EGYPT
OIL&GAS
NEWSPAPER

POLITICS, ECONOMICS, AND ENERGY SECURITY: HOW PIPELINE NEGOTIATIONS PLAY A KEY ROLE

Exclusive Interview

Temperature & Corrosion-Resistant Pipelines:
an Interview with Jonathan Gibson, Shawcor VP

Research & Analysis

Egypt's Natural Gas: Bright Prospects

Smarter, Safer:
Integrating Smart Technology into Pipeline Infrastructure

Connecting Slums to the Natural Gas Grid:
How to Achieve this Goal?

Field Best Practices Workshop:
Enhancing the Role of Field Engineers

Egypt's Leading Oil And Gas Monthly Publication
October 2018 - 44 Pages - Issue 142
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HELD UNDER THE PATRONAGE OF HIS EXCELLENCY THE MINISTER OF PETROLEUM ENG. TAREK EL MOLLA

"Our unconditional commitment to the highest standards of HSE will always remain true. By keeping an uncompromising focus on HSE, we will be more efficient and more profitable. By safeguarding our most precious resource our people we are ensuring that our companies are achieving their best performance. Therefore, we have initiated the annual safety excellence award with the objective of promoting an atmosphere of friendly competition among the petroleum and mining companies in their continuous efforts towards safety excellence by recognizing the outstanding achievements, projects and initiatives in HSE. I would like to invite our sector entities and colleagues to submit their contributions to this award and work together in elevating the safety culture among our petroleum and mining communities"

H. E. Tarek El Molla
Minister of Petroleum
& Mineral Resources

HSE performance

For organizations, projects, and/or sites that recognizes the top one oil and gas operator, refinery and/or petrochemical plant that have attained sustainable model of safety performance in the Egyptian oil and gas sector.

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For top three sector employees with exceptional dedication, strong visionary HSE leadership, effective management strategies, and remarkable commitment to HSE. These champions can be from any level and any function (not necessarily from HSE department).

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- Egyptian state owned Oil and Gas sector entities and their affiliates are invited to submit for the **1**st Annual Safety Excellence Award.
- Submissions for the HSE awards are accepted from HSE or Operations Seniors and shall be endorsed by other three different seniors in the same organization/project that had been influenced by this achievement.
- Each entity can only have one HSE Award submission and a single nomination for the HSE Champion of the year .
- Deadline for submissions is **5:00** pm, **31** st October **2018.**

To submite your application for safety excellence award visit :
http://www.petroleum-modernization.org/safety/

EDITOR'S NOTE

Pipelines are the backbone of the oil and gas sector. Reliable pipeline infrastructure leads to great production enhancement and cost reduction, and opens new markets and economic prospects. Given this, Egypt Oil & Gas has decided to explore the technical, economic, and business-related aspects of Egypt's pipelines.

Jonathan Gibson, Shawcor vice president, business development international composite production systems, has joined us during his visit to Cairo to comment on the innovative high-temperature and corrosion-resistant pipelines that Shawcor is introducing to the Egyptian market. For our interview section, we have also sat with Wafaa Kassem, risk and insurance director for Maridive Group, who told us about her journey through the company, its history, and the risks of its work.

Following the government's plans to link 684,000 households across 18 governorates to the national gas grid, Egypt Oil & Gas has talked with experts about the challenges of connecting households from overpopulated areas to the national grid and the government's alternatives to overcome those challenges. In addition, you can find relevant information on the key role of pipeline negotiations considering its political, economic, and energy security aspects.

On pipeline technology, we bring you insights on the application of smart technology to pipelines as well as different methods to mitigate pipeline corrosion. Egypt Oil & Gas Research & Analysis Department has also contributed to this issue with a brief report on Egypt's natural gas resources – the full version of the report will be published soon and can be purchased by contacting our marketing team. You can also find in this issue the coverage of Egypt Oil & Gas's inaugural Field Best Practices Workshop.

As always, thank you for your readership and support. Hope this issue is as pleasant to read as it was to prepare.

EDITOR IN CHIEF

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EGYPT OIL&GAS NEWSPAPER

EGYPT'S LEADING OIL AND GAS MONTHLY PUBLICATION

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NATURAL GAS ACCOUNTS FOR 20-40% OF INDUSTRIAL PRODUCT COSTS

Natural gas accounts for between 20% and 40% of the total cost needed to produce industrial products, according to a source at the Egyptian Natural Gas Holding Company (EGAS). Natural gas sales to the industrial sector are priced according to separate tariffs, different from those used for the domestic and commercial sectors. The government raised natural gas tariffs for households and businesses by EGP 0.075 at the beginning of August, increasing prices by as much as 75%, although these price increases do not necessarily affect all companies in the industrial sector.

DOMESTIC BUTANE PRODUCTION COVERS MORE THAN 50% OF EGYPT'S NEEDS

Domestic butane production covers almost 50% of the market's needs, said Abed Ezz El Regal, head of the Egyptian General Petroleum Corporation (EGPC). He clarified that consumption witnessed a slight increase since Eid al-Adha, reaching 16,000 tons per day, 8500 tons of which are provided by the domestic production. He added that the Ministry of Petroleum is working hard to increase petrochemical production by opening new refineries.

EGYPT TO PAY UNION FENOSA $2B IN GAS DISPUTE

Egypt will pay $2 billion to Union Fenosa Gas Company as a settlement for halting gas supplies to the company's Damietta LNG plant in 2012. Union Fenosa, a joint venture (JV) between Italian Eni and Spain's Naturgy, took the case to the International Center for Settlement of Investment Disputes in 2014 arguing that the government had breached contract by stopping supplies. The Egyptian government was forced to suspend gas exports in 2012 due to ongoing political turmoil in the country. Naturgy said in a statement that the court ruled that Egypt had failed to give "fair and equitable treatment" to Union Fenosa, and was in breach of a bilateral investment treaty with Spain.

GUPCO CRUDE PRODUCTION HITS 71,000 B/D IN FY 2017/18

The Gulf of Suez Petroleum Company's (GUPCO) produced an average of 71,000 barrels per day (b/d) of crude oil and condensates in fiscal year (FY) 2017/18 from its field in the Gulf of Suez. Sabry Abu el Wafa, head of GUPCO, said that the company added over 10 million barrels of crude oil in 2017/18, which represents 41% of annual output. The reserves increased due to drilling two new development wells and two exploratory wells. Abu el Wafa revealed the information during a general assembly chaired by petroleum minister Tarek El Molla to review GUPCO's performance during the last financial year.

PHARAONIC PETROLEUM ANNOUNCES 174 BCF OF GAS PRODUCTION IN FY 2017/18

Pharaonic Petroleum Company produced 174 billion cubic feet (bcf) of natural gas and 2.2 million barrels of condensates during FY 2017/18. Speaking during a review meeting with oil minister Tarek El Molla, company head Hassan Abady said that the company's Ras El Bar concession produced 108 bcf during the last fiscal year. Abady said that the production from Atoll field seven months ahead of schedule with 350 million standard cubic feet per day (mmcf/d) production capacity was among the company's biggest achievements of the year. The field produced a total 66 bcf of natural gas during the year.

PETROBEL DRILLED 35 WELLS IN 2017/18

Belayim Petroleum Company (Petrobel) drilled 35 wells in FY 2017/18 at a total cost of $179 million. Company head Atef Hassan said that the newly-drilled wells include 30 wells in Sinai, and five wells in Nile Delta. The company also spent $137 million on conducting 307 well maintenance operations. The Petrobel chief's comments came during a meeting with Minister of Petroleum Tarek El Molla to review the company's performance in FY 2017/18. Petrobel is pushing ahead with plans to establish a 36-km pipeline connecting Nooros wells in the Nile Delta to an onshore processing plant in order to maintain the field's 1.2 bcf/d production rate.

EGYPT OIL & GAS LAUNCHES CSR SUBCOMMITTEE

Egypt Oil & Gas Technical Committee has officially launched the Egypt Oil & Gas Corporate Social Responsibility (CSR) Subcommittee. The initiative aims to promote CSR awareness in the Egyptian oil and gas sector, and increase participation in social programs and community services. The subcommittee had its first meeting on September 3 at the headquarters of Shell Egypt. The members have discussed their goals and approaches, suggesting that the objectives of Egypt's Vision 2030 and the Ministry of Petroleum's Modernization Program could be used as a blueprint for the subcommittee's future actions.

QALAA HOLDINGS LOOKS TO INCREASE SHARES IN ERC

Qalaa Holdings is in negotiations to increase its shareholdings in the Egyptian Refining Company (ERC), Qalaa managing director, Hisham El Khazindar, said. Qalaa Holdings currently owns 16.2% of the company's shares, and hopes that it can acquire a larger stake by increasing its level of capital investment. The move is part of a wider investment drive as the company looks to expand its holdings in companies operating in a number of sectors such as ERC, Taqa Arabia and Tawazon. The ERC is a joint venture between the state-owned Egyptian General Petroleum Corporation (EGPC) and the Arab Refining Company (ARC) – a company owned by a consortium of private investors including Qalaa Holdings.

EGYPT DELAYS PURCHASE OF OIL PRICE HEDGING CONTRACT

The government will delay purchasing the oil price hedging contract, despite agreeing a deal with several investment banks, Minister of Finance Mohamed Maait has said. The contract aims to secure the country against fluctuating oil prices, and the government had entered talks with J.P. Morgan and Citibank to provide the contract earlier this year. Maait pointed out that the Brent price reaching around $81 per barrel affected the national economy negatively, adding that Egypt is keeping an eye on the current ongoing events between the US and Iran regarding oil prices.

EGYPT TO REOPEN DAMIETTA LNG FACILITY

The Ministry of Petroleum has reached an agreement with its partners in the Damietta liquefaction plant to gradually re-open the facility and export natural gas produced from Zohr in 2019, a source said. The re-opening of the plant comes after six years halt as the Damietta plant had stopped in July 2012, the source pointed out. Italian Eni is currently working on establishing an onshore pipeline from the Zohr gas processing plant to the Damietta plant. According to the agreement, Eni is entitled to export part of its production share if the local market needs are covered.

NATURAL GAS PRODUCTION INCREASES BY 19.4% YOY

Egyptian natural gas production increased by 19.4% year-on-year (YOY) to reach 3.805 million tons in June 2018, compared to 3.286 million tons in June 2017. Statistics published by the Central Agency for Public Mobilization and Statistics (CAPMAS) reveal that Egypt's consumption of natural gas increased by 7.4% between June 2017 and June 2018, rising from 3.688 million tons to almost 3.961 million tons. Monthly figures show that Egypt's gas production declined by 2% between May and June 2018, while consumption rose by 1.4% to 3.9 million tons of natural gas in May 2018.

AGIBA PETROLEUM INVESTS $237M IN 2017/18

Agiba Petroleum Company invested $237 million during FY 2017/18. Company head Mohamed El Kafas said that the East Aman, Karnak and North Meleiha wells added around 1.1 million barrels of crude oil to proven reserves.

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- Ensures accurate measurements

PETROLEUM, FINANCE MINISTRIES AGREE REAL ESTATE TAX STANDARDS FOR PETROLEUM SECTOR

The petroleum and finance ministries have agreed on the standards for calculating real estate taxes on petroleum and mineral facilities. Tax on petroleum facilities will be calculated based on the "developed value" of the land. Calculations will not contradict existing compliance agreements and will be consistent with international standards. The Egyptian cabinet announced that a protocol was signed by the two ministers in the presence of Prime Minister, Mostafa Madbouly, at the cabinet's headquarters. The protocol was signed in light of the provisions of the 2008 Building Property Tax Law. The law outlines the need for a mechanism by which real estate tax can be levied on land used for important infrastructure such as industrial and petroleum installations.

EGYPT TO EXPORT 250 MMSCF/D OF GAS TO JORDAN

The Egyptian Ministry of Petroleum has finalized negotiations with Jordan to sign a deal for exporting around 250 mmscf/d of gas to a Jordanian electricity-generating power plant, an official source at the ministry said. Gas exports will start in 2019 as a new agreement will be signed with Jordan with new prices different from the original agreement. According to the new agreement, Egypt will resume exporting natural gas to Jordan in early 2019 via the pipeline linking the two countries, said the source, adding that the agreement would help turning Egypt into an energy trade regional hub.

EGYPT TO CONNECT 72,800 HOUSEHOLDS IN QALYUBIA TO NATIONAL GAS GRID

Egypt is planning to link 72,800 households in Qalyubia province to the national gas grid by the end of 2018. Yasser Salah, head of Egypt Gas Company, said that 1,840 properties have been connected to the grid so far this year and that another 30,000 are in the process of being linked. He also noted that 844,500 households have so far been connected to the grid in the province. Salah revealed the information in a speech during a field visit by Minister of Petroleum, Tarek El Molla, and Alaa Abdel Halim, governor of Qalyubia.

PETROLEUM PRODUCTION DROPS BY 2.56% YOY

Production of crude oil, condensates, and butane fell by 2.56% YOY in June 2018, producing 2.63 million tons compared to 2.69 million tons in June 2017. CAPMAS statistics show that consumption of petroleum products in Egypt dropped by 0.53%, recording 3 million tons in June 2018, from the 3.016 million tons consumed in the same month in 2017.

EOG TECHNICAL COMMITTEE DISCUSSES UPSTREAM OPERATIONAL EXCELLENCE CONVENTION

The Egypt Oil & Gas (EOG) Technical Committee gathered on September 5 at the Kuwait Energy Egypt premises to discuss the activities that will take place during its 2nd Upstream Operational Excellence Convention. The event will happen in December under the High Patronage of H.E. Eng. Tarek El Molla, Egypt's petroleum minister. The convention brings together representatives of national and international oil companies (NOCs and IOCs), and service companies to share and discuss best practices to optimize operations and increase production. It will also present a Young Professionals Day to encourage the career development of young professionals in the sector.

EOG TECHNICAL COMMITTEE WELCOMES NEW MEMBERS

Egypt Oil & Gas (EOG) Technical Committee has welcomed five new members to its board. Karim Badawi, Managing Director of Egypt and East Mediterranean at Schlumberger; Hussam Abuseif, Director and General Manager Egypt, Sudan, and South Sudan at Baker Hughes, a GE company (BHGE); Sameh Sabry, DEA Country Manager; Hussein Fouad El Ghazzawy, Schlumberger former Vice President and General Manager; and Marwan El Shazly, Petroleum Services Marketing and Contracts Manager at Pan Marine.

ZOHR PRODUCTION REACHES 2 BCF/D

Natural gas output from Zohr has reached 2 bcf/d within the first nine months of production. Italian oil major Eni, which started production at the Zohr field in December 2017, announced that the field's output is set to plateau at 2.7 bcf/d in 2019. Zohr's production increased due to starting the fifth production unit (T4), which is supported by the eight gas producers as well as a new 218-km subsea pipeline. Zohr field is the biggest natural gas field in Egypt and is located in the Shorouk concession.

ABU QIR ACHIEVES 263 MMSCF/D GAS OUTPUT IN 2017/18

Abu Qir Petroleum produced an average 263 million standard cubic feet per day (mmscf/d) of natural gas during FY 2017/18, a 45% increase from FY 2016/17. Output levels were boosted after four wells at North Abu Qir were linked to production. The company also produced 5,025 b/d of oil and condensates, a 58% increase from the previous fiscal year, and 239 tons of butane per day, a 36% increase from the year before. Over the course of the fiscal year Abu Qir produced a total of 96 bcf of natural gas, 1.8 million barrels of crude oil and condensates, and 87,000 tons of butane.

EGYPT, ITFC SIGN $2B PETROLEUM FINANCE DEAL

The International Islamic Trade Finance Corporation (ITFC) has agreed to finance $2 billion worth of petroleum products, as a part of a larger $3 billion agreement with Egypt's Ministry of Investment to fund the import of a number of basic goods. The deal was signed by the head of the Egyptian General Petroleum Corporation, Abed Ezz El Regal, and the ITFC's CEO, Hani Salem Sonbol. El Molla revealed afterwards that he and Sonbol had had a productive discussion about increasing cooperation in the upcoming period, pointing out the benefits the ITFC can have on several aspects of the modernization program.

AMOC POSTS EGP 1.48B PROFIT IN 2017/18

Alexandria Mineral Oils Company (AMOC) posted profits of EGP 1.48 billion in FY 2017/18, a 35% increase from the EGP 1.1 billion profit made in FY 2016/17. AMOC head Amr Mostafa said that the company's market value has risen from EGP 2 billion at the end of FY 2015/16 to more than EGP 15 billion at the end of FY 2017/18 – a 750% increase in value. The company's board of directors have agreed to pay out dividends of EGP 0.85 per share in two installments. The first EGP 0.55 payout will take place in October 2018, while a second EGP 0.3 disbursement will occur in February 2019.

EGYPT'S NATURAL GAS OUTPUT REACHES 6.6 BCF/D

Egypt has boosted its natural gas output to record 6.6 bcf/d upon the news that Eni had succeeded in boosting Zohr's production to 2 bcf/d. Minister of Petroleum Tarek El Molla said that the increase was thanks to the efforts of all oil and gas employees and government workers. Zohr's total natural gas in-place is estimated at around 850 bcm, which may double the country's total gas reserves. Eni, which started production at the Zohr field in December 2017, announced that the field's output is set to plateau at 2.7 bcf/d in 2019.

