Sohag, qena,

and Al Sharqiyah and has obtained three certificates of ISO in the fields of quality,

health, safety and environment (QHSE) as well.

BURULLUS GAS TERMINATES RIG CONTRACT WITH TRANSOCCEAN

As of April, Burullus Gas terminated a contract for Transocean's Deepwater India rig.

Per the terminated contract, the Deepwater India rig was expected to work until August at a rate of \$170,000 per day. Burullus sent a notice of early termination to Transocean

in April for its drilling contract with the Discoverer India. As per the terms of the drilling contract, Burullus will now pay a termination fee associated with its early termination of the contract. However, the termination fee has not been publicized by the company.



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SDX ANNOUNCES NEW COMMERCIAL DISCOVERY AT SOBHI WELL

SDX company announced a new commercial discovery at Sobhi Well, which is located in the South Disouq Exploration Permit onshore Nile Delta, saying that the well has encountered 108 feet net of high-quality gas-bearing sands with an average porosity of 20%.

The company elaborated that the management estimated that the well has encountered around 24 billion cubic feet equivalent (bcf) of recoverable gas and

condensate resources exceeding the minimum commercial volume of eight bcf.

SDX added that they are completing the drilling operations of the well and preparing for testing in the coming weeks.

The company's management expects that Sobhi will be tied to the Ibn Yunus- 1X location in 2021.

SDX ENERGY COMMENCES NEW OPERATIONS AT SOUTH DISOUQ

SDX Energy has announced that it has begun drilling its SD-12X (Sohbi) well at South Disouq in Egypt, with potential to increase production to 50 million standard cubic feet per day (mmscf/d) by 2024.

Sobhi is planned to reach its targeted drilling depth of around 2,300 meters in late April, with a gross P50 unrisked prospective resources of c.33 bcfe. Sobhi's primary target is in the same Kafr el Sheikh formation that the company's existing Ibn Yunus well is already producing from.

If this were to be successful, the Sobhi well would be tied in during 2021 via a 5.8 kilometer tie-in to the Ibn Yunus-

1X location where an existing flow-line connects to the South Disouq Central Processing Facility. This would cost an estimated \$3.5 million.

SDX will drill the Sohbi well at a 100% working interest for an estimated gross dry hole cost of \$2.3 million, which will be paid over the coming three months.

In light of the upcoming oil crisis, SDX believes that the company is in a strong position to cope with the fall in price, noting that the company remains well funded with \$11.0 million as of December 2019 and \$7.5 million of debt available in the European Bank for Reconstruction and Development (EBRD) credit facility.

SDX CONTINUES PRODUCING 50 MMCF/D FROM SOUTH DISOUQ IN Q1 2020

SDX company announced that the performance of South Disouq operations continues to produce 50 million cubic feet per day (mmcf/d) during the Q1 of 2020, as operations remain unaffected by the coronavirus outbreak.

SDX mentioned that the performance of South Disouq exceeded the expectations during 2019 reached to 50 mcf/d which has continued until now.

Meseda performance has also exceeded the expectations as a result of a number of successful operational improvement initiative. Two wells were discovered and drilled in Meseda, supporting the string

gross production in the first nine months in 2019. Regarding North West Gemsa, the gross production was 500 barrels of equivalent per day (boe/d) above the predictions due to the stronger performance than the expected.

SDX stated that \$7.2 million were posted for drilling two exploration wells and well workovers planned for South Disouq.

Furthermore, the company posted \$2 million for development wells in Meseda and \$2 million for up to ten workovers in North West Gemsa expecting that it will exit the concession during 2020.

DANA GAS DELAYS SELLING EGYPT'S ASSETS

Dana Gas has confirmed delaying the selling of its assets in Egypt.

The company confirmed that the sale is still taking place, however, the company is not certain when the process will be completed due to the rapidly changing

circumstances arising from the global reaction to the COVID 19 pandemic.

It should be noted that the initial sale process was supposed to be completed by March 2020.

Dana Gas to Pay \$397 MM of Outstanding Sukuk

Dana Gas's proceeds from selling its Egypt assets will go towards paying \$397 million of outstanding Sukuk.

The company confirmed earlier in April that its plans to sell Egypt assets are on hold, but assured that the company is not backing out of the sale. When the aforementioned assets are sold, the proceeds will be used to pay down the Sukuk as required by the terms of the Sukuk.

GEMPETCO'S PRODUCTION INCREASES TO 7,000 BBL/D

Gemsa Petroleum Company's (GEMPETCO) production in the Red Sea has increased from 5,000 barrels per day (bbl/d) to 7,000 bbl/d.

Ali Kandil, GEMPETCO's Chairman and Managing Director said that production has increased by 2,500 bbl/d after streamlining the development well-15 south of Gemsa. Amr Abdullah, GEMPETCO's Operational Manager and Member of the Board of Directors, mentioned that the company's projects, from drilling new exploratory wells, development wells and reforming existing

wells, reflected on the company's production despite the unusual circumstances.

Additionally, he assured that the company adheres to all precautionary and preventive measures against the coronavirus (COVID-19). Abdullah added that the company is 100% operational, noting that the personnel are doing their best to increase productivity. In addition to implementing preventive measures, the company is disinfecting and sterilizing all its buildings, equipment, service areas, and performing medical check-ups for all employees.

PHAROS ENERGY DISMISSES ACQUISITION OF SHELL'S EGYPTIAN ASSETS

Pharos Energy company announced that its board decided to withdraw from the consortium that is evaluating the opportunity of acquiring Shell's Western Desert assets.

The company added that its board has determined that such acquisition is unlikely to be in shareholders' best interest due to

the current market conditions amid the coronavirus spread.

It is worth mentioning that Shell Egypt had announced in October 2019 that it is putting its current onshore upstream assets in the Western Desert up for sale to be able to focus on expanding its Egyptian offshore exploration and integrated gas business.

DAMIETTA LIQUEFICATION PLANT AGREEMENT EXPIRES

The agreement conducted between Eni, the Egyptian Natural gas Holding Company (EGAS), and the Spanish company Naturgy to settle the disputes related to operating the Damietta liquefaction plant in Egypt has expired.

EGAS has implemented some of the conditions for this agreement which

was conducted on February 27, but the implementation of the remaining conditions are on hold due to the coronavirus outbreak, which led to the termination of the agreement.

EGAs said that it is ready to negotiate that matter again after taking some conditions in consideration.

SDX PROVIDES SUCCESSFUL NATURAL GAS FLOW RATE AT SOBHI WELL

SDX Energy announced that it provided a successful flow rate test of natural gas at Sobhi well on the South Disouq exploration permit, in Egypt's onshore Nile Delta.

The company said that the well flowed with a maximum rate of 25 million standard cubic feet per day (mmscf/d) during an hour of the initial test, after that it followed by a three-hour-period test in which it flowed at a stable rate of 15 mmscf/d and then a further four-hours flowing at a stable rate of 10 mmscf/d.

The company said that the initial review of the test demonstrated that the well is expected

to produce at an optimum stabilized rate of 10-12 mmscf/d when connected as well as to produce mostly dry gas as opposed to gas and condensate.

SDX explained that it will go into a longer rig-less test in the coming weeks which will provide more data to help determine the recoverable volume in the discovery. It said that the management expect that Sobhi well will be tied in during 2021 by a 5.8 kilometer tie in to the Ibn Yunus -1x location and it will cost \$3.5 million.



UNDER THE HIGH PATRONAGE OF **HE. ENG. TAREK EL MOLLA**
MINISTER OF PETROLEUM & MINERAL RESOURCES - ARAB REPUBLIC OF EGYPT



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SAUDI ARABIA

Saudi Arabia's oil production exceeded more than 12 million barrels per day (mmbbl/d) for the first time in the Kingdom's history. The previous production record of KSA was 11 million barrels of oil. The Kingdom has vowed to ramp up production in the face of a price war in order to stir up the global energy industry following the end of a supply agreement with other producers.

Bahri, Saudi Arabia's national shipping firm, has provisioned 19 supertankers in order to export a record of 12.3 million barrels per

day (mmbbl/d) throughout the month of April. Of the 19 supertankers chartered, six are set to take 12 million barrels of Saudi crude to the US, as the US intends to stockpile in the aftermath of record low oil prices.

EcoDem, an Italian provider of environmental services, has signed a joint venture (JV) agreement with Saudi Drill Company to provide solutions and services in Saudi Arabia. These solutions include decommissioning, reclamation, remediation, sludge treatment and metal recovery from waste.

U. A. E

BlackRock Inc, KKR & Co. and Italian infrastructure operator Snam S.p.A. are among others that have made bids to claim a stake of Abu Dhabi National Oil Company (ADNOC)'s natural gas pipeline which could be valued at about \$15 billion. ADNOC is looking to sell as much as 49% of the business through a lease structure. This is part of its attempt to diversify the UAE's economy and to generate additional sources of funding. Prior to this, a \$11 billion stake in ADNOC's fuel retail unit was sold to Baker Hughes.

Sharjah National Oil Corporation's (SNOC) \$40 million Moveyeid gas storage surface facility project has been assigned to Petrofac Facilities Management International. The project includes the construction of a new high-pressure compressor facility, a high-pressure pipeline and flow lines to four existing wells in the Moveyeid Field. There is potential for add ons to the deal including drilling horizontal legs in existing wells, and potentially drilling new wells in 2023. The timeline of this project is to be split into separate phases, with the surface facilities to be commissioned by the end of 2020 and drilling in 2023.

Petrofac Ltd has announced that its Petrofac Emirates joint venture with Abu Dhabi National Oil Company (ADNOC) for the Dalma Gas Development Project has been terminated. The project, worth around \$1.65 billion, and awarded in February 2020, comprising two contracts for the Dalma Gas Development Project. Petrofac Emirates' portion of the scope of work is valued at \$1.5 billion.

GP Global announced it is to operate two bunker barges out of UAE's port Jebel Ali, the largest port in the Middle East. Each barge has a reported capacity of 4,800 million tons of fuel oil and 1,000 million tons of gas oil. This will constitute MAROPOL and ISO-compliant distillate marine, including high quality marine gasoil (MGO) grades such as DMA and DMB as well as residual fuels including RMG and RME grades.

Japan's largest upstream company Inpex is expected to lift more Abu Dhabi equity oil in April in line with the UAE's policy of increased oil production of up to 4 billion barrels per day (bbl/d). Saudi Arabia and the UAE are the only two Gulf OPEC producers to publicly announce plans for major supply ramp-up and production capacity boosts. Inpex has a 5% stake in ADNOC Onshore, and 12% in Upper Zakum. The offshore Upper Zakum concession is expected to ramp up by 100,000 bbl/d to 750,000 bbl/d this year.

Fuel stockpiles at the Fujairah Port recorded an increase of 7%, signaling a dwindling storage space for oil products in the region after the demand decline. The Fujairah Oil Industry Zone Stockpiles of heavy distillates and residues, used by shippers and for power generation, increased to 15.445 million barrels over the week. The total stockpiles, covering light, middle and heavy distillates, rose by 3.5% to 23.701 million barrels, the highest since February 24, when the total was 25.98 million barrels. Meanwhile, capacity for oil products and crude oil storage is about 60 million barrels.

IRAN

The Iranian oil minister, Bijan Namdar Zanganeh, said an Iranian drilling company is set to take over the drilling project in phase 11 of the country's South Pars project as French company Total and China National Petroleum Corporation (CNPC) dropped out of the project. Total signed a \$1 billion deal to develop the South Pars gas field in cooperation with China National Petroleum Company (CNPC) and Iran's PetroPars. However, the companies have pulled out of the deal in light of the US sanctions.

Iran's Sarajeh and Shourijeh underground gas storage has increased by

33% year-on-year (YoY). Over 902 million cubic meters of gas (mcm/d) were reproduced from the Sarajeh storage during the cold season, an increase of 17% over the preceding year. The Shourijeh storage reproduced 1.722 billion cubic meters of gas (bcm/d), registering a 43% increase YoY up from 1.449 bcm/d.

National Iranian Oil Company (NIOC) plans to implement new oil projects in the near future. The future plans include measures trying to alleviate restrictions placed on Iranian oil exports. In terms of projects, development of West Karoun oilfield and South Pars gas field are a top priority for Iran's oil and gas industry.



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OIL AND GAS DIGITAL TRANSFORMATION

EGYPT

SCHLUMBERGER PRESENTS EGYPT'S DIGITAL UPSTREAM GATEWAY

The Egyptian General Petroleum Corporation (EGPC) and Schlumberger signed an agreement to build, operate, and transfer Egypt's Upstream Gateway. The agreement will focus on digitally promoting Egypt's oil and gas bid rounds through seamless online access to the sector's data.

The Egypt Upstream Gateway is a unique and innovative national project for digitizing subsurface information and delivering a digital subsurface platform to ensure Egypt's subsurface data is kept evergreen. It will also be a platform to promote Egypt's exploration and production potential worldwide.

This step comes in line with the ministry's path to digitize the oil and gas sector and in line with the minister's Modernization Project.

EL MOLLA HIGHLIGHTS DIGITAL TRANSFORMATION AT CAIRO ICT

The Minister of Petroleum and Mineral Resources, Tarek El Molla, expressed the ministry's interest in digital transformation during the Cairo International Communication and Technology Conference (Cairo ICT 2019).

This came during the Digital Transformation in the Oil and Gas Industry symposium, where El Molla added that digital transformation will attract international oil companies (IOCs), especially in the areas which face challenges and require large investments and advanced technologies.

El Molla also highlighted the importance of Egypt's E-Gate project to market the petroleum areas and exploration, which is in line with the global trend supporting digital transformation as well as introducing investment opportunities to IOCs to explore for oil and develop it.

The minister said that the sector's development and Modernization Project are based on a vision that aims to improve operations and productivity through utilizing and analyzing data and modern technologies.

DIGITAL TRANSFORMATION TAKES CENTER STAGE AT MOC 2019

The 10th Mediterranean Offshore Conference and Exhibition (MOC 2019) has dedicated, for the first time in its history, a day for digital transformation in the oil and gas sector.

