

Volume 33  
August  
2018

Not For Sale

# Petroleum Today

## THE EGYPTIAN STRATEGY TO ATTRACT MORE INVESTMENTS

Lubricants Market  
and Technology

The Relevance of Chemistry  
in Deepwater Design and  
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# Petroleum Today

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The Egyptian Strategy  
to Attract More  
Investments



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مليون دولار

٣ فرص استثمارية جديدة للبحث والاستكشاف بالبحر  
الأحمر وغرب المتوسط

٤ اباشتى تخطط لاستثمار مليار دولار سنويا فى قطاع  
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Expanded operating range due to low axial force

**Applications:**

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- Operations of wells with instable influx or production decline.
- Optimization of the pump selection process.

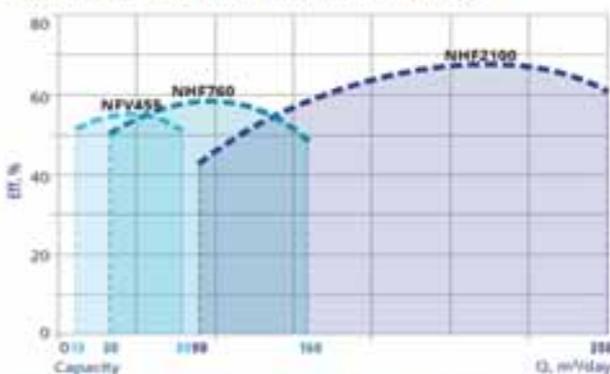
**About the technology:**

New product line with extended operating range 362, 406, 535 series ESP. Extended operating range enabled reduction of product line for 62-2200 bpd within 362 and 406 series from 13 to 3 pumps.

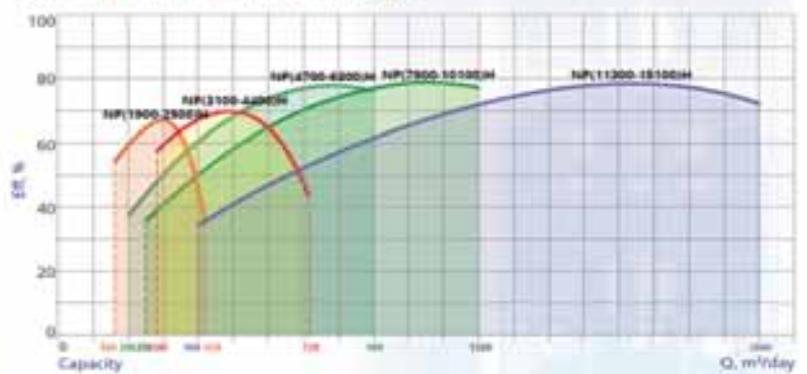
**The design features of the new stage:**

Uses the device aimed to compensate axial force and to keep the impeller in the floated state. The upper disk of the impeller has special holes, providing crossflow of the small amount of fluid from the upper gap to the lower. This reduces the axial force. The greater the value of the axial force, the more intense is crossflow. It makes possible to achieve low values of the axial force in wide range of flow rates, achieving a wider operation range.

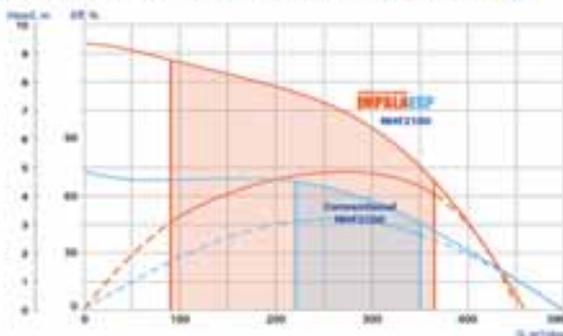
Extended operating range 362 and 406 series ESP



Extended operating range 535 series ESP



Performance comparison of conventional stage and **IMPALAESP**



# Sustainable Development Strategy Egypt 2030

**S**ustainable Development has been defined as development which meets current needs without compromising the coming generation's capacity to meet their special needs. Sustainable Development calls for concerted efforts to build up future for people and earth, being inclusive for everyone, sustainable and resilient.

To achieve Sustainable Development, there must be reconciliation between three basic elements: Economic Growth, Social Development Integration and Environmental Protection. All these elements are interrelated and all of them are critical for individual's luxury and societies.

On February 2016, President Sisi witnessed the release of Egypt Sustainable Development Strategy [**Egypt 2030**] which we hopefully wishing Egypt to become within the best thirty countries in the world in Economic and Social Development and fighting corruption in framework of respecting human rights and ensure law sovereignty in the light of effective and balanced external policy according to strategy goals.

Sustainable Development Strategy represents: [**Egypt 2030**] is a basic step in overall development march in Egypt, connecting present to future and inspires ancient Egyptian civilization, to adopt clear development process for an advanced country.

**Egypt gives special importance to the Energy Sector in the strategy. There are clear programs for this development:**

1. Integrate Medium and long term Development Strategy for Energy.
2. Re Structuring Energy sector.
3. Re Consider Legislation Governor.
4. Energy management programs.
5. Development of energy sector infrastructure.
6. Strengthen Energy related Innovations.
7. Application of Environmental standardization and expansion of best tracking mechanisms.
8. Qualifying oil and gas sector calibers.
9. El-Dabaa Nuclear Power Plant.

From this point, Petroleum Today magazine inaugurates its latest publication "Sustainable Development" Newspaper to be a mean of communication serving the energy sector in general and the petroleum sector in particular to introduce the most important steps that are being implemented to achieve this strategy to achieve the desired objectives of [**Egypt 2030**].

**And In the end, we salute you all and wish for Egypt pride and dignity.**

*Petroleum Today*

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# Egypt News

## Egypt Signs 5 New Oil Agreements with Investments \$ 204 Millions

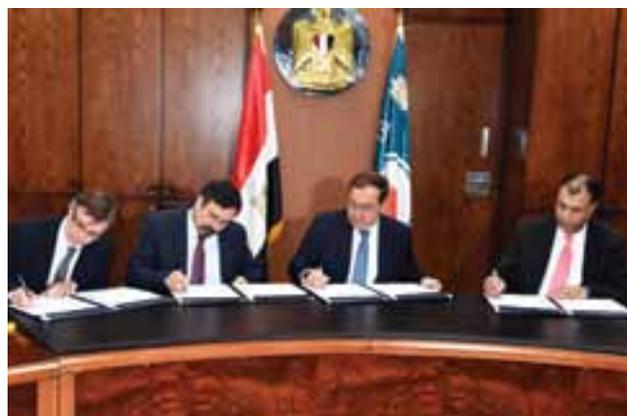
H.E Eng. Tarek Al-Mulla, Minister of Petroleum and Mineral Resources signed 5 new oil agreements for oil and natural gas exploration in the Mediterranean, Western desert, Nile Delta, Sinai and Gulf of Suez with investments \$204.2 million and \$58.5 million grant.

The first agreement between EGAS and THARWA Petroleum and ENI of Italy in Mediterranean Sea - Noor area to drill two wells with a total investment of \$105 million.

The second agreement between EGPC and the Italian ENI and ENNA NAFTA Plaine of Croatia in Ras Qattara, Western desert to drill nine wells with total investments of \$11.7 million.

The third agreement between EGPC and the Italian ENI and the British BP, in Nile Delta region (Nidco) to drill four wells with total investments of \$22.5 million.

Fourth agreement with GPC in the region of Sinai « Sidr and Assal and Mattarma and Kareem « to increase production



to cope with plans of petroleum sector to support national companies operating in the E&P industry And the Fifth agreement between EGPC, Cameron and O'Shinnear and Sahara companies in north Zafarana region in the Gulf of Suez.

## Western desert produces 57% of Egypt's crude oil production

H.E Eng. Tarek Al-Mulla Minister of Petroleum and Mineral resources announced that there is an integrated development program currently implemented to increase production of the western desert oil and gas through launching bid rounds and signing new petroleum agreements to intensify exploration and production operations using latest technologies and modern drilling techniques in the light of oil and gas sector modernization strategy, which resulted in achieving several discoveries for crude oil and natural gas in new geology structures to confirm that the Western desert is still a promising area to encourage international petroleum companies to have new investments, Pointing out that use seismic surveying modern technologies will make important development in oil and gas exploration activities which maximizing production and reserves.

Al-Mullah added that total production of western desert area



now represents 57% of the Egypt's total production from crude oil, Pointing out that coming period will notice great growth at western desert after collaborations to tie in the new discoveries to the current production facilities using the available pipeline network and processing facilities, as well as drop high production costs and be similar to the world's best achieved one.

## New Investment Opportunities for Exploration in the Red Sea and the Western Mediterranean



Minister of Petroleum and Mineral Resources Tarek Al-Mulla said that the ministry is currently working through the development and modernization of the oil and gas sector to increase the investment opportunities available in the field of oil and gas exploration and intensify efforts to expand the exploration of new explored areas with promising prospects, especially the wild areas such as the Red Sea and the West Mediterranean and make it eligible to start exploitation and production for the first time. Al-Mulla confirmed that a global bid round will be launched

for the first time at the end of this year to explore for oil and gas in the Red Sea region in light of the results of the seismic survey project carried out in the region in cooperation with Western Geco a Schlumberger company. Is one of the most important projects to evaluate opportunities in this region, which is one of the oldest oil producing areas of crude oil in Egypt .

## Cyprus-Egypt gas pipeline to cost \$ 800 million- \$ 1 billion



CAIRO (Reuters) - A planned pipeline connecting Cyprus' Aphrodite gas field to Egypt's liquefied natural gas (LNG) facilities will cost between \$800 million and \$1 billion (590 million and 737 million pounds), Egyptian Petroleum Minister Tarek Al-Mulla said.

Egypt has rapidly increased its production of natural gas and hopes to become a hub for exporting to Europe after making a series of big discoveries in recent years .

Al-Mulla ,speaking at a joint news conference with Cyprus Energy Minister Yiorgos Lakkotrypīs , said Cypriot gas would be used in part for domestic consumption and in part for export . Al-Mulla said that Egypt aims to sign an agreement with Cyprus for a pipeline to transport gas from the Aphrodite field to its LNG facilities .

Lakkotrypīs said a final agreement on the pipeline would have been signed as quickly as possible but did not specify when. Egypt hopes to halt gas imports by 2019 and achieve self-adequacy.

Egypt has an extensive pipeline network and two idle gas liquefaction plants ready to export new gas as it arrives .

## Egypt Creates Petroleum Electronic Gate To Promote Investment Opportunities

H.E Eng. Tarek Al-Mulla reviewed the executive position of the project of establishing the Egyptian Gateway for Research, Exploration and Production, which took the necessary steps to start its establishment through the signing of 4 memorandums of understanding with specialized international companies to establish a digital information bank and a new investment map to promote investment opportunities in the field of exploration and production following the pioneering major producing countries in order to maximize the value of the technical data of exploration and production activities and develop, promote and globally marketing for these activities in accordance with latest applied concepts developed to attract and diversify foreign investments in these activities to increase oil and gas reserves and production.