BUTANE IMPORTS DECREASE BY 16.4% YOY IN JUNE 2018

Egypt's butane imports decreased by around 16.4% YOY as the country imported 139,800 tons in June 2018, compared to 167,600 tons in June 2017. The new figures published by CAPMAS show that Egypt's monthly butane imports dropped by 35.9%, compared to the 218,100 tons imported in May 2018. Meanwhile, Egypt's butane consumption rate remained at 324,500 tons in June 2018 – the same figure recorded in June 2017. The country's butane output grew by around 4.3%, reaching 155,500 tons in June 2018, up from the 149,100 tons in 2017.

SAUDI ARABIA

Saudi Arabia's sovereign wealth fund borrowed $11 billion from international banks after plans for an initial public offering (IPO) of state-owned oil firm Saudi Aramco were delayed indefinitely. This is the first commercial loan taken on by the kingdom's sovereign wealth fund – the Public Investment Fund (PIF). **The Aramco IPO was expected to raise around $100 billion, and its postponement has created a financial hole for the PIF,** which also has major multi-billion dollar tech and infrastructure investments.
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The Saudi government has offered Aramco a 40-year concession term for the kingdom's oil reserves, replacing its current evergreen contract which permits it indefinite exclusive rights to the resources. The agreement overturns norms in place in since the 1930s when the government first allowed private companies to drill in Saudi territory. **The new agreement imposes a finite concession term on Aramco, although the company will be able to renew the contract at the end of the term.**

Aramco doubled its scientific employee base to 1,300 and has greatly increased its patented technologies over the past five years. The Saudi state-run oil company was granted 230 patents in 2017 by the US Patent and Trademark Office, four times as many as the 57 it filed in 2013. Aramco has also opened nine new research centers including ones in Detroit, Paris and Beijing. The company's scientific workforce now stands at 1,300 out of 65,000 total – twice as many as it employed five years ago.

Aramco has awarded a contract to China's Harbour Engineering Arabia for the construction of two drilling islands in its Berri oilfield. The two islands are part of Aramco's Berri Increment Program (BIP), and will be constructed on the north and south sides of the King Fahd Industrial Port causeway in Jubail off the east coast of Saudi Arabia. Also included in the project is **the construction of a new gas oil separation plant (GOSP) in Abu Ali Island, as well as additional gas processing facilities at the Khursaniyah Gas Plant to process 40,000 barrels per day (b/d) of condensate from the field.**

Aramco announced that it will choose between six companies to develop the $6 billion Berri Offshore Oilfield Increment Program project. The six contenders for the engineering, procurement, and construction (EPC) contract are the **UAE's National Petroleum Construction, Italian contractor Saipem, Subsea 7, American companies Dynamic Industries and McDermott, and India's Larsen & Toubro.** The project for the development of the field includes building 10 production deck modules, subsea pipelines, and a tie-in platform. The field will produce more than 250,000 b/d of crude once operational.

IRAN

The National Iranian Drilling Company (NIDC) signed a memorandum of understanding with an Iraqi company to conduct drilling and oil well repair at the Basra and Az Zubeir oil fields. The NIDC will support the drilling operations of an unnamed partner in the fields, and have also joined the Iraqi partner in bidding for local drilling tenders conducted by Eni and Lukoil.

Greek company Hellenic Petroleum suspended purchases of Iranian crude oil in June because of the recently reimposed US sanctions on the country. "The Iranian crude was effectively stopped from our feedstock in June 2018", Deputy Chief Executive Officer Andreas Shiamishis stated. He added that the company has secured oil purchases for its refineries from other sources including Europe and Saudi Arabia.

Japanese oil distributors plan to suspend Iranian crude imports in October before US sanctions become effective on November 4. Japan had previously requested a sanctions waiver from the US on the basis that it has already made efforts to cut its imports of Iranian crude. Government data shows that Japanese imports of Iranian crude fell 28% to 165,481 b/d in FY 2017/18.

India will not cut all its crude exports from Iran, according to a senior Indian government official. "Definitely we are not going to zero," the official said, adding that the government will clarify its purchasing policy after it completes detailed talks with top-level US government officials.

South Korea's imports of Iranian crude plummeted 86.5% year-on-year (YOY) in August, in anticipation of US sanctions on the country taking full effect. South Korea imported just 1.71 million barrels of crude and condensate from Iran in August, compared to the 12.63 million barrels imported in the same month last year, and down 72.4% from 6.20 million barrels in July. **The August figures mark the 10th consecutive monthly decline in Iranian imports since November 2017 when they fell 26.8% YOY to 10.37 million barrels.**

Iran is planning to move its primary export terminal from the Arabian Gulf to the Gulf of Oman to avoid using the strategic Strait of Hormuz, President Hassan Rouhani stated in a televised speech. He said that exports have already started shifting from the Khark Island terminal in the Gulf to the Bandar-e-Jask terminal on the Gulf of Oman, adding that the move would be completed by the end of his term in 2021.

KUWAIT

Kuwait and Iraq plan to appoint consultants to study the development of shared oil fields, as a solution to long-standing tensions over cross border oilfields. Kuwaiti oil minister Bakhit al-Rashidi said that the two countries should agree on plans for shared fields by the end of the year, as well as agreeing on a supply of Iraqi natural gas to Kuwait.

UAE

UAE emirate Ras Al Khaimah will build six new power stations in residential areas by 2020 at a cost of $133 million. Director-General of the Federal Electricity and Water Authority (Fewa), Mohammed Saleh, said that more power is needed for the new residential areas in the emirate, as well as new and ongoing industrial projects and property investment projects.

The UAE has built a 120 MW, $100 million power station in the Yemeni port city of Aden. The station, reportedly powered by one of the world's largest engines, is located in the Al Haswa district and is slated to become operational in October.

Abu Dhabi National Oil Company (ADNOC) Gas Processing has awarded a $1 billion gas production contract to a joint venture between Spain's Técnicas Reunidas and Target Engineering Construction. The project aims to increase gas production by between 200 million and 400 million cubic feet per day at the Habshan offshore fields. ADNOC Gas Processing also plans to launch a tender for the design of two gas processing plants.

Emirati Brooge Petroleum and Gas Investment Co (BPGIC) plans to raise $400 million in capital in an IPO on the London exchange before the end of 2018. BPGIC is looking to diversify its investor base through the IPO, and has approached both HSBC and First Abu Dhabi Bank to advise on the public share sale, the sources said. The IPO plan comes as the company looks to expand the storage capacity of its Fujairah oil hub.

ADNOC is looking to sell a minority stake in its refining business, and is in advanced negotiations with multiple potential buyers including Italy's Eni. The stake in its $20 billion refining business will likely be split between two or more parties.

Abu Dhabi's investment company Mubadala plans to list 25% of Spanish oil company Cepsa, of which it owns 82.5%, in an IPO. Sources close to the matter estimated Cespa's value to be around $11.6 billion, making it one of the largest oil company listings of the last decade. The listing is expected to take place in Q4 2018, and a greenshoe option will be available for more shares to be sold depending on the demand.

IRAQ

Iraq's state oil marketer SOMO is closing in on a deal with China's state-run Zhenhua Oil for a joint venture to help boost Iraqi oil sales to China, the world's top oil importer. "Zhenhua helped Iraq to penetrate the Chinese market and make more revenues for Iraq," a source familiar with the situation said, adding that the proposed joint venture would be a 50/50 split and could be finalized by October or November.

TEMPERATURE & CORROSION RESISTANT PIPELINES:

AN INTERVIEW WITH JONATHAN GIBSON, SHAWCOR VP

Shawcor, an oilfield services company specialized in providing services to the pipeline sector, is introducing the Flexpipe Linepipe High Temperature (FPLP HT) into the Egyptian market. The FPLP HT is a pipeline able to operate in higher temperatures and extreme conditions, and is the most reliable onshore high-temperature linepipe on the market thanks to its winning combination of high-density polyethylene, helically-wound epoxy-free dry fiberglass, and a protective outer jacket.

JONATHAN GIBSON, Shawcor vice president, business development international composite production systems, sat with Egypt Oil & Gas during his visit to Cairo and told us about the company's innovative technologies and interest in the Egyptian oil and gas sector.

BY MARIANA SOMENSI, OMNIA FARRAG

HOW DOES SHAWCOR'S TECHNOLOGY CONTRIBUTE TO THE ENHANCEMENT OF EGYPT'S PIPELINES?

One of the strengths of our product is that it does not corrode. We know that in Egypt, as in many countries, corrosion is a huge problem. With the steel pipeline, you get corrosion, and in some places they are replacing the pipes even after a few months or years, which is expensive, because you are replacing the pipelines all the time. Our pipelines do not corrode and are expected to have a lifetime of about 20 years.

WHAT MAKES THE PIPELINE THAT RESISTANT?

It is made of high-density polyethylene - a plastic - which in fact is the same as the coating that is put on steel pipelines. So, rather than having a coated pipeline, you just have a plastic pipeline. Around the polyethylene liner we wind glass fiber, then on the outside we extrude more high-density polyethylene. The product is very simple: it is plastic and glass.

DOES THIS AFFECT THE COST OF THE PIPELINES?

The install cost of these pipelines is less than that of a steel pipeline, because it not only comes with these materials, but it also is produced on big reels. The reels, for instance, can be 570 meters, meaning you connect it every 570 meters, whereas a steel pipeline is connected every 12 meters. A steel pipeline needs to be welded, you have to conduct an x-ray inspection, put a field joint on it; ours has a joint that can be connected in about 20 minutes. That makes the install cost of the pipeline less than a steel pipeline.

In addition, going back to what I was saying about corrosion, if you look at the lifetime of a pipeline, we do not need corrosion inhibitors; we do not need cathodic protection and so on, since there is no metal, and that makes the lifetime cost much cheaper as well.

WHAT IS THE ADVANTAGE OF HAVING DIFFERENT PIPELINES WITH DIFFERENT TEMPERATURE CAPACITIES?

It covers different temperatures of the oil coming out of the ground. If the temperature of the oil is less than 60°C, we recommend one version; if the temperature is between 60°C and 82°C, we recommend the higher temperature version. One other further factor is that the pipe can be laid on the surface, which gets hot, particularly in the summer here in Egypt. We generally advise our customers to use the higher temperature pipe because, although the pipe comes with UV protection that reflects the sunlight, it still gets hot. For instance, in Saudi Arabia, we have just sold the higher temperature pipe, not only because the oil is hot but also because the ambient temperature in the summer can become very hot as well.

WHAT MAKES EGYPT AN ATTRACTIVE MARKET FOR SHAWCOR? HOW DO YOU EXPECT THE COMPANY TO EXPAND ITS PRESENCE IN THE COUNTRY?

Egypt is an interesting market because it has a number of pipes which are corroding; they are leaking and they are having to be replaced regularly - so our pipe is a simpler solution to attend this big market. Our pipe is only for use onshore, and there is a lot of drilling and activity in the Western Desert; it is perfect for that because, apart from being used to replace pipelines, it is good from the wellhead to the first treatment separator, what we call gathering lines.

Additionally, in some countries, such as Saudi Arabia or Abu Dhabi, there is only one potential customer. Here we have lots of interesting companies: international companies - we have met Shell and Apache - we are also working with EGPC, so we see an interesting market as there are lots of potential customers. We also see the enthusiasm from EGPC, who has recognized the benefits they would get from using our pipelines. The make-up of the Egyptian market is particularly interesting for us.

We are building a plant in Saudi Arabia, because one of our largest customers is Saudi Aramco.. The plant in Saudi Arabia will obviously be much closer to Egypt than Calgary in Canada, which is where our pipes are made at the moment. In the future, we will be able to offer a 'just in time' solution for the Egyptian market. We see the demand, and we also see that in the future we will be able to supply our pipes more quickly and cheaply.

SHAWCOR HAS COLLABORATION AND PARTNERSHIP AS VALUES FOR ITS BUSINESS. HOW ARE THESE VALUES APPLIED IN THE COMPANY'S INTERACTIONS WITH ITS CLIENTS IN EGYPT?

We are working with a local partner to develop the business in Egypt, we will also be looking to train local people to do the installation of our pipe. Our practice in all countries is always to train local people; we will send people here to train Egyptians who will then conduct the installation. Through our pipe we provide employment for local people and obviously improve their skills by training them, then once a year we come back and check and recertify them.

A PROFESSIONAL JOURNEY IN MARIDIVE; AN INTERVIEW WITH WAFAA KASSEM, MARIDIVE GROUP - RISKS & INSURANCE DIRECTOR

Maridive Group is one of the largest providers of offshore marine and oil support in Egypt, and one of the biggest in the region in terms of fleet size. The Maridive Group in Egypt manages fleets in in the Mediterranean and Red Seas, North and West Africa, the Caspian Sea, and Latin America (Venezuela and Brazil). Wafaa Kassem, risk and insurance director for Maridive Group, spoke to Egypt Oil & Gas about her journey through the company, its history, and the risks of its work.

BY OMNIA FARRAG

HOW DO YOU DESCRIBE YOUR OVER 25-YEAR JOURNEY IN MARIDIVE?

I joined the company in 1992, and moved to the insurance team in 1998. After years of proving myself and involving myself more widely on every and each matter, I was promoted in 2005 to the position of Risks and Insurance Director. I was reporting to the chairman of the board, and after he passed away I have been reporting to the executive president and board member. I have learned enormously from their expertise and I owe them for the knowledge I have gained.

My function within the group involves dealing with all the branches and sectors responsible for all types of insurance, including personnel, properties, liabilities, offshore projects, and all the activities that Maridive is doing.

WHAT ARE THE CORE VALUES OF MARIDIVE?

Maridive Group is a pioneer and has extensive experience and very understandable management. Since the establishment of the company, the main shareholders have always been very keen to keep the company at the highest standard of professionalism.

> *"WE KNOW THAT TEAM MEMBERS ARE THE MOST IMPORTANT ASSET WE HAVE FOR ENSURING OUR BUSINESS IS RUN PROPERLY."*

AS PART OF MARIDIVE'S MANAGEMENT, HOW CAN YOU MAKE SURE THAT THE TEAM IS MOTIVATED AND PRODUCTIVE AND HOW DO YOU DEVELOP YOUR TEAM?

Communication is key for motivation, hence, delegation is crucial. The only way to achieve our goals is by having an adequate team.

Part of my work is to provide the best benefits to the team members. We know that team members are the most important asset we have for ensuring our business is run properly. We are trying to submit some benefits, so I am dealing with some of the HR colleagues.

We are always trying to develop the team by attending conferences and seminars. We also have a training department specialized in this matter to arrange the suitable programs.

CAN YOU COMMENT ON MARIDIVE'S HISTORY?

The Maridive Group of Companies provides a very wide range of offshore support services worldwide. It has enjoyed steady growth since its formation more than four decades. The Maridive Group was founded in 1978, although the business actually started in 1977. It was known as Maridive and Oil Services S.A.E. The group's mother company started operations in Port Said as a free zone joint stock company governed by the Egyptian foreign investment legislation. Since then, it has established an enviable reputation in the provision of complete and integrated services and solutions to offshore oil companies.

We are one of the largest companies of our type in the MENA region, from the Gulf of Mexico, North and South Africa, the Mediterranean, the Caspian Sea, Gulf region, and others.

Maridive has an adequate and incredible experience with oil companies in Egypt and all over the world.

It always enhances its projects (underwater diving works, construction and repair, pipe-laying, fabrication and marine works, etc). It has high qualifications, specifically for underwater services, offshore and onshore.

I would like to mention the three main shareholders -God bless their souls- who I believe are the reason behind the obvious success of Maridive. Although, I did not meet Mr. Maged Nadim - because he passed away before I joined Maridive - I was lucky to meet and work with Captain Issa Eleish and Mr. Magdy Zeid, and they were one of a kind. They had a vision and knew how to implement it impeccably.

WHAT ARE THE TYPES OF INSURANCE YOU OFFER TO YOUR EMPLOYEES?

Maridive does not only provide the social insurance, which is obligatory by law, but also provides some benefits on the company's own cost.

I personally get involved when an incident happens to any of the crew (injury, death, or kidnapping) to compensate the employee and follow the appropriate precautions.

WHAT IS THE MOST CHALLENGING ASPECT OF YOUR ROLE IN MARIDIVE AND HOW DO YOU OVERCOME IT?

My job actually is very interesting and very challenging. I am on call 24/7 as we have vessels in different time zones in the world. Insurance is to cover the risk when incidents happen, my role comes in. In the oil field, incidents are drastic. Several are challenging to be studied, reviewed, and justified to convince the insurers to compensate us.

CAN YOU DESCRIBE YOUR EXPERIENCE OF BEING A MANAGER IN AN INDUSTRY THAT IS DOMINATED BY MEN?

In Egyptian culture, it is not that easy to be a woman with a voice to be heard. In Maridive, however, they assist, cooperate, and accept us, because being a female or a male at work is not an issue as long as you are doing your job. Some may be difficult at times, but the majority are very cooperative and accepting.

AS A FEMALE, DID YOU FIND IT HARDER FOR YOU TO CLIMB THE COMPANY'S HIERARCHY COMPARED WITH YOUR MALE COUNTERPARTS?

It was quite difficult, to be frank. However, I can say that 95% of employees were accepting and helped me. The minority that opposed me being a director fortunately did not succeed.

It is a very different environment. You will not find many other companies offering such jobs to women. However, the culture here in Maridive is open-minded. They do not care about gender as long as the person is doing his or her job efficiently. They will make sure to fully support him or her regardless.

> *"YOU WILL NOT FIND MANY OTHER COMPANIES OFFERING SUCH JOBS TO WOMEN. HOWEVER, THE CULTURE HERE IN MARIDIVE IS OPEN-MINDED. THEY DO NOT CARE ABOUT GENDER AS LONG AS THE PERSON IS DOING HIS OR HER JOB EFFICIENTLY."*

EGYPT'S NATURAL GAS: BRIGHT PROSPECTS

By Amina Hussein, Mahinaz El Baz

Egypt is closer than ever to becoming a natural gas energy hub in the Eastern Mediterranean region. It is moving steadily towards reaching natural gas self-sufficiency in 2019 and even resuming exporting activities by 2020.