More than 100 abstracts were studied and evaluated and the best 12 papers were selected to be presented on the second day of the conference. Abstracts were selected based on their importance and their alignment with the petroleum sector's vision towards digital transformation.

This will help the sector in attracting more investments and establishing Egypt as an energy hub by setting up an investment map in Egypt and showing the areas of concession and production facilities.

MENA

ENOC LAUNCHES NEXT ACCELERATOR PROGRAM

Emirates National Oil Company (ENOC) has launched "NEXT", an accelerator program designed to unlock growth opportunities and tackle challenges in the energy sector through building new digital ventures for business-to-business (B2B) and consumer (B2C) categories.

The program enables core digital transformation through an organization-wide SAP system implementation and digital upskilling its workforce. NEXT reflects the United Arab Emirates (UAE)'s future vision to be a global platform for knowledge-based, sustainable, and innovation-focused businesses.

ENOC Group is cooperating with other partners to deliver different components of NEXT; including BCG Digital Ventures, which is a US-based corporate investment and incubation firm; Moro, the Dubai government-owned digital data hub; and EY, a multinational professional services firm.

SAUDI ARAMCO INTEGRATES IMOMS INTO JAZAN REFINERY COMPLEX

Saudi Aramco is implementing an integrated manufacturing operations management system (imoms) technology at the Jazan Refinery Complex (JRC) in Saudi Arabia.

The new technology will resolve manufacturing operations management (MOM) technologies' information and automation gaps. Imoms aims to create an instant

solution with minimal customization. This new technology is designed to enhance the four pillars of operational excellence by providing advanced tools that will help improve profitability, efficiency, reliability, as well as health, safety, and environment (HSE).

The imoms is a cloud-based technology which can also be made available on-premise or in private or public cloud infrastructures. Additionally, the JRC project technology consists of 20 integrated and interoperable solutions that are digitally transforming the plant's operations and helping enable operational excellence.

INTERNATIONAL

ENI UTILIZES HPC5 SUPERCOMPUTER FOR COVID-19 RESEARCH

Eni will make its supercomputer, HPC5's, infrastructure and molecular modeling skills available for coronavirus (COVID-19) research.

The company has collaborated with the biopharmaceutical company Dompé on the European EXSCALATE4CoV project which brings together institutions and research centers in Italy and other European countries to identify the safest and most promising drugs in the fight against COVID-19.

Eni started providing Cineca, a non-profit research consortium, with its technical skills and its HPC5 supercomputing system, the world's most powerful supercomputer for industrial use. With its hybrid architecture, it makes the algorithms for molecular simulation particularly efficient.

It would allow for creating dynamic molecular simulations of viral proteins relevant to the COVID-19 strain, to identify the most effective pharmaceutical components among the 10,000 present in the databases. Afterward, an activity will be carried out for the research of new specific antiviral molecules through the screening of billions of structures.

SHELL UTILIZES ROBOTICS TO WORK IN HOSTILE ENVIRONMENTS

Royal Dutch Shell has launched Sensabot, the first resident mobile robot certified to work in hostile environments.

The Sensabot system was produced by the efforts of world-leading robotics experts including; Carnegie Mellon University in the US, the UK's Soil Machine Dynamics (SMD), and Improvia in the Netherlands. The robot is set to work in remote and unmanned oil and gas facilities and has the ability to work for six months without the need for maintenance. Operators will be able to use and control Sensabot to check equipment and respond to alerts faster whilst gathering accurate real-time data.

Sensabot is a robot packed with sensors and cameras, and can handle driving in various soil conditions including; gravel, mud, slush, and snow. Additionally, it can travel up to three kilometers with at least four hours' operating time between charges.

BAKER HUGHES, C3.AI RELEASE AN AI APPLICATION

Baker Hughes and C3.ai launched the first Baker-HughesC3.ai joint artificial intelligence (AI) software application: BHC3 Reliability™.

The application uses deep learning predictive models, natural language processing, and machine vision for continuous data collection from plant-wide sensor networks, enterprise systems, maintenance notes and piping, and instrumentation schematics.

The application can notice irregularities that could lead to failure of equipment and halting operations by utilizing historical and real-time data from entire systems. Application alerts enable proactive action by operators to reduce downtime and lost revenue.

Additionally, the new technology can be applied to all operations across all sectors of the energy value chain, it approaches scales to any number of assets and processes across offshore and onshore platforms, compressor stations, refineries, and petrochemical plants, reducing downtime and increasing productivity.

HALLIBURTON, PTTEP INK A DIGITAL TRANSFORMATION DEAL

Halliburton has inked a deal with PTT Exploration and Production Public Company (PTTEP) for a digital well program application to automate drilling, completions, and engineering processes across the well lifecycle.

The program is expected to transform the way wells are constructed and delivered by combining a digitalized planning and design process with engineering models on a single and open platform. It will also leverage data from over 1,500 existing wells to reduce planning cycle times, enable automation and advanced analytics, and optimize the well design.



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COVID-19 OUTBREAK: A BLACK SWAN EVENT FOR THE PETROLEUM INDUSTRY

BY AMINA HUSSIEEN, REHAM GAMAL & TASNEEM MADI

****The data & expectations were last updated on April 27, 2020 and they may differ due to the dynamics of the outbreak.**

The international petroleum industry has been facing major threats since the global spread of the COVID-19 outbreak in January. Brent crude price has been falling, reversing the increase in prices achieved in the last four months of 2019. On March 18, Brent crude oil and Organization of Petroleum Exporting Countries (OPEC) Basket prices hit their lowest value since the first Gulf war in 1991, as they remarkably declined to about \$20 per barrel, according to Bloomberg. Meanwhile, on April 20, West Texas Intermediate (WTI) oil prices witnessed an unprecedented decline of about 300%, to reach below \$0 per barrel.

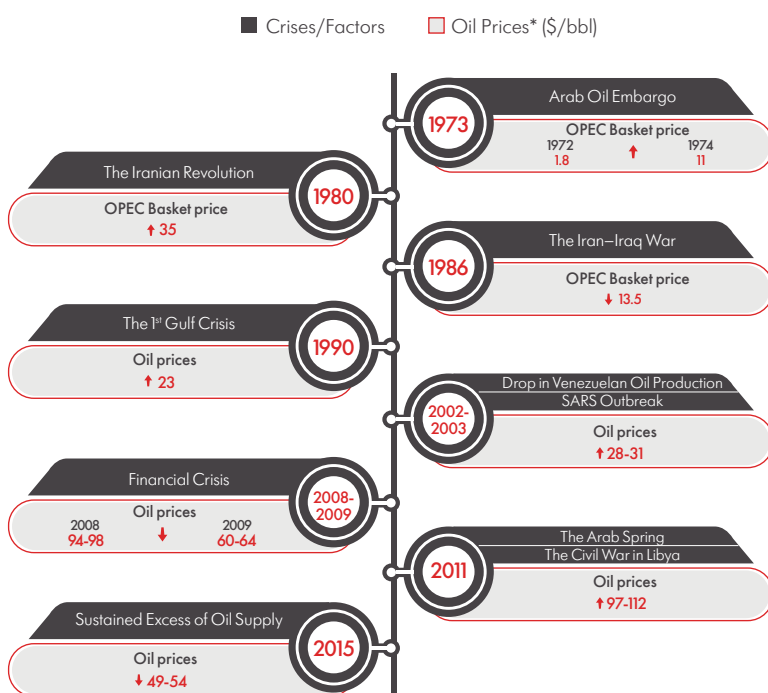
With the growing sense of uncertainty towards the future of the petroleum sector, this report intends to reflect the whole picture of COVID-19's impacts on the petroleum sector internationally and in Egypt.

Some parts of the report are based on a survey conducted by Egypt Oil & Gas' Research & Analysis team to test the impact of the virus on different aspects of the sector. The survey targeted different categories in the sector, as C-level executives represented 41.5% of the respondents, while 30.2% were engineers and geologists. Research managers in oil and gas departments contributed as well.

GLOBAL CRISES AND OIL PRICES FLUCTUATIONS

Since the 1970s, oil prices have witnessed several fluctuations arising from global crises. Starting from the Arab oil embargo crisis in 1973, one of the earliest oil crises that caused a surge in oil prices until facing the Covid-19 outbreak in 2020 which outstandingly brought oil prices to low values.

Global Crises and Oil Prices Fluctuations Since 1970s



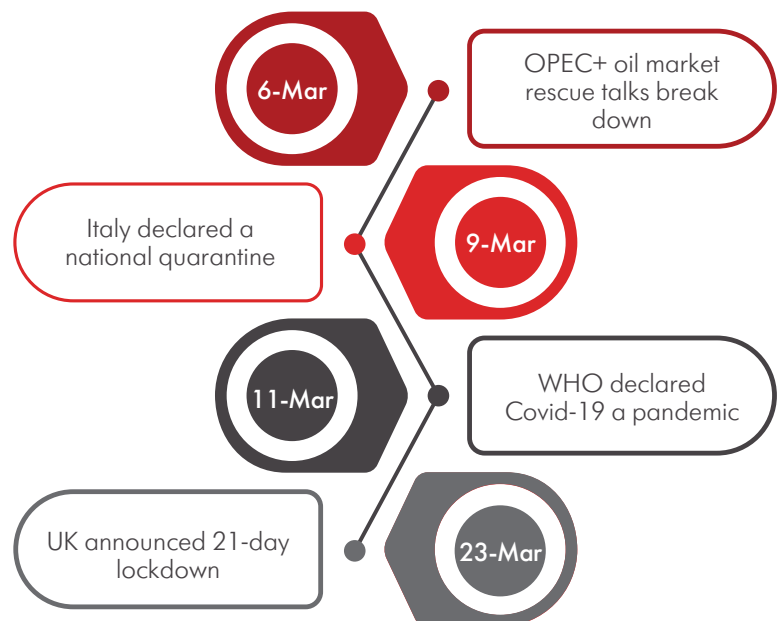
*Oil Prices for Brent Crude Oil, WTI Crude Oil and OPEC Basket Price
Sources: EIA, OPEC Secretariat, and Bloomberg

COVID-19 IMPACTS ON THE INTERNATIONAL OIL & GAS MARKET

i. Effects on Oil Prices

Oil prices have been increasing prior to the outbreak, as the demand for oil was increasing and the market was at its boom. However, some actions including Coronavirus spread, the Saudi-Russian oil war, drove the global oil demand to plummet, and the oil prices witnessed an unprecedented decrease of about 55% in March compared to February, according to Bloomberg and OPEC Secretariat.

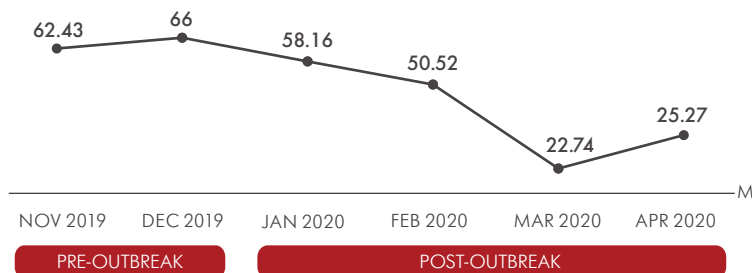
Major Events Affected Oil Prices in the Outbreak



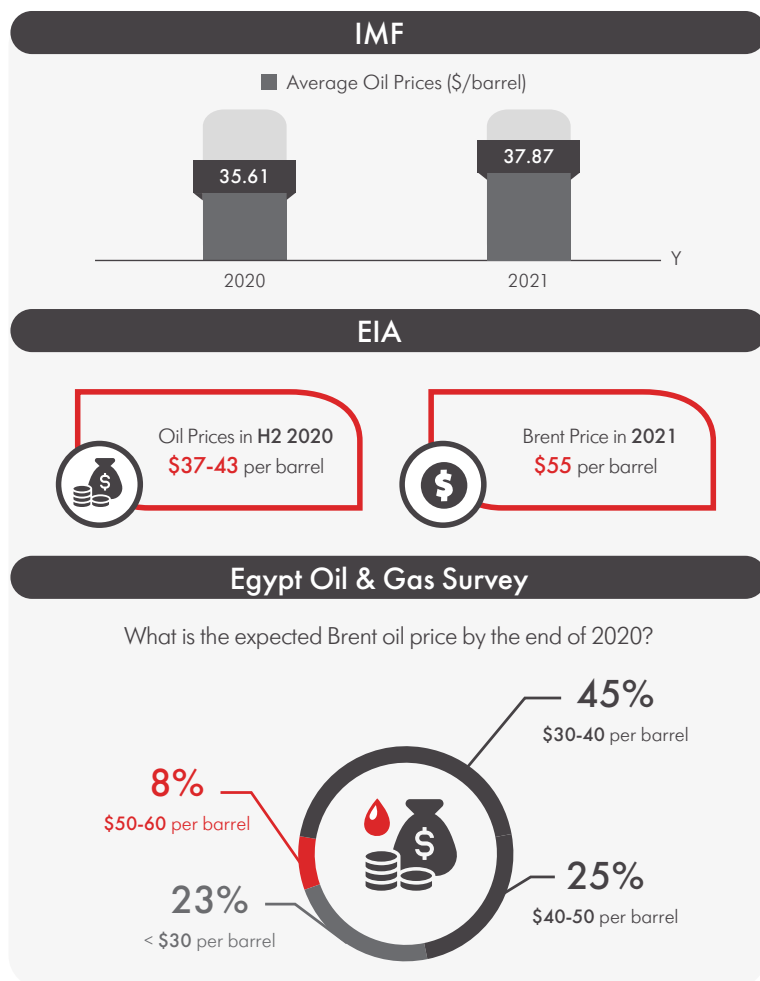
International oil prices declined by an average of 66% from November 2019 to April 2020. Brent crude oil declined from \$62.43 per barrel to \$25.27 per barrel. Meanwhile, WTI oil price decreased from \$55.17 per barrel to \$18.84 per barrel,

while the OPEC Basket prices fell to \$18.05 per barrel down from \$63.83 per barrel, according to Bloomberg and OPEC Secretariat.