# Arab & International News

## Algeria In Talks With 14 Oil Firms To Set Up Trading Venture

CEO of SONATRACH, Algerian National Energy said that the company is in talks with 14 international companies on a joint venture for trading oil and gas products after the Algerian state energy company reached a deal this year to buy its first overseas refinery.

Potential partners, which have held talks with Sonatrach in recent weeks, include BP, Total, Royal Dutch Shell, Chevron, Repsol and Vitol, the world's biggest independent oil trader.

Sonatrach's move to form a venture is one of several steps aimed at easing the burden of its hefty fuel import bill that tripled year-on-year in 2017 to a record \$2.5 billion.



## Iraq decides to develop two fields of gas and oil by [ National Effort ]



The Iraqi Oil Ministry said that Iraq will develop Mansuriya gas field near the border with Iran, using national companies after the « reluctance and failure » of foreign companies to resume work in the field.

Iraqi Oil Minister Jabbar Alluaibi said in a statement that he directed state-run companies under the Ministry of Oil to develop Mansuriya gas field in the national effort .

In 2011, Iraq signed an agreement with a group led by the Turkish government-owned TABAO Company, including South Korean KOGAS and Kuwait Energy to develop Diyala field.

Ministry officials said the Turkish company had not resumed development work despite repeated demands by the Iraqi government .

The statement said that Iraq allocated \$140 million to increase production from Nasiriyah field, which has reserves of more than 4 billion barrels.

The field currently produces 90.000 barrels a day, which the ministry aims to increase to 200.000 barrels per day in a year.

## Iran Granted Discounts for those who buy Its oil

A Source at Iranian Ministry of Oil confirmed that his country decided to grant discounts for its oil buyer customers, announcing that this action based on knowing market according to discounts provided by other exporters.

The Source said, in remarks told to Iran News « IRNA », that discount which Iran grants on Oil exports for Asians customers, is considered as part from essence world market.

He added that grant discounts for customers, is an action that all oil exporters do, according to demand and supply status, and competitors activity, Oil exporters decide discount rate which they will give for buyers .

He explained that grant discounts for customers, are done at mostly for individual shipments, as such long term oil sales are ongoing under contracts.





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# Corporation News

## KHALDA Succeeds in Achieving 16 New Oil Discoveries during the year 2017 / 2018



From his side Eng. Khaled Mowafy, KPC chairman and managing director, said that according to fruitful cooperation between Petroleum Sector and foreign partner (American APACHE), KHALDA company succeeded in achieving 16 new oil discoveries and drilled 59 wells out of which 49 oil producing wells, 7 gas producing wells and 3 Water injectors, also 153 re-completion operations have been done, in addition to completing 24 exploration wells, which contributed in achieving company's production target from crude oil by 110%, and natural gas production 99%, and condensates by 93% and Butane by 77%.

That came during Minister of Petroleum presidency of the company's general assembly for work results accreditation in the fiscal year 2017 / 2018

## QPC to drill 25 New Wells and Rises Production to 33 KBOPD

Eng. Ashraf Abd Algawad, QPC chairman and managing director said that total investment spending is high toward \$206 million during current year and it drilled 25 new wells which contributed achievements plus 4900 oil barrels oil at daily production daily from QAROUN fields in June 2018, explaining that annual cumulative production up to 12 million barrel oil with daily average at 33 KBOPD oil barrels daily, in addition to adding 13 million barrel of proved oil reserve.

He added that keeping up with new technologies at drilling and production operations contributed at rationalization and reduction costs at QPC fields, he explained that they applied new technology for drilling wells in Beni Suif, west Nile, which led to cost reduction besides its use of modern technologies which contributed at rationalization spending on tangible way on artificial lift of wells and chemicals that used in oil processing and pipeline coating.



## PETROBEL Youth Runs the Latest and Largest Laboratory to Analyze Natural Gas Samples in ZOHR Field



PETROBEL started the experimental operation of the largest and most modern natural gas sampling laboratory in Egypt, which is located in the back field to carry out all the gas, water, condensate and sulfur analyzes produced from the field.

It is the second lab of its kind in the Italian production areas. It gives the correct measurements of the natural gas and the associated liquids on which to calculate the permissible standards and ratios. The gas is a product that must be confirmed before being pumped into the national network of natural gases which cannot be separated from them.

The laboratory consists of two parts: the first to analyze gas and the second to analyze the accompanying liquids and is managed by a group of youth and calibers of the petroleum sector well trained internally and externally and able to operate the laboratory with its modern techniques.

## Exxon Mobil quarterly profit jumps 18 percent on higher oil prices

Exxon Mobil, the world's largest oil producer, said its quarterly profit jumped 18 percent as rising crude prices offset falling production.

The company posted second-quarter net income of \$3.95 billion, or 92 cents per share, compared to \$3.35 billion, or 78 cents per share, in the year-ago quarter.

Production fell 7 percent to 3.6 million barrels of oil equivalent.



## BP Celebrates Supported 100 researchers Egyptian Study at The United Kingdom



British Petroleum Egypt has held an event to celebrate the graduation of the 100th student in the post graduate studies it sponsors within its Egypt Cambridge scholarships program. Minister of Petroleum, Tarek al-Molla, and Minister of Higher Education, Khaled Abdel-Ghaffar attended the BP celebration which BP Regional President of North Africa, Hesham Mekawy, also participated in. The eight graduates who acquired their Master's degree from Cambridge within the BP Egypt Cambridge Scholarships for 2017 / 2018 were also invited by BP.

Molla applauded the BP initiative which, he said, greatly supports gifted researchers and contributes to sustainable development. He explained that BP and other oil companies operating in Egypt are active contributors in various fields such as education and healthcare, boosting thus sustainable development. He also reminded that BP is a time honored strategic partner to Egypt, and has always actively participated in various societal development projects. Mr Molla explained that the petroleum sector in Egypt strongly believes in investing in human resources which he explained is the cornerstone of development in any nation.

Mr Mekawy said that BP is happy to be adopting a sustainable program that invests in human development and enhances caliber building in Egypt. These high quality calibers will eventually add to the economic value of the country through their knowledge and unique skills, he said. He pointed out that graduates of the BP Cambridge Scholarship are required to work in Egypt once they get their master degree for at least two years. He said that 35 per cent of those who benefitted from the program were females.

## Apache Plans to Invest \$1bn Annually in Egypt

President of Global APACHE Mr. John Christmann said his company's planned investments are expected to reach \$1 billion annually, a matter he said reflects Egypt's importance for the company, adding that plans are under way to clinch more tenders in the light of the expected discoveries in the country.

He expressed hope for forming a joint work team to prepare a five-year plan to explore for oil and increase the company's investments in the oil and gas domains in Egypt.

The Apache CEO also pointed out that a plan is being outlined to start work in the new concession area «Sharq Bahariya» in the Western Desert after the signing of an agreement in this respect last month.

He praised the economic achievements made in Egypt during the past three years especially in the oil sector, saying Egypt is on the right track and that its bold decisions would



bring more investments to the country.

This came during a meeting with Tarek Al-Mulla, Minister of Petroleum and a high - level delegation from APACHE Global Company included both Mr. John Christman President Executive Director for APACHE and Vice-President Steve Rainy, Financial President and Graydy Apples Regional Deputy President for cooperation operations, and David Chi Regional Deputy President and Director of APACHE Egypt.

## Misr Petroleum Signs Refining Agreement with Petronas

Misr Petroleum company and Malaysian PETRONAS signed memorandum of understanding (MoU) to cooperate in the production and marketing of special oils by exploiting the excess production capacities of the petroleum complex of Misr Petroleum Company. Every year, high quality oils are marketed both inside and outside of Egypt by exporting to African markets.

The memorandum was signed by the accountant Hussein Fathi, president of Misr Petroleum Company, and Joseph Dee Arrigo, general manager of PETRONAS International Lubricants Group (BLI) in the attendance of Egypt's oil minister Tarek El Molla.

President of Misr Petroleum Company explained that (MoU) is a step in formation of venture company between the two sides aims to invest infrastructure and excess production capacity in the supply of specialized petroleum products with the highest standards of quality which is not locally produced and imported from abroad by 20.000 ton annually from first class oils and 10.000 ton annually from Diesel engines oils.



From his side Arrigo stated that the company is interested in cooperation with petroleum sector which is considered a basic pillar to promote its investment position in North Africa and middle east specially with success availability and wide market includes all productive facilities and technical possibilities.

## Saudi Aramco says awards Baker Hughes services contract for Marjan field

Saudi Aramco has awarded Baker Hughes an integrated services contract for its Marjan oilfield, the Saudi state oil giant said in statement

The oilfield is one of the three major offshore expansion projects in Saudi Arabia, Aramco said, adding that Baker Hughes will provide drilling services, voiled tubing services and drilling fluids engineering services in Marjan.

Under the contract Baker Hughes, a GE company, "will commence work this month with an aim to increase the



field's capacity," the statement said.

"Baker Hughes' provision of drilling services will include logging-while-drilling, reservoir navigation services, and rotary steerable services," the statement added.

## Total's Profit Jumps in the Second Quarter to \$3.6 Billion

Oil and gas major Total reported better-than-expected results in the second quarter thanks to new record oil production and high oil prices, which enabled it to raise its output and savings targets for 2018.

The French group said second quarter adjusted net profit soared 44 percent to \$3.6 billion (£2.72 billion), compared with analysts' estimates of \$3.4 billion.

Oil production rose by 8.7 percent to 2.717 million barrels of oil equivalent per day, the highest ever produced in a quarter, driven by the early completion of its Maersk Oil deal and the ramp-up of several projects including Yamal LNG in Russia and Moho Nord in Congo.

Total also raised its oil production growth target to 7 percent in 2018 from 6 percent previously, expecting a strong boost from the start-up of production in Angola's Kaombo North, Nigeria's Egina and Ichthys LNG in Australia



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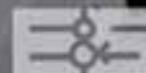


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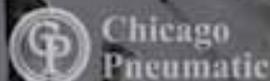


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# New Products

## Ultra-deep Resistivity Service

Halliburton introduced the EarthStar ultra-deep resistivity service, a logging-while-drilling technology that helps operators map reservoir and fluid boundaries more than 200 ft from the wellbore. The service delivers a comprehensive reservoir view so operators can eliminate costly pilot holes and side-tracks, make informed geosteering decisions in real time, and plan future field development. The service uses azimuthal electromagnetic measurements to map the geological structure around a wellbore. Operators can deploy the service in several applications, including geomapping, to estimate the volume of hydrocarbons in a reservoir and to identify bypassed pay. In geosteering applications, Earthstar helps position wells in the reservoir's sweet spot for maximizing recovery. Additionally, through geostopping, the service provides early indications



of potential drilling hazards. An operator in the North Sea recently deployed the service in a mature carbonate field to identify remaining oil within a partially waterflooded reservoir. The service mapped the location of the oil and helped guide geosteering decisions to maximize well contact with the oil-bearing zones. After successfully drilling a long interval, the well entered a zone of injected water that continued for more than 400 ft. The operator considered halting drilling, but the data indicated a second oil deposit approximately 50 ft below the well. This increased the productive length of the zone by 50%.