The state recently put efforts in restructuring the natural gas legal framework in order to facilitate the transformational phase. The new law supports liberalizing the market and guarantees its competitiveness.

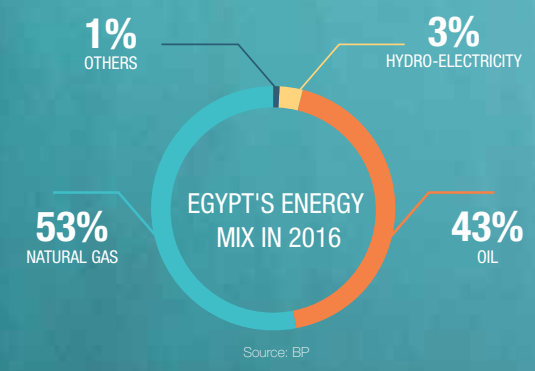
In 2017, natural gas represented 53% of the Egyptian energy mix, according to the British Petroleum (BP) 2018 Statistical Review. In addition, natural gas investments represented around 12.1% of Egypt's total inward investments from fiscal year (FY) 2010/11-2015/16, the Ministry of Planning, Monitoring and Administrative Reform (MPMAR) reported. This indicates the importance of the commodity in the different aspects of Egypt's economic activities.

LEGAL FRAMEWORK

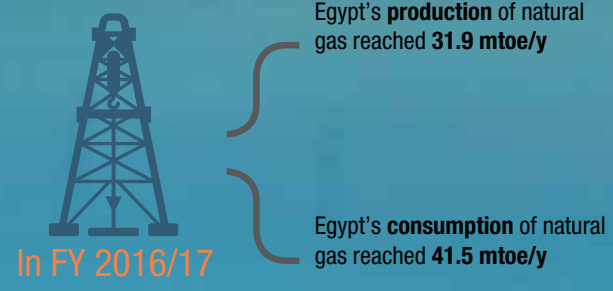
Prior to 2017, natural gas activities in Egypt were covered by law No. 217 of 1980. Under this law, the Egyptian Natural Gas Holding Company (EGAS) was responsible for all operations related to transportation and domestic supply of natural gas to different sectors. Private companies were allowed to construct and operate gas pipelines as well; however, carrying out these activities depended on EGAS's approval and monitoring.

The decreasing domestic supply and the growing domestic demand of natural gas forced Egypt to start importing natural gas. Over the past few years, the state has invested billions to close this supply-demand gap. As a result, the government made the decision to liberalize the natural gas market. EGAS and the Egyptian General Petroleum Corporation (EGPC) announced in May 2015 the decision to allow private companies to use the state-owned national gas grid to import, transfer, and distribute natural gas to the local market.

The decision to liberalize was enshrined in law in July 2017, when EGAS and EGPC declared the issuance of the Gas Market Law No. 196 for 2017. At the same time, it was announced that the market would be fully liberalized by 2022. In February 2018, the law was followed by the promulgation of the executive regulation to implement the law.



Source: BP



Source: MPMAR

MAIN PRODUCTION AREAS

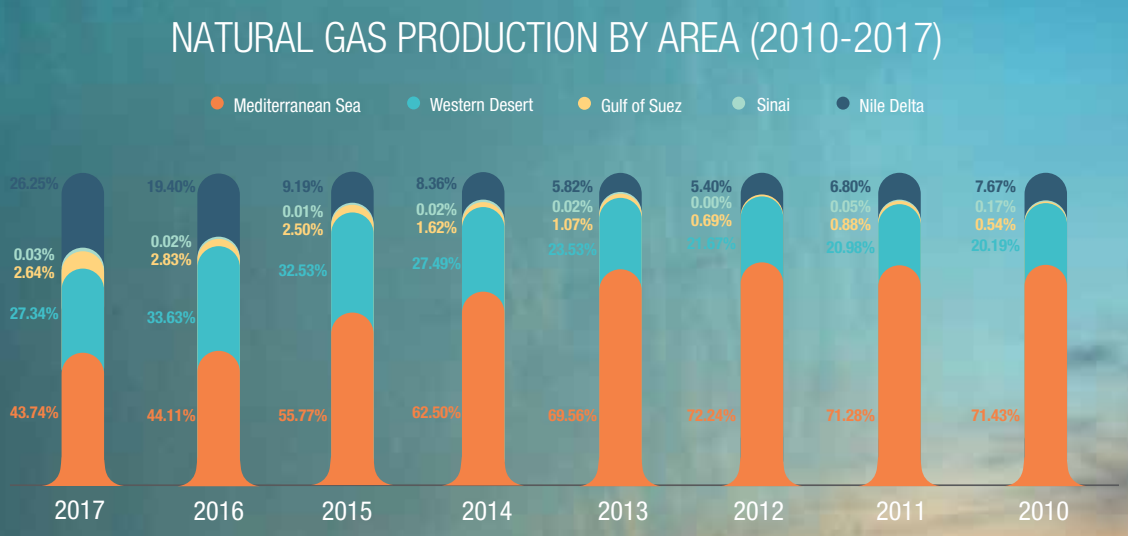
Egypt's production of natural gas comes mainly from the Mediterranean Sea, which possesses around 87% of the country's total proven gas reserves. On average, the Mediterranean's natural gas production represented 58.1% of Egypt's annual production between 2010 and 2017. Moreover, Egypt has more than 40 producing wells in the area. In 2017, Mediterranean fields produced around 27569.3 billion cubic feet per year (bcf/y), according to EGPC and EGAS.

In 2012, the Mediterranean Sea and the Western Desert regions produced 94% of Egypt's natural gas. Over time, this share declined in favor of production coming from the Nile Delta. During FY 2016/17, 19 new natural gas discoveries were announced, of which five were in the Nile Delta and 10 in the Western Desert, according to EGAS's Annual Report. The new natural gas discoveries added about 2008.3 bcf to actual reserves.

Meanwhile, Egypt's share of natural gas production from Sinai and the Eastern Desert is nearly zero. Natural gas wells in these regions participate annually with 0.01% and 0.08% of the total natural gas production in Egypt, respectively.

PRODUCTION

According to official figures, Egypt's natural gas production was almost stable between FY 2010/11 and FY 2011/12, with a slight decrease from approximately 46.3 million tons equivalent per year



Source: EGPC and EGAS

MEDITERRANEAN NATURAL GAS PRODUCTION REPRESENTED 58.1% OF EGYPT'S ANNUAL PRODUCTION BETWEEN 2010 AND 2017.

(mtoe/y) to 46.07 mtoe/y. Since FY 2012/13, the level of production has been declining steadily. Annual production reached its lowest level of 31.3 mtoe/y in FY 2015/16, before recovering slightly in FY 2016/17 to reach 31.9 mtoe/y.

On average, Egypt produces approximately 39.2 mtoe/y of natural gas, which makes Egypt the fifth largest natural gas producer in the Organization of Arab Petroleum Exporting Country (OAPEC) during the comparison period. In terms of percentage share, Egyptian production represents 8% of the total amount produced by OAPEC member states.

CONSUMPTION

Egypt's gas consumption reached its highest level in FY 2016/17 with 41.5 mtoe/y. On the other hand, it reached the lowest level in FY 2010/11 with 35.2 mtoe/y, according to MPMAR. The Egyptian domestic market, on average, consumes 37.8 mtoe annually, which represents approximately 14% of the natural gas consumed across OAPEC countries.

Egypt is the fourth largest natural gas consumer in OAPEC, following Saudi Arabia, the United Arab Emirates, and Qatar.

Egyptian consumption significantly increased from FY 2010/11 to FY 2012/13 by 4 mtoe/y. After that, consumption witnessed a decline until FY 2014/15, and increased once more in FY 2015/16.

CONTRIBUTION TO INVESTMENT

Natural gas private investment declined to its lowest level during the comparison period in FY 2013/14, recording EGP 21900 million. Similarly, public investment reached its lowest levels in the same year, contributing only EGP 3609.4 million. Overall investment, therefore, hit a low of EGP 25509.4 million in that year.

Both private and public natural gas investments reached a peak in FY 2011/12, recording EGP 39512 million and EGP 14779.2 million respectively. This meant that overall investment peaked in FY 2011/12 with EGP 54291.2 million.

EGYPT IS THE FIFTH LARGEST NATURAL GAS PRODUCER IN OAPEC.

From FY 2010/11 to FY 2015/16, total public investment amounted to EGP 40998.6 million, while total private investment reached EGP 175350.4 million. Overall investments over the comparison period reached EGP 206349 million.

The highest percentage of natural gas investment as a share of the total inward investments in the Egyptian economy was achieved in FY 2011/12. Natural gas activities represented approximately 22% of the total investments that took place in Egypt in this fiscal year. Nevertheless, this declined dramatically in the following year, decreasing by 50% and representing only 11% of the total inward investments.

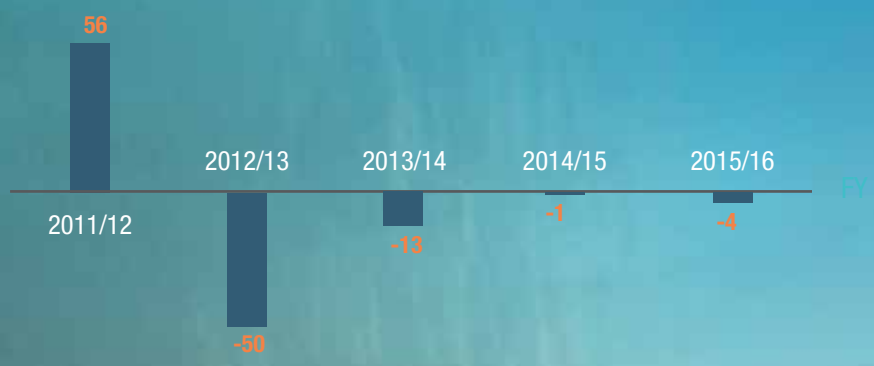
Moreover, the share of natural gas investments compared to other sectors hit a low of 9.1% in FY 2015/16.

Despite the increasing consumption trend, the recent natural gas discoveries – Zohr field in particular – have encouraged Egypt to set plans to reclaim its old position as a natural gas exporter, and establish itself as a regional energy hub.

Egypt is currently working towards several objectives, including speeding up output at newly discovered natural gas fields, liberalizing the natural gas market, reducing gas flaring, and diversifying energy sources to obtain self-sufficiency.

The Egyptian government is optimistic about achieving natural gas self-sufficiency by 2019. Moreover, the state expects to restart exporting natural gas by June 2020, according to the statements made by the president and the petroleum minister.

CHANGE IN NATURAL GAS CONTRIBUTION TO INVESTMENT (%)



Source: MPMAR

Since providing the petroleum industry's stakeholders with the full picture is our responsibility, Egypt Oil & Gas Research & Analysis division is offering a full report covering Egypt's prospect of becoming a regional natural gas energy hub. The full report will be available soon. To get your copy please contact Ayman Rady, Egypt Oil & Gas' Business Development Manager: Ayman@egyptoil-gas.com

CONNECTING SLUMS TO THE NATURAL GAS GRID: HOW TO ACHIEVE THIS GOAL?

BY OMNIA FARRAG

Providing citizens with safe, clean, and sustainable sources of energy is an important step towards Egypt's development, where most of the households depend on butane cylinders for heating and cooking. That is why successive governments have been adopting programs to connect houses to the national gas grid.

For the current phase of the project, the Egyptian government is aiming to link 684,000 households across 18 governorates to the national gas grid. This is a part of a bigger plan that aims to connect 2.3 million households to the grid by 2021, as Marwa Khalil, World Bank Energy Specialist told Egypt Oil & Gas. If finished on time, 8.3 million houses will be connected to the grid, which will be a 40% increase in number of houses connected to the national gas network up from 5.8 million already connected, according to a World Bank report. Khalil noted that the project is currently targeting 20 governorates and work has started on 11 of them.

The program focuses on connecting houses in poor and overpopulated areas and linking governorates where no city is connected to the national gas grid - a mission that looks challenging putting into consideration its financial and technical obstacles. Egypt Oil & Gas talked to experts who are working on the project in order to know more about the project's technical aspect and the measures needed to make the connection of overpopulated areas become reality.

TECHNICAL ASPECT OF THE PROJECT

Generally, the project uses two types of pipelines: Steel and Poly Ethylene (PE). The former is used for high-pressure gas pipelines ranging from 70-7 Bar, Mohamed El Sayed, Senior HSE Engineer at Town Gas, told Egypt Oil & Gas. They are installed at the project's connection linking between the Pressure Reduction Station (PRS) and the city gate regulator, which are usually located outside highly-populated areas of the city, he explained.

"PE is used for medium and low-pressure pipeline (7-1 Bar) networks that are used at the project's connection from regulators until houses crossing main and secondary roads in the city," he added. Then comes the role of steel pipelines with smaller diameter and less pressure, which is used in natural gas connections inside houses and apartments.

According to El Sayed, the techniques used in the natural gas connections and pipelines simply rely on taking high-pressurized gas from a specific offtake point from the national gas grid and then reducing gas pressure. Then odorants are added for safety reasons to alert members of the public about leaks. They are added through different steps starting from PRS until ground valves downside homes.

SPECIAL TECHNIQUES TO CONNECT GAS TO SLUMS

Companies working on the project have to use special techniques to meet the Ministry of Petroleum's plan of prioritizing slums. For instance, companies normally build scaffold outside the kitchen and the bathroom next to the building or inside it as in planned areas many apartments have an inner atrium which all kitchens and bathrooms windows overlook. However, in overpopulated areas there is not enough space for technicians to build safe constant scaffold, so they use Special Scaffold, which has a different safe structure than the normal one, to connect a specific floor or apartment to the natural gas grid, El Sayed elaborated.

> IN OVERPOPULATED AREAS, ALL OTHER UTILITIES LIKE ELECTRICITY CABLES, WATER, SEWAGE PIPELINES, AND TELEPHONE LINES ARE VERY CLOSE TO EACH OTHER IN THE BOTTOM OF STREETS, SO FITTING OF NATURAL GAS NETWORKS PIPELINES WILL BE MORE DIFFICULT IN SLUMS THAN IN OTHER AREAS.
>
> François M. Jacob, QHSE Manager, National Gas

Stretch Steel pipes are another tool helping the project team overcome technical challenges faced in slums due to lack of spaces between houses. El Sayed explained that while companies use normal steel pipes to connect natural gas to buildings, in some cases of slums buildings they use Stretch Steel pipes, which can connect many houses through one steel pipe instead of connecting each house with a separate one.

SAFETY CHALLENGES FOR GAS CONNECTIONS IN SLUMS

By definition, houses in slums are not planned and areas are overpopulated, which raises questions about the feasibility of achieving the ministry's plan of prioritizing these areas without any safety compromises. "In overpopulated areas, all

other utilities like electricity cables, water, sewage pipelines, and telephone lines are very close to each other in the bottom of streets, so fitting of natural gas networks pipelines will be more difficult in slums than in other areas," François M. Jacob, QHSE manager at National Gas, explained to Egypt Oil & Gas. Additionally, the apartment has to be furnished with some specifications, such as the installation of ceramic in the walls of bathrooms and kitchen. Flats in slums might not meet these requirements, Jacob added,

From his side, El Sayed believes that the main hazard in slums is the fact that it has more people than its capacity and houses are very close to each other, which means more people will be harmed if any leakage or fires take place.

OVERCOMING SAFETY CHALLENGES IN SLUMS

The two experts agree that the degree of hazard faced in slums is bigger than it is in less populated areas; however, these hazards can be combated using safety measures provided by the state-operated Egyptian Natural Gas Holding Company (EGAS) and the Gas Regulatory Authority. These measures include radiographic examination, painting inspection, pneumatic/hydrostatic tests, commissioning and handover, Jacob stated, adding that operators should also apply clear warning signs on the city gate regulators along with securing network pipelines and provide network service points and external riser pipelines on buildings. Jacob, who also serves as client service general manager for National Gas, emphasized the importance of educating people about safety measures within the household itself and the steps they should take if they smell gas. Additionally, companies have to write emergency numbers on the gas meter as per EGAS regulations.

THE PROGRAM FINANCES

The program is supported by the Egyptian government and international organizations. The total cost of the project is EUR 1.710 million (approximately $1.989 million). The World Bank contributes with a $500 million loan with interest rate of 7.19%. The French Development Agency (AFD) gives Egypt around EUR 70 million ($81.43 million) with a EUR 68 million ($79.10 million) grant delegated to AFD by the European Union, mainly earmarked for the project's institutional and social components.

From the Egyptian government's side, the Ministry of Petroleum adopted a program that enables citizens to pay for the cost of gas connection installations through monthly EGP 30 payments added to the gas bills. Following this, citizens will be able to pay the cost over six years without having to pay any interest.

In August, the Egyptian government increased natural gas prices for household use. The cost of consuming up to 30 cubic meters rose from EGP 0.100 to 0.175 per cubic meter, recording a 75% hike, while consumption of between 30-60 cubic meters went up from EGP 0.175 to 0.250 per cubic meter, a 42.8% rise. Consuming more than 60 cubic meters now costs EGP 0.300 per cubic meter instead of EGP 0.225. Yet, Khalil believes that it is still cheaper than butane cylinders, considering that the cost of a butane cylinder increased from EGP 30 to EGP 50 for households in mid-June.