Brent Oil Price (\$/bbl)



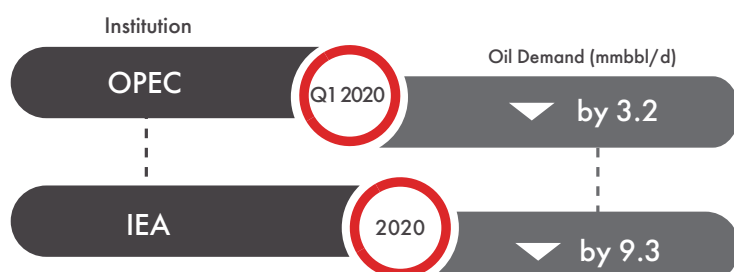
Oil Prices Expectations



ii. Effects on Global Oil Demand & Supply

As a result of the outbreak, the global oil demand has been negatively affected. During Q1 2020, the demand was estimated to decrease from 100.8 million barrels per day (mmbbl/d) to 97.6 mmbbl/d, according to OPEC Secretariat.

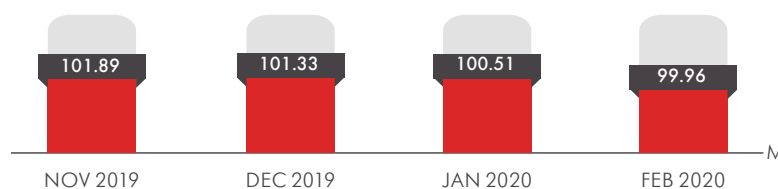
Global Oil Demand Estimations



The demand on global marine fuel was expected to increase to 4.2 mmbbl/d in 2020, according to OPEC's expectations in the World Oil Outlook. However, the outbreak has become a game changer, driving the demand to lower values. In addition, the demand on jet fuel is expected to decrease by 6.6% in 2020.

On the other hand, the global oil supply decreased by 0.8 mmbbl/d in January to reach 100.5 mmbbl/d and then declined by 0.6 mmbbl/d, recording 99.96 mmbbl/d in February. Over the period from November 2019–February 2020, global oil supply declined by about 2%, according to the IEA's Oil Market Report, published in March.

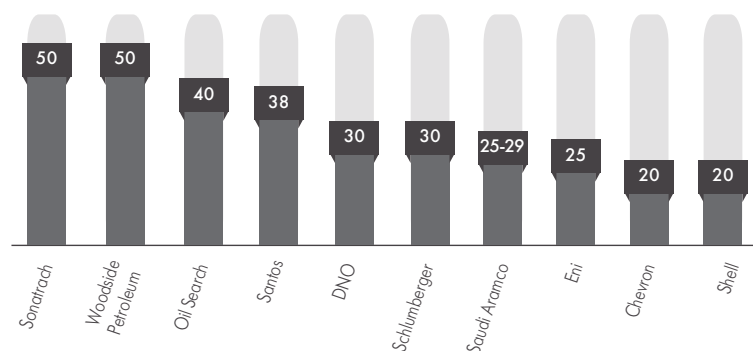
Global Oil Supply (mmbbl/d)



iii. Impact on IOCs Spending Cuts

Investment in exploration and production (E&P) activities in the petroleum sector was set to hit over half a trillion dollars in 2020, according to the French research body IFP Energies nouvelles (IFPEN). However, the emergence of COVID-19 has overthrown all forecasts. Since March, more than 21 international oil companies (IOCs) have announced capital cuts ranging from 20% to 50% for 2020 in comparison to 2019.

Planned Spending Cuts by Major Oil Companies for 2020 (%)

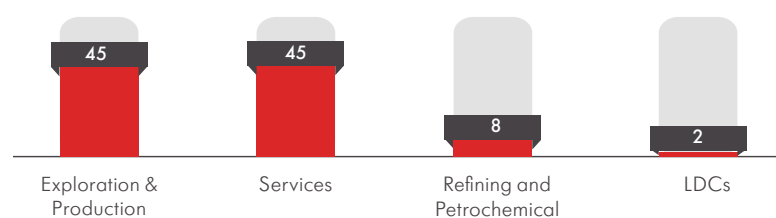


COVID-19'S EXPECTED EFFECTS ON THE EGYPTIAN OIL & GAS MARKET

i. Oil & Gas Companies and their Investments

The shock-waves from the outbreak have been reflected in the performance of the oil and gas companies in the Egyptian petroleum sector. Most of the current projects are still operating; however, they will take more time to be accomplished due to the curfew, which increases the corresponding cost of renting the rigs, hence, increasing the production cost. Due to these relatively higher production costs, the Egyptian General Petroleum Corporation (EGPC) and some oil producing companies sent official letters to the petroleum services companies asking for a reduction in services' cost by 20%-40%, stated by Omar Ezz El Din, CEO of the International Naval Works company, to the local media.

Which type of companies will be affected more? (%)



For investments, the petroleum sector has executed nine projects with investments of EGP 11.7 billion in H1 2019/20. Meanwhile, the net Foreign Direct Investment (FDI) to the sector increased by about 53% in Q1 2019/20 compared to the same period in fiscal year (FY) 2018/19, to reach about \$256 million.



How will IOCs' investments plans be affected in 2020 and 2021? (%)

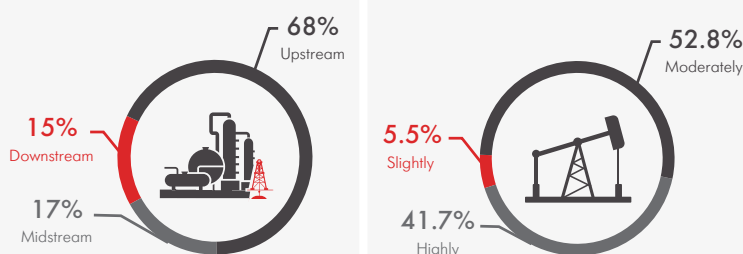


ii. Upstream Activities

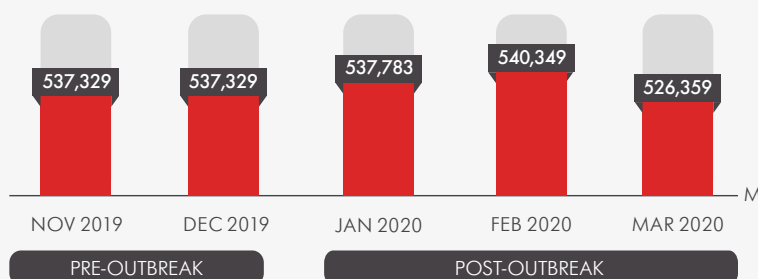
According to the survey results, upstream activities will be the most affected activities by COVID-19. The outbreak is expected to have an impact on production, drilling, and field development activities. As the global crude oil production is expected to decline, the official data of the EGPC shows a consistent reaction for the Egyptian crude oil production which exhibited a 2.6% decline between February-March.



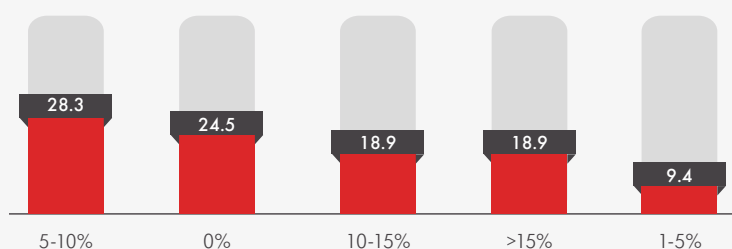
Which activities will be more affected? And how?



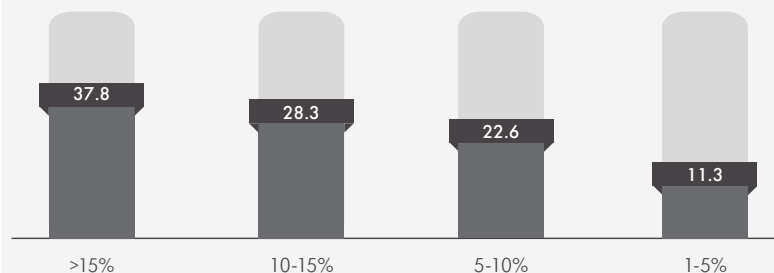
Egypt's Crude Oil Production (bbl/d)



By how much will the production decline? (%)



By how much will the drilling activities decline? (%)



Which type of activities will be more affected?



In 2019, 10 petroleum development projects were conducted, which added 15,400 barrels per day (bbl/d) of crude oil and condensates, and 1.8 billion cubic feet per day (bcf/d) of natural gas, according to a press release by the Ministry of Petroleum and Mineral Resources (MoP). However, after the COVID-19 outbreak, the field development activities are expected to slow down as IOCs head to cut spending, whereas the expectations of the majority of sector's experts in the survey show that investments will be redirected.

iii. Midstream & Downstream Activities

In Q1 2020, Middle East Oil Refinery (MIDOR), one of the biggest refineries in Egypt, has refined about 9.3 mmbbl of domestic and imported crude oil, according to a ministerial press release published in April.

Moreover, with the aim of reducing the government's burden of importing butane for local consumption, in H1 2019/20, natural gas was widely delivered to 630,000 residential consumers, 31 industrial facilities, and 1,045 commercial units. In H2 2019/20, natural gas connections are expected to reach about 570,000 residential units, bringing them to more than 1.2 million in FY 2020/21 with investment costs of EGP 4.7 billion, as stated in a ministerial press release to approve the Egyptian Natural Gas Holding Company's (EGAS) planned budget for FY 2020/21.



What will be the effect on the national gas grid and refining expansion projects?



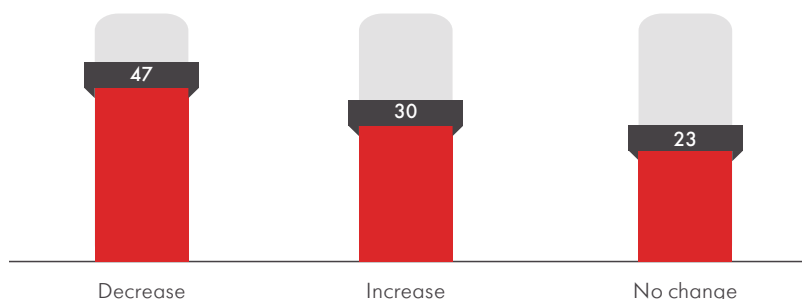
Regarding the midstream activities, it is worth mentioning that the quantity of petroleum products transported by different channels in FY 2018/19 recorded 149.8 million tons (mmt), which cost a total of EGP 21.9 billion, according to the

Central Agency for Public Mobilization and Statistics' (CAPMAS) Annual Bulletin of Petroleum Materials Means of Transportation and Natural Gas in Egypt 2018/2019.

For the survey, most of the respondents explained that a decrease in cost was prompted by the decrease in fuel prices and the low oil demand with the high competition between transportation companies.



What is the expected effect on petroleum products transportation cost? (%)



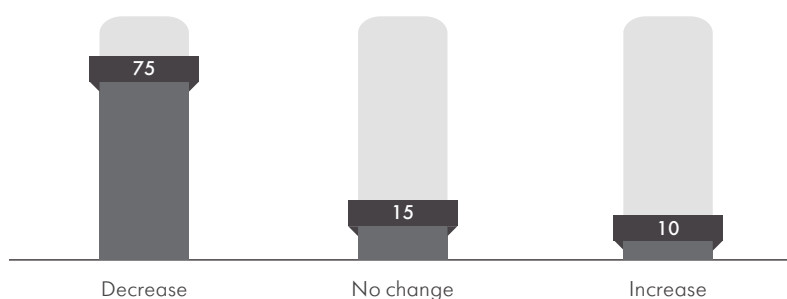
Concerning the local consumption of natural gas and petroleum products, in Q1 2019/20, the consumption recorded about 19.6 mmt, with a decline of 5.2%, compared to the same period a year before. The consumption of natural gas represents around 63% of the total local consumption, yet it declined by 4.9% compared to the same period a year before. This was due to the drop in natural gas consumption in power stations by 6%.

Meanwhile, the consumption of petroleum products decreased by 5.7% compared to the same period a year before, reaching 7.5 mmt, according to a ministerial press published in November 2019.

It is expected that the petroleum products' consumption will be affected by two factors. The first factor is the curfew imposed by the government to reduce crowds on public transportation, which the Egyptian Cabinet announced on March 24. The second factor is the latest decision of the Automatic Pricing Committee, taken on April 10, to reduce fuel prices by a rate of 3-8%, according to a press release by the MoP.



What is the expected effect on petroleum products demand by end users? (%)



iv. Other Effects

The petroleum activities are not the only variables affected by the outbreak as the employment rate is one of the most vulnerable factors when it comes to the COVID-19 outbreak effect.



Which work category will be more affected?



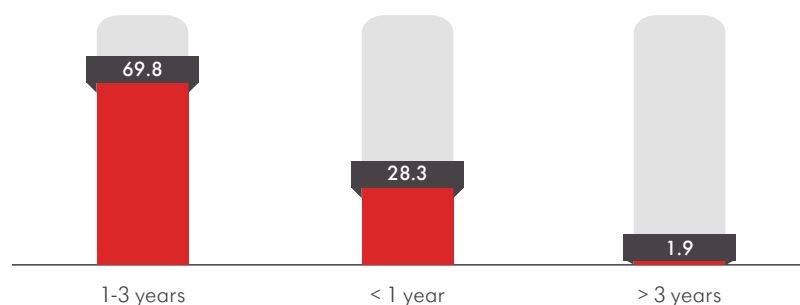
How will Day-to-day workers be affected?



The survey's respondents further clarified that for companies to cope with the current circumstances, they should focus on the Health, Safety, and Environment (HSE) performance especially the safety of the staff. Companies also should reduce current costs and look forward to the future demand and exploration.