■ For additional information, visit [www.halliburton.com](http://www.halliburton.com).

## Coiled-Tubing Unit



National Oilwell Varco (NOV) introduced its new Genesis ST2438 four-axle trailer-mounted coiled tubing unit at the 2018 SPE/ICoTA Coiled Tubing and Well Intervention Conference. The Genesis ST2438 unites design ingenuity with advanced coiled-tubing equipment and technology, giving service companies a new option for challenging North American coiled-tubing applications. A new wet kit provides suitable hydraulic and electrical requirements for full operation and uses improved hydraulic filtering techniques, while the high-visibility control cabin provides the operator with expanded line of sight for spooling and a panoramic view of the wellsite. The HR-6100 injector mounts onto a hydraulic tilt stand at the rear of the trailer, allowing tubing to remain stabbed during transit. The injector has a continuous pull capacity of 100,00 lbs at a maximum speed of 160 ft/min and a snubbing capacity of 50,000 lbs. The unit is optimized to maximize tubing payload and legally carries up to 24,000 ft of 2 $\frac{3}{8}$ -in. coiled tubing with a dry tubing tare of 110,000 lbs. This means that the unit is structurally capable of carrying the largest tubing load possible into the most diverse group of basins—those in high-activity areas across Texas, New Mexico, Oklahoma, Louisiana, Ohio, Colorado, and Wyoming—without exceeding axle and tire ratings.

■ For additional information, visit [www.nov.com](http://www.nov.com).

## Wellhead-Sealing Solution

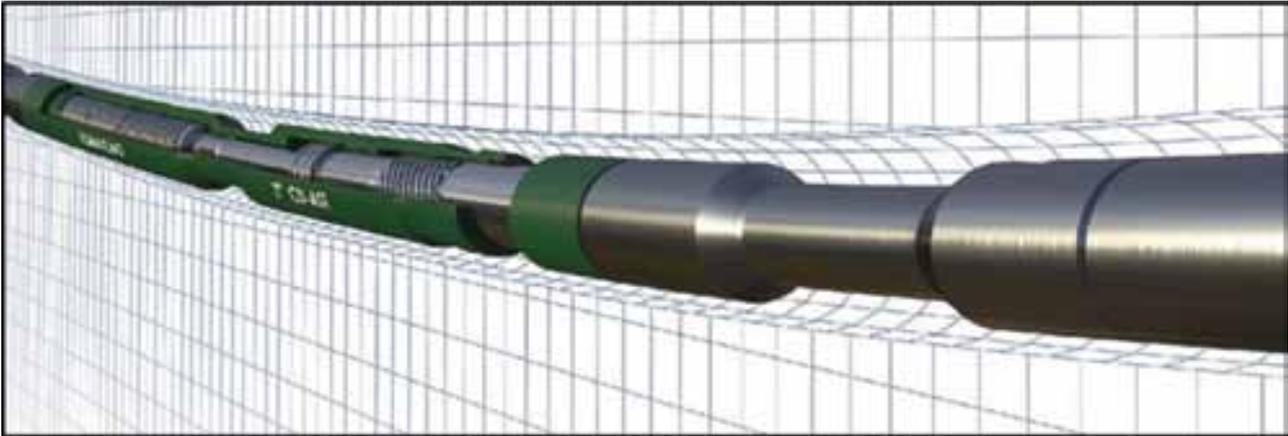
High-pressure wellhead-sealing environments, such as casing strings and tubing hangers, are safety-critical applications requiring a robust and capable sealing product. Trelleborg Sealing Solutions introduced a metal end cap seal specifically engineered for high-pressure/high-temperature (HP/HT) wellheads, tubing, and casing-hanger-sealing environments that combines the pressure and extrusion resistance of a metal-to-metal bonded component with the flexibility of an elastomer. The high-performance elastomer-to-metal bonded sealing elements provide the high level of extrusion resistance necessary for HP/HT casing and tubing hanger applications. Combining the range of proprietary XploR rapid-gas-decompression and sour-gas-resistant elastomers with corrosion-resistant metal end caps, the company's engineers can design a customized sealing solution to meet specific oilfield requirements. Sealing in the elastomer-to-metal design solution is achieved by controlled deformation of the elastomer and metal end cap elements during installation and operation. Optimal stress distribution throughout the elastomer body is modeled through finite-element analysis to ensure that appropriate design standards are applied to each customer's application. Extrusion resistance is provided by the specially designed metal end caps that provide positive metal-to-metal sealing interference with the hardware upon assembly and conform to any potential extrusion gaps under pressure.

■ For additional information, visit [www.oilandgas-seals.com/en](http://www.oilandgas-seals.com/en).



Trelleborg Sealing Solutions' metal end cap seal combines the pressure and extrusion resistance of a metal-to-metal bonded component with the flexibility of an elastomer.

## Anti-Stick/Slip Technology



Anti-stick/slip (AST) technology from Tomax, as used in its new Curve-Drilling (CD-AST) tool, is installed close to the drill bit and will stabilize the loading of the bit within 20 milliseconds. With assistance from the AST at the bottom end of the string, the driller can push harder with less worry about the motor and the bit. The result is faster rates of penetration without a commensurate cost in bit wear and failures. The AST regulator pushes the system toward the optimal intersect between cut and friction. This is where the cutters remove the most rock with the least waste. The constant push toward optimal efficiency has a clear positive effect on bit life and footage per bit. The CD-AST can accompany high-performance-motor-powered, flexible rotary steerable systems. These systems are designed to drill wells through the most challenging geology in one fast run. The new tool combines the proved tool design with a new progressive energy storage and deflection capability. The tool is initially produced in 7-in. outer diameter for hole sizes from approximately 8 $\frac{3}{8}$  to 9 $\frac{7}{8}$  in. The inner diameter matches that of the existing tools, and the operational range matches the relevant motors.

- For additional information, visit [www.tomax.no](http://www.tomax.no).

## Plunger-Lift Bottomhole Assembly

Plunger lift of horizontal and unconventional wells is typically impaired by the attempted application of tools designed for vertical applications, which can lead to suboptimal artificial-lift performance. Well Master Corporation developed two new variations of plunger-lift bottomhole assemblies (BHAs) to address degraded artificial-lift performance in unconventional plunger lift wells. These are the Horizontal BHA and the Heavy-Duty BHA. Both are available in multiple hold-down configurations. Continuous plunger operations in high-energy unconventional wells result in high plunger velocities. Dissipating the kinetic energy resulting from these high velocities requires absorbing significant impacts on the BHA—repeatedly, routinely, and at high frequency. Well Master has developed a heavy-duty Rhino spring designed to better absorb and dissipate the energy of these impacts without deforming the fishing neck. This enables cost-effective deployment of steel BHAs into applications that have historically required expensive titanium BHAs. One of the primary artificial-lift challenges in unconventional wells is how to lift fluids from deeper in the heel. To facilitate such plunger operations, the company designed a horizontal spring, a BHA that contains a standing valve. This valve will remain seated at inclinations in excess of 70° and will reset at inclinations of up to 68°.

- For additional information, visit [www.wellmaster.com](http://www.wellmaster.com).



Well Master's Horizontal and Heavy-Duty BHAs are available in multiple hold-down configurations.

## Reservoir Simulator

Italian energy company Eni and US-based Stone Ridge Technology (SRT) have entered into a cooperative agreement designed to advance the development of ECHELON, SRT's high-performance reservoir simulator. The agreement initially covers a 3.5-year period, during which SRT and Eni will work together to enhance and promote simulation technology and work flows that are enabled by ECHELON's performance. Reservoir-simulation codes model the subsurface flow of hydrocarbons and water in a petroleum reservoir. They allow energy companies to optimize recovery from their assets by simulating numerous hypothetical scenarios for well-placement and -development strategies. ECHELON offers enhanced speed and scalability and is built to run entirely on Nvidia Tesla graphics-processing units (GPUs) and CUDA software, used in artificial-intelligence, machine-learning, and big data applications.

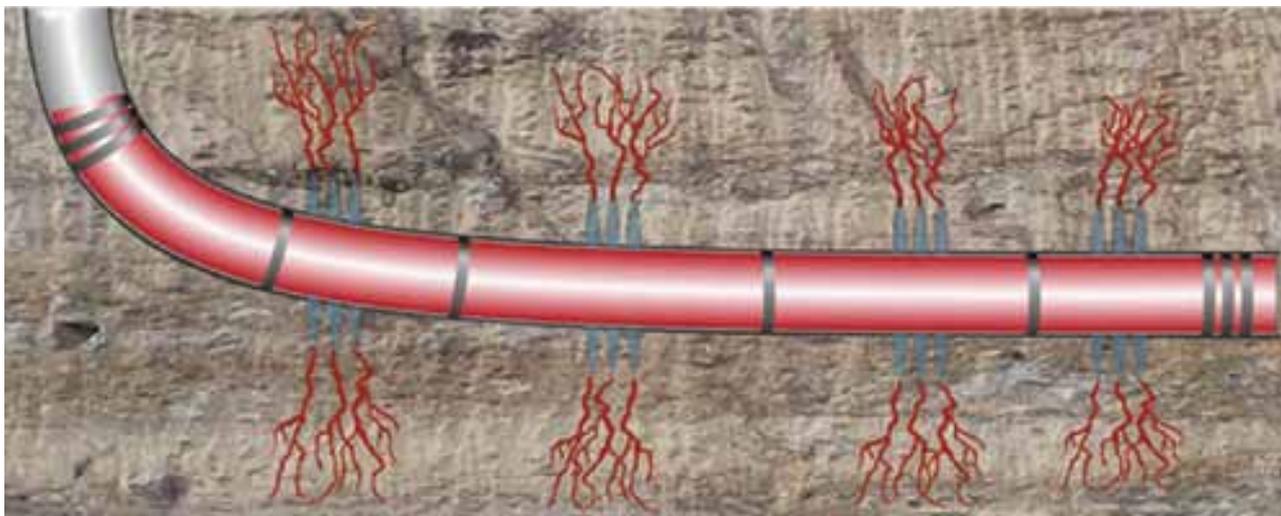
Recently, Eni announced the completion of a breakthrough calculation using ECHELON and its HPC4 cluster. A high-resolution model of a deepwater reservoir, with 5.7 million active cells, was used to generate 100,000 realizations with different petrophysical properties. All 100,000 models were completed in 15 hours running on HPC4's 3,200 Nvidia Tesla GPUs. Each individual model simulated 15 years of production in an average of 28 minutes. By comparison, most reservoir engineers can run one single simulation in a few hours with legacy central-processing-unit-based hardware and software.

■ For additional information, visit [www.stoneridgetechnology.com](http://www.stoneridgetechnology.com).