"Expenses of fuel used for cooking will be reduced as households will substitute [butane] cylinders by natural gas, which is cheaper. Also, people will not have to stay in long lines for hours to get liquefied petroleum gas (LPG), especially if the stores are far from their homes," Khalil elaborated.

IMPACT ON CITIZENS

Replacing butane with natural gas has a direct impact on the country's budget as the country still depends on imports to fill the gap between butane production and consumption. Additionally, the increase in natural gas output and prospects of achieving natural gas self-sufficiency indicate that the state will pay less when using natural gas instead of butane. For citizens, Khalil noted that gas is not only a more economic option when compared to butane cylinders, but also "significantly safer, cleaner, and more available."

FIELD BEST PRACTICES WORKSHOP: ENHANCING THE ROLE OF FIELD ENGINEERS

BY MARIANA SOMENSI, MATTHEW HOARE

Egypt Oil & Gas (EOG) launched the first Field Best Practices Workshop on September 22. The event took place at the Qarun field in the Western Desert under the High Patronage of H.E. Eng. Tarek El Molla, Egypt's minister of petroleum. The one-day workshop was technically prepared by the Egypt Oil & Gas Technical Committee and sponsored by Apache, and offered an opportunity for field engineers to share best practices in oil and gas upstream operations.

"The EOG Technical Committee came up with this idea for the Field Best Practices Workshop after our successful Upstream Convention earlier this year, and we thought it was important to highlight lots of the excellent work going on the fields … and share the best practices and the technology that is being used," Thomas Maher, President and COO of Apex Energy and Chairman of the EOG Technical Committee, said in his opening speech.

The workshop featured six presentations from six different joint ventures, in addition to five poster presentations that were available for attendees during the coffee break. Attendees included Abed Ezz El Regal, CEO at the Egyptian General Petroleum Corporation (EGPC); Ashraf Abd El Gawab, Chairman of Qarun (QPC); Thomas Maher, President and COO of Apex Energy and Chairman of EOG Technical Committee; Mohsen El Noby, Chairman of the General Petroleum Company (GPC); and Alaa El Batal, Chairman of BAPETCO.

PRESENTATIONS

SAFETY MANAGEMENT SYSTEM

In the first presentation, Ahmed Fawzy, senior engineer at BAPETCO, introduced the company's successful approach to enhance its safety management system. According to him, Process Safety Management (PSM) - a blend of engineering and management skills focused on preventing catastrophic accidents and near misses associated with loss of containment of energy or dangerous substances - is not only a social or legal obligation in the oil and gas sector, but also makes commercial sense. "It is good for business because it ensures reliability, which can be translated into more production and less operating costs," he stated.

In order to better overcome safety hazards, Eng. Fawzy mentioned the ALARP Triangle as a tool to measure risk levels within oil and gas operations. The triangle helps define the number of barriers that shall be applied in each situation – and these barriers are measures that reduce the probability of releasing hazard or its consequences.

> **"FOCUS ON THE COMMERCIAL ISSUE. ECONOMICALLY STUDY IT BEFORE PRESENTING IT AT THE EVENT, AND THE IMPACT - FROM A COMMERCIAL POINT OF VIEW - ON EACH PROCEDURE."**
>
> Eng. Abed Ezz El Regal, CEO at EGPC (on oil and gas projects)

The ALARP triangle goes from the Unacceptable Risk Zone, which includes risks that must be reduced (except in extraordinary circumstances); the ALARP Zone in the middle of the triangle, which includes risks that should be reduced where reasonably practicable, considering the costs and benefits of risk reduction; and the Acceptable Risk Zone, which consists of risks that do not need to be reduced. According to Eng. Fawzy, most of the oil and gas operations are within the ALARP zone.

After properly analyzing its hazards through the ALARP Triangle, BAPETCO's response to manage these operational hazards consisted on the enhancement of the role of frontline supervisors. According to Eng. Fawzy, frontline supervisors are essential because they provide a link between management and workers; a system for enabling the active participation in the design, implementation, and continuous improvement; a consultative relationship between management and workers; and opportunities for reinforcing mutual trust by enhancing dialogue and interaction on process safety issues.

In this context, Eng. Fawzy affirmed that the successful deployment of the PSM system based on best practice is characterized by obtaining management commitment and support, nominating a dedicated competent focal point, defining scope and objectives, carrying out gap assessment versus the requirements of PSM elements, developing a multi-year roadmap to close gaps and achieve the desired level and track progress, among other key practices that can be executed by frontline supervisors.

These key practices also include completing the procedural structure as first priority and settle the existing gaps, ensuring adequate resource allocation and cover the defined process safety roles and responsibilities, and having multi-disciplines messengers on the facility from frontline supervisors – as choosing HSE staff only for this role will be misguiding. It additionally includes developing and deploying a process safety communication plan, and monitoring work place culture to assure the workforce commitment. Managers should also recognize and reward positive safety behaviors and performance.

Commenting on Eng. Fawzy's presentation, Mark Konecki, Region Operations Director at Apache, praised BAPETCO's efforts to improve their process and operational safety management. On a side note, Konecki highlighted that oil and gas operators should, alongside their own efforts, focus on the safety performance contractors. "I think it is the contractors' safety that we struggle with the most. In general, our employees in Qarun and in Khalda do not have the same kind of incidents that the contractors have, so I think the big focus should be on those contractors' safety performance," he explained.

DRIVE RODS AND DRIVE HEADS FAILURES OF PCP SYSTEMS

PCP pumping systems have shown good performance in oil fields in comparison with RRPs under different operating conditions, like low API oil and high sand cut. In the second presentation, Ahmed Ibrahim, senior petroleum engineer at PetroDara, stated that West Bakr (WB), PetroDara, and North West Gharib have shown increasing number of PCP usage since 2010. The first PCP installation was in 2006, and over the past 12 years the technical team has gained sufficient experience to select the most effective PCPs in terms of high performance and well uptime.

According to him, the PC pump was the main reason behind WB's 25% production increase in fiscal year (FY) 2016/17. He also noted that there are around 75 PC pumps running at the fields at the moment, producing around 80% of the companies' total production, and another 20 PC pumps are planned to be run during FY 2018/19.

Although the system presents a wide range of production benefits, it also presents challenges. Its main problems consist of rod failures, pump failures, and tubing leakage. In the company's analysis of drive rods, Eng. Ibrahim has pointed out that drive rod parting includes PR failure. After investigation, it was found that the fatigue failure is the dominant failure type (+97% of failures), while the second type (tensile failures) is rarely occurring. The tensile failure mostly happens when the maximum tensile strength of sucker rod is exceeded while trying to free stuck pump, and parted PR happens due to misalignment and mis-leveling of DH with wellhead.

In addition, drive rod connection failure happens due to improper makeup torque (over TQ), while drive rod unscrew represents the highest failure frequency found in PCP drive rod systems. Eng. Ibrahim stated that the investigation showed that it often occurs due to lack of back spin control.

As for drive heads, failures include oil seal damage, mechanical failure due to manufacturing issue, misalignment or overheating due to lube oil leak, brass rings improper clearance with PR, lack of lubricant grease, drive head vibration at higher RPM due to unstable/unfixed wellhead, lack of bearing greasing, and motor failure for running at low RPM (cooling issue).

With this failure analysis, PetroDara's general recommendations for an effective PCP system consist of closely monitoring wells and recording running parameters (W.C,TQ, Rate, etc) while updating C-FER runs to check rod load and stretch; double checking RTR spacing to avoid RTR and rods damage; using VSD panel to give torque log tracking to predict premature failure of PC pumps; adjusting TQ set point for low and maximum operating value to prevent rod failure; and checking PR stick up periodically to confirm rod clamp position.

> **"I THINK IT IS THE CONTRACTORS' SAFETY THAT WE STRUGGLE WITH THE MOST... THE BIG FOCUS SHOULD BE ON THOSE CONTRACTORS' SAFETY PERFORMANCE."**
>
> Mark Konecki, Region Operations Director at Apache

Eng. Ibrahim also mentions the importance of real-time data monitoring of PCP wells; for this, including P/T downhole sensors is strongly recommended for remote wells to monitor and optimize wells remotely. In addition, it is important to perform FBU testing in a cost-effective way, establish periodical performance and failure analysis, and use failure frequency to help in maximizing well uptime.

"The company is developing a software application - Integrated Track - to track PCP & RRP failures in order to figure out failure root causes and set corrective actions," Eng. Ibrahim disclosed.

At the end of the presentation, EGPC Head, Eng. Abed Ezz El Regal, noted that, although it is important to have failures diagnosis, the oil and gas industry should also look at prevention. According to him, PetroDara has done a great job in identifying these failures, and the industry should build on this kind of analysis to start predicting failures before they occur.

From his side, Eng. Osama El Shenoufy, Account Manager, Business Development at Weatherford, stated that after valuable failure analysis such as the one presented by Eng. Ibrahim, companies should carry out a second-phase analysis to dig deeper into details and serve as reference for the industry. "I think we can have some statistics about the comparisons and challenges that have been mentioned [in Eng. Ibrahim's presentation], and we can take this over to present it to the industry," he added.

SUCKER ROD SYSTEM

The third presentation, presented by Mohamed Ghoneim, senior engineer at QPC, exposed a successful practice applied by QPC to increase run-life and reduce costs for sucker rod system. As he explained, most failures in rod string can usually be categorized as either man-made or well-made, and using proper storage and transportation techniques helps prevent some of the damages that result in premature failure.

Considering this, QPC's corrective actions to overcome these problems included training courses with Lufkin Company about rod handling in the Karama field by Lufkin Experts; close supervision of the inspection yard, the storage material and rigs during RIH to ensure perfect rod handling; and the adoption of new rod handling equipment, which were ordered and fabricated and include steel boxes, wooden blocks, thread protectors, and spreader bars. Eng. Ghoneim stated that these actions have resulted in run-life increase and protected QPC's assets from damage and failures.

When it comes to sand control, when producing sand up through production tubing, QPC's engineer noted that separation will occur. The heavier, more abrasive sand, will settle back on top of the rod pump, he explained. Sand friction causes rod buckling, as well as plunger sticking and premature wear due to sand being trapped between plunger and barrel. It also packs off cages and plunger with sand, have valves stuck open and pump stuck in setting nipple. In other to avoid these problems, Eng. Ghoneim stated that sand control can be done by tubing screen, rotating plunger, and sand tolerance pump (STP).

In the case of the tubing anchor catcher (TAC), unanchored or improperly anchored tubing allows movement of tubing string relative to rod string motion and allows rod/tubing contact and wear. When properly set, anchor/catchers eliminate tubing buckling, elongation and movement; reduces rod, tubing, and casing wear; and improves pump efficiency. In this context, QPC started to apply TAC Calculation since 2015, leading the proportion of failures due to tubing leak to decrease from 18% in 2013 to 6% in 2017.

Mahmoud Shawkat, Sales & Marketing Director, Egypt, Sudan & South Sudan at Baker Hughes, a GE company (BHGE), stated that these cost-reduction actions are an important step to attract investors. "Transferring this kind of improvement into cash is a very important message to the people who would like to invest in this kind of technology."

WELLHEAD COMPRESSION UNITS

Wellhead compression units (WHCU) are a new technology implemented by the Western Desert Operating Petroleum Company (WEPCO) at their BED 9-5 and BED 9-1 wells. The fourth presentation speaker, Walid Soliman Mohamed, Petroleum Engineering Department Head at WEPCO, introduced the technology as a method of extending the lifespan of dead oil and gas wells, reducing the amount of flared gas, and boosting the performance of a range of different artificial lift wells including ESP, PCP, BP and gas lift.

They operate by simultaneously reducing wellhead pressure to 0 psi and increasing discharge pressure up to 350 psi, therefore overcoming the back pressure that prevents the flow of oil and gas from dead wells. These units can handle 300 barrels of liquid per day (blpd) and 0.2-2 million square feet per day (mmsf/d) of associated gas, and can intake gas from multiple wells. They are also easy to position, operate and maintain.

To illustrate the effectiveness of WHCU's, Eng. Mohamed described how WEPCO has used them in two of its wells: BED 9-5 and 9-1. Before the installation of the unit, BED 9-1 was

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> Mahmoud Shawkat, Sales & Marketing Director, Egypt, Sudan & South Sudan at BHGE

unable to flow due to high back pressure from BED 9-5. After bringing in the WHCU however, WEPCO was able to reduce the wellhead pressure down to 30 psi and save around 1 mmscf of gas.

Following the presentation, the speaker fielded a number of questions from attendees. Several questions addressed protocol in the event of malfunction or abnormal pressure, and whether WHCU's required extra manpower to operate. Eng. Mohamed said that alarms can be installed on the unit in case of shutdown, eliminating the need for constant monitoring and extra employees. In events of abnormal pressure, he said that WHCU's can shut down, preventing an incident from occurring.

Regarding cost, Eng. Mohamed said that WHCU's cost around $3,000 per month to operate. Said Abd El-Moneim, QPC Operations Manager, asked about the unit's hydrogen sulfide (H2S) and CO2 tolerance. Although Eng. Mohamed acknowledged that the material was still undergoing tests, he said that to his knowledge WHCU's can handle five parts per million (ppm) of H2S and 3% sodium, which he described as good.

BACTERIAL GROWTH AND WELL PERFORMANCE

The fifth presentation of the day was delivered by Ibrahim Hassan, chemical treatment staff member at QPC. working on the company's Karama field. Ahead of the presentation, Mark Konecki described bacterial growth as "a key operating headache" for companies, highlighting the importance of overcoming the issue.

During his presentation, Hassan discussed the two principle methods used by QPC to combat the build-up of iron sulfide (FeS) and hydrogen sulfide (H2S) souring gas. According to Hassan, the accumulation of such compounds results in the plugging of ESP and SRP pumps. This in turn reduces the running time of the wells, slowing the production rate and increasing maintenance costs.

Hassan firstly described the rationale behind the company selecting THPS as its chemical of choice. According to test results, THPS fulfilled each of QPC's selection criteria, including its ability to dissolve FeS and control bacteria, as well as its suitability for all fields.

QPC uses two methods to combat scale build-up: continuous injection via slip stream carrier and chemical backwash. According to Hassan, the company uses chemical backwash (CBW) downhole when problems arise from slipstream such as plugging. He then presented the THPS injection results from the Yomna-20 and Yomna-2 wells, and the data collected from CBW programs on the Rahma-30 and Hamra-26 wells. CBW data showed a decline in net liquid above pump (NLAP) after the application of the chemical, demonstrating an unblocking or a clearing of scale from the pump.

Hassan also presented information about the history of QPC's CBW program – including the respective costs and cost savings in each of the three previous calendar years. In 2016, the company conducted 64 CBW operations at the cost of $33,105 – saving $8,580,000 in the process. In 2017 meanwhile, the company completed 61 CBW operations, at the cost of $24,735 and saving $7,100,000. These figures show the potential economic benefits CBW can have.

Hassan's presentation generated the most engaged debate of the day, with participants debating the merits of different methods of preventing the build-up of bacterial scale. Eng. Ahmed Fawzy, earlier presenter from BAPETCO, said that while slip stream carriers can be "very effective", there are other methods and chemicals that QPC could explore.

Immediately following the conclusion of the presentation, Konecki highlighted the positive economic effects demonstrated by QPC's CBW history. "Probably the most important thing we heard from you was the economic benefits that this downhole treatment has provided for Qarun," he told Hassan.

However, Alaa El-Batal, chairman of BAPETCO, remarked that the inconsistent success rate of the programs requires explanation, and said that he would like to hear further recommendations about how to prevent plugging.

The final comments came from Eng. Abed Ezz El Regal, who said that more must be done to eliminate the causes of contamination. "The root cause of this is coming from the water injection itself," he said to Hassan. "We must improve the quality of injection or add some additives to the injection to prevent the accumulation."

Hassan replied that infection had come from the drilling equipment, as well as from the water injection. Eng. El Regal then recommended that QPC experiment with two separate biocides, and suggested periodically switching between the two to prevent the bacteria from becoming acclimatized.

GROUNDWATER CONTAMINATION

The final presentation, presented by Raafat Abdelrazek, Safety Department Manager at the General Petroleum Company (GPC), dealt with the prevention of groundwater contamination, what Abdelrazek described as a "serious problem in the Western Desert". To illustrate the importance of preventing this occurring, he cited a study conducted in the US which showed that groundwater contamination had led to 403,000 people becoming infected and 80 dying.

To remedy this problem, he proposed the use of septic tank technology. These tanks separate wastewater into three layers – solid, liquid, oil/grease. Anaerobic bacteria then biodegrade the solids while liquids are disposed of in soil layers.

Septic tanks can only be used in certain types of soil however. Soil must be at least semi-permeable and not be saturated around the tank. Bedrock layers, groundwater wells, springs and trenches must also be considered when planning the installation of a septic tank.

Abdelrazek then listed the many advantages of opting for septic tanks as a practical solution for wastewater. They are simple and relatively cheap to install; they require little maintenance and can be used for as long as 20 years; they are safe, with no electrical or chemical hazards; and they can be used as a source of biogas if designed in the right way.

POSTERS

WATER FLOOD BOTTLENECKS

Besides the six main presentations, attendees also had the opportunity to engage with five poster presentations during the coffee break. In one of the posters was prepared by Hany Elbarbary, senior production engineer at Apache/QPC, in which he commented on water flood bottlenecks, explaining how the company performed pressure survey by master pressure gauge and identified high-pressure drops in the system.