When will the petroleum sector be able to recover from this outbreak? (%)



According to the results, the petroleum sector as a whole might recover the losses and restore its normal performance in a period of one to three years. Since global crises usually take a longer time to recover, such range is relatively considered a quick recovery. According to the companies, policy makers, and governments' upcoming responses and acts, in addition to the speed of finding a vaccine for the pandemic, gradually, the petroleum sector will reshape itself and recover back again.



PREDICTING ANALYTICS: NEW HOPE FOR PREVENTING FAILURE IN TIMES OF CORONAVIRUS

BY JASMINE SHAHEEN

Non-linear and unpredictable; the novel coronavirus (COVID-19) has ferociously hit the oil and gas markets leaving a rippling effect across the industry, leading to a possible global economic crisis and a grave decline in oil prices. However, the pandemic also opened the minds about technology as a solution that can minimize the losses.

According to the International Energy Agency's (IEA) forecast in February of this year, the global oil demand was expected to grow by 825,000 barrels per day (bbl/d). However, due to the current situation, the IEA has severely cut its prediction to expect a decline of about 90,000 bbl/d from 2019's. "The coronavirus outbreak will significantly impact oil and gas demand. The sharp decline in prices will entail the postponement or cancellation of the more costly investment projects. Some oil and gas companies -notably the smallest with above-market price production costs- may face financial difficulties," noted Pascal Devaux, Senior Economist for the Middle East and North Africa (MENA) at BNP Paribas.

The COVID-19 effects on Egypt's economy led to several precautionary governmental decrees to help the industrial sector remain solid amid the outbreak. Devaux commented on the situation in Egypt, saying that "for Egypt, we may have a slowdown or postponement of investment projects. Producers -notably gas- may have to adjust production to take into a declining demand in Egypt."

In such circumstances it was natural for people to turn towards technology, as a coping mechanism to get a grasp on the world around them. The oil and gas industry is no different. Technological advances have been utilized in exploration and production (E&P) field, maintenance and other aspects in the industry for quite a while now. Right now, adopting artificial intelligence (AI) and machine learning is essential. Internet of Things (IoT) technology can shift the way things work in the energy industry overall, as it has many advantages; not only can it be utilized to increase equipment productivity and longevity, but it also reduces unplanned downtime in the upstream and downstream mediums.

THE ROLE OF PREDICTIVE ANALYTICS

One of the most crucial IoT technologies in the oil and gas industry is Predictive Analytics. Search Business Analytics defines predictive analytics as "a form of advanced analytics that uses both new and historical data to forecast activity, behavior, and trends. It involves applying statistical analysis techniques, analytical queries and automated machine learning algorithms to data sets to create predictive models that place a numerical value on the likelihood of a particular event happening." This means that through the data collection process, wasted times as well as financial losses can be avoided, while also maintaining efficiency.

Predictive analytics is integral during the COVID-19 outbreak as it limits the presence of personnel in the field and instead they rely on data and remote technologies to sustain the workflow.

For the oil and gas industry, predictive analytics is fundamental in maintaining assets from aging, and errors; in the hope of preventing shutdowns for maintenance, which halts production. Mohamed Abd El-Kader, Maintenance and Condition Monitoring Mechanical Engineer at Wintershall Dea, leverages the use of predictive analytics in maintenance over other types of maintenance such as preventative maintenance, and corrective maintenance. Abd El-Kader says that "predictive maintenance is very useful to [sustain] the availability and reliability of equipment, [as well as saving] cost, time, spare parts, and [work hours]."

PREDICTIVE ANALYTICS IN UPSTREAM AND DOWNSTREAM

One advantage of predictive analytics is that it can be integrated into versatile oil and gas operations; whether it focuses on upstream, downstream or midstream, predictive analytics can assist in streamlining key oil and gas operations. One of the usages of predictive analytics in the upstream medium is through optimizing the drilling and production process, asset maintenance, and risk assessment through customizing predictive models that can predict possible failures before they take place. This indicates that instead of using traditional methods of scheduled maintenance and losing time and money, predictive maintenance would create a better and safer work environment through avoiding such failures.

As for the downstream medium, predictive analytics can be utilized in improving asset management by reducing downtimes and maintenance costs of the refining equipment. "Predictive maintenance is so relevant in the oil and gas industry wherein proper Just-In-Time (JIT) maintenance of key equipment can save millions of dollars in unplanned downtime which is the need for real time operations taking place in the refinery operations," added Anish Mahesh Shah, Engineering Project Specialist at Honeywell. According to Forbes, offshore equipment has 13% of downtime, of which it is largely unplanned; downtime does not only cost companies time, but it delays operations in addition to causing grave financial losses.

According to Baker Hughes' The Impact of Digital on Unplanned Downtime: An Offshore Oil and Gas Perspective report, the offshore oil and gas industry loses an average of \$38 million annually due to unplanned downtime. This is where predictive analytics, specifically in maintenance, come to play; by expecting equipment failure sooner than its occurrence, financial damages can be prevented. Baker Hughes' report indicates that operators using a predictive, and data-driven approach, experience 36% less unplanned downtime, and it could result in an average of \$34 million droppings to the bottom line annually.

ECONOMIC IMPLICATIONS

COVID-19 has shown the fragility of a paper world, and so, it is pivotal for the oil and gas industry to take matters into its own hands and adjust its multitude of data and operations through digitization. "Digitization leads to better asset management, easy access to the historical data and speeding up the work cycle," Abd El Kader stated, emphasizing on the importance of digitizing Egypt's oil and gas sector. In addition to this, realizing its economic value alongside its operational value is an important step to fully realize the future of the oil and gas industry. According to McKinsey Global Institute, the implementation of IoT could result in measurable cost reduction in the oil and gas operations by more than \$470 billion a year in economic value by 2025 in worksites, and \$360 billion per year in equipment maintenance.

With the arrival of the Fourth Industrial Revolution (4IR), competitiveness in the oil and gas industry increases and adopting predictive analytics and other IoT technologies become keys to improving operations and staying on top. The 4IR paves the way for oil and gas companies to further invest in digital transformation to handle the boom and bust of the economy. Therefore, investing in digitalization would help advancing core operations such as production, maintenance, safety and asset management by integrating Information Technology (IT) within operations.



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TECHNOLOGICAL MEDIUMS

to Accelerate the Digitalization Shift



BY RANA AL KADY

GENERAL OVERVIEW OF DIGITALIZATION IN THE OIL & GAS SECTOR

While the concept of digitalization is not new, the recent emergence of the coronavirus (COVID-19) pandemic has brought it into the spotlight more than ever. Digitalization in the oil and gas sector has become a necessity as opposed to a mere option over the last several months. In fact, digitalization has been a topic of discussion over the last five decades. However, it is becoming more and more crucial for oil and gas companies to ensure that operations can continue without the physical presence of employees in case of emergency situation or lockdown. For these reasons, it is beneficial for companies in the oil and gas sector to recognize the technologies and softwares that are essential in promoting advancements in production and services.

There are many ways in which the oil and gas industry can implement advanced tools, equipment and data. According to a study conducted by Massachusetts Institute of Technology (MIT), the oil and gas industry was rated 4.7 out of 10 in this regard, which indicates that the industry has only embraced limited technological and digital implementation. While this rating is quite low, it leaves a massive potential for improvement; especially in a time when the digitalization shift will be more vital than ever.

DIGITALIZATION DURING A GLOBAL PANDEMIC

Nevertheless, the COVID-19 was not the first pandemic that resulted in an international lockdown. During the SARS and Ebola pandemics, the oil and gas industry also suffered damage due to lack of preparation. In fact, during the event of the swine flu in 2009, the oil and gas industry also suffered, not only due to the pandemic's widespread, but also the economic crisis which affected services and production altogether. Additionally, it is found that the implementation of technologies could actually result in a cost reduction – due to limited physical presence – by nearly 36%. However, had companies and organisations in the industry been better prepared for the lack of physical presence needed on-site, the effect would have been minute.

The COVID-19 has yet again proven the need for digital platforms, as Microsoft confirms that the number of people using their online collaboration software has increased over 40% during the first week of March 2020 alone. Meetings, events, interviews and examinations take place through different communication platforms. This step alone shows how the lack of physical presence should not affect the workflow or decision-making processes within the industry. In fact, upstream operational costs could also be reduced by approximately 5% with the correct implementation of technological firmwares. According to Hassan Hafez, Country IT Manager of TOTAL, "The concerned party of implementing the digital transformation within the company should focus on the aim of using the digital solutions, not only for future improvements, but to a part of the daily business workflow and to emphasize on the crucial role of the digital transformation of increasing the revenue of each business along with its direct or indirect impact on ROIs."

USEFUL TYPES OF SOFTWARES AND TECHNOLOGIES

Consequently, some of the most crucial technologies in the oil and gas sector include the use of digital sensors, drones, wearable technologies, drilling automation equipment, 4D seismic images, mobile technologies and even cybersecurity solutions. Each type of emerging digital technology has a lot to offer in the industry. For example, drones – while often controversial in their applications – could be of benefit for monitoring operations in real-time; not only that, but enabling drones and digital sensors on-site promote proactive maintenance and even minimize the number of personnel present on dangerous locations or platforms.

Furthermore, the use of drilling automation equipment or machinery could not only be enabled remotely, but could also improve efficiency of work that used to be carried out by hand. In fact, companies have reported that, over the last several years, the use of drilling automation equipment have resulted in a reduction of capital expenditures by at least 25%. Digitalizing drilling also ensures a high level of performance in operations. At the moment, it is estimated that data collected on-site does not often exceed approximately 10 Gigabytes (GB) of space because the total entire set of data is available from multiple sources. However, if all the data is compiled in one place, a 'user-centric' domain is created; this allows professionals to work from the same platform, limiting errors in communication and data.

Moreover, other emerging technologies such as 4D seismic imaging and mobile technologies are encouraged and would be beneficial, especially during an international lockdown where movement is limited. For instance, the use of 4D seismic imaging differs from the conventional 3D imaging as the 4D version adds a time lapse layer, providing potential changes in fluid movement in reservoirs over a specified period of time. This feature gives companies a better overview of when action is necessary and when it is not; 4D seismic imaging is also reported to increase upstream revenue by nearly 5%. Also, enhanced mobile technologies (i.e. via smartphones or even wearable devices), promote efficiency as data is provided in real-time, potential errors are predicted and avoided, and safety is enhanced by communicating and acting remotely. Hafez added that "The use of the digital collaboration applications / systems within the company has increased significantly by almost 70% during the pandemic time until now."

Finally, the use of cybersecurity solutions is no longer seen as an extravagant digital solution, but a necessity. In fact, the main concern most companies have with regards to shifting to digitalization, is the lack of security on data attained. For this reason, it is important to ensure that all confidential data attained via computers, mobiles, cameras, etc. are well-protected from cybercriminals aiming to steal data for competitive or even political purposes. There are several softwares available to prevent the hacking and the theft of confidential and unauthorized data. This is where the necessity of installing Intruder Detection Systems (IDS) and encryption technologies comes in; to prevent malwares and

phishing campaigns. The more digitalized items become, the greater the risk of cyber-attacks; therefore, it was suggested that investing in a Security Operations Centre (SOC) – composed of industry professionals and experts – that is fully functional 24/7 across all operations could create a large obstacle for those attempting to hack the system.

ADVANTAGES & DISADVANTAGES OF A DIGITALIZATION SHIFT

It is essential to adequately analyze the advantages and disadvantages of having a digitalization shift before its execution. For example, there are many advantages of digitalization such as being prepared for lockdown situations and minimizing physical presence on-site; this is achieved by actively monitoring and taking decisions on actions remotely. Also, a shift to digitalization promotes the sustainability of production and efficiency of oil and gas companies, instead of closing down operations as the digital technologies allow for smooth operations regardless of external factors (i.e. pandemic, political instability, etc.). Additionally, essentially there would be a reduction in the initial capital costs, which would later be compromised in the added revenue attained. In terms of safety, on a daily basis, this would be entirely different as human presence around hazardous materials or dangerous equipment leaves a high probability for risks. Most importantly, there would be an overall change in the organizational focus as well as business models as professionals can focus on more important tasks and activities.

However, some disadvantages could include the high costs associated with implementing such technologies. It is important to recognize that the cost of the technologies installed is only a fraction in comparison to the operational and maintenance costs of the equipment as well as the training costs required to operate the technology. Many argue that while lockdowns do occur every now and then, they are uncommon and not worth the investment in digital technologies altogether. Additionally, human presence is required in the event of a technical failure, which could be seen as a drawback. Also, the reduction in jobs or increase in lay-offs could cause concern for the industry; many professionals have trained to carry out tasks machines can now perform faster and more efficiently. Finally, there is a high risk of data exposure where there are digital solutions installed. This is a more complex, yet understandable, disadvantage as it could not only lead to companies suffering from huge financial losses, but also years' worth of confidential data and planning strategies would be compromised.

In conclusion, there seems to be a universal agreement that an industry shift towards digitalization is necessary to progress in the field. In fact, digitalization is viewed as an inevitable change that must be embraced with great care. There is a huge potential for improvement in the oil and gas sector with regards to international emergencies. It can be concluded that the benefits of implementing emerging and innovative digital technologies outweigh the drawbacks, especially when companies are prepared for emergency situations.



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GROWTH WITH ENERGY

DIGITAL TWIN

PAVES THE WAY FOR REMOTE WORKING



BY FATMA AHMED

The global community is now facing a revolution of information technologies. Computers, telecommunication networks and other digital systems allow us to transmit information quickly and connect with distant places allowing the institutions and organizations to enhance their quality, productivity, as well as control the costs.

The digital twin is one of these important evolved technologies, which is rapidly becoming imperative and cost effective when implemented in business operations thanks to Internet of things (IoT).

IOT: THE FUTURE CONNECTIVITY

IoT refers to a system of connected computing devices, mechanical and digital machines, objects or people that have unique identifiers; this provides individuals with the ability to transfer data over a network without requiring a human-to-human or human-to-computer interaction.