## Refracturing Liner

The accelerated decline rates of tight unconventional reservoirs have intensified a surge in refracturing programs. Operators are taking advantage of improved fracturing designs to increase production and estimated ultimate recoveries of largely impermeable shale wells. Enventure introduced a series of expandable liners, including the ESeal refracturing liner, that provides zonal isolation in higher-temperature environments in order to extend the safe operating window. Operators have achieved production increases with solid expandable technology after refracturing liners have been installed, compared with production before the refracturing. The enhanced expandable refracturing liner provides 16% more tensile strength to allow installations in the 225°F–250°F range. The high-temperature refracturing liner provides 40% more strength to allow installation in the 300°F range. Pairing this offering with its proprietary engineered liner analysis, the company can assist operators in making data-based decisions about their refracturing options. Two successful field installations using the new expandable liners have been completed. The first installation occurred in south Texas. 5,000 ft of 4¼-in. expandable liner was installed and expanded inside 5½-in. casing at a bottomhole temperature of 230°F. A second 450-ft installation occurred in west Texas, also inside 5½ in. casing at a bottomhole temperature of 165°F. Both were installed, pressure-tested, and fractured with no indication of pressure loss.

■ For additional information, visit [www.enventuregt.com](http://www.enventuregt.com).



The ESeal expandable refracturing liner from Enventure provides increased tensile strength.

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We are accredited by the ILAC, based on the international mutual recognition arrangements (MRA), under the guidelines of ISO/IEC 17025 for general requirements for competence of calibration and testing laboratories. We are certified ISO 9001, OHSAS 18001 and ISO 14001. The ILAC is the peak international authority on laboratory accreditation. Laboratory accreditation provides our clients with formal recognition of the competence of our laboratory. We are re-evaluated regularly by the accreditation body to ensure our continued compliance with requirements. Thus, being accredited is highly regarded both nationally and internationally as reliable indication of our technical competence. Accordingly our data is readily accepted overseas.



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### Admasco Work Shop

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# THE EGYPTIAN STRATEGY TO ATTRACT MORE INVESTMENTS



— The —  
2018  
— Big —  
Bid Round

by: Osama Radwan

**E**gypt has recently ramped up efforts to attract foreign investment in its oil sector to boost its struggling economy. Along with Eni, and Royal Dutch Shell also have significant operations in Egypt in offshore gas production, which is consumed domestically although Cairo aims to become a gas exporter. The energy map has changed by starting to exploit the hydrocarbon potential in the Mediterranean. Taking about the east Mediterranean specifically, it is considered as one of the richest basins all over the world. The east Mediterranean is a unique opportunity for the European market to get their energy need faster and in a more economic manner. The east Mediterranean is highly qualified to be an energy hub for exporting and processing the natural gas. Having a central location and excellent logistics facilities makes this region one of its types in the area. The industry leaders and large upstreamers recommend Egypt to be the energy hub and the region outlet for the gas. Collecting the natural gas from Cyprus and other producers for liquefaction and exporting finds its way in Egypt. Egypt is equipped with the talented man power, facilities and economic logistics means. Egypt stands on a hard basis and infrastructure to be a unique regional energy hub. In addition, Egypt has good relations with its neighboring countries with the readiness to make flexible deals. Egyptian LNG Terminal is an LNG terminal in Beheira, Egypt on the Mediterranean coast. It facility is also called Idku LNG.

Egypt's domestic market had diverted natural gas feedstock from export plants. Operations at the ELNG terminal greatly decreased in 2014. Political upheaval caused power shortages and forced Egypt to save gas for



its own use. LNG ceased export in 2015. It has not been formally decommissioned. In 2015 Egypt became a net LNG importer. The International Gas Union predicts new gas drilling in the Zohr gas field of the Mediterranean Sea, as well as Egypt's West Nile Delta, may restore Egypt's status as a net gas exporter by 2021. Egypt started exporting limited amounts of LNG from the Egyptian LNG terminal in September 2016 to keep equipment running. It plans to run the facility at full capacity for export in 2020 or 2021. According to the International Gas Union's World LNG 2017 report, Egypt was the 18th largest LNG exporter by share between 2015 and 2016.



The oil and gas industry in Egypt has grown rapidly in this period. We can notice the dynamic environment in the E&P business concerning all levels and sectors. Egypt is witnessing a golden era in the petroleum industry nowadays supported by the unprecedented efforts from management to operations. All the petroleum sector aims at unlocking the hydrocarbon potential in the Mediterranean. The dream of transforming Egypt into an energy hub motivates



all the partners to devote their technology and efforts for the sake of Egypt. The mindset of the government has evolved greatly to consider the companies as partners of success and builders of tomorrow. The ministry is always welcoming the new initiatives, projects, and paradigms as long as they are constructive ones. On the other hand, we can call the Mediterranean a national treasure and Egypt is where the treasures stay and flourish. Egypt proves its readiness and priority to be an energy hub in the region.

Continuing the day to day success in the Mediterranean, the ministry is always supporting the international oil companies to uncover the potential of the Mediterranean. All the suppliers, service companies, and contractors are supporting the Mediterranean with high technology and talented minds and hands. These efforts resulted out a great success during the last period. Doing things right came out with ensured quality and unique achievements. The understanding of Egypt's key strength points helps out participate in this mega project. Egypt dominates with the best logistics and with the best prices due to its special geographic and geopolitics location among the countries. The infrastructure in Egypt encourages the application of any new mega project supported by all the national resources. Egypt's petroleum industry has the sufficient capacity and labor to be the gas hub for the region.

Concerning the regulation parameters, Egypt's current regulations qualify it to go through the business with all the parties without having insecurities or conflicts. Egypt ensures its place to be a leading hub in the region cooperating with the neighboring countries to supply the domestic and world energy need. Counting on the stability of the Egyptian market to fulfill the domestic need, all the companies can work effectively with Egypt ensuring that there production will be completely sold out without the unknown risks to store and ship the production overseas. Even if you would like to export a portion of your production, you can count on the pipelines infrastructure with the economic shipment facilities.

Furthermore, Egypt enjoys well established facilities that will enable it and its international partners to play a very important role in the global sector, in terms of investment opportunities, especially in non-explored and non-developed areas and locations such as the Red Sea. This vision is supported by the Red Sea economic sea borders agreement, signed between Egypt and Saudi Arabia. The agreement allows each country to issue laws for their economic borders, and to carry on E&P activities, eventually resulting in more hydrocarbon resources for both countries.

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## Real Success and Prosperity Indicators

Recently, there have been several mammoth onshore and offshore natural gas discoveries in Egypt. Zohr, along with several fields at West Nile Delta and North Damietta concessions, represent the most important recent discoveries that will help Egypt increase local natural gas production.

Zohr was discovered in August 2015 by the Italian company Eni and is located in the Shorouk concession. As the biggest natural gas field in the Mediterranean, the mega field is considered a game changer for Egypt. It includes an estimated 30 trillion cubic feet (tcf) of natural gas, which increases Egypt's total natural gas reserves by about 40%, based on the Italian company's official statement. The gigantic field started production on December 16, 2017 with an initial capacity of 350 million cubic feet per day (mcf/d), which will contribute to decreasing Egypt's imports. An official from EGAS stated that Zohr production will reduce Egypt's import bill by around \$50 - 60 million monthly.

## Egypt Petroleum Industry in a Nutshell

The Egyptian petroleum industry witnesses a hot year of activities. Starting by ENI, it will work on increasing Zohr field production by drilling new wells. Apache Corporation will adopt a new exploration plan which includes drilling 50 new wells during fiscal year (FY) 2018/2019, via Qarun and Khalda oil companies. Egypt will start drilling operations at the 9B phase of the West Nile Delta deepwater concession in the Mediterranean Sea in April 2018, for producing natural gas. Tharwa Petroleum Company drilled seven development and exploratory wells and successfully made two new oil discoveries at Abu Sennan concession in 2017. SDX Energy Corporation has announced making a new oil discovery at the Rabul 5 well, located in Egypt's West Gharib concession.

## Gas Market Liberation

The Egyptian General Petroleum Corporation (EGPC) announced the Gas Market Law, a piece of legislation aiming to liberalize the gas sector in Egypt, which was in July 2017 as law 196 for 2017. The law is aiming at putting the Egyptian market in a win-win situation with the investors and the customers. The law capitalizes on the dynamics of the Egyptian market and on the domestic

need to enable the best outcome. The law supports the fact that the petroleum industry will always be a pillar in the Egyptian economy.

## The Ministry Modernization Plan:

The ministry is working with different international corporates to assist in achieving the modernization target in the oil and gas sector. Minister of Petroleum and Mineral Resources Tariq Al-Mulla met Joe D. Rainey, Halliburton Eastern Hemisphere President and Eng. Osama Abdel Halim, President of Halliburton Egypt, in the presence of geologist Ashraf Faraj, the deputy of the Ministry of Petroleum for Agreements and Exploration, where they discussed aspects of joint cooperation between the two sides in oil projects during the coming period, Egypt's electronic portal for the marketing of petroleum areas and exploration, which comes within the framework of the project to develop and modernize the oil sector currently underway, as well as cooperation in the exploitation of non-traditional sources of oil and gas production, training the upcoming calibers and ways to apply the latest technologies to enhance the efficiency of drilling activities and improve field productivity. El-Mulla pointed out that the meeting reviewed the position of joint cooperation to complete the project of Egypt's electronic portal for the marketing of petroleum areas and exploration in light of the agreement signed between the two sides last April to increase the utilization of the global expertise of these specialized companies to work in the field of geological information bases and marketing of global auction areas for oil and gas exploration Egypt in front of the largest number of international companies through the international information network, processing new seismic data and improving old data using the latest technologies to identify structures with good petroleum potentials.

For his part, Rainey pointed out that the company is currently working to expand the mechanization of field production operations using digital solutions and that it would like to participate in the program of developing human calibers within the project of developing and modernizing the petroleum sector which represents one of the important tracks in supporting the qualification of young cadres for leadership positions through scientific training programs and a process to be applied according to the best global models.

On the other hand, Al-Mulla announced that an integrated work program is being implemented to increase the production of Western Desert from oil by offering

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international tenders and signing new oil agreements to intensify exploration using the latest technologies and modern drilling methods. Oil and gas production is expected to increase within the project of development and modernization of the oil sector, which resulted in several discoveries of crude oil and natural gas in new geological structures to confirm that Western Desert is still a promising area, which encourages attracting companies to pump new investments, pointing out that the use of seismic survey of modern technologies will be significant in developments in the oil and gas exploration including maximizing production. Al-Mulla stressed the importance of continuing to develop, modernize and follow the latest international standards in occupational safety and health measures in various production activities and to rationalize public spending, reduce production costs to maximize revenues and improve drilling rates to explore more crude oil and natural gas to increase production and reserves.

The establishment of the Egyptian Portal for Exploration and Production took the necessary steps to start its establishment through the signing of 4 memorandums of understanding with specialized international companies to establish a digital information bank and a new investment map to promote investment opportunities in the field of research and exploration as applied in the major producing countries, To maximize the value of the technical data of the activities of exploration, production, development, promotion and marketing globally for these activities in accordance with modern concepts developed in order to attract and diversify foreign investments in these activities to increase reserves and production.

The ministry is working on the portal with Schlumberger. Al-Mulla discussed with Mr. Maan Razzouki, President of Schlumberger International Company for the North Middle East, and Mr. Karim Badawi, Executive Director of Egypt and Eastern Mediterranean, the use of latest technologies and digital solutions to provide the assistance in the modernization program as well as the training programs.