According to him, the Karama area produces over 22,000 barrels of oil per day (b/d) and 175,000 barrels of water per day (BWPD) and is the largest oil producing area of QPC under waterflood recovery. Addressing waterflood bottlenecks is critically important to maintain production and water injection rates, according to Eng. Elbarbary. Two recent field projects that addressed waterflood bottlenecks resulted on a combined 8,500 additional barrels of water injection per day (BWIPD) plus the reactivations of shut-in wells and optimization of many others.

INTELLIGENT ROD PUMPING SYSTEMS

Raeid Syame, BD Executive GM at the Egyptian Maintenance Company (EMC) and M. Ghareeb, Vice Present SSi Artificial Lift, prepared a poster on ways of maximizing production and meantime between failures by applying intelligent rod pumping systems. Their poster was based on the Alamein case. The successful application of the system in the Houras field in the Egyptian Western Desert helped the Alamien Petroleum Company reduce operating expenses (OPEX) by minimizing well interventions, and by changing units running parameters for well optimization (speed, stroke length, and balancing).

CORROSION MANAGEMENT

Mohammad Mahrous, Inspection Section Head at Oil & Gas Skills, prepared a poster on production facilities integrity and corrosion management. His case study consisted of an opportunity that the company had to stand on the condition of a Re-Boiler bundles after about 12 years of service.

A visual inspection has been carried out while cutting of deteriorated sheets and tubes, according to Mohammad, and samples cut out from bundles have been subjected to chemical analysis. The scale and sediments found between the tubes was big enough to disable the main function of the Re-boiler (Hot Stabilization). High percentage of carbonates (about 10%) revealed that the water was existing continuously inside Re-boiler. Not only that, but enough to form a scale (scale tendency was high) which considered as a deviation in operating condition.

THE FLOWBACK PROBLEM

Mostafa Kortam from Petrobel prepared a poster on the inventive proppant placement halting flowback problem, using a case study carried in Sinai as example. The new proppant type has been extensively modified and developed by the company to fit all natures of sandstones of any strength (not just unconsolidated) with any reservoir fluid, according to Kortam. A spherical intermediate strength blend with angular bauxite grains has been used to provide a mechanism to prevent proppant flow back, and sintered bauxite with medium Iron Oxide levels has been used in the manufacture of welding flux.

In the first job, in well 113-168, proppant was utilized as tail-in. Pumped amount is 80 Klb representing 40% of the whole job proppant. In the second job, in well BLNE-4, proppant was also utilized as tail-in. Pumped amount is 44 Klb representing 25% of the proppant in whole job.

TIC SURVEYING

Ashraf Said, senior production engineer at QPC, had a poster on tubing-casing integrity (TIC) surveying. According to him, frequent injector tubing corrosion has led to significant tubing-casing communication and a large number of casing leaks. Tubing-casing communication negatively affected injection operations and required high well intervention costs to repair the problem. Unidentified tubing-casing leaks was the main challenge for the company, as he explained. The solution to this problem included the implementation of a company-wide Tubing Casing Integrity (TCI) program, and the identification of wells with tubing-casing communication earlier as work over candidates before advanced corrosion put them at risk of catastrophic tubing failure.

CONSTRUCTIVE FEEDBACK

The workshop finished with a constructive feedback from the organizers and attendees. From his part, Eng. El Regal praised the workshop's role in enhancing communication among the technical employees in the Egyptian oil and gas sector. According to him, the presentations – which covered safety and environment issues – meet the sector's priorities.

After thanking the organizers for their efforts in preparing the workshop, the head of EGPC made some recommendations, which included the creation of a committee to evaluate the commercial issues of oil and gas projects. "This is my personal advice to my colleague engineers: to focus on the commercial issue; economically study it before presenting it in the event, and the impact - from a commercial point of view - on each procedure and study."

Representing the organizers, Thomas Maher thanked the presenters and attendees, and highlighted his satisfaction to see six different joint-venture companies presenting successful practices in the workshop. "I remember seeing some of the problems presented here being mentioned in the past, and I am glad to see that there is work – as we saw today – being done to address them."

Each one of the workshop speakers received a certificate for their participation at the end of the event. Ibrahim Hassan, who made the presentation on bacterial growth and well performance, was awarded a recognition of best presentation.

POLITICS, ECONOMICS, AND ENERGY SECURITY:

HOW PIPELINE NEGOTIATIONS PLAY A KEY ROLE

BY FELIX FALLON

Pipelines are an important foreign policy consideration. The energy security concerns of fuel-importing countries are often at the center of political disputes, while petroleum-rich countries wield power through the strategic distribution of their energy wealth. A transit country can use its geographical location as a bargaining chip for political gain, yet in some cases can be vulnerable if the exporting country threatens to avoid its territory. Third party countries not directly involved with negotiations have also been known to take preventative measures in cases where a pipeline threatens their political or economic security.

Graham Coop, partner at Volterra Fietta and former General Counsel to the Energy Charter Secretariat, told Egypt Oil & Gas that politics has always been intrinsic to pipeline negotiations.

"I don't think the days have yet come, and I wonder if they ever will come, where gas and electricity, but particularly gas, will be traded on a purely commercial and utilitarian basis," he says. "Gas has always had and probably for the foreseeable future will continue to carry political connotations."

THE TRANSIT COUNTRY

Examining the role of transit countries is crucial to understand the importance of pipelines to international relations. Transnational pipelines that cross borders of two or more countries introduce a host of jurisdictional challenges for construction, operation, and maintenance. All parties have to reconcile the interests of the others involved in the project, and establish a rent-sharing agreement. If the intermediary transit country is not satisfied with the terms and the fees paid, or the circumstances for the agreement change over time, it has the potential to disrupt the security of the energy supply. The same is the case with pipelines where the proposed transit country (if fortunate in its geographical position) can stop a project in its tracks to make a political stand against one of the other parties.

This is exactly what happened with the Qatar-Turkey natural gas pipeline, proposed in 2009 to transport Qatari gas from the South Pars field to Europe, passing through Saudi Arabia and Syria, and crucially bypassing Russia. Syrian president Bashar Al-Assad refused to allow the pipeline to pass through Syrian territory; his rationale for which, an AFP report claimed, was "to protect the interests of [his] Russian ally, which is Europe's top supplier of natural gas".

For Syria, ensuring the dominance if its ally Russia in the European gas market proved more important than the economic gain of being a transit nation.

Transit countries can also exert power through what economists refer to as obsolescing bargaining. This is where bargaining power shifts from the investor to the host country after the initial investment has been made and the project has started commercial operation.

"The power dynamic certainly shifts between the time when a pipeline is being planned and the time construction is completed; this is a case of obsolescing bargaining. It is the same with any other investment project: once the investment has been made it is normally no longer possible to unmake it, or to move it somewhere else," Coop stated.

After investment is made, the bargaining power of the initial investor - the option of investing elsewhere - is diminished, and the transit country receiving the investment is subject to fewer constraints and gains a coercive ability. The high fixed costs and low operational costs make pipelines very susceptible to obsolescing bargaining as the initial development costs make up the majority of investment needed.

"It is not so easy for the other country to force the transit country to respect [the initially agreed] terms once the construction is completed," Coop added; however, this eventuality is often accounted for in the negotiations. "It's not uncommon to have long-term contracts for 20-30 years with price clauses which are designed to operate so that both parties' economic interests are taken into account. For there not to be a completely anarchic free-for-all, often there is the possibility of a three yearly or other price review."

THE EXPORT COUNTRY

The Nord Stream Pipeline – running between Russia and Germany while bypassing central and eastern Europe – demonstrates how energy-exporting countries may attempt to weaken the position of transiting countries. Indeed, Moscow's detractors have criticized the construction of the pipeline as a means of exerting political influence over its neighboring eastern European nations.

The subsea Nord Stream pipeline was laid in the Baltic Sea, thereby circumventing Ukraine and Belarus – the two main transiting countries for Russian gas to enter Europe. Prior to its construction in 2011, Russia had been involved in several energy supply disputes with both Ukraine and Belarus. In 2007, Russia reduced oil and gas supplies to Belarus following disagreements over energy sale prices, debts owed by Belarus and transit fees paid by Russia. Russian state-owned company Transneft terminated oil shipments down the major Druzhba pipeline, threatening Belarus's energy security. Similarly, Russian gas giant Gazprom halted all natural gas supplies into Ukraine for nearly three weeks

in 2009 after Gazprom and Naftogaz Ukrayiny failed to reach agreement over gas prices and outstanding debts.

The construction of Nord Stream pipeline stripped Ukraine and Belarus of a significant part of their power as transiting countries, and provided Moscow with additional political and economic leverage. "[Nord Stream] is born out of a strong desire by Russia to change the dynamic of its relationship with Ukraine in such a way that Ukraine no longer has any control over the transit to western Europe of that part of Russia's natural gas exports that flow through that pipeline," Coop said.

The Nord Stream pipeline is therefore designed to remove Ukraine's ability to disrupt Russian natural gas exports. While Russia and Ukraine threatened each other's respective energy interests, Ukraine's power remained contingent on Russian gas transiting its territory. Taking advantage of its geographical position, Russia has created for itself an additional option for transit thereby diluting Ukraine's power to threaten its exports.

Moscow is seeking to further decrease its reliance on Ukraine and Belarus as transit countries by constructing two additional lines between Russia and Germany, known as Nord Stream 2. The pipelines are expected to be completed in 2019, and will increase the total capacity to 110 billion cubic meters of gas per year.

THIRD PARTY INTERVENTION

Pipeline politics is a game that is played, not just by exporting, importing or transiting countries, but also by third parties: countries whose interests are affected by a proposed pipeline that intervene and attempt to turn events in their favor.

This is what happened during negotiations for the proposed Nabucco pipeline: a project intended to transport gas from Iraq, Turkmenistan, Azerbaijan, and Egypt through Turkey to Europe. The pipeline would enable Europe to diversify its energy sources and lessen its dependence on Russian oil and gas.

"Russia, for some time until now has successfully preempted this pipeline by directly purchasing a large proportion of the available gas supplies from many of the states which would have otherwise sold their gas to be fed into the pipeline, thus depriving the pipeline of some of its potential customers," Coop said. Russia intervened because the pipeline represented a potential rival to its gas supply to Europe. Removing incentives for its construction therefore ensured the security of its own energy sales.

The interference of a third party in pipeline negotiations is also demonstrated in the proposed gas pipeline from Iran through Pakistan to India (IPI) that became entangled in a strategic contest between the US and Iran.

The proposed construction of the IPI defied Washington's sanctions regime. It would have been a major setback to its ambitions of isolating the Islamic Republic, risking Pakistan and India becoming dependent on Iranian gas.

In May 2008, the Heritage Foundation – an influential right-wing think tank - published a paper that spelled out an integrated approach to the IPI from the US political standpoint, which included changing the domestic and regional conditions that had combined to make the IPI pipeline a potentially viable enterprise. Its list of recommendations included increasing political pressure on the two countries to exit the talks, encouraging an alternative pipeline between Turkmenistan and India, and assisting both countries to develop alternative sources of energy.

This list of preventative actions demonstrates the lengths which America was willing to go to prevent the construction of the IPI and maintain pressure on Tehran.

Some of the strategies recommended by the Heritage Foundation were implemented to good effect. For instance, American pressure on India resulted in the country increasing its LNG imports from 3.49 billion cubic meters (bcm) in 2004/05 to 12.31 bcm in 2009/10, most of which came from Qatar, a US ally. India was also influenced by its growing relationship with states opposed to Iran, specifically the Gulf countries and Israel. Saudi Arabia in particular had long pressed India to limit its economic ties with Iran, and increase its hydrocarbon imports from the Gulf.

Pakistan, however, remained keen on the IPI as it did not have the same energy flexibility as India; in 2009, natural gas accounted for almost a third (31.9%) of Pakistan's energy mix according to the IEA. Prospects of Pakistan-US cooperation were undermined by suspicions of collusion between Islamabad and the Taliban. Despite Pakistani efforts to secure the services of international oil companies such as Shell, Total and BHP, these companies were ultimately deterred by mounting US pressure against both Tehran and Islamabad.

PIPE-TO-PIPE POLITICS

Pipelines are intrinsically political. For most countries in the world – whether exporters, energy-dependent importers, transit countries or third parties defending their national interests – pipelines are a key foreign policy tool and an essential means of economic development. Their importance is such that global powers such as Russia and the US will go to sometimes extreme measures in order to defend their economic and political interests.

Perhaps more than any other type of infrastructure, pipelines can provide several forms of economic and coercive power: transit nations can obtain a degree of power over the exporting and importing countries while receiving long-term economic benefits; exporting countries can establish new, reliable relationships with purchasers, while also using energy dependency as a source of political leverage; and importers can secure new sources of energy and ensure their needs are met.

SMARTER, SAFER: INTEGRATING SMART TECHNOLOGY INTO PIPELINE INFRASTRUCTURE

BY MATTHEW HOARE

The proliferation of smart technology within the pipeline management industry is providing companies with a previously-unthinkable level of control when it comes to monitoring, inspecting and maintaining pipelines. This new array of devices– loosely termed the Industrial Internet of Things (IIoT) – has brought operational technology (OT) within the digital domain. Companies now have real-time access to critical pieces of infrastructure and can harvest vast amounts of data that can be used to improve efficiency and minimize safety hazards. This not only helps assuage health, safety and environmental (HSE) concerns and protects against reputational damage, but can also improve a company's bottom line when implemented intelligently.

MAKING PIPELINES SMARTER

In their report into the uses of smart technology in pipelines, Schneider describes IIoT as being the "DNA of modern industrial operations". This technology has become an integral part of certain industrial products – pipeline infrastructure being one of them. Nowadays, all pieces of infrastructure crucial to maintaining a functioning and efficient pipeline – from pumping stations and tank farms to terminals and compressor stations – are connected via the IIoT.

Supervisory Control and Data Acquisition (SCADA) systems are at the heart of this technological revolution. SCADA is the point of the contact between a company's IT systems and their OT, linking a network of microcomputers to the array of sensors, end devices and factory machines attached to pipeline infrastructure. Pipeline engineers and data analysts can now monitor a raft of different variables; temperature, air and water quality, pressure, flow and pipeline conditions to name just a few. The ability to collect and analyze such large pools of data provides companies with a powerful predictive tool. Rather than react passively in problematic scenarios, engineers can now put preemptive measures into practice before damage occurs.

SCADA is used, not just to monitor systems, but to control connected devices integrated into pipeline infrastructure. A host of actions – such as turning a valve or changing the behavior of a mass flow controller – can now be done remotely. This provides companies with a greater degree of control and significantly improves their responsiveness in problematic scenarios.

> "THE KEY TO HANDLE THESE ISSUES [INTEGRATING IIOT TECHNOLOGY TO OLD PIPELINES] IS THROUGH ADEQUATE PLANNING, PHASED IMPLEMENTATION, AND TO SEGMENT THE APPLICATION OF THE NEW TECHNOLOGY TO CERTAIN DOMAINS WITHIN THE COMPANY."
>
> Thony Brito Cardier, Regional Sales Manager at Rockwell Automation's Digital Oilfields Division

In-line inspection pigs are equipped with smart technology in order to provide greater insight into the integrity of the pipeline. A range of devices that analyze the diameter, roundness and thickness of the pipe, and produce data on a range of variables such as temperature and pressure. These tasks are achieved through different types of pig: magnetic flux leakage (MFL) pigs are deployed to scan for welding deficiencies after the pipelines has been constructed, while caliper pigs analyze the circumference of the pipeline and check its roundness. Some pigs are equipped with ultrasonic technology which measures thickness, while others utilize electromagnetic acoustics to identify weaknesses in the pipe. Tilt sensors and odometers, meanwhile, record the pig's movements and show engineers where the damage is located. The sophistication of this smart technology now allows companies to detect pinhole leaks, and faults that are almost impossible to find through visual inspection.

GREATER TRANSPARENCY

The most obvious benefit that IIoT has brought to the pipeline management industry is the improvement of safety standards. As discussed already, smart technology has made incidents preventable by making the entire infrastructural network visible to engineers and analysts. It is this new level of transparency that Thony Brito Cardier, regional sales manager at Rockwell Automation's digital oilfields division, says is one of IIoT technology's most powerful aspects. "What IIoT helps with is to integrate these systems in the OT domain and give visibility of the status of an asset at any given moment while providing the ability to remotely access, diagnose, and troubleshoot the controllers," he says. It is this transparency that allows companies to identify issues with pipelines, compressors and valves before they become problematic.

SAVING MONEY

The benefits of IIoT technology go beyond safety – investing in smarter infrastructure can also have a positive impact on a company's balance sheet. While the initial outlay may be expensive – depending on the integration strategy of the company – these costs, according to Cardier, can be made back quickly, "sometimes in weeks, depending on the complexity of the project".

The ability to automate many processes reduces operational expenditure. Companies are no longer required to employ large in-house teams charged with operating and maintaining manual functions. Instead, automated technology means that small teams of specialists can now perform a large range of tasks, eliminating a substantial amount of maintenance and support costs.

IIoT technology can also significantly increase a company's productivity. Connected wireless communication systems now allow engineers working in remote locations to contact other areas of the company, enabling them to solve problems faster with only the click of a button.

Companies building new pipelines for greenfield sites will see reduced capital investment costs. Unlike older pipelines, new pipelines will be fitted with smart technology from the outset, eliminating the necessity to upgrade and replace legacy devices.

IIoT does not just save cash on a day-to-day basis. By improving pipeline safety, it can potentially save companies from having to pay out huge sums in financial damages and repair costs in the event of a mechanical failure or faulty pipeline. There are many case studies that could be used to illustrate the potentially-disastrous financial effects of an environmental incident, incurred both from the cost of repair and the subsequent fines imposed by governments.