In simple terms, the IoT consists of billions of physical devices around the world that are connected to the internet; all of which are collecting and sharing data.

IoT has many benefits to most businesses, especially those in the oil and gas sector. It enables monitoring the overall processes, improving customer experiences, saving time and money, enhancing employee productivity, integrating business models, making better decisions and generating more revenue.

For example, in oil and gas sector, the oil and gas tankers that are provided by IoT sensors can inspect parts of ships that carry products from remote areas as well as monitor the transportation facilities, which are hard to be reached without any need to use human workforce. These sensors also track the location of any tanker and its safety situation.

DIGITAL TWIN: REINVENTING DIGITALIZATION

Digital twin is a virtual image of an asset maintained throughout the lifecycle and it can be accessed easily at anytime and anyplace. It can collect data and integrate that data with different software products. This technology encourages predictive maintenance of the asset, provides a monitoring system and data analysis. These features can improve operations, reduce the costs and time of operations as well as increasing the efficiency.

HISTORICAL GLIMPSE

The concept of the digital twin was first recognized by Micheal Grieves, who introduced a presentation containing all the related elements of digital twin. Such elements include real objects, virtual objects and the spreading of information between the real and virtual objects, with the aim of reaching a high level of excellence in manufacturing through virtual replication.

The concept of the digital twin was initiated in the 1960s, when NASA used some basic twining ideas for space programming. NASA experts created duplicate systems on land to replicate systems in space, much like the one that has been developed to asses and simulate conditions on board the Apollo 13.

TYPES OF DIGITAL TWIN

Before identifying the types of digital twins, it is important to understand how digital twins work. A digital twin receives data form the sensors that are gathering data from a real object. This enables the twin to simulate in the real time, while also offering insights into performance and potential problems. Additionally, the twin can create a prototype of its physical counterpart via its ability to simulate. Also, the twin can serve as a prototype itself before building the physical replica.

There are three main types of digital twins. Those includes status twins, operational twins and simulate twins.

The status twin is used in monitoring applications such as dashboards and simple altering systems. This type of twin is created with visualization tools.

Next, the operational twin provides more extensive information which is used in decision support, mainly for operators and engineers. Moreover, it enables changing operating parameters and controlling actions.

Finally, the simulation twin provides different types of simulations which enable it to predict and provide insights into future operational conditions. It also can forecast



the needed maintenance operations as well as improve the recovery yield of a processing plant.

DIGITAL TWIN REVOLUTIONIZES OIL AND GAS INDUSTRY

Digital twin technology is now implemented in several industries around the world. Recently, the digital twin entered the manufacturing sector, retail, vehicle production, healthcare, construction, smart cities and oil and gas sector.

In oil and gas industry, digital twin enables optimizing the assets by avoiding halt hazards as well as storing inspectional and operational data. Also, it helps in reducing the efforts on manual processes, backing up information and eliminating any associated risks.

"Actually, Digital twin technologies is a revolutionary step towards the optimizing performance and cost for assets based on a clone model from real life in our oil and gas" field" Mostafa Sobhy, Petroleum Engineer at Qarun Petroleum Company, Apache JV said.

Digital twin can help in making decisions based on information across the lifecycle of assets. Besides improving the production and maintenance operations, it provides consistent, accurate sources of information for operators to manage the efficiency, safety and environmental performance of the assets.

Therefore, digital twin is one of the best ways to elevate the efficiency levels of operation to the next level and allow businesses to continuously improve in their respective competitive markets.

APPLICATION IN THE OIL AND GAS INDUSTRY

Digital twin can simulate pipelines, gathering systems such as compressors, pumps, turbines and heat exchangers.

There are many companies that started to introduce applications of digital twin solutions within oil and gas sector. Emerson is one of these companies; the company introduces several solutions, such as the mimic simulation software, ovation simulations, run simulations (which optimize oil and gas operations), in addition to gaining deeper insight into the subsurface and support responsible asset management with Paradigm.

Also, DNV GL company has presented some solutions and applications of digital twin. Hisham El Grawany, Vice President and Area Manager of North Africa for DNVGL, said that his "company have many applications stand in different parts of oil and gas projects life cycles started from construction modelling design review, fire mapping design review, assets integrity and RBI software's, gas and fire detectors design optimizations and simulations software, remote inspection and remote surveys."

Other applications of the digital twin have been implemented to benefit the oil field. Tech Digital Twin is one of these beneficial applications; it uses sensor technologies to monitor equipment uptime and downtime and conditions that enable field workers to initiate and schedule work remotely to deal with any operational downtime.

Smart leak detection sensors are applications working along with video-based analytics to monitor the potential leak conditions and prevent them from occurring. Consequently, this will help field workers to avoid any potential hazards.



Furthermore, rig- in-a-box technology streams downhole data during drilling operations. This device provides edge analytics which enables better and faster decisions that reduces time of production as well as improves the drilling operations.

Another application is the voice-recognition technology which can improve safety and operations maintenance. The field worker can access the online manuals of equipment or the instructive videos using voice commands, which enable following simulations of the needed repairs and communicating with remote experts.

In Egypt, Digital Twin hasn't been used yet. Sobhy said that "It Digital Twin started with offshore platform designs, however it still not that much use in the Egyptian market".

"We do simulation in all levels but using separate software in each process

but for assets management and asset planning not using a virtual asset management tool. So, I see it is a very good step if it comes with reasonable cost", he added.

Ahmed Abdel Hasseb, a Senior Reservoir Engineer at Wintershall Dea, said that they applied a digital twin model in Germany by "creating a digital version on the production facilities and each single equipment with serial number and real time measuring devices to allow field workers to track status and troubleshoot problems without the need to physically check the equipment."

DIGITAL TWIN IN THE ERA OF CORONAVIRUS

Nowadays, the entire world is suffering from the new coronavirus pandemic outbreak. The economies are broken down, cities and countries are isolated and most of the industries are disrupted. The whole world is directed towards taking precautionary measurements, seeking to keep the pandemic outbreak under control. Most organizations, including oil and gas institutions, are trying to facilitate working remotely for most employees.

The new digitalization trend enables most of the organizations and industries to implement the concept of remote working. Digital twin is an optimum example of technological application allowing the distance working. It can transform an outdated workplace into a dynamic, smooth-operating and modern environment. This could happen by compiling information and data together from different sources and producing a contextual model that enables optimizing conditions employees to interact with their work spaces.

Sobhy said that "It Digital Twin is a very important feature that gives you the whole filed dynamics on hands to be controlled in your premises or may be uploaded on cloud so you can access it anywhere."

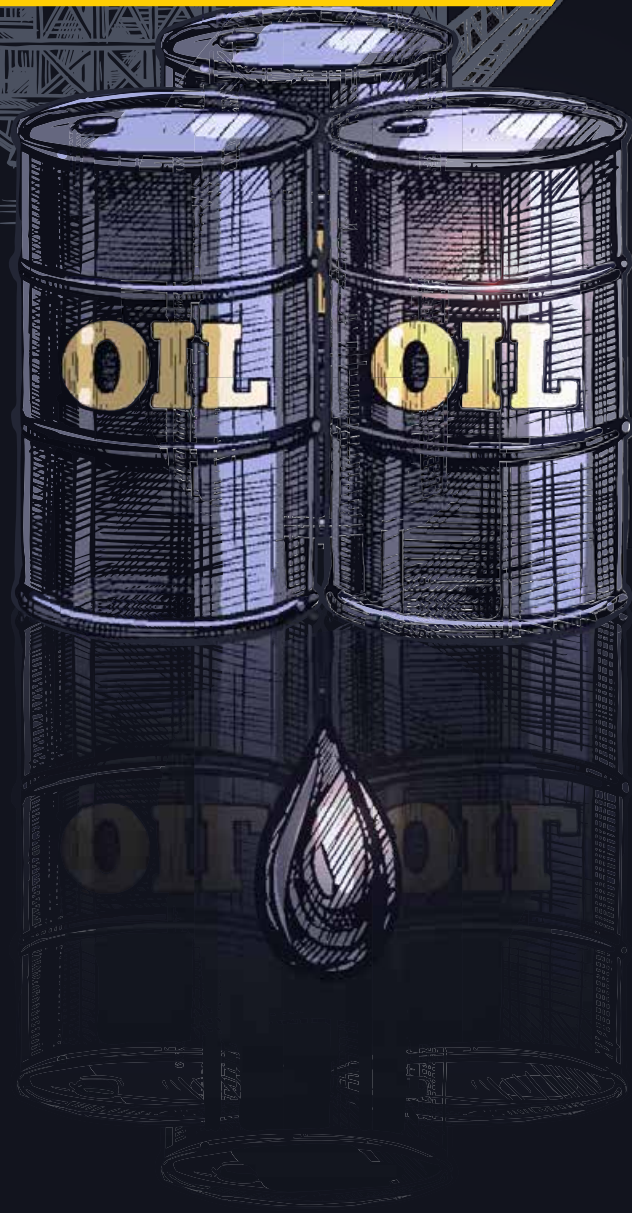
Moreover, digital twin can provide missing insights about building usage through 360 dashboards, floor plans, analytics and other tools that give real-time information, predict the future states and optimize conditions.

Also, digital twin provides holistic data that helps the owners and operators to make right decisions about a range of topics.

FUTURE VISION

There are many predictions that state that the application of digital twin will be expanded as long as the continuous development of IoT, big data and AI. A report recently conducted by Reportlinker, mentioned that the digital twin market is anticipated to grow from \$3.8 billion in 2019 to \$35.8 billion in 2025. It was reported that the key factors leading to this growth include the reduction of time and cost of product development, the increase in adoption of new technologies such as IoT and cloud, as well as the growing use of digital twin for predictive maintenance.

"Simulation is your tool to test every decision you will make in our industry. Each decision is a cost so we try to optimize with keeping the high performance." Sobhy concluded.



A NEW OIL & GAS ORDER IN THE MAKING?

By Ihab Shaarawy

With the emergence of the coronavirus pandemic and an unprecedented price war, 2020 should go down in history as a defining moment for the oil and gas industry.

Four months after the looming of the pandemic, the US West Texas Intermediate (WTI) crude fell to an unbelievable negative \$37.63 a barrel while Brent crude sank below \$16 a barrel, its lowest level since the beginning of the century, as storage facilities all over the world were overwhelmed by stockpiles.

The low prices were no wonder as oil producers have continued to pump record levels of crude even as the outbreak pushed oil demand to its lowest levels since 1995.

The crisis has wiped billions from the market value of oil companies, many of which will not be able to pay dividends if the crisis stayed for a longer period.

Even a historic pact to cut production by 10 million to 20 million barrels of oil seemed too little and too late to avoid a market crash.

Fatih Birol, head of the International Energy Agency (IEA), described 2020 as the worst for the oil industry, as his agency estimates that global oil demand this year will fall by 9.3 million barrels per day (mmbbl/d) versus 2019, erasing almost a decade of growth— even if restrictions are eased in H2 2020.

The coronavirus has devastated the world economy. However, for the oil sector, the matter was even more complicated by political conflicts that haunted the sector over its history.

COUNTERACTING A CRISIS

Lockdowns imposed by governments all over the world to contain the pandemic have resulted in a sharp fall of nearly 30% in oil demand as airlines have cut services, factories closed doors, and drivers deserted the roads.

China's total refinery output, for example, slumped by around 3.3 million barrels per day (mmbbl/d) in February from the month before to just over 10 mmbbl/d, according to S&P Global Platts survey. This is close to a 25% month-on-month decline.

Due to the pandemic effects, the Organization of the Petroleum Exporting Countries (OPEC) had to amend its prospects for oil demand in 2020, saying that global oil demand will drop by 6.8 mmbbl/d in 2020, with the sharpest contraction in April.

POLITICS IS THE ROOT OF ALL EVIL

At the beginning of the crisis, Saudi Arabia, the second largest oil exporter that possesses around 18% of the world's proven petroleum reserves, tended to practice its usual role as the influential OPEC member who is able to control prices and dictate cuts. However, the Saudi move to contain the situation by proposing production cuts was refused by Russia, the influential oil producer, who saw the low oil prices as a good tool to harm the US shale oil industry.

As a counterattack for Russia refusing to support OPEC+ output cuts, Saudi Arabia had pumped every possible barrel for sale at rock-bottom prices.

The price war, that lasted for nearly six weeks, forced oil companies to slash spending and cancel investments, while oil-rich countries appealed to the International Monetary Fund for help.

After strong pressure from US President Donald Trump, Saudi Arabia and Russia ended the devastating price war, agreeing to slash output together with other members of the OPEC+ alliance.

Despite of the historic agreement between OPEC and its partners to cut output by almost 10 mmbbl/d from May, prices remained at multi-year lows as demand needed to pick up again.

Members of OPEC and their allies, including Russia and Mexico, announced in mid-April that they have agreed to cut production by 9.7 mmbbl/d in May and June, the deepest cut ever agreed to by the world's oil producers. After that, the group will



steadily ramp up production until the agreement expires in April 2022.

According to IEA, "the historic decisions taken by OPEC+ and the G-20 should help bring the oil industry back from the brink of an even more serious situation than it currently faces."

According to analysts, situation would have been far better for the oil industry, if the initial production cut proposals were taken seriously. It seems that parties of the price war underestimated the effects of coronavirus on the global demand.

Although effects of political conflicts are not new for the oil sector, the recent conflict seems to have more devastating impact, not only on the oil industry, but also on the political regimes that took part in this conflict.

A WAR WITH NO WINNER

In Saudi Arabia, where the energy sector, according to a Bloomberg report, accounts for about 80% of the kingdom's exports and two-thirds of its fiscal revenue, the decline in oil is expected to hinder Crown Prince Mohammed bin Salman's efforts to diversify Saudi Arabia's economy away from oil — a campaign that was mainly funded by oil revenues.

The kingdom had to cut expenditures by \$13.2 billion, or nearly 5% of its budget spending for 2020.