In addition, Al-Mulla met Mr. Matthias Heilmann, the President and CEO, Digital Solutions for Baker Hughes General Electric and his accompanying delegation, where they discussed ways of cooperation between the oil sector and the company to activate the agreement to launch the project of Egypt's electronic portal for the marketing of petroleum areas and exploration through the information network International.

This approach comes within the framework of the project to develop and modernize the oil sector through the provision of digital infrastructure and new applications to

contribute to the preparation of a digital investment map of the auction areas offered by the petroleum sector and use in the marketing processes of auctions to keep pace with modern technologies and improve the quality of the services of exploration activities.

### **Foreign Investments:**

Moreover, Al-Mulla has recently signed three new oil agreements for the exploration of oil and natural gas in the Mediterranean, Western Desert and Nile Delta regions. The first agreement was with EGAS, Tharwa Petroleum and Eni in the Mediterranean Sea of Noor to drill two wells with a total investment of \$ 105 million. The second agreement was signed with EGPC, Italy's Eni and the Croatian INA Naftaplina in the Ras Qattara region in the Western Desert to drill nine wells with a total investment of 11.7 million dollars. The third agreement was with EGPC, ENI and BP in the Nile Delta (Nidoko) to drill four wells with a total investment of 22.5 million dollars.

Apache has announced its plans to increase its annual investment in Egyptian oil exploration projects to \$1 billion, Xinhua reported. Apache CEO John Christmann and petroleum minister Tarek El Molla said that the plan "reflects the importance of Egypt for Apache," according to a ministry statement. "Christmann and El Molla discussed means to expand Apache's exploration activities in Egypt as well as the company's ongoing projects and future investment plans in the country," the statement added. Christmann expressed the importance of creating a joint team to prepare a five-year plan for Egyptian oil exploration, breaking down the expected investments and production. The Apache CEO also recognized Egypt's economic achievements in the petroleum sector over the past three years, stressing that the country is heading "in the right direction".

Apache signed a \$9 billion agreement with the Ministry of Petroleum in mid-July for oil and gas exploration in the Western Desert.

Foreign direct investment (FDI) in Egypt's oil and gas sector reached \$10 billion in fiscal year (FY) 2017/18/, Minister of Petroleum Tarek El Molla told Al Ahram newspaper in an interview published on August 24, Reuters reported. El Molla stated in the interview that he expects the same amount of investment for the current fiscal year. In comparison, Egypt's petroleum sector received \$8.1 billion of foreign investment in FY 2016/17/.

Egypt is expected to become self-sufficient in natural gas by the end of 2018, with plans to become a regional gas export hub off the back of major discoveries in the

Mediterranean Sea. Egypt's Zohr gas field located in the Mediterranean is expected to reach 2 billion cubic feet per day in production capacity by September, according to field operator Eni.

### Steps Towards the Energy Hub:

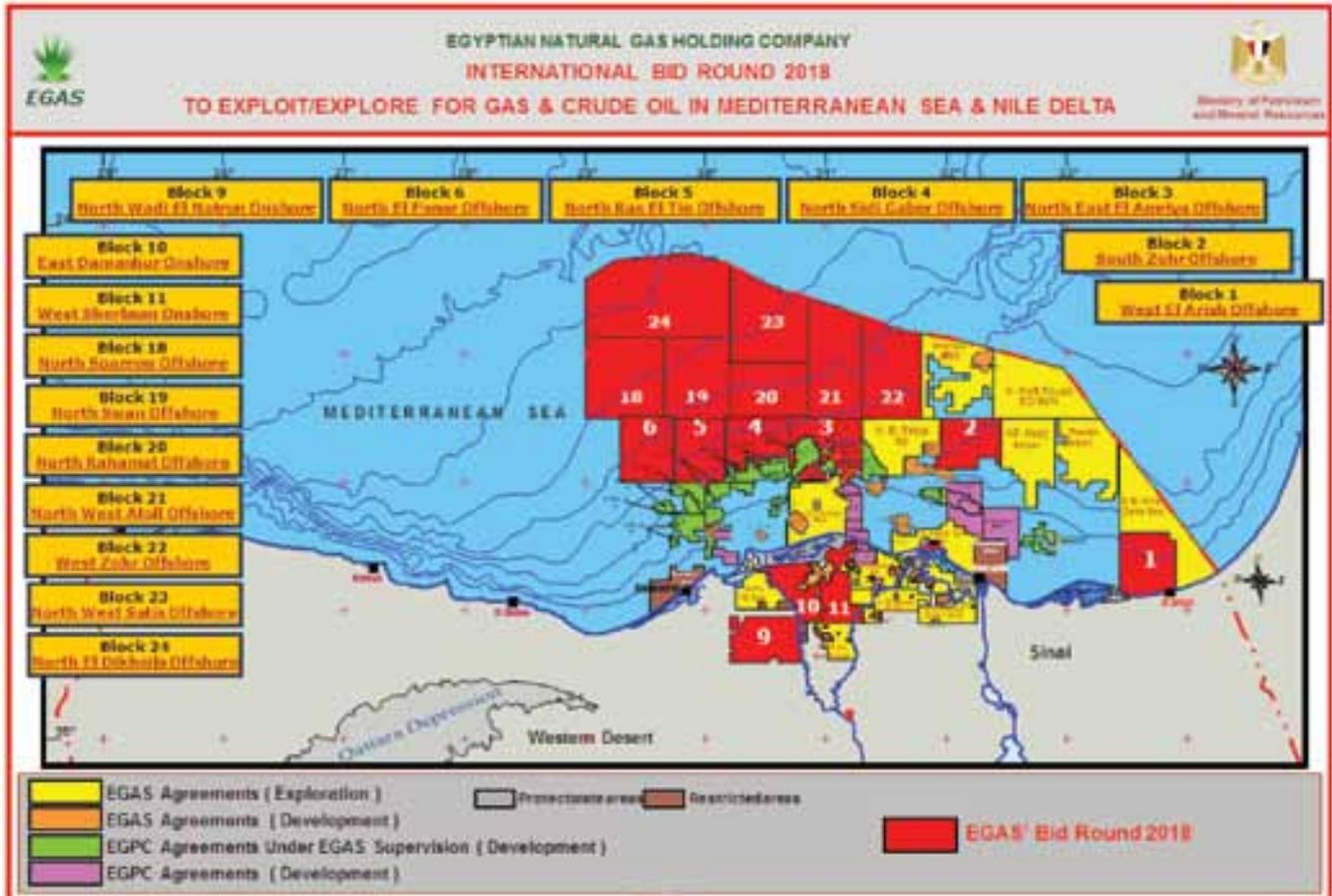
The Egyptian Natural Gas Holding Company (EGAS) has applied for shipping and supply licenses from the Gas Regulatory Authority (GRA) while the Egyptian Natural Gas Company (GASCO) has applied for transportation and distribution licenses. Fourteen Egyptian companies have submitted license requests to the GRA to perform various gas market activities. The regulatory body is expecting another two companies to submit their requests within the next week, the source added.

Earlier this month the GRA set the fees for the licenses that will allow companies to use the national gas grid. The license fee will depend on the activity and the amount of gas. Transmitting 1 million British thermal units (MMBtu) will cost \$0.057, and shipping will cost \$0.031 per MMBtu. Distribution and supply licenses will cost \$0.023 and \$0.008 per MMBtu respectively. The

GRA also set a tariff of \$0.38 per MMBtu for companies looking to transfer natural gas through the national grid. Egypt issued the executive regulations of the gas market liberalization law in February. The new law allows private market players to ship, transport, store, market, and trade natural gas using the national grid.

### New Exploration Tenders

the ministry is looking to increase investment opportunities in the field of oil and gas exploration, through offering tenders on new exploratory areas in the Red Sea and West of the Mediterranean. Molla asserted during a work meeting on attracting the investments that the ministry will offer international tender for oil and gas exploration in the Red Sea area according to results of the upcoming seismic survey project in December 2018. The project is implemented by global oil company WesternGeco Schlumberger, aiming to identify non-exploratory oil and gas areas and find new geological layers in current production areas at the Gulf of Suez. Molla also announced that the ministry signed four Memorandums of Understanding with global companies to establish a digital information bank and new investment map, aiming





to increase investment opportunities in field of oil/gas research and exploration.

#### **EGAS Bid Round Release:**

The Egyptian Natural Gas Holding Company (EGAS) launched the 2018 bid round for oil & gas exploration on 16 concession areas: 13 blocks in the Mediterranean Sea and three concessions in the onshore Nile Delta region. The EGAS bid round is set to be the largest since its founding in 2001.

The Egyptian Natural Gas Holding Company (EGAS) invites Petroleum Exploration Companies for 2018 International Bid Round to explore/exploit for Gas and Crude Oil in Egypt.

This Bid Round includes sixteen (16) Exploration Blocks in the Mediterranean Sea and Nile Delta basins of Egypt as shown in the attached map.

Interested companies shall submit their offer(s) based on the Procedures, Main Terms and Conditions and the Production Sharing Model Agreement. Any offer(s) with different conditions, other than the announced Main Terms and Conditions, shall be disregarded.

Starting on Monday 21st, May 2018; interested companies are welcomed to review and/or purchase the Principal Data Package (2D seismic, digital log curves & composite well logs) as well as the Optional Data Package (3D seismic data & well reports), all in digital format, according to

prices indicated in the following table.

The Egyptian Natural Gas Holding Company (EGAS) announces the Change of the closing date of its 2018 International Bid Round for 16 blocks. The closing date is extended from Monday 8th of October, 2018 to Thursday 29th of November, 2018 to encourage more investors and let the opportunity for more review and study.

#### **EGPC Bid Round Release:**

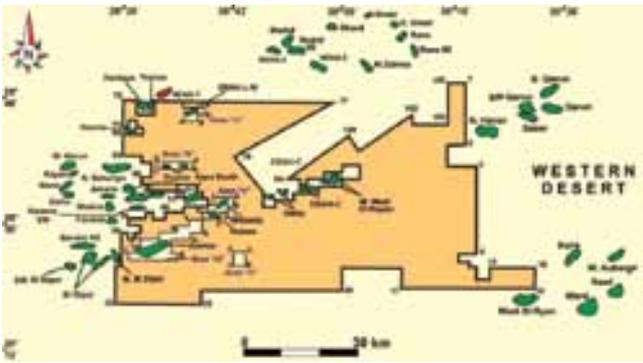
EGPC'S 2018 International Bid Round includes Eleven (11) exploration blocks, Four (4) blocks, out of the Eleven are situated in Gulf Of Suez and Eastern Desert while the remaining Seven (7) blocks lie in Western Desert.

The Four blocks in Gulf of Suez and Eastern Desert have an aerial extents ranging between 365 km<sup>2</sup> (South Lagia Block) and 1025.3 km<sup>2</sup> (North West El Amal Block), while the remaining Seven (7) blocks lie in Western Desert have an aerial extents ranging between 822.58 km<sup>2</sup> (South Burg El Arab Block) and 6192.74 km<sup>2</sup> (North El Minya Block). All of these blocks are covered with 2D and 3D seismic surveys, and all of them have previous drilled wells.