OVERCOMING THE HURDLES

There are, of course, challenges that come with integrating IIoT into existing pipeline management systems. First and foremost, all companies must be mindful of the vulnerability of smart technology to outside exploitation. The growth of automated processes and remote access technology, and the connection of OT to centralized IT systems mean that cyber criminals now have more points of attack than ever. Data theft, virus intrusion and loss of control over remote processes are clear and present threats that have the capacity to cripple a company's day-to-day operations. It is critical therefore that a watertight cyber security policy is adopted, and that adequate training is provided to all employees regarding how to maintain the integrity of the company's digital systems.

Another challenge associated with IIoT technology involves how to integrate it with older, non-smart devices. Moreover, some pieces of technology cannot be made smart and will always need to exist alongside IIoT infrastructure. There are specific measures that companies can take to overcome this. Fog computing for instance is an IIoT technology that allows for older devices to become somewhat integrated into modern systems. More broadly, however, companies should plan carefully how they introduce new technology, how legacy technology will interact with it, and how they begin to transition away from older systems.

"The key to handling these issues is through adequate planning, phased implementation, and to segment the application of the new technology to certain domains within the company," Cardier says. By doing this, companies will be better able to understand and mitigate the potential risks that come with introducing this type of technology.

SMARTER, SAFER

IIoT technology has undoubtedly brought tangible benefits to the pipeline industry over the past few years. Not only is it providing companies with additional tools by which to mitigate HSE hazards, it is opening doors for companies to trim their operating costs and make efficiency savings. The initial costs of transitioning to smarter systems can certainly be expensive, and the amount of money saved can be limited if it is not integrated in an intelligent way. Nevertheless, IIoT represents the future for both pipeline management, and the oil and gas sector as a whole. Over the coming years, industry infrastructure will become ever more connected, more processes will become automated, and big data analytics will continue to grow both in size and in importance.

SHIELDING PIPELINES:

ANTI-CORROSION SAFETY TECHNIQUES

BY SARAH SAMIR

Ensuring the safety and the quality of pipelines is one of the main priorities of the oil and gas sector. In Egypt, as in many other countries, the high temperature and humidity are challenging the performance of those pipes. Many onshore pipeline accidents are caused by corrosion. However, although corrosion challenges are still very present in the industry, it can be largely decreased by following anti-corrosion techniques, including cathodic protection (CP) and several pipelines coating methods.

PIPELINE MATERIAL

Before installing a pipeline to transmit hydrocarbon, the operator firstly decides on the material from which the pipeline is manufactured. In order to bear natural circumstances like heat and humidity, and to be able to survive the nature of the fluid or gas that it will transport, as well as the pressure, pipelines should be made of strong material.

Industry experts prefer using steel pipelines, whether carbon steel, stainless steel, or alloy steel. Particularly, operators mostly resort to carbon steel, according to the Canadian Energy Pipeline Association (CEPA). Carbon steel is usually selected as it is able to bear high-operating pressure and temperature. It is also easily welded, can be protected from corrosion, and has the ability to remain in service if maintained properly, according to CEPA. Yet, the material alone is not enough to prevent corrosion, as safety measures need to be fulfilled.

CAUSES OF CORROSION

When a pipeline corrodes, there is a high probability that work will be delayed due to the required maintenance. Oil and gas leakages originated by corrosion potentially cause accidents that lead to the closure of the pipeline, besides harming the environment of the neighboring region or the marine life if it is an offshore pipeline.

> THE MOST SIGNIFICANT CORROSION PROBLEM ON COATED AND CATHODICALLY PROTECTED PIPELINES IS THAT OF DISBONDED PIPELINE COATINGS THAT SHIELD CATHODIC PROTECTION WHEN DISBONDMENTS OCCUR AND WATER PENETRATES BETWEEN THE COATING AND THE PIPE.
>
> Mahmoud Rapoh, team leader at the W/D Corrosion & Inspection Management Department at Khalda Petroleum Company

Corrosion has different types based on the cause and nature of it. Generic corrosion happens when the pipeline's metal loses its uniform, and leads to eroding the metal with high-velocity fluid, according to an article published by African Review.

Another type of corrosion is the galvanic one, which takes place "when two metals with different electrode potentials are connected in a corrosive electrolytic environment," according to the article.

Crevice corrosion happens in crevices and only with bolds, gaskets, and cap joints, while concentration cell corrosion takes place in areas with low fluid velocity or in presence of stagnant fluid due to the exposure to "electrolytic environment where the concentration of the corrosive fluid or the dissolved oxygen varies," as the article points out.

Other types of corrosion include microbiological induced corrosion, in which chemical and physical interactions take place due to the existence of biological growth in the pipelines, as well as the graphitic corrosion, which is led by the loss of iron ions in acids and salt water in case of cast iron pipelines, according to African Review.

Pipeline corrosion is thus affected by the nature of the surrounding environment. Accordingly, from the unavoidability of the nature in which the pipeline is placed – whether in deserts, underground or subsea –comes the need to use proper protection methods.

PIPELINES COATING

In order to protect the pipeline, the metal could be coated with material that protects it from corrosion. "Pipeline coatings are the number one defense against corrosion," Mahmoud Rapoh, team leader at the W/D Corrosion & Inspection Management Department at Khalda Petroleum Company, told Egypt Oil & Gas.

The industry has mainly applied pipeline coating inside the oil and gas fields for around 55 years due to the speed and cost, according to Argus Limited's article on pipeline corrosion protection. It was not very challenging to coat long pipelines as the operators used a special an automatic machine called line travel CPT, while hand operated machines were used for short pipelines, the article explains. However, as technology and science progressed, and as coating method users increased, operators started to lean towards applying pipelines' coating in specialized plants, which became more reliable and cheaper compared to those applied in the field, the article stated.

IN ORDER TO PERFORM CP, THE OPERATOR SHOULD DECIDE ON THE AMOUNT OF CURRENT USED IN THE PROCESS. THIS IS DECIDED BASED ON HOW MUCH METAL SURFACE IS EXPOSED AND THE SURROUNDING ENVIRONMENT'S DEPOLARIZING CAPABILITIES.

The internal coating liner of a pipeline is required to protect the metal from the pressure of the transported product. It is "applied prior to installation of virgin pipes or for repairs and replacement pipes," an article published by Pipeline & Gas Journal states.

Moreover, pipelines should be secured from any external surrounding environment. Accordingly, external coating protects the pipeline "against a variety of dangers arising from soil stress, soil-born chemicals and salt water. Pipelines must be resistant to indigenous bacteria, other flora, wastewater and the chemicals and solvents used in the processing of the hydrocarbons," the article adds.

According to Rapoh, coating protects metals from the diffusion of oxygen and water, slowing corrosion. "The anti-corrosive pigments contained in quality primers change the surface properties of the base metal. The metal develops a high electrical resistance as a result. Different pigments accomplish this reaction in different ways. Primer absorb and tie up moisture so that it does not react with the steel" he said.

There are five systems used to coat oil and gas pipelines. Three-layer PE coating, which has a 50% market share of the global markets, is best used in temperatures ranging from -45°C to 85°C, according to the Pipeline and Gas journal. Moreover, there is the three-layer polypropylene (3LPP), which is used for pipelines going through extreme mechanical stress. This coating system is best used in temperature ranging between 0°C and 140°C.

To coat pipelines, operators also follow the polypropylene (PP) coating system, which is used to challenge any deep-sea project using external pressures and high operating temperatures, the article points out.

Coating systems further include fusion-bonded epoxy (FBE) and the PUR system. Newly-installed pipelines are mostly coated using "3LPE, 3LPP and, up to seven layers, PP plus FBE, while for repairs, PUR is the coating of choice," the magazine says.

CATHODIC PROTECTION

As metal pipelines could be damaged due too external effects, not just internal contents, operators resort to CP in order to counteract the external corrosion through the use of direct electrical current, according to NACE's article on pipeline corrosion.

Metal corrosion is caused when oxygen, water, and other impure element like sulfur are present, which makes metals be an anode through losing their electrons. Hence, "the metal becomes oxidized and corroded. CP simply supplies the metal with electrons from an external source, making it a cathode," according to Inspectioneering's overview of CP.

In order to perform CP, the operator should decide on the amount of current used in the process. This is decided based on how much metal surface is exposed and the surrounding environment's depolarizing capabilities, according to an article published by the US Department of the Interior Bureau of Reclamation Denver, Colorado.

For proper CP, "the protected structure must be polarized to a certain value. The polarized potential is measured with respect to a certain reference electrode. A copper/copper sulfate reference electrode (CSE) is the most common electrode used in soil and freshwater," said Rapoh.

There are two types of CP: galvanic anodes cathodic protection, and impressed current cathodic protection.

The galvanic protection is "achieved by connecting the protected structure to a sacrificial anode, which is placed close to the protected structure," Rapoh stated.

In this CP technique, "Sacrificial anodes are made from active metals such as zinc, aluminum, or magnesium," while the current is produced using "the potential difference between sacrificial anodes and the protected structure," Rapoh explained, adding that the used type of anodes is selected based on the "electrolyte resistivity and the chemical compositions of the electrolyte to which the substrate is exposed."

Yet, it might seem uneconomic to apply galvanic cathodic protection on long pipes. For long pipelines that need more than just few galvanic anodes, operators choose to use impressed current cathodic protection (ICCP) because it is a more economic technique of CP, and it is applied through supplying electrons via "an external DC power source, called rectifier," Inspectioneering's overview pointed out.

In the ICCP, the rectifier is used to the pipeline to an anode bed. Anode beds include "soluble anodes (aluminum and steel), semi-soluble anodes (graphite and high silicon cast iron (HSCI), and non-soluble anodes (platinum, mixed metal oxide, and polymer)," according to Rapoh.

In this type of CP, the transformer rectifier "forces the current to flow from the anodes to the protected" pipeline. The operators decide on the type of anodes used during ICCP based on "the chemical composition of the electrolyte, to which the substrate is exposed and the area to be protected," he added.

ANODEFLEX

Although CP is one of the two main anti-corrosion protection techniques in the pipeline industry, in some cases it could cause some problems in the pipeline. "Traditional anodes employed in the cathodic protection of pipelines may lead to one or more serious problems, such as lack of uniform distribution of the protective voltage along the length of the pipe," according to an article published by Argus Limited.

"The most significant corrosion problem on coated and cathodically protected pipelines is that of disbonded pipeline coatings that shield cathodic protection when disbondments occur and water penetrates between the coating and the pipe," Rapoh said.

Accordingly, the necessity came for a more updated CP cable called anodeflex, which is an impressed current cable anode that is very flexible. The anodeflex is installed alongside a pipe and it works through supplying uniform CP to each point of the pipeline with the slightest interference from the adjacent structures, according to SAMM Technology.

Through using the anodeflex cable, the pipeline's connection points decrease by around 10 times. The CP's current "flows without significant loss through the central copper conductor, which is covered with a protective layer of conductive polymer," according to Argus Limited.

The anodeflex cables get installed in the ground. They are placed very close to the steel surface of the pipeline in order to protect the pipes and provide "uniform distribution of protective current to the entire steel surface," as explained by Farwest Corrosion Control Company. Moreover, anodeflex cables can be used in places where pipelines coating has not succeeded, Argus Limited wrote.

Operators have been developing the pipelines anti-corrosion techniques, whether by changing the nature or place in which it is applied, or through creating new tools to improve protection. As time changes and technology flourishes, operators tend to choose the cheapest, most accurate methods to ensure having protected pipes. Hence, the future is open for new additions in the pipeline and anti-corrosion industries.

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ZEITCO: A CHALLENGING CASE

One of the most challenging cases that **SAHARA CHEMICAL SOLUTIONS – SCS** has faced recently was the Zeitco Iron Sulfide Dissolving case. Well A-13 was an oil producing developed well completed initially in the Nubia formation (strong water drive), which later ceased flowing naturally due to high water cut. Nubia was isolated and another formation called Lower-Senonian was opened to resume the natural flow.

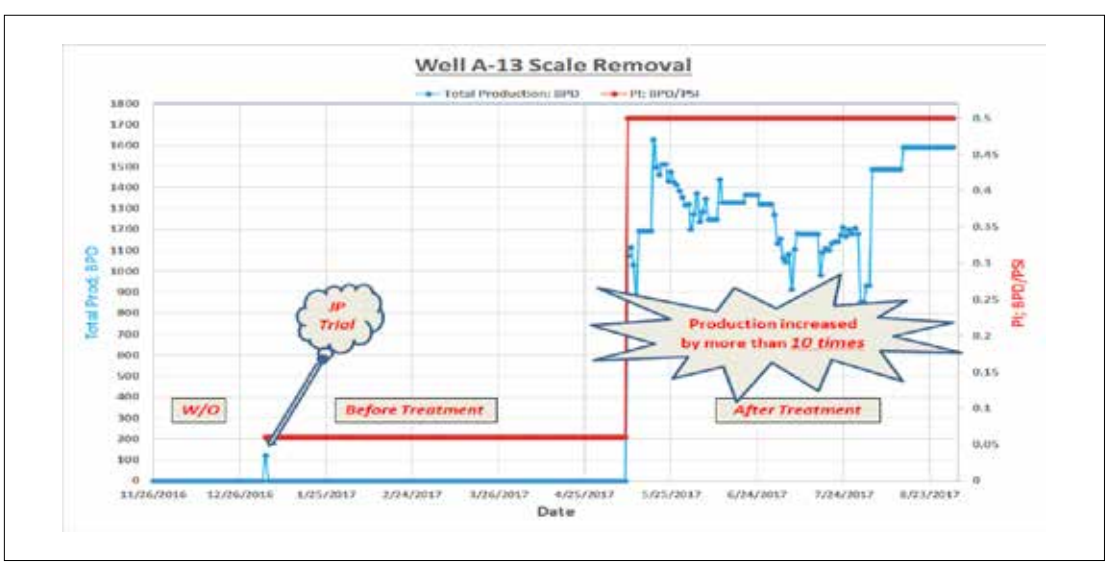
Since Lower-Senonian is communicated with Nubia, the natural flow sustained for only a year due to high water cut, and hence the well was converted into Jet Pump (JP). From time to time, the well was suffering from scale accumulation problems, which were extremely aggravated with the JP work.

During the workover to replace the JP completion, significant scale was found inside the casing, which resulted in many obstacles in the workover (that costed Zeitco $1 million) and ended up with almost complete plugging to the formation.

Hard scales were found accumulating in the well bore starting from the end of tubing, which resulted in an inaccessible wellbore, very low PI, and very low flow rate. Iron sulfide scales are classified as one of the hardest and most complicated scales in nature. Deep high scaly wells lead to very low productivity (0.06BPD/PSI), the accumulation of iron sulfide hard scale deposits, plugging perforation zone, preventing production, and hole accessibility.

Zeitco has collected all data and scale analysis regarding this complicated case and delivered them to four different specialized vendors in chemical services, including SAPESCO.

None of the vendors could supply any solutions for this case, and the best solubility for this type of iron sulfide scale was 2%. Other vendors have suggested the milling solution, which is a very costly solution.



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CSR: WHAT REALLY IS IT?

CSR, short for Corporate Social Responsibility, has become a modern-day mantra. Ironically, it is a concept with ideological underpinnings, rooted in the early years of the Cold War. The movement was said to buttress free-market capitalism in its fight against totalitarian Soviet Communism by highlighting the societal benefits provided by corporations. However, to this day, CSR remains a concept in search of a universal definition. CSR practices vary significantly by company and also by country. Still, the mere fact that CSR is once again a hot topic raises awareness about its purpose. Corporations have obligations that extend beyond that of the company and the shareholders - they also have a societal purpose. It is an obvious fact that corporations operate within the parameters set by society, by its expectations, as well as by its laws and regulations.

Recently, in January 2018, Laurence D. Fink, founder and CEO of the world's largest investment firm, BlackRock, penned an eye-opening letter to executives of publicly-traded companies, pressing them to incorporate "a social purpose" into their business practices. He forthrightly stated that "society is demanding that companies, both public and private, serve a social purpose." According to Fink, what was not long ago considered - and even dismissed as - a mere "mantra", could cost the corporations who disregard societal needs the "license to operate from key stakeholders".

But is forcing companies to incorporate CSR into their operations the answer, as India has required? In April 2013, India adopted Section 135 of the Indian Companies Act mandating that all companies meet a financial threshold to spend 2% of their average net profits made "during the three immediately preceding financial years" on CSR activities. While a legal - and therefore obligatory - requirement, mandating CSR is still a positive step, even if the legislation allows corporations to determine the societal needs they support. It reminds the supervisory and management boards, as well as the employees, that they are part of society and therefore need to contribute.

Furthermore, the very notion of a forced "philanthropy" is a paradox. Many argue that once choice is taken out of the equation, CSR is simply a tax for which corporations collect accolades, a public relations prize. If so, does this allow a corporation to shed or avoid its responsibility when polluting the environment, lobbying for lower tax rates, or marketing poor quality products? It is for this reason that some critics question whether CSR is simply a mirage.

This raises a critical issue: is CSR a veil for public relations? Moreover, there is the misconception that CSR is as much about sustainability and integrity, as it is about social activities. Advertising CSR operations under the auspices of a company's marketing division green-washes its otherwise noble initiatives for the sake of looking good. One can rightly ask whether the company is truly contributing to society or merely applying a "tax" deduction for its PR and advertising expenses.