The price war also cast shadow over the historic Saudi Aramco's initial public offering (IPO) of last year as many investors now show concern over the political risk associated with the company that Saudi Arabia still uses as a political tool.

While Saudi Arabia's price war was against Russia, it had its damaging repercussions for nations whose economies depend on oil exports, such as Venezuela and Iran. It also devastated emerging economies such as Brazil, Angola and Nigeria.

The outcome of the price war was not in favor of Russia either as Russian President Vladimir Putin had to postpone several social spending programs that he had hoped would stimulate a stagnant economy.

Under the new agreement, Russia will cut production four times larger than the proposed cuts in March. Russia has not only lost revenues from weeks of lower oil prices, but also undermined trust in its judgement and opened the door for US to play a key role in brokering the new OPEC+ agreement.

But one of the bigger losers in the war until now seemed to be the US oil companies, many of which now face the danger of bankruptcy.

Trump, who cheered the OPEC+ agreement, had to come out with what he described as a plan to prevent the looming wave of bankruptcies and mass layoffs in America's oil industry after US oil prices crashed into negative territory for the first time ever. However, no details were announced about this plan.

NOT IN ANYONE'S INTEREST

Some people may cheer the low oil prices as a good opportunity for growth in poorer countries who are likely to increase their spending on other goods and services. It also may help economies recover more quickly and help prevent a recession becoming a depression.

However, very low prices will be negative for all as the larger the fall in the oil price, the bigger the risk that the negatives outweigh the positives as risk of deeper recessions for producers is growing and many oil companies may be driven out of business altogether.

Very low prices may be also bad news for savers and pensioners as the world's biggest oil and gas firms may consider cutting dividends as they weather the fallout from the pandemic.

Many oil companies' cash goes directly into pension schemes. BP and Shell contribute nearly a fifth of all dividend income generated by UK companies for example. Public coffers also may suffer big losses of taxes paid by these companies.

Whiting Petroleum Corp became the first major shale producer to file for Chapter 11 bankruptcy.

Some of major companies had to cut their expenses and investments such as Exxon Mobil Corp., which cut its capital budget for 2020 by 30%, or \$10 billion, while a company such as Baker Hughes said it approved a plan to slash its 2020 net capital expenditures by more than 20%.

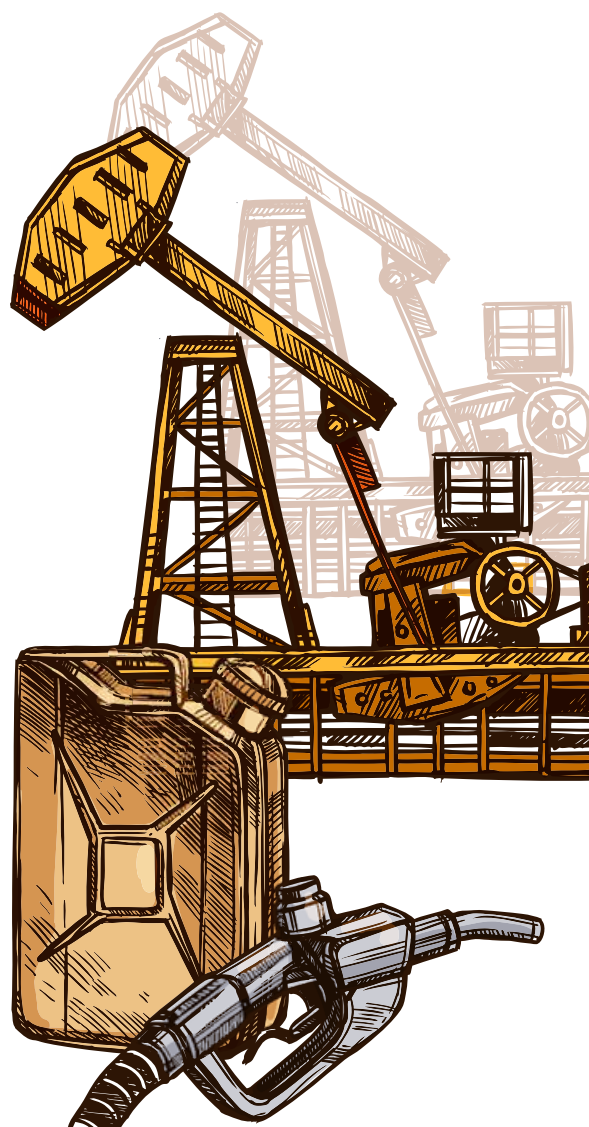
And then there are the environmental concerns as cheap oil will limit economic incentive to look for renewable and clean energy sources.

The current prices crisis may also threaten stability in several countries which mainly depend on oil exports.

Although such low prices can help Egypt in decreasing the burden on public budget, the country's oil sector will be negatively affected by plans of international oil companies (IOCs) to cut their exploration and production (E&P) investments in different countries including Egypt.

As confirmed coronavirus cases surge around the world, uncertainty also grows about what is next for the oil and gas industry. Until scientists find a solution for the disease that haunted the world, it is the role of politicians to put their differences aside and formulate a way to shore up this important industry.

It became clear that the drop in oil prices due to OPEC's loss of pricing power is a sign that a new oil and gas order is in the making. Hence, oil companies should be prepared for the uncertainties, risks, and opportunities ahead.



ARTIFICIAL INTELLIGENCE: APPLICATION IN THE OIL AND GAS SECTOR



BY JACK BECKFORD

In an industry where profit margins are becoming ever slimmer, innovation and technology is becoming in the heart of the oil and gas industry's attempt to boost efficiency and buoy profits. Artificial intelligence (AI) helps the oil and gas companies in optimizing their production by identifying the areas of inefficiency and providing informed decision making.

A paper that focuses on the techniques implemented within the oil industry is "Application of artificial intelligence techniques in the petroleum industry: a review" by Hamid Rahmanifard, a research engineer at the Canadian Energy Research Institute; and Tatyana Plaksina, Principal at Aegis PetroSolutions.

The paper highlights the applications of AI in the oil and gas industry, analyzing the following AI categories: swarm intelligence, fuzzy logic and artificial neural networks. Furthermore, the paper sheds light on the improvement of AI methods in the optimization of industrial decision making and the streamlining of the industry.

SWARM INTELLIGENCE

Swarm intelligence (SI) is an innovative intelligent optimization technique that replicates social and collective behavior of swarms of ants, bees, fish schools, and insects when they are searching for food, communicating with each other, and mingling in their colonies. Main characteristics of SI models are their self-organization, decentralization, communication, and cooperation behaviors between individuals within the group. In this paper, the theory of Particle Swarm Optimization (PSO) is discussed along with its use in the petroleum industry.

According to the study, PSO algorithm has several advantages including a reduced number of parameters for the input data, simplicity for implementation, high efficiency in a global optimum search, and flexibility in scaling of design search.

Implementation to optimize oil recovery of a heavy oil reservoir was investigated through the convergence behavior and performance of three different PSO algorithms. The results showed that conventional PSO

yielded the highest objective function.

The combination of PSO and the Generalized Pattern Search (GPS) simultaneously and sequentially optimizes well placement and control problems. The results shown indicate better performance of the sequential approach in comparison to that of the simultaneous approach. The study showed that utilizing hybrid techniques has led to the improvement of technical and economic scenarios for heavy oil reservoirs' development.

FUZZY LOGIC

Fuzzy logic (FL) is a powerful mathematical tool for modeling the uncertainty of information in the real world by generalizing any specific theory from a crisp (discrete) to a continuous (fuzzy) form. It is employed to handle the concept of partial truth, where the truth value may range between completely true and completely false.

Nowadays, there are numerous applications of FL in the oil and gas industry. Using a fuzzy neural network and a backpropagation neural network evaluates factors affecting rock fracturing and measures their relationship with fracture intensity. The paper found that the use of FL method and a stochastic framework, whereby a pattern that may be analyzed statistically but may not be predicted precisely, can minimize the risks associated with data reliant techniques and facilitate the interpretation process.

FL has also been used in the oil industry for stimulation candidate-well selection. To determine fuzzy variables, analysis was conducted relating to the factors affecting oil well fracturing, and then selected target wells and formations for hydraulic fracturing using a fuzzy mathematics model.

The results showed that optimization with GA could prevent their neural network and neuro-fuzzy models from trapping in local minima, which is a common case for a back-propagation algorithm.

ARTIFICIAL NEURAL NETWORK (ANN)

Artificial neural networks (ANN) are computing systems inspired by the biological neural networks that make up animal brains. These systems learn to perform tasks by considering examples, generally without being programmed with task-specific rules.

Within the oil and gas sector, this system has been used to determine the conditions of offshore oil and gas pipelines. A case study is used whereby an ANN model used datasets from three existing offshore oil and gas pipelines in Qatar. The authors considered different factors including diameter, material, type of the carried product, anode wastage, support condition, joint condition, free spans, and corrosion.

OPTIMIZING RESULTS

The research showed that the application of AI methods has noticeably improved performance in terms of prediction, estimation, and optimization of different objective functions such as oil production well placement and reservoir characterization. In general, faster convergence has been reported on operations using original PSO algorithms. Conversely, hybridization of FL and ANN methods with other optimization algorithms have been shown to be more efficient and have obtained better solutions in comparison with the conventional FL and ANN models.



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TRUSTWORTHY DIGITAL TWINS POWER A MORE EFFICIENT FUTURE

Establishing trust will be key to the adoption of digital twins. Companies will only be able to extract maximum value from a digital twin if they are assured that it will function as specified. It is vital that companies in this space use a structured, systematic approach to ensure performance matches expectations, including setting clear goals and managing working processes. That is why TechnipFMC and DNV GL are developing the oil and gas industry's first methodology for qualifying the integrity of digital twin technology.

Digital twins provide virtual representations of systems and physical assets over their lifecycles. Recognizing the potential to increase safety and efficiency, the oil and gas industry is increasingly applying this technology.

As the industry prioritizes digital twins and technologies integrated within them for investment in 2020, this is set to grow, according to DNV GL's latest industry outlook *New Directions, Complex Choices*. The report assesses sentiment, confidence, and priorities for 2020 in more than 1,000 senior oil and gas professionals.

The attraction is that a digital twin can support information-based decisions across the lifecycle of assets, from the design stage through to decommissioning. The big question though is whether the information from a digital twin can be trusted.

Establishing such trust will be key to adoption, as companies will only be able to extract maximum value from a digital twin if they are assured that it will function as specified.

"As more digital twins enter the oil and gas sector, it is key for operators to know that their twin works as planned, and that its output is reliable," said Julie Cranga, Vice President, Subsea Digital at TechnipFMC.

TechnipFMC – a global leader in subsea, onshore/offshore and surface projects – is partnering with DNV GL to develop the oil and gas industry's first methodology for qualifying the integrity of digital twin technology. It is being piloted in 2020 in two subsea development projects.

To ensure that the performance of digital twins matches expectations, organizations involved require a structured, systematic approach. This shall provide evidence that the twin have valid system information and accurately predict system performance. To be qualified in this approach, a twin would need to achieve these tasks within well-defined limits and a stated level of confidence, and to do so over time.

"Clearly specifying what you want to achieve from a digital twin and how you will manage the change or disruption to working processes is a genuine challenge for many companies," said Hisham El Grawany, Vice President & Area Manager North Africa, DNV GL Oil & Gas.

"Bringing clarity and structure to the qualification process is critical. In these early years of the industry using this technology, clearly specifying what you want to achieve from the digital twin and how you will manage the change or disruption to working is a genuine challenge for many companies," El Grawany said.

OVERCOMING SPECIFICATION AND WORK PROCESS CHALLENGES

To help overcome these challenges, the industry will benefit from the twins in terms of functional elements. A functional element is the part of a twin's capabilities that supports the user in making a specific decision. For example, the process and checklist for a functional element should cover: the need that it must meet; the key decisions it must support; and, the types, quality

and number of data sources such as sensors that will be required. The feasibility of the functional element will be continuously assessed as it matures and is ultimately validated. The functional element should also cover the performance of the digital twin over time, as expressed through a quality indicator.

The quality indicator reflects the fact that users need to be able to trust the digital twin at any and all times. For example, a sensor may have stopped working without anyone noticing, or the maintenance and modification work on a physical asset may not have been updated in the virtual model.

"Through a structured combination of automated and audit-based assurance processes, companies can trust that the twin is always up to date," said El Grawany.

A Scalable and Broadly Accepted Methodology for All Parties

A methodology to qualify digital twins should adhere to the following three principles.

First, it must enable a modern agile approach to the development of digital twins, while being systematic at the same time. Second, it should be scalable as digital twins mature and evolve. Finally, the qualification process must become broadly accepted in order to serve as terms of reference between supplier and buyer, enabling efficient development and procurement processes.

The methodology that TechnipFMC and DNV GL are developing aims to meet all three of these goals.

DATA AND ALGORITHM QUALITY IN DIGITAL TWINS

Advanced industrial operations depend on information systems for control and analysis. Data is increasingly considered to be of equal value to physical assets, and considerable costs are involved in collecting, storing, and acting upon data. An advanced digital twin is no exception.

The quality indicator component involves continuous assessment of the quality of data and algorithms, and of the twin's output and automated recommendations. The indicator also includes periodic assessment of the functional elements and of changes to the asset.

The methodology and logic for how to ensure quality of data and algorithms is based on two recommended practices: DNVGL-RP-0497 Data quality assessment framework; and the forthcoming DNVGL-RP-0510 Framework for assurance of data-driven algorithms and models. DNVGL-RP-0497 includes a process for organizational data maturity assessment.



A RECOMMENDED PRACTICE FOR DIGITAL TWINS

DNV GL's Technology Outlook 2030 forecasts the emergence this decade of a full digital value chain in oil and gas, with the digital twin at its core, to reduce development times and costs in the energy transition.

As the TechnipFMC/DNV GL pilot project continues, the aim is to refine the methodology by the end of 2020 to publish a new DNV GL recommended practice for the quality assurance of digital twins to increase their efficiency. While the methodology is a first for the oil and gas industry, it is being built on tried and tested foundations.