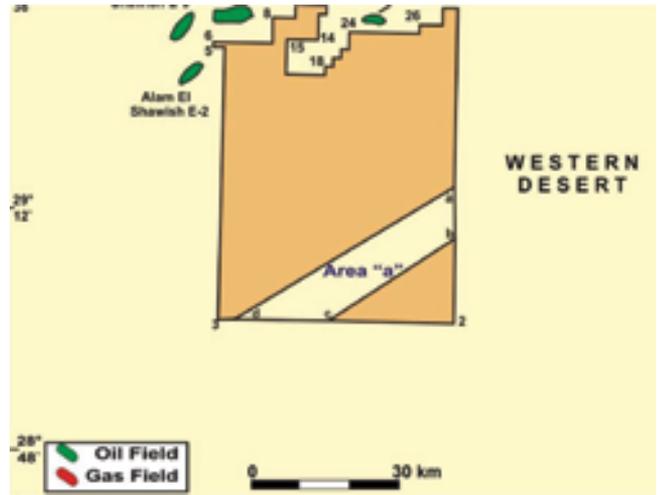
EGPC takes in consideration to extend the Eastern Offshore blocks of the Gulf Of Suez to the onshore of Sinai to facilitate services provided for the working companies and reduce the cost of the near offshore wells drilling (Onshore Deviated Wells).



**7** WEST ELFAYIOUM BLOCK



**10** SOUTH ABU SENNAN BLOCK



**8** SOUTH BORG ELARAB BLOCK



**11** SOUTH EAST SIWA BLOCK



**9** SOUTH EAST HOROUS BLOCK



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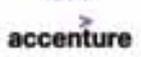
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# The Relevance of Chemistry in Deepwater Design and Operations

By

Nikhil B. Joshi, Anadarko Petroleum Corporation; Qiwei Li, Nalco Champion, An Ecolab Company; Kashyap Kapadia, Consultant

**A**bstract  
Appropriate design and operations of deepwater facilities require prior knowledge of expected properties of gas, oil and water to be produced. With the subsurface uncertainty of reservoir connectivity, compositional gradients, aquifer presence and support and the extent of the reservoir to be developed, it is challenging to put bounds to the expected fluid properties. Any estimates of production rates and the fluid property variations in a field to be developed is riddled with uncertainty, as are other aspects of the development. The integrated project team consisting of reservoir, flow assurance, facilities and production disciplines is tasked to convert this uncertainty to a robust set of design basis for execution. For the team to be successful in this endeavor, the team members are expected to be aware of the potential impact of the production chemistry on the project success. This paper is a discussion of principal fluid characteristics that may compete with other uncertainties to define project risks. In this discussion, production chemistry refers to both fluid compositions and the macroscopic flow-related elements. For example, fluid compositions and flowing pressure and temperatures impact hydrate, paraffin and/or asphaltene precipitation and deposition characteristics. And kinematic properties such as viscosity and phase equilibria impact the design of flowlines, separators and ultimately operations. Specific discussions are on condensate and water properties in wet gas field developments and for oil developments, asphaltene and water properties are discussed. Intent of this discussion is to assess the influence of fluid properties on successfully developing and operating wet gas and black oil fields.

## Introduction

To assess the fluid properties and its influence, sampling and testing is at its core. The experience during sampling

and data from laboratory analysis is important information for the design and subsequent operations of a deepwater field. The following discussion is on current fluid sampling practices followed by challenges associated with testing/analyzing those fluids. This process is to design facilities that can be effectively operated while producing from field.

## Current Fluid Sampling Practices

In a deepwater Gulf of Mexico (GoM) field development, emphasis is on appropriate sampling and testing of in-situ fluids to meet the subsurface objectives. These are distinguished between fluids and core tests: (i) fluid testing to assess reserves and expected recovery, well deliverability, reservoir connectivity, standard vapor-liquid-solid equilibrium to support facilities design, fluid-fluid compatibility testing for completion design and (ii) routine and specialized core testing that supports completion design and other rock properties such as rock compressibility, porosity, permeability, critical flow velocity that are used to assess static and dynamic properties of the reservoir (Honarpour 2006). Over the years, advances in formation testing (MDT) as well as laboratory testing methods have resulted in better quality hydrocarbon samples collected. With technical advancement, the sample volumes collected during such evaluations have been limited. There are several reasons for that such as:

- The fluids in most deepwater reservoirs are expected to vary because of expected vertical and / or spacial heterogeneity (Hashem 2011). Hence, it is desired to collect samples from several depths instead of a large volume from only one depth.
- Each downhole evaluation run typically carries 3 tool strings, each tool string is either a 6-sampler configuration with of 400 - 800 cc sample chambers or a large 1-gallon sample chamber. There are various types of sample chambers fitted in such a configuration with some samples

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always being kept above reservoir pressure or conventional samplers with a floating piston. Each sampler varying in type and volume caters to a different objective of fluid testing that supports overall development.

- While most laboratory testing methods have been optimized to use small volumes, testing for core or flow assurance challenges need sample volume in the order of gallons. Such a need to collect large downhole sample volume requires multiple MDT runs which cannot always be justified at an early assessment stage of field development.
- Also, since there are no facilities associated with such discoveries during early assessment, flowing the well to collect surface samples is not feasible. In addition, with advances in technology such as logging while drilling (LWD) and MDT, the perceived need to conduct drill stem tests (DST) has reduced.

Thus, current practices result in available downhole sample volume from each depth in the order of 1 – 2 liters at reservoir conditions. Such a sample volume is required to fulfill various objectives of testing and support field design and development.

## Challenges

The relatively low volume downhole sample collected is usually sufficient for reservoir characterization but poses a significant challenge for fit-for-purpose facilities design and operation. These challenges for various types of reservoir fluids are discussed as follows:

### Wet Gas

For a wet gas development where the expected liquid yield of the reservoir fluid is less than 10 bbl / mmscf, measurement of produced liquids to gas ratio is critical for facilities design. Assuming the wells are drilled using oil-based mud (OBM), simulation studies as well as experience has shown that it is not feasible to get the desired 5 – 10 wt% OBM contamination in the stock-tank oil (Malik 2009). It is common to observe OBM contamination levels of greater than 50 wt% in the stock-tank oil for such fluids. In gas condensate fields, two types of liquid yields are expected from production: (i) hydrocarbon condensate, and (ii) connate water. The chemistry of these liquids significantly impact the facility design and operation of the field. In the laboratory, significant focus is placed to accurately measure the condensate to gas ratio (CGR) but the water to gas ratio (WGR) is not measured. With a CGR of 5 bbl/mmscf, for example, with reservoir conditions of 10,000 psi and 200°F, each sample chamber is expected to yield ~6 cc of stock-tank oil which contains greater than 50% OBM that cannot be separated from the condensate. Most laboratory equipment need a minimum of 2 - 3 cc of

stock-tank oil for accurate measurement of properties such as density, carbon distribution composition and molecular weight. These properties are important inputs to facilities/process design. Such a small stock-tank oil volume is barely sufficient for expected CGR of 5 bbl / mmscf or higher but insufficient for lower yielding gases. The relatively low liquid yield requires laboratories to flash the sample for 12 hours or greater. Since such a process is not automated, it is subject to further measurement uncertainties. Thus, the CGR measurement is dependent on such testing uncertainties and assessment of OBM contamination can vary by 50 - 100 % because of high uncertainties in assessment of OBM contamination (Smellie 2010).

In addition to the uncertainty in the expected produced condensate rate, in such a gas field, it is expected that the produced gas would contain 0.2 – 0.5 bbl/mmscf of produced connate water that is not measured in the laboratory. Such variations in estimated liquid production (condensate and water) of greater than 50% leads to high uncertainty in facility design, i.e. doubling slug catcher size, downstream liquids handling vessels, associated pumps and other auxiliary equipment (control valves, flowmeters, level measurement - critical instrumentation to operability). Facilities are almost always overdesigned to ensure that production is not bottlenecked by liquids processing capacity. CAPEX increase, in the order of a few million dollars, to overdesign facilities is not significant in comparison to overall project cost. However, operation of such overdesigned equipment is a significant challenge due to equipment turndown limitations, increased downtime and/or change out of equipment after initial production. Post-startup facility modifications can be costly from a EH&S, production uptime and economic standpoint.

Another impact on facility design is assessment of flow assurance mitigation strategies and equipment installation. For most dry gas developments in deepwater, the subsea infrastructure is uninsulated and the produced fluids are expected to reach ambient temperature of ~40°F within 1- 2 miles of the wellhead. Such design requires continuous hydrate mitigation by injection of chemicals such as methanol or monoethylene glycol (MEG) or low dosage hydrate inhibitors. MEG injection is most common because of its capability to be regenerated at the topside processing facilities (Brustad 2005). Since the connate water composition is not measured from the MDT samples, mixing of connate water produced from the wells with the injected MEG for hydrate mitigation poses unexpected challenges during the MEG regeneration processes (Latta 2013). These include formation of divalent cation (such as calcium Ca<sup>++</sup>) forming complex substances with MEG and increasing the MEG viscosity 4-fold. Such increase in regenerated MEG viscosity not only makes the regeneration process

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less effective but it also hampers MEG deliverability to the wellhead - impacting effectiveness of hydrate mitigation.

As the chemistry of the produced condensate is not well known due to high OBM contamination, the ability to assess threat of paraffin deposition in the subsea flowlines is limited. The development team is expected to assess whether to plan for paraffin mitigation using periodic pigging and/or injection of paraffin control chemistries and invest in additional subsea chemical deliverability. The chemistries are likely not tested due to low volume of condensate available and the condensate is highly contaminated. Pre-investment to install injection of paraffin inhibitor is additional CAPEX increase in the order of a few million dollars.

An example of the differences in the composition of the condensate measured from MDT samples with the composition of produced condensate is presented in Figure 1. As seen in the figure, the differences are stark. Also, presented in Figure 1 are the gas chromatograms of the stock-tank oils and it is observed, in this case, that the produced oil is highly bio-degraded and primarily aromatic in nature. Such aromaticity, in this example, had resulted in contamination of the MEG and produced water with organic compounds present from the condensate. Such challenges resulted in significant contamination of both overboard water as well as the regenerated MEG with hydrocarbons. Such chemical contaminations led to the requirement of installation and subsequent operation of large carbon filters that were not part of the original topside processing design. To mitigate such continued challenges and make the development of such lean gas condensate fields successful, advances in fluid testing and risk assessment methodologies along with flexibility in the project to adapt to surprises from production are essential. Also, DSTs with appropriate liquid sample collection capabilities installed on the rig are highly recommended. The DST would facilitate not only subsurface evaluation of the reservoir but also provide an opportunity to collect representative liquids to conduct fit-for-purpose facilities design.

### Black Oil

Unlike gas condensate sampling, it is more common to have stock tank oil OBM contamination less than 5 wt% in the pressurized downhole samples. Therefore, OBM contamination exerts a lower influence on fluid characterization and facilities design. However, black oil reservoirs are more heterogeneous in fluid properties, requiring more sample to be collected. Each sampling station may have its own set of objectives for assessment such as vertical / spatial connectivity, hydrocarbon sourcing, flow assurance challenges in production, wellbore commingling, amongst others.