CSR is undeniably important and should not be dismissed as mere public relations. But neither should the integrity behind its intent be taken for granted without a closer look at a company's CSR operations and its place within a company. There is, however, a simple test to determine whether a corporation has integrated CSR into its business or whether CSR is merely a marketing tool. One needs only to ask some simple questions. Is the person responsible for CSR a member of a company's governing executive committee or just a department manager? Or, worse, does this person ultimately report to the marketing or PR manager? And an associated question is whether CSR is being properly financed, which is not the case if the PR budget of a company exceeds its CSR budget. Society demands more than PR from the corporations to whom it has issued a legal license to operate. Society, rightly so, has come to demand proof that a corporation is meeting its societal purpose.

JENIK RADON
Adjunct Professor at the School of Public Affairs (SIPA), Columbia University
Tinatin Japaridze, Graduate Student at SIPA, Columbia University

RESERVOIR DEVELOPMENT AND ENHANCED OIL RECOVERY

The role of reservoir development is to ensure that the choice of development of the field will be able to maximize the profit of the company. This is done by implementing different strategies at the right time throughout the life of the reservoir. Careful planning and stringent economic analysis has to be carried out in order to justify these proposals. According to the type of contract either production sharing or royalty/tax or service agreements this section must be designed. Based on this production sharing contract between the national oil company (NOC) and the contractor, the development team would have to comply with this timeframe in proposing plans to develop the field. Other terms and conditions about the title deed of the hydrocarbon inside the contract must be carefully read and well understood; for example sometimes in the contracts it has been specified that associated gas and condensate belongs solely to NOC while gas-cap gas belongs solely to the contractor etc.

Enhanced Oil Recovery (EOR) was considered as a potential future development plan to increase the recovery factor. Easy oil is no longer abundant and the industry is seeking for EOR methods to improve recovery from mature oil fields. Techniques for EOR can be further subdivided into three major categories: chemical flooding, miscible displacement, and thermal recovery. By using EOR, 30-60% (and potentially up to 70%) of the reservoir's original oil can be extracted, compared with 20-40% using Primary and Secondary Recovery.

DR. AHMED ABD EL-GAWAD SULTAN
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Petrophysics Section Head
agawad@tharwa.com.eg

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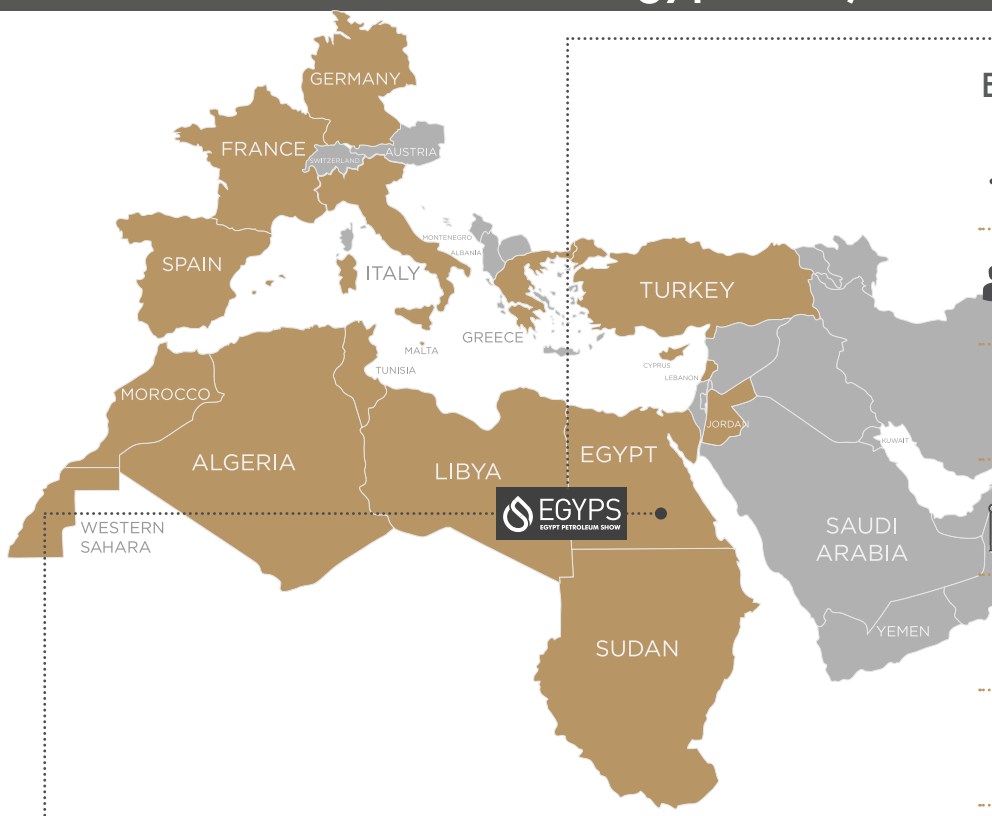

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EGYPT OIL&GAS RESEARCH & ANALYSIS

Annual Inflation Headline CPI

JUL 2018	AUG 2018
13.50%	14.24%

Egypt's Debt

Q3 2017/18	Q4 2017/18
$88.2bn	$92.6bn

Net International Reserves

JUL 2018	AUG 2018
$44.3bn	$44.4bn

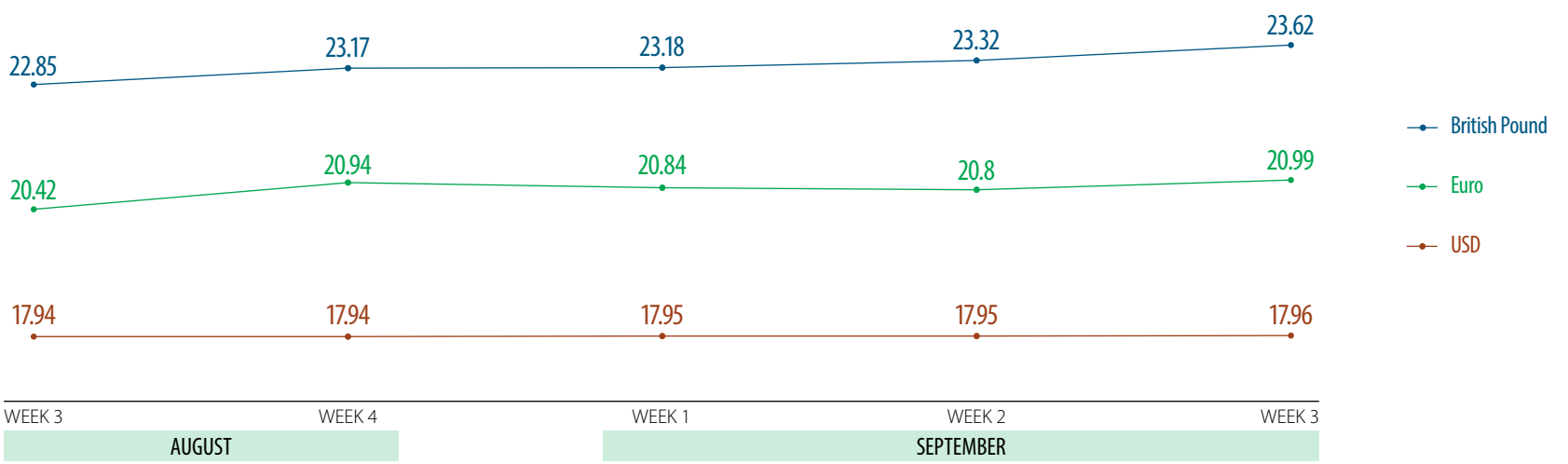
Egyptian Trade Balance Deficit

MAY 2018	JUL 2018
$3.8bn	$3.6bn

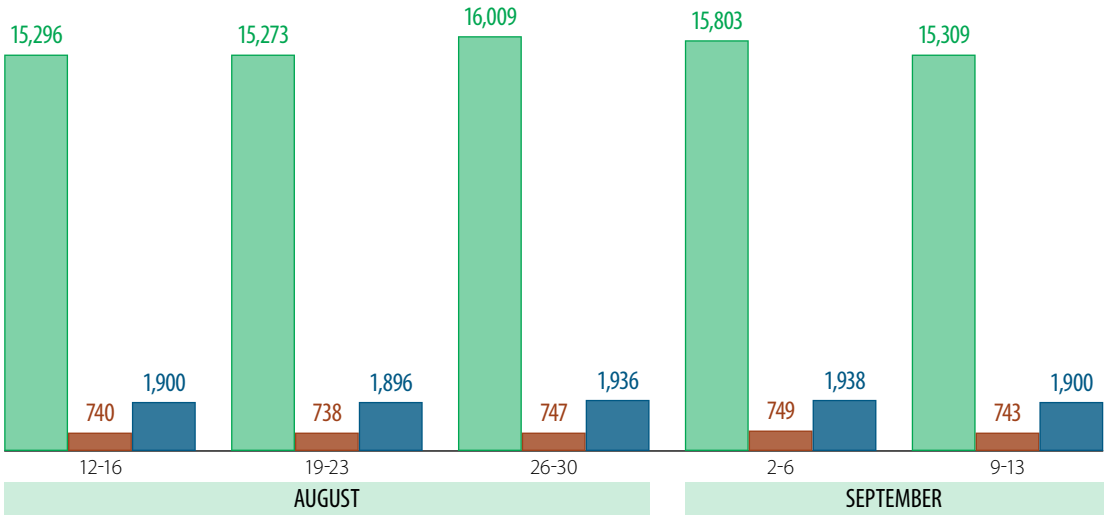
Egypt's Non-oil Exports & Imports

During the first seven months of **2017**	EXPORTS $13.3bn	EXPORTS $34bn
During the first seven months of **2018**	EXPORTS $14.9bn	EXPORTS $38.2bn

Exchange Rates



Capital Market Indicators



EGX 30
14,098

The Egyptian Exchange suffered its biggest daily loss since mid-2016 on September 19, falling **3.8%** during the day's trading.

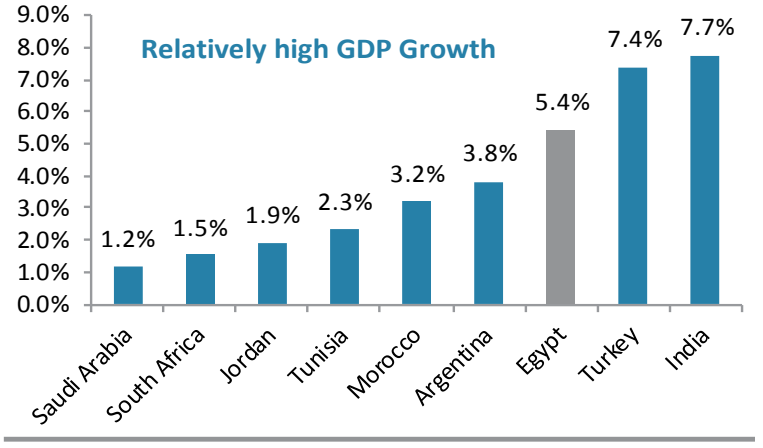
EGX 30 EGX 70 EGX 100

Source of Raw Data: Central Bank of Egypt, Ministry of Trade and Industry, Central Agency for Public Mobilization and Statistics and Egyptian Exchange.

RESEARCH BY HAGER MAGDY

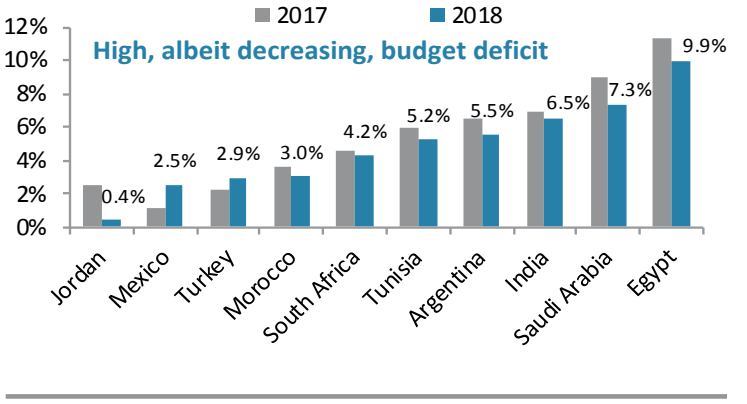
Egypt's Key Economic Indicators V.S. Selected Emerging Economies

Fig. A — Annual Real GDP Growth (%) in Q1 2018



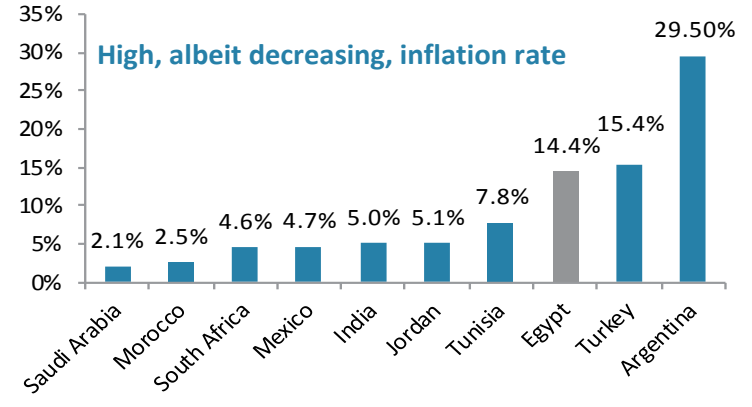
Source: CEIC & Ministry of Planning for Egypt's Data.

Fig. B — Fiscal Deficit (% of GDP) in FY 2018



Source: IMF's World Economic Outlook Database (April 2018).
Note: FY 2018 figures are based on IMF projections.

Fig. C — Annual Headline CPI (%) in June 2018

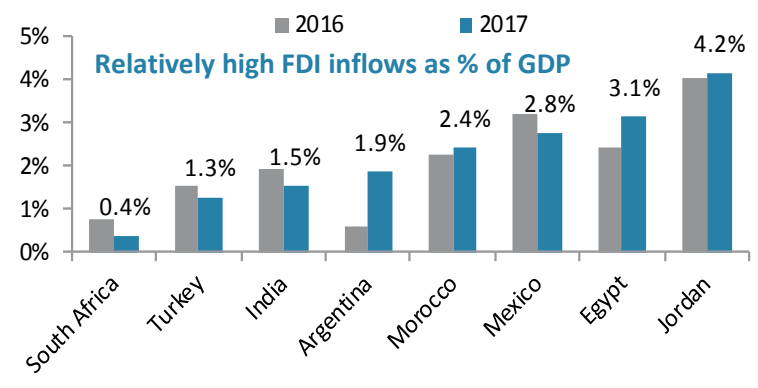


Source: CEIC, Focus Economics & Central Bank of Egypt.

Fig. D — External Debt (% of GDP) in 2017

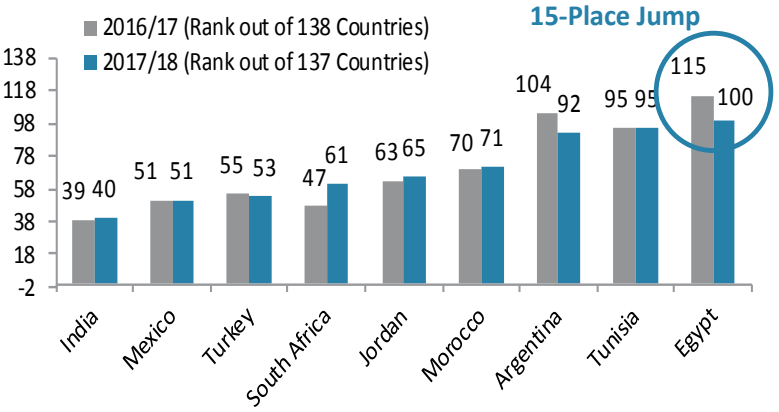
Source: CEIC, IMF & Central Bank of Egypt.

Fig. E — Net FDI Inflows (% of GDP) in 2017



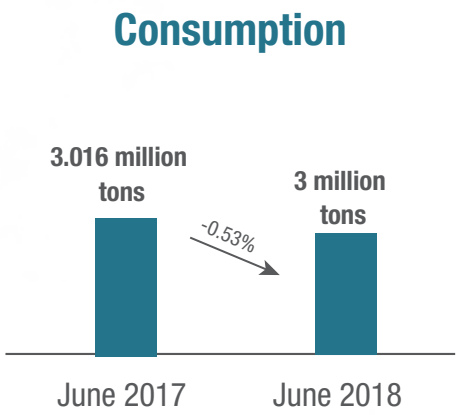
Source: World Bank.

Fig. F — Global Competitiveness Ranking in 2017/18

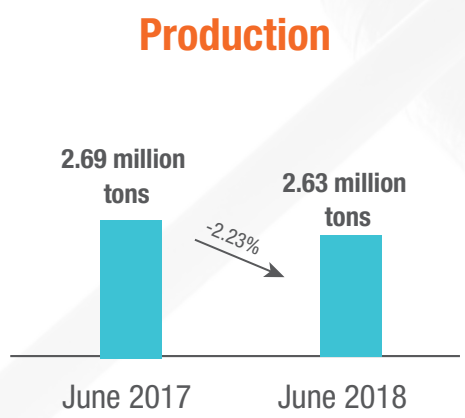


Source: CEIC, Focus Economics & Central Bank of Egypt.