It is derived from the Recommended Practice DNVGL-RP-A203 Technology qualification, and from other standards, adapting them on digital twins. DNVGL-RP-A203 was first published more than 20 years ago as a common framework for oil and gas industry players to gain acceptance for implementing unproven hardware technology. It has been used to demonstrate the trustworthiness of hundreds of technologies.

The digital twin qualification methodology being developed uses the definition of digital twins previously provided. It is applicable to alternative definitions, though this may require adjustments depending on the scope and application at hand.

"We invite other companies to come forward with digital-twin modules with which we can test and refine the assurance methodology before the recommended practice is published," said El Grawany. "We aim to create a broadly accepted recommended practice that operators and technology providers can use as a key reference. Having a standardized approach will remove uncertainty and move the industry to a more efficient future powered by trustworthy digital twins."

CONTACT US TO LEARN MORE:

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STI WEB-BASED TRAINING ANYTIME, ANYWHERE



The ongoing spread of coronavirus (COVID-19) presents many of us, perhaps you too, with the challenge of working from home. SAHARA Technical Institute (STI) is committed to the health and safety of its clients and employees. With that in mind, STI has rescheduled its on-site programs through May to later in the year. However, to fill your training needs now, we are delighted to introduce to you the most robust virtual training system recently implemented with our training mechanisms to support the web-based training anytime, anywhere.

The online training is self-paced and customizable to suit an individual's specific learning needs. The training can be conducted at almost any time and place, provided there is a computer with high-speed internet access. This makes this form of training convenient for users who want their training to fit into their day-to-day schedule.

The virtual training systems comply with the recent instructions of the Egyptian General Petroleum Corporation (EGPC) and the Egyptian Ministry of Health and Population to maintain social distance, in addition to the directives of the government to keep the production cycle running to maintain the country's progress and production.



The system includes all of training lectures, assessments, knowledge progress track-records, certification, attendance, interactivity in two ways between instructors and participants, etc. Every offering has a kick-off meeting with the mentor to introduce participants and teams, establishing a web-based communication. In most programs, there is a supplemental mentor during the last day of the sessions to summarize the course results.



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METHANEX EGYPT SUPPORTS MORE THAN 12,600 FAMILIES IN DAMIETTA



The global pandemic has posed a different set of challenges for individuals and corporates. Methanex Egypt rose to these challenges, truly honoring its corporate values and commitment to support the community through these difficult times. By partnering with the Egyptian Food Bank, Methanex Egypt provided food boxes to 10,000 families in Damietta where its Methanol production plant operates.



The focus of the campaign is the provision of support to day workers—those who depend on their daily wages to survive one day at a time, in addition to those who have been significantly impacted by the current curfew and the call for social distancing. The company has also set up an Employee Matching Fund, whereby the company provides full employee contributions to the Egyptian Food Bank campaign. The successful employee donation campaign has enabled Methanex to support more than 2,600 additional families to the 10,000 originally supported by Methanex's main donation. Of these contributions, 1,000 boxes were distributed directly by Methanex Egypt's team, in collaboration with the National Council for Women, to reach the neediest members of the community in Kafr el Battikh and Sinanya areas.

With safety being the company's number one priority, Methanex Egypt was one of the first companies to respond to the rising number of confirmed cases and started working on response plans, guidelines and internal communications materials since January, while closely monitoring the evolving situation worldwide. After COVID 19 was announced as a pandemic and as the number of infections significantly rose globally, Methanex Egypt immediately activated its response plan and shifted to minimum manning and remote working starting from March 15 to ensure maximum the safety of its team while maintaining its full operations to meet the market's needs. The company has also initiated a number of internal controls such as measuring body temperature for everyone entering or leaving its Damietta plant or Cairo office, having rigorous hygiene measures including daily disinfection and sanitization of common stations after each shift as well as offices and company vehicles, and requiring everyone to enter the plant or office wearing a mask.

Given the priority Methanex gives to product stewardship, disposable personal protective equipment and masks are used throughout the whole shipping process with all agreements done on radio communications. For methanol truck loading, drivers get a daily checkup and disinfection takes place for each truck. The team maintains direct and constant communication with customers to ensure truck deliveries meet the curfew timings.





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LEGAL INSIGHTS FOR PETROLEUM COMPANIES: TAKING THE RIGHT PRECAUTIONS

By Mohamed Agamy - Managing Partner at Links & Gain

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There is no doubt that the COVID-19 pandemic and its impact on all the countries all over the world, with no exception, has never been witnessed by the existing governments, authorities, or companies, especially the oil and gas companies. Hence, the crisis impacts, not only the petroleum sector, but all the other sectors as well, on the economic level at surface, and on the human level at core.

In this article, we will shed light on several important legal issues to be considered for reducing risks, improving performance, and speeding up production after things are better and this plight is gone.

LIQUIDITY IS MANDATORY

Liquidity or the cash is recognized as the king nowadays because it has the power in making timely business decisions by either avoiding default, maximizing the benefit, or seizing an investment opportunity. Thus, the positivity of the cash flow can be ensured through several main factors.

These factors are: fully-collecting all third-party debts; cutting expenditure and maximizing deferment of payments; reviewing all contracts that require high cash flow and amending all project payment programs in line with the amended cash flow; urging stakeholders to pump cash flows within the company or increase the company's capital; amending or concluding credit facilities contract; and issuing financial instruments, shares, bonds, investor floatation, etc. according to each company's position, procedures, and objectives.

FORCE MAJEURE AND GIVEN NOTICES

In these contingent conditions, the company must review all obligations, contracts, and agreements that may make the company under the risk of execution, the default of execution, or in some cases, the impossibility of execution. There are a set of precautionary measures and provisions that

should be taken into consideration. For example, to review all contracts and obligations to be in line with the outputs of the crisis. Also, to initiate finding solutions and adjustments so that a company may not in the long term be on the threshold of bankruptcy or subjected to legal threats arisen from the obligation of execution. Besides, notices must be served that such force majeure may have an impact on obligations. Thus, a legal notice must be used as a right to request either to amend the schedule of obligation execution to modify or postpone contracts to all parties, noting that the company under such force majeure has payments or installments; to remove some articles of a contract due to the impossibility of execution; or to request cancellation; or sometimes to reconcile legal status of contracting.

As for the execution of long-term contracts, the relevant contracting parties shall be notified, and it is necessary to review the price items and periods of time or the delivery premises with the legal or bank guarantees to be amended.

Also, a notice must be officially served. Non-official notices, via smart apps, that are not accurately defined in a contract, must be avoided. Such notices are not legally effective.

INTERNAL POLICIES AND PERFORMANCE EFFICIENCY

Currently, companies must document all administrative decisions they issue, and must ensure that these decisions are announced so that they

may be legally effective against third parties. Also, clear rules must be established for using certain smart apps while maintaining the confidentiality of the information and data exchanged between team members and the company, in order to ensure that such confidential information will not be leaked to any competitors.

In addition, call for a general assembly must be taken into consideration in case of approving exceptional resolutions, etc.

DATA PRIVACY CONTROLS

The world is now heading aggressively towards remote working. This strategy may lead to facing some challenges in the data privacy in general. Data privacy challenges are not only controlled by technology, data control software, government employees, and third parties, but data privacy protection challenges extend to the way of applying laws and regulations in practice with full awareness of the applicants, in order to preserve and maintain the privacy of their data including but not limited to main obligations imposed on data holders, controllers, and processors.

The current situation is changing businesses and investments. Digital investment and investment in technologies and artificial intelligence, in particular, should be the center of attention. These kinds of investments guarantee the reduction of risks, while improving performance, and fast-tracking production amid and post the crisis.



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A ROBUST CRISIS MANAGEMENT PLAN

President Abdel Fattah El Sisi and his Cabinet led by Prime Minister Mostafa Madbouly have ruled and managed the recent pandemic crisis in a professional way that pushed the World Health Organization (WHO) to praise Egypt for its COVID-19 crisis management.

As an Egyptian citizen, I have to admit I was amazed by the way that frightful pandemic was being handled by the Egyptian authorities; starting from sending exclusive flights to bring back the suspended Egyptian citizens from the world airports to ceasing food and beverages exports to fulfill the local demand during the curfew and monitor the prices to make sure citizens get their food with fair prices.

Our military forces started to sterilize crowded places and markets across Egypt during curfew to combat the spread of coronavirus. Police forces helped the Cabinet to enforce the curfew which was introduced to combat the horrific spread of the virus. Most importantly, El Sisi had instructed the government to compensate the workers who were affected by the pandemic.

Banning of all flights coming in and out of Egypt, in attempt to decrease the people coming from abroad, limited possible chances for the virus to spread. Furthermore, the decision to close mosques and churches also helped to reduce number of infections that could have happened during religious gatherings. The Ministry of Health has dedicated its facilities and brave manpower to

provide the utmost care for patients in quarantine places with no fear

In the oil sector, H.E. Tarek El Molla, Minister of Petroleum and Mineral Resources, has set many development programs to cope with the world international standard. On top of that, the petroleum ministry delegated team has made extraordinary efforts in attracting international oil companies (IOCs) to invest in oil and gas exploration. During the pandemic, the minister decreased the fuel prices and there was no shortage of any petroleum products across the country.

All precautionary procedures taken above made me bow for the highly proficient calibers in the Egyptian Cabinet for managing the pandemic crisis in a more superior way than first world countries. My happiness, love, and pride for our country are beyond words.

**Dr. Tarek Abdelhafez, Exploration
General Manager at the Egyptian
Natural Gas Holding Co. (EGAS)**



THE IMPACT OF COVID-19 ON THE OIL INDUSTRY

One of the petroleum industry's characteristics is the high-risk and unstable environment when it comes to prices. The oil market has witnessed a decrease in oil prices as a result of the failed negotiations between Saudi Arabia and Russia – two of the largest oil producers in the world. This sharp decline in oil prices caused a great economic harm to some companies, which led them to take more stringent measures. The matter became even more complicated by the appearance of the coronavirus (COVID-19), which struck most of the world.

COVID-19's impact was not limited to the country where it appeared, which is China, but its impact extended to all countries of the world. As we move forward, the energy sector is facing two headwinds: managing the health emergency issues and simultaneously coping with a low oil-price scenario, lower demand and the need to shore up revenues and manage debt.

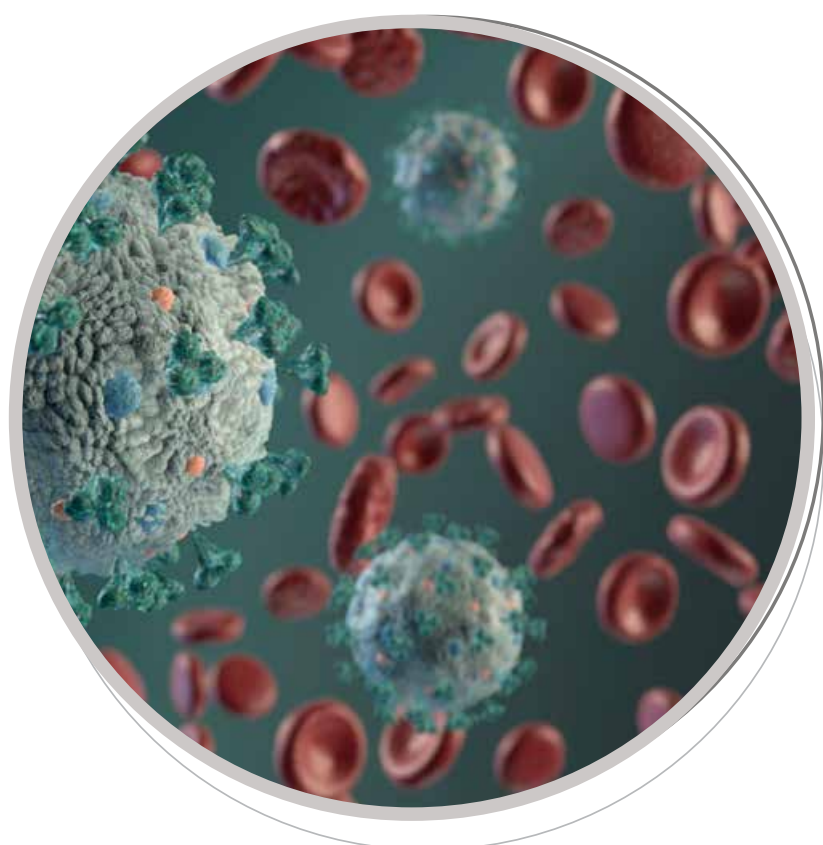
Most countries have taken precautionary measures to limit the spread of this virus and alleviate its consequences. Among these measures is imposing a travel ban on international air flights and reduce domestic travel. The transportation sector is considered one of the largest consumers of oil and its derivatives. Consumption also dropped in many factories. The decrease in demand and the increase in supply led the oil prices down. This sharp decline in oil prices represents a major challenge for all parties to this industry, national oil companies (NOCs), international oil companies (IOCs) and service companies.

Companies in such situations usually take strict measures to reduce the impact of the price drop on the financial position of the company. The first of these measures is to reduce labor and defer some projects in addition to reducing salaries. Some companies have already been forced to cut their capital program by 75%, reduce the number of employees by more than a third, and cut the salaries for the rest.

Despite the unclear picture of the current situation, there are some positive indicators that must be worked on in order to benefit from these crises and be ready for the next phase. These indicators were represented in the slight increase in oil prices and the return of operations in some ports in China. Therefore, it is not logical that some companies tend to reduce drilling activities and reduce the number of rigs. Instead, companies should exploit the current decline and increase the number of wells while taking advantage of the new technology available to services companies in order to make these wells ready for production and be prepared for the post-COVID-19 phase.