### Viscosity

One of the most common and basic requirements from downhole samples is the oil viscosity per zone at initial reservoir conditions and at lower pressures expected with pressure depletion. With OBM contamination of less than 5 wt%, the viscosity at initial reservoir conditions is representative of the downhole fluids. The oil viscosity with pressure depletion is easily measured in the laboratory for most oils except for highly unstable asphaltenic oils. For an oil containing unstable asphaltenes, the precipitation of asphaltenes causes the oil viscosity to increase significantly resulting in uncertain measurements - see Figure 2. The oil viscosity is expected to continue decreasing with pressure until bubble point pressure is reached and then gradually increase as the dissolved gas evolves. As seen in the figure, the viscosity increases much before bubble point pressure is reached. Such an increase not only reduces the productivity of the well but also the flow characteristics in the wellbore and flowlines. Since asphaltene precipitation results in an additional and separate phase, current laboratory testing equipment and simulation models do not adequately assess effects of asphaltenes on operations. Lack of such tools results in uncertainty to assess potential for flowline blockages and topsides separation issues.

### Asphaltene

Asphaltenes in the oil are usually not a significant concern to upstream exploration and production except when unstable. Asphaltene destabilization and subsequent deposition causes significant and costly challenges: affecting (or afflicting) wateroil separation, deposition in tubular restricting flow, accumulation in vessels facilitating under-deposit corrosion, amongst others. Significant research has been focused on measurement of asphaltene onset pressure using various techniques with most recent and popular methods being oil depressurization along with near-infrared light scattering and modeling using refractive index of oil with and without precipitants (Khaleel 2015). These methods are not standardized and results vary across testing methods and laboratories conducting these tests. Table 1 summarizes asphaltene onset pressure (AOP) at reservoir temperature using different testing methods. While experts may object to such a simplistic representation of AOP measurements, the uncertainty in measurements is significant.

However, AOP measurement is only relevant to assess the location where asphaltene precipitation is expected to initiate and sustain. For example, consider a scenario with Oil B, where the AOP of 6,500 psi as measured by Refractive Index 1 method and the well abandonment pressure is 8,000 psi. In such a scenario, asphaltene precipitation and possibly deposition would occur in the tubing and a decision to place

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asphaltene inhibitor and/or solvent injection upstream of the AOP would mitigate the threat. For same oil, if the AOP was 13,000 psi, as measured by Depressurization method, asphaltene precipitation may occur in the reservoir and mitigation measures become even more challenging and costly than for tubing mitigation. This may result in long-term productivity decline of the well (Al-Qattan 2013) and strategies to mitigate asphaltene related challenges would be different (Gonzalez 2016). In the case of asphaltene precipitation in the reservoir, the project team would have to consider options such as (i) periodic specialized clean-out chemistries/solvent bullhead into the reservoir and appropriate highpressure equipment required for it (not necessary if the AOP was truly lower), (ii) estimation of productivity and EUR of a well for the economic assessment (including solvent stimulation costs), (iii) possible influence on whether to use smart well technology at the risk of smart sleeves being stuck from asphaltene precipitation, (iv) periodic rig intervention to stimulate the well when solvent bull-heading is not effective. The subsea system could be divided into the reservoir (near-wellbore), tubing, subsea infrastructure and topsides. Generating such a phase envelope for the life of the wells enables identification of the section at risk corresponding to the stage of the well life. In the same vein, asphaltene precipitation and deposition below bubble point pressure is not expected to occur. If the flowlines downstream of the subsea choke are operated below bubble point pressure, restriction in the flowlines because of asphaltene deposition is not a significant threat to the project. Figure 3 is an illustration to assess the location where asphaltene precipitation could be initiated. As seen, in early-life, the asphaltene precipitation and possible deposition is expected in the tubing and the flowline near the subsea tree because those areas are above the saturation pressure but below the asphaltene onset conditions. Midlife reservoir pressure is above the asphaltene onset conditions and hence, concerns of deposition are in the tubing. However, the pressure and temperature conditions at the subsea tree are below saturation pressure and hence, there should not be any deposition in the flowlines (downstream of the tree). In late-life, the reservoir pressure is within the asphaltene onset region and hence, the near-wellbore area is susceptible to asphaltene precipitation that would result in productivity impairment. Reservoir impairment would require stimulation of the near wellbore region whereas tubing or flowline deposition would require a solvent soak of those areas. The logistics, pressure and temperature considerations and associated OPEX and HSE are different and hence, such assessment is useful. As discussed above, asphaltene precipitation measurements provide the project team with critical information needed to

effectively develop the field. The operational team is also interested to determine the kinetics of asphaltene deposition to initiate responses such as chemistry treatments and rig interventions. Production surveillance such as monitoring pressure drop between flowing bottomhole pressure (BHP) and tubing head pressure (THP) is conducted to qualitatively assess the threat of plugging due to asphaltene deposition. An example of solvent stimulation based on a differential pressure trigger is shown in Figure 4. As seen in the figure, whenever the wellbore differential pressure (DP) increased to 8,000 psi, solvent treatment was initiated which brought the DP back to the expected 7,500 psi. This differential pressure approach relies on relatively high velocities of produced fluids that generate sufficient frictional pressure drop in the wellbore. Since the asphaltene deposition thickness along the wellbore cannot be reliably calculated, semi-arbitrary triggers are established to initiate intervention of solvent treatment or wellbore entry with riserless or coiled tubing or other methods to remediate the deposition. The solvent stimulations are also learned based on field experience to determine parameters such as solvent volume and soak time before flowback. If the productivity of the well is predictable, algorithms can also be generated to optimize such solvent treatments (de Boer 2015). In cases where the flow rates aren't high enough to cause significant frictional pressure drop, likely during mid to late life of a well, such surveillance of differential pressure is not feasible. In those cases, time based triggers of solvent intervention, for example, solvent treatment once a year are implemented as remediation measures. Performance monitoring after solvent treatments without feedback from differential pressure is difficult to assess with high uncertainty in wellbore plugging. Such methods are sufficient responses for operations team to keep the well flowing. However, these reactive approaches are not adequate for project design and planning purposes. In the early stages of a project when field experience is not available, planning solvent stimulations (frequency, cost and production downtime) is challenging. The estimates to remediate against these challenges can significantly burden project economics. Therefore, more robust assessment to understand asphaltene deposition in the tubing as well as in the reservoir are required. Current laboratory methods to assess asphaltene deposition require sample volume of 300 – 600 cc per test, which is significant (Akbarzadeh 2011). Planning to collect appropriate downhole samples and generate a comprehensive test matrix to conduct such tests is necessary for field development. Nearwellbore simulation tools capable of modeling organic deposition related formation damage (i.e. - Eclipse and CMG GEM) coupled with tubing deposition models are necessary to assess effect of deposition on production and reservoir productivity and

study remediation effectiveness.

This integrated approach will drive implementation of a probabilistic approach to project development and supporting economics.

## Water

Along with expected hydrocarbon production, effective field development requires information on expected water production profiles also. The subsurface team is concerned about aquifer drive and pressure support to assess hydrocarbon recovery and cash flow analysis for a project. The facilities and operations teams are equally interested to design and operate the subsea and topside facilities such that water processing is done appropriately to meet overboard water specifications and does not bottleneck hydrocarbon production.

Typical production profile of a new field usually has hydrocarbon production peak early with no water.

With time, the hydrocarbon production declines and water production increases as illustrated in Figure 5.

For a facility, the water processing equipment is sized for the maximum water production at the end of the field life, for example 50,000 barrels per day (bpd). The turndown for such a facility is ~2,500 – 5,000 bpd of water processing (1020-x turndown). The field may take a few months or years to get to a minimum water production rate of ~2,500 bpd. During this time, the facility is literally not-equipped to process water with initially installed equipment. Hence, temporary equipment such as activated carbon filtration or other technologies capable of processing 0 – 2,500 bpd of water are necessary to be installed and maintained. This low-water cut production scenario is the most challenging operational mode to treating produced water.

The effectiveness of any mitigation measure in this low-water cut scenario is dependent on the chemistry of the produced water and associated oil. Initial facility design should incorporate this operating mode (i.e. – project life 15- years) and complete technology qualification / selection of such temporary (or not so temporary) equipment. It should also allocate necessary space and weight on the facility and design operational flexibility to cope with production uncertainties.

During field delineation and subsurface evaluation, the project team attempts to find the water-oil contact in the reservoir. In pursuit of the water-oil contact, a well is drilled in the water leg and a sample of the downhole pressurized water is collected. Like the hydrocarbon sampling, there are several objectives for water sampling and hence, appropriate sample types and volumes should be used to meet such objectives (Carnegie 2011). The produced water composition affects following aspects:

- Corrosion of installed infrastructure (usually carbon steel)

- Scale formation and deposition leading to productivity impairment of a well and flow restrictions (if not mitigated)
- Hydrate formation and deposition leading to flowline plugging
- Water-oil separation and challenges to meet regulatory-based overboard water quality specifications with respect to oil and grease

The corrosion and scale concerns are severe but slow in their occurrence. The relatively slower kinetics of such concerns allow the team to develop fit-for-purpose solutions once producing to mitigate such threats. Other concerns of hydrate plugging and water-oil separation are immediate impact to the production operations and require appropriate design as part of project design.

## Hydrates

Hydrates in deepwater remain the largest threat to flow assurance and production operations and hydrate formation is dependent on the salinity of the produced water (Edmonds 1996). It has been observed that wells with production of high salinity produced water do not undergo hydrate formation during steady state, shut-in or restarts (Goodman 2013). It is conceivable that: (i) if the salinity of the expected produced water is known, and (ii) that salinity is high enough to eliminate hydrate formation concerns for the field, the field development plan can optimize design associated with hydrate mitigation. These include:

- Reducing or eliminating dedicated umbilical tubes for hydrate inhibitors such as methanol and low dosage hydrate inhibitors (LDHI).
- Reducing or eliminating topside chemical storage and pumps for such hydrate inhibitor injection.
- Optimizing insulation of subsea flowlines and risers.
- Simplifying subsea architecture and operating guidelines.
- Revising well design to allow surface controlled subsurface safety valve (SCSSV) to be installed shallower, reduce deep-set installation risk. For example, the SCSSV placement (assuming conditions upstream of the SCSSV are out of hydrate conditions), could vary from 2,000 ft to 4,000 ft below sea floor and it depends on the assumed water salinity (Figure 6).