Consumption of Other Petroleum Products (YoY)



Production of Crude Oil, Condensates and Butane (YoY)



Domestic Butane Production in August 2018

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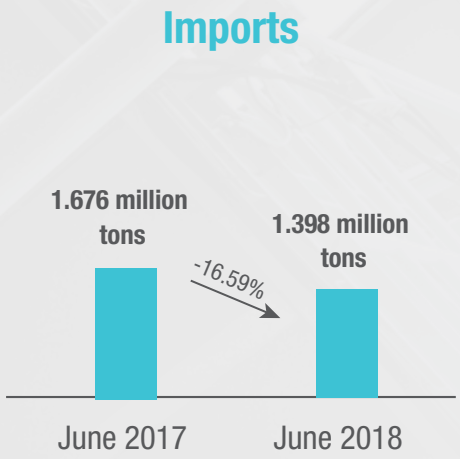
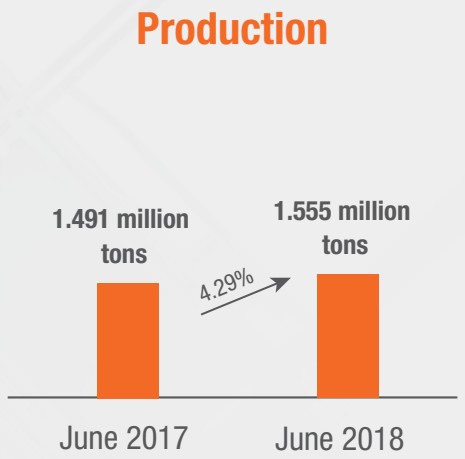
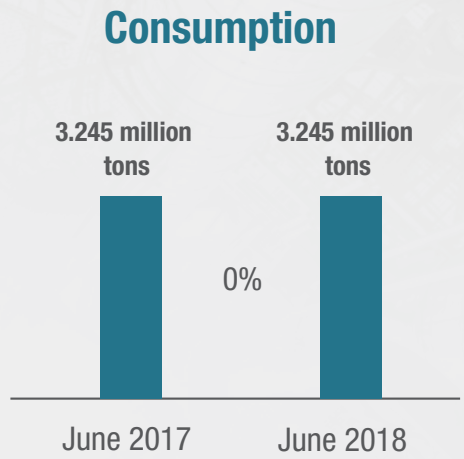
covers almost **50%** of the market's needs

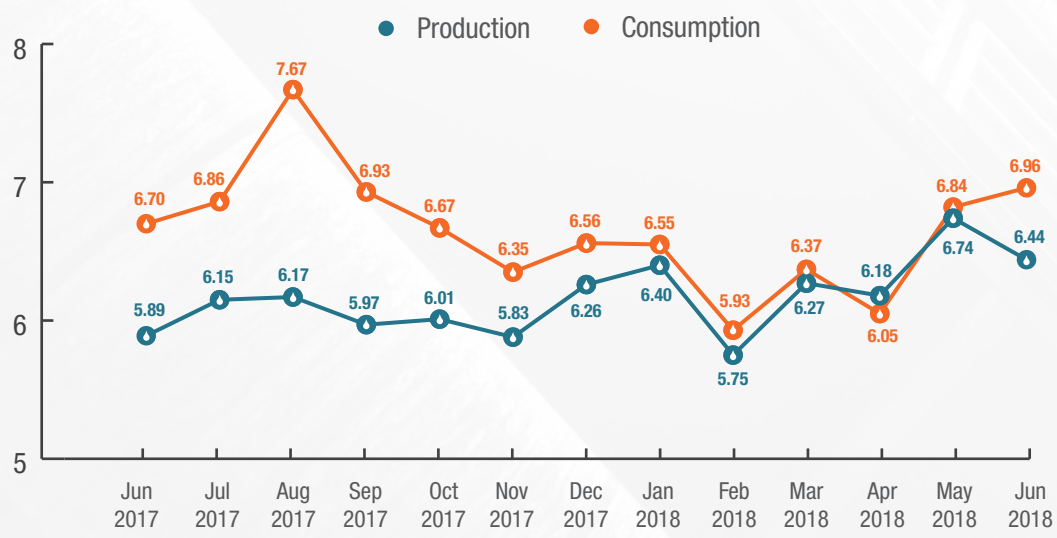
Butane Imports, Production & Consumption (YoY)



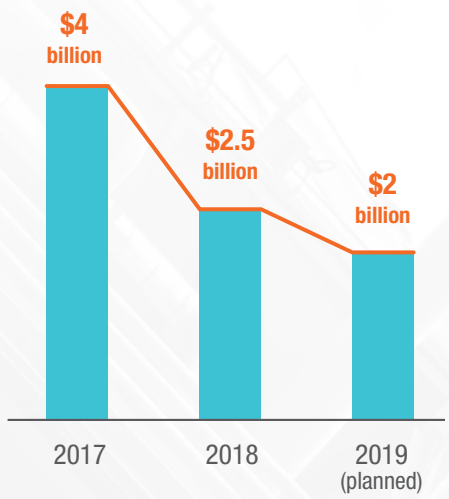




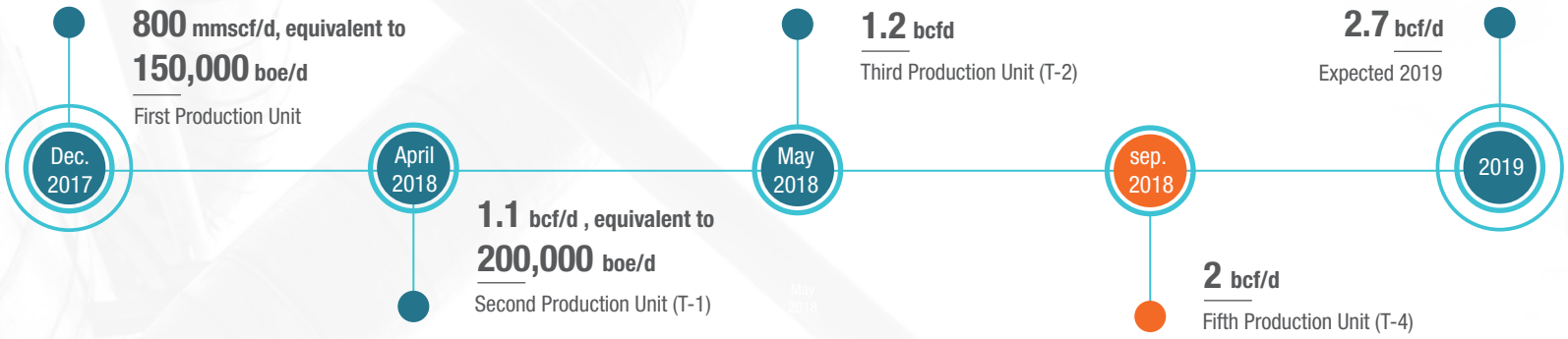
Production & Consumption of Crude Oil & Natural Gas (mn tons)



BP's Annual Investments in Egyptian Oil and Gas Fields



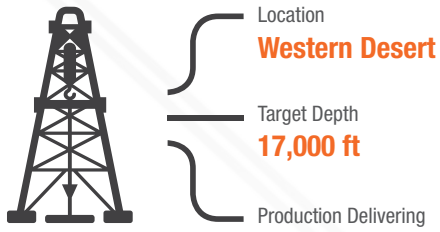
Zohr Developments



Egypt signed a **$10 million** E&P agreement covering **Abu Sennan concession** in September.

The agreement includes a **$2 million** signing bonus for **drilling four wells** in the concession.

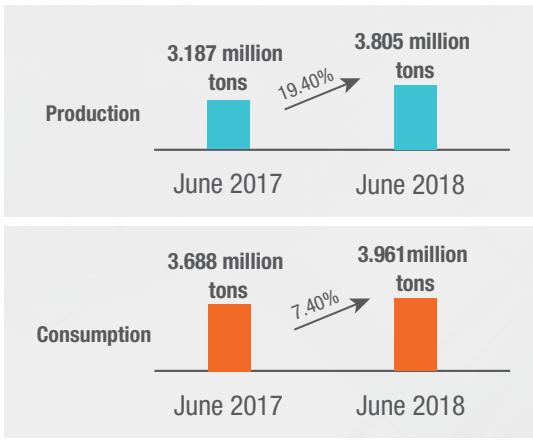
Eni's New Gas Discovery in Egypt



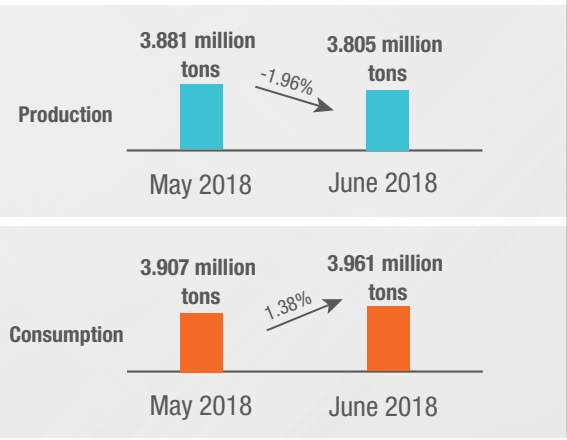
Eni's Average Production in Egypt

320,000 boe/d

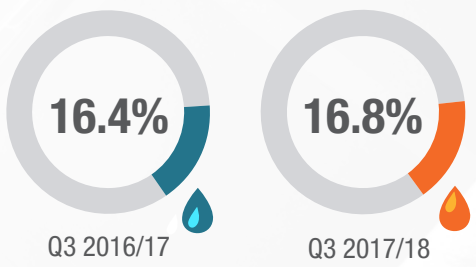
Natural Gas Production & Consumption (YoY)



Natural Gas Production & Consumption (MoM)

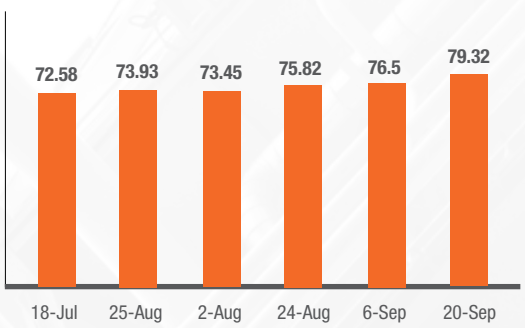


Ratio of Investment in Natural Gas Sector

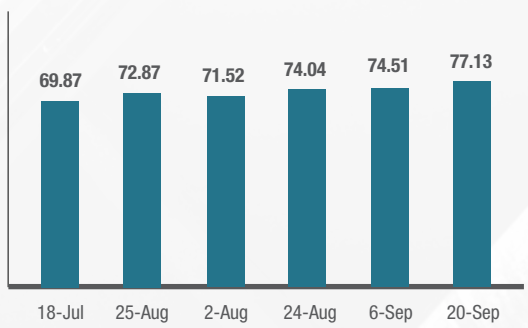


Sources of Raw Data: Ministry of Petroleum, Ministry of Planning, Eni and Central Agency for Public Mobilization and Statistics.

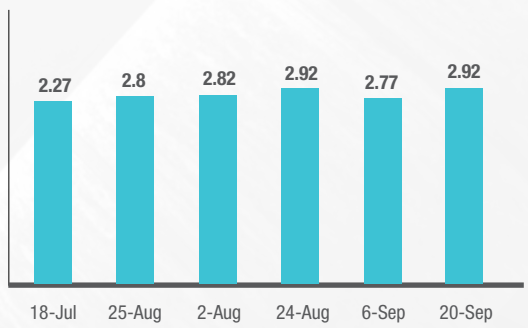
BRENT PRICES



OPEC BASKET PRICES

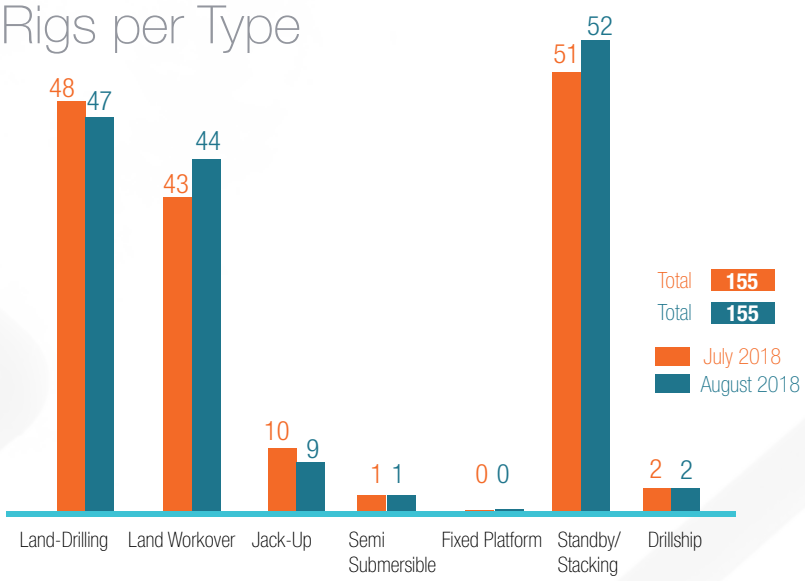


NATURAL GAS PRICES

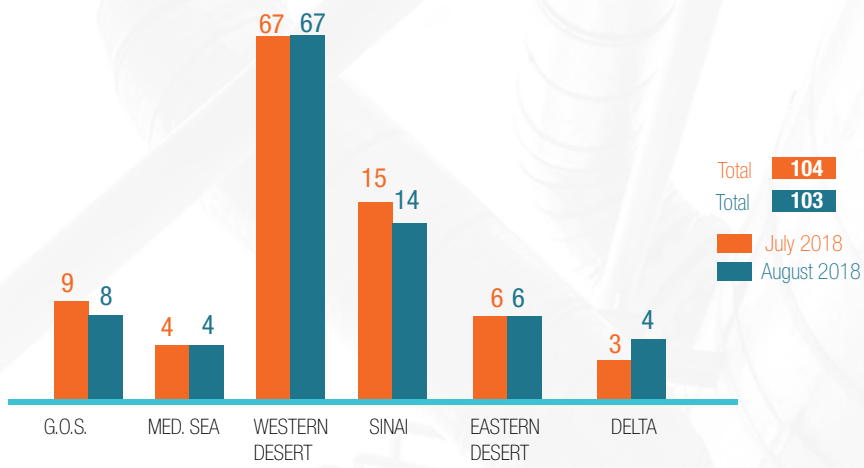


EGYPT STATS

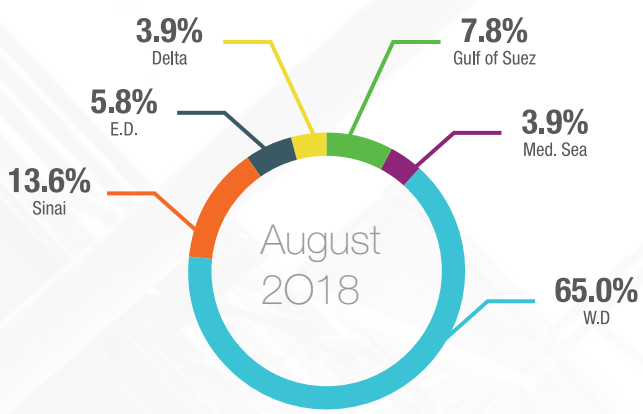
Rigs per Type



Rigs per Area

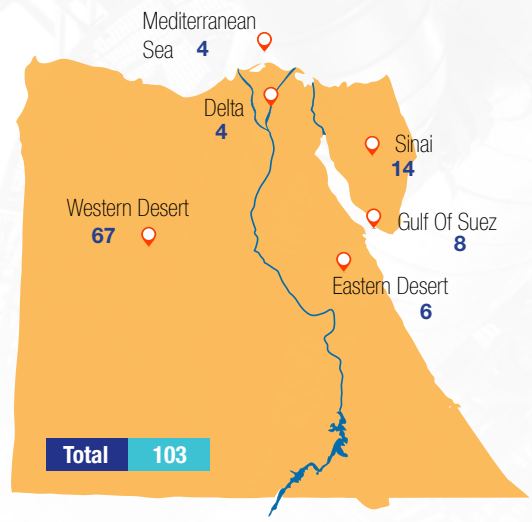


Distribution of Rigs



Egypt's Rig Count per Area

August 2018



PRODUCTION

August 2018

TOTAL		
17604000 Barrels	194.2073953 BCF	
189017 MCF	2,774,500 Barrels	

	CRUDE OIL	GAS	SOLD GAS	CONDENSATES
MEDITERRANEAN SEA	17,000	107.0427574	104182	956,000
EASTERN DESERT	1,930,000	0.18998826	185	3,000
WESTERN DESERT	10,056,000	42.0772996	40953	1,348,000
GULF OF SUEZ	4,053,000	3.17075304	3086	60,500
DELTA	16,000	41.72434126	40609	390,000
SINAI	1,528,000	0.00226156	2	17,000
UPPER EGYPT	4,000	0	0	0

Drilling Updates

REGION	COMPANY	WELL	WELL TYPE	RIG	DEPTH	WELL INVESTMENTS
SINAI	PETROBEL	113-202H	Development	ST-1	10,745	3.820 M$
WESTERN DESERT	AGIBA	FARAMID S-1X	EXP	EDC-41	17,100	6.600 M$
	AGIBA	MEL WD-18	Development	ST-6	10,821	1.800 M$
	QARUN	WON C-211	Development	EDC-63	7,350	820,001 $
	QARUN	WON C-210	Development	EDC-63	7,250	800,100 $
	KHALDA	SIWA 2L-5	Development	EDC-11	15,462	1 M$
		M.RZK 155X	EXP	EDC-62	8,728	1.120 M$
		MENES - 6	Development	EDC-1	12,042	1.670 M$
	SHELL	NUMB-CA	EXP	EDC-48	14,370	3.620 M$
	BAPETCO	BED 3 C6-1	Development	EDC-51	11,155	1.660 M$

*DRILLING are for August 2018.


supplement
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