Hany Shaker

**General Manager, Feasibility Studies & Project Evaluation at Egyptian
General Petroleum Corporation (EGPC)**





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Annual Inflation Headline CPI (%)

FEB 2020 **5.32** ↓ MAR 2020 **5.09**



Net International Reserves (\$ billion)

FEB 2020 **45.51** ↓ MAR 2020 **40.1**



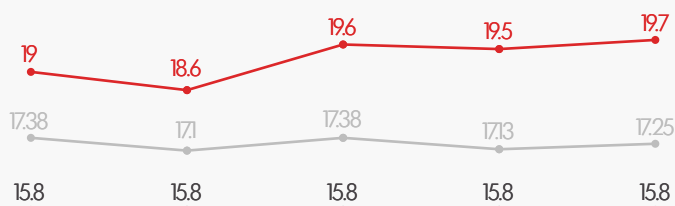
Non-Oil Private Sector PMI (Points)

FEB 2020 **47.1** ↓ MAR 2020 **44.2**



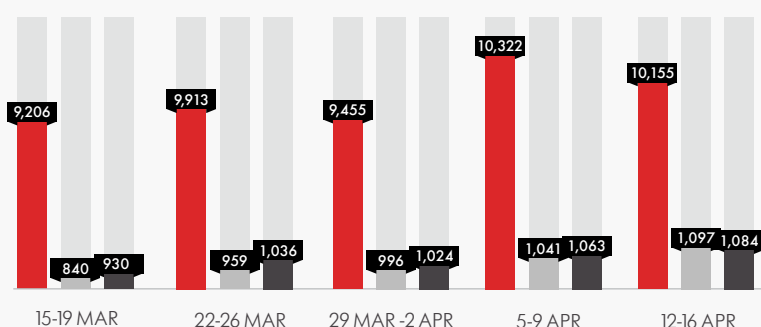
Exchange Rates

— British Pound — Euro — USD

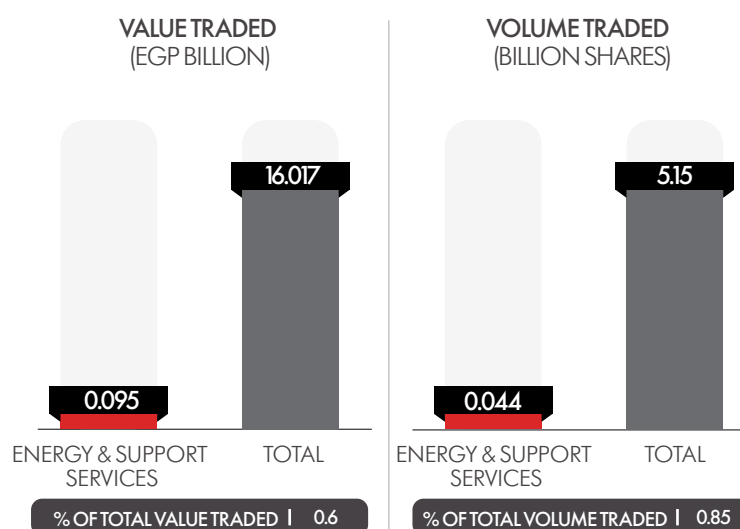


Capital Market Indicators

■ EGX 30 ■ EGX 70 ■ EGX 100



Performance of Petroleum Companies in the Egyptian Exchange in March 2020



National Drilling

CURRENCY USD | CLOSE PRICE 4.96 | YTD PRICE CHANGE (%) 0



Alexandria Mineral Oils Co.

CURRENCY EGP | CLOSE PRICE 2.16 | YTD PRICE CHANGE (%) ▼ 40.5



Egypt Gas

CURRENCY EGP | CLOSE PRICE 50.57 | YTD PRICE CHANGE (%) ▼ 8.88



Sidi Kerir Petrochemicals

CURRENCY EGP | CLOSE PRICE 5.52 | YTD PRICE CHANGE (%) ▼ 38.53



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THE PETROLEUM SECTOR'S ACHIEVEMENTS IN H1 2019/20



Implemented projects
9



Developing
North Sinai Phase 2 &
South Baltim Fields



Investments
EGP 11.7 billion



Estimated Capacity
75 mmcf of Natural Gas



Natural Gas Sector achieved a growth rate of
4.5%.



A NEW COMMERCIAL DISCOVERY
AT SOBHI WELL "SD-12X"

Company



SDX Energy

Date



April 2020

Location



South Disouq Concession

Depth



7,245 feet

Estimated Reservoir



24 bcfe of gas recoverable
and condensates

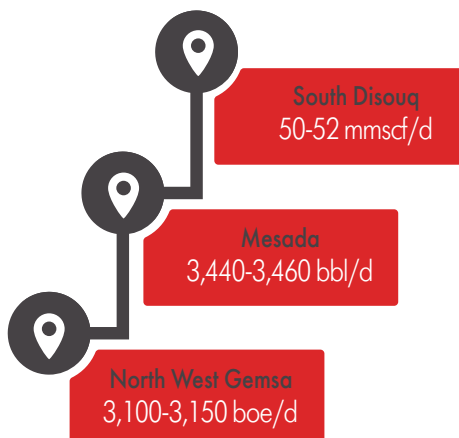
Plans for 2021



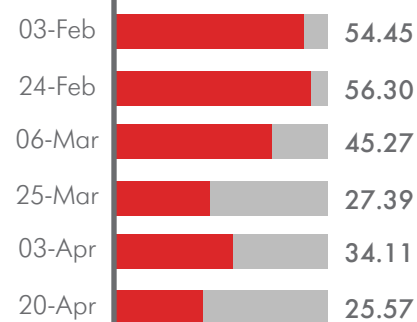
Tie to Ibn Yunus-1X with
costs of \$3.5 million



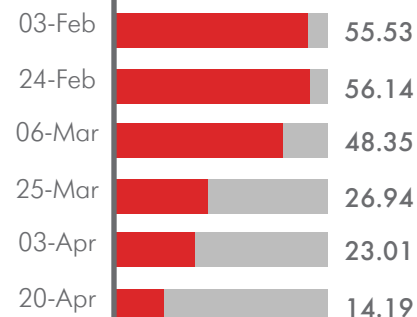
SDX'S GROSS PRODUCTION PER
CONCESSION IN Q1 2020

INTERNATIONAL
OIL PRICES

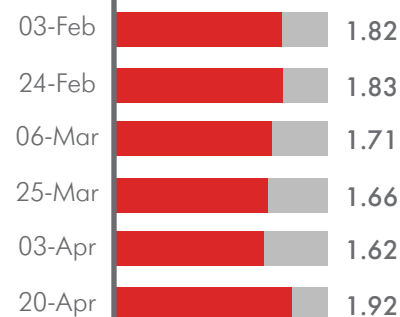
BRENT PRICES (\$/bbl)



OPEC BASKET PRICES (\$/bbl)



NATURAL GAS PRICES (\$/mmBtu)



ACHIEVEMENTS AND PLANS OF THARWA OVER 2019 & 2020



ACHIEVEMENTS IN 2019



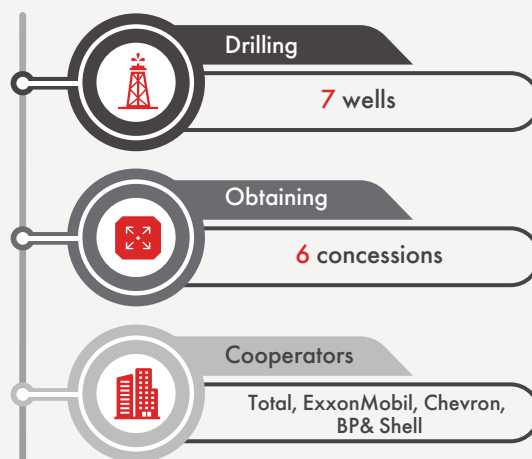
Drilled
8 wells

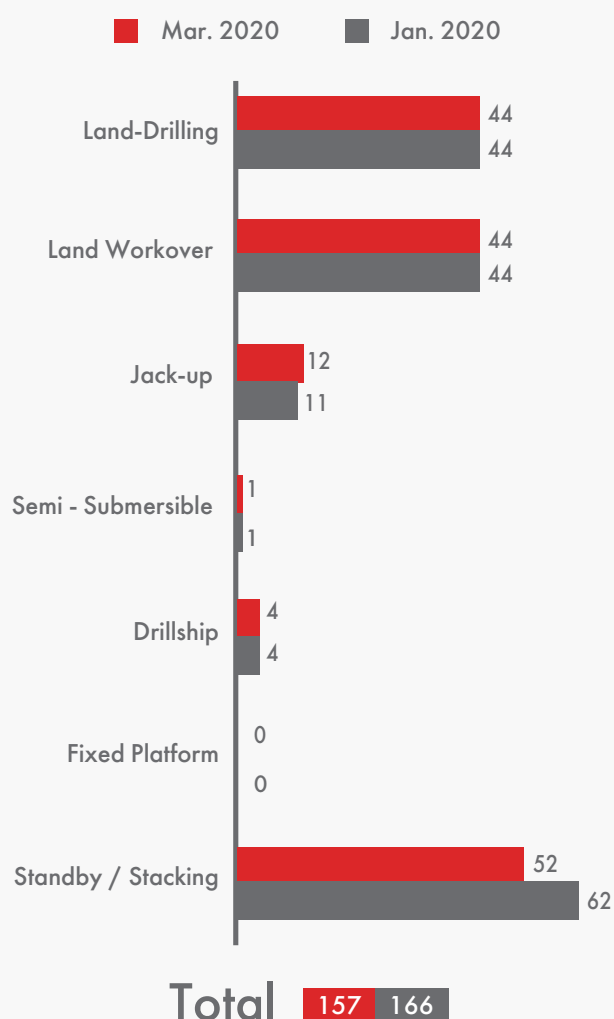
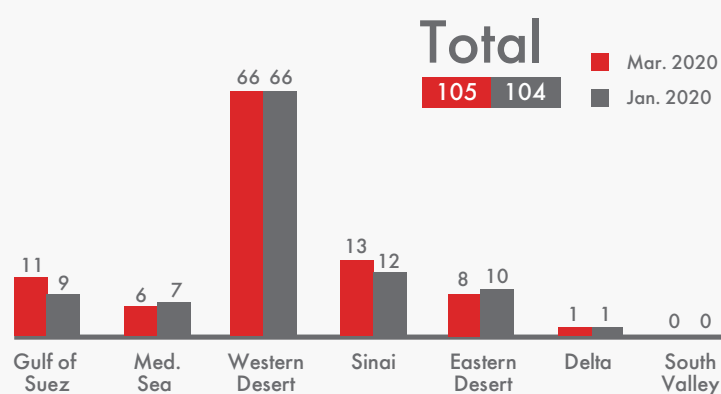


Average Production
6,8000 bbl/d of crude oil

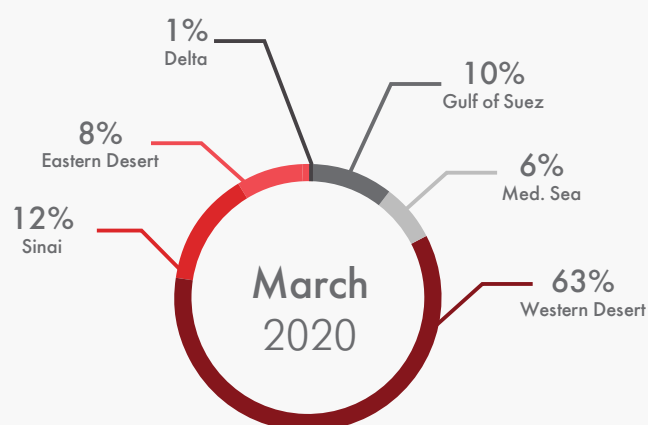


PLANS FOR 2020



EGYPT RIG COUNT PER TYPE Mar. 2020

EGYPT RIG COUNT PER AREA Mar. 2020


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. 2020
Total

526,359	BBL/D
5.7	BCF/D
5538.45	MMCF/D
81425.03	BBL/D

Numbers are calculated per day on average.

	CRUDE OIL	NATURAL GAS	SOLD GAS	CONDENSATES
MEDITERRANEAN SEA	330	3.6	3464.13	30974.65
EASTERN DESERT	62,214	0	10.13	41.52
WESTERN DESERT	290,546	1.1	1111.52	39268.74
GULF OF SUEZ	121,112	0.2	160.23	1812.39
DELTA	158	0.8	792.45	8744.90
SINAI	51,844	0	0	582.84
UPPER EGYPT	155	0	0	0

DRILLING UPDATE MAR. 2020

REGION	COMPANY	WELL	WELL TYPE	RIG	DEPTH	WELL INVESTMENTS (M\$)
EASTERN DESERT	GPC	BAKR-134	Development	ST-4	5,400	1.500
MEDITERRANEAN	BP	ATOLL NORTH	Exploration	DS-12	6,300	77.800
	PETROBEL	BALTIM SW-7	Development	EL QAHER 2	3,950	17.400
DELTA	SEA DRAGON	SD-6X-A	Exploration	ST-1	2,926	2.177
GULF OF SUEZ	EL AMAL	AMAL-18 ST A	Exploration	ADM-6	3,122	6.007
WESTERN DESERT	KHALDA	NU NORTH EAST - 1X	Exploration	EDC - 17	12,500	1.800
		PTAH - 31	Development	EDC - 54	12,800	2.500
		KAHRAMAN C - 186	Development	EDC - 61	10,918	1.300
		MENES - 11	Exploration	EDC - 61	2,865	1.500
		PTAH- 19	Exploration	EDC - 11	12,615	2.400

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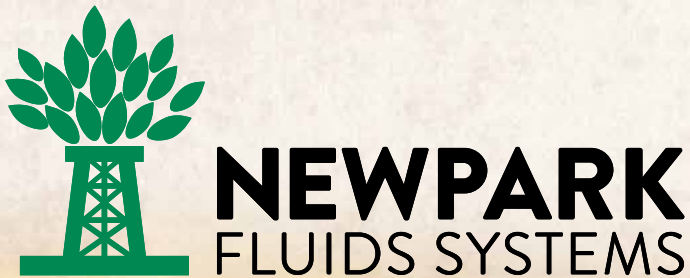
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