These design optimizations have several benefits for the project including CAPEX and OPEX reduction while maintaining uptime and production efficiency. With such an objective at a field development level and subsequent planning for placement of delineation wells, significant CAPEX savings could be achieved. While the vision to eliminate or simplify infrastructure based on produced water salinity has not materialized, production systems designed to mitigate hydrate formation based on

intelligent design is already implemented (Turner 2015). In most cases, hydrate mitigation using methanol or LDHI (methanol based is common) is needed rather than complete avoidance. While these methods are effective in hydrate mitigation, methanol is partially soluble in the produced oil. Excessive use of methanol results in the crude oil being contaminated with methanol with concentrations ranging from 10 – 10,000+ mg/L. Most oil contracts limit the methanol concentration to remain below 50 mg/L. Methanol extraction from produced crude oil offshore is not a routine process and involves processes such as water wash of the crude. Since large volume of water is required to scavenge methanol from crude oil, sea water is used. The sea water contains corrosive oxygen and bacteria that are unsuitable for continuous processing and hence, must be pre-treated with oxygen scavenger (or appropriate de-oxygenation tower) and biocide before introduced in the process stream. In addition, the sea water contains sulfates that will form hard barium sulfate scale (depends on the composition of the produced water) and hence, pre-treatment with scale inhibitor is also required. Thus, a relatively simple method to mitigate hydrates compounds into a complex set of unit operations and adds challenges to fluids processing and separation. Foresight of such challenges in the design phase of a project could lead to selection of non-methanol based LDHI selection or design the system to mitigate hydrates using other methods such as direct electrical heating or improved operating procedures.

### Water-Oil Separation

The compositions of produced oil and associated water create emulsions that are necessary to be demulsified for two reasons: (i) most oil contracts leaving the topside processing platform require the oil to contain 1 vol% of lower of water in it, and (ii) the produced water is discharged overboard with criteria of achieving a monthly average of 29 mg/L oil and grease in it. Therefore, all water-oil emulsions are expected to be treated to achieve appropriate separation. The water-oil separation primarily entails mechanical separation equipment such as gravity separators, hydrocyclones, gas-assisted floatation devices along with application of heat and chemicals. Residence time for the produced fluids on the platform is in the order of 1 – 3 hours to achieve the specified separation of water and oil. In most cases, water soluble organics (WSO) are minimal and do not impact the quality of separated water for overboard discharge. In unique cases, the produced oil contains organic components that are highly soluble in water and difficult to separate with conventional mechanical or chemical methods. McFarlane's assessment of produced water indicated that WSO removal is most effective by reducing the produced water pH. Lowering

water pH by addition of glycolic acid or similar acids is not ideal because of increased risk of topsides corrosion. Using the laboratory testing and modeling techniques, assessment of the threat for WSO is important for field development. If such a threat exists, it is advisable to have mitigation measures implemented in the design phase of the project. These mitigation measures could include ability to inject appropriately determined rates of acid, vessels coated and/or appropriate metallurgy selected to mitigate corrosion concerns. It is also determined that water passed through carbon filters provide the necessary stripping of WSOs from the produced water. However, the carbon filters get spent over time and must be regenerated onshore/offshore. Also, the bulk of carbon filters required to process large rate of produced water daily is not feasible and can be used as a supplement to acid injection.

### Summary

The chemistry of produced fluids (oil and water) significantly impacts the design and development of a field. Challenges such as asphaltene deposition, water-oil separation, hydrates, equipment sizing and turndown are all related to produced fluids chemistry. Thus, significant and focused efforts to understand and characterize the fluids are needed during the initial stages of the project. While such efforts are typical for reservoir engineering needs, facilities and operation teams should understand the fluid sampling and testing programs and influence the programs to fulfill their needs of understanding the fluids as well as the uncertainties associated with the process. Such educated involvement during the early stages of the project will allow the project design and operations to be fit-for-purpose for the project lifecycle and allow relatively easy adaptability to surprises. Important assessments include:

- For gas condensates, collect sufficient produced condensate and possibly water from drill stem tests (DST). MDT samples are inadequate for rigorous and robust design of production facilities.
- For oil samples, detailed understanding of solid-liquid phase behavior of asphaltenes from both thermodynamic and kinetic standpoints is required. While industry knowledge of asphaltene is still not adequate to be accurate and predictive, high level understanding of asphaltene precipitation, its impact and design to mitigate or minimize its impact (wellbore or reservoir) is important.
- Produced water salinity impacts hydrate equilibrium temperature curve and operating guidelines for a field. Knowledge of expected produced water salinity allows a project to design fit-for-purpose hydrate mitigation methods - both chemistry and non-chemistry.
- Produced water also creates challenges such as water



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soluble organics that cannot be discharged overboard. Removal of WSO is not easy offshore with conventional equipment. Thus, prior knowledge of the potential to encounter WSOs allows optimized project design to mitigate such a threat.

Thus, a cross disciplinary assessment and focus on the produced fluid chemistry provides a robust field development methodology to mitigate surprises during production

operations, maintains or improves project economics and maintains high focus on operational safety through robust design and operation procedures.

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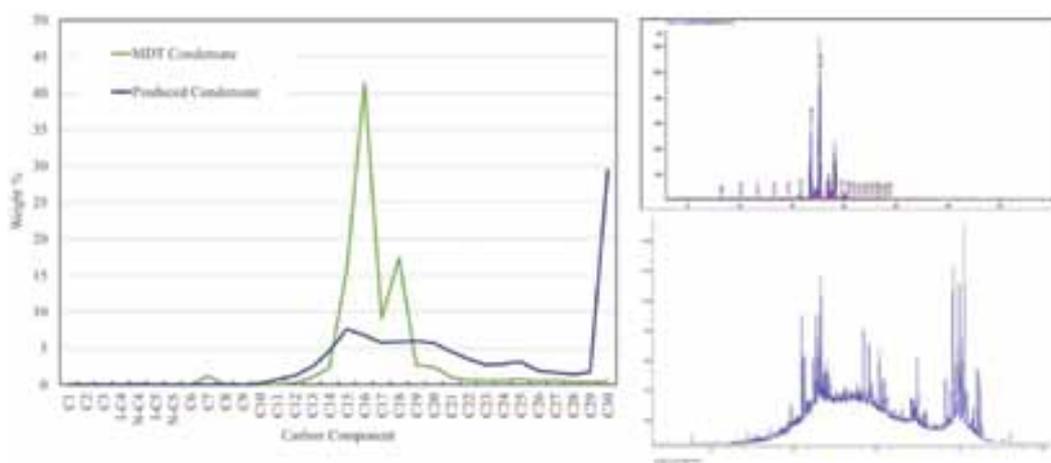


Figure 1—Comparison of condensate compositions and Chromatograms from MDT and Production

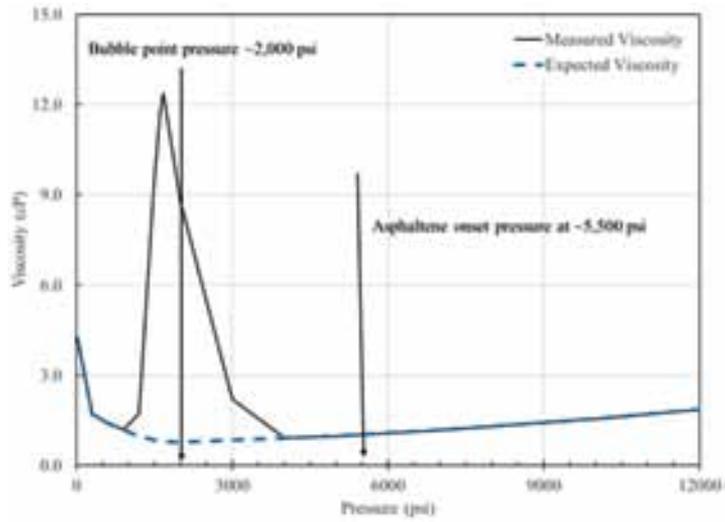


Figure 2—Oil viscosity measurement with unstable asphaltene

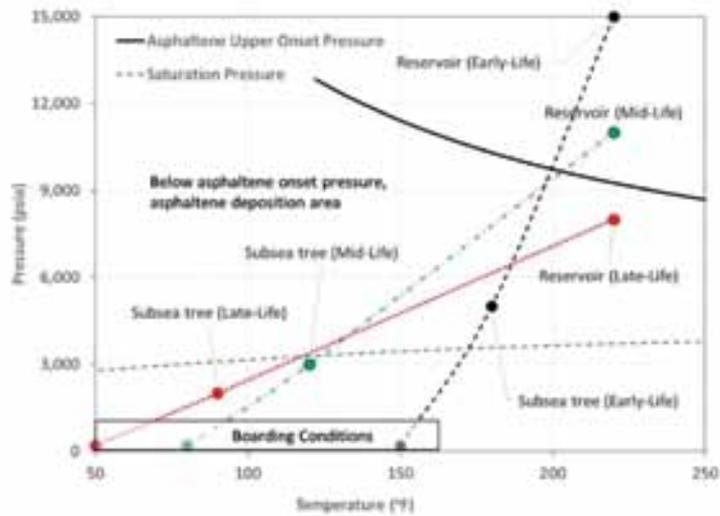


Figure 3—Asphaltene phase envelope and operating conditions for well life

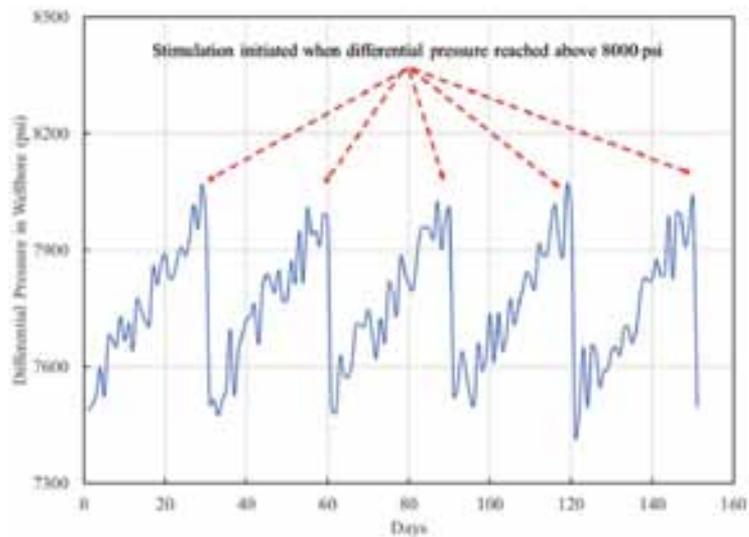


Figure 4—Stimulation of wellbore - differential pressure based trigger (illustration)

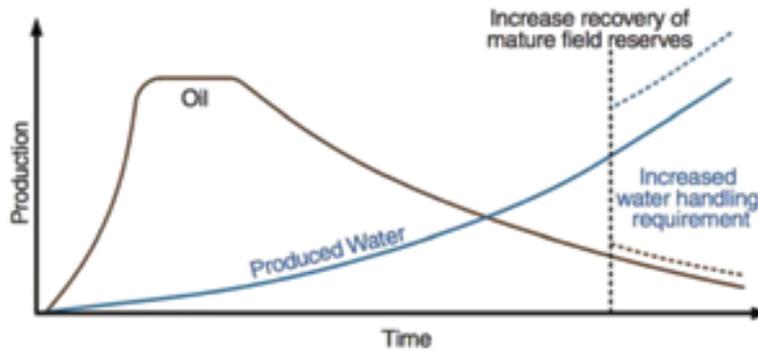


Figure 5—Typical production from an oil field (oil and water production) (Bedwell 2015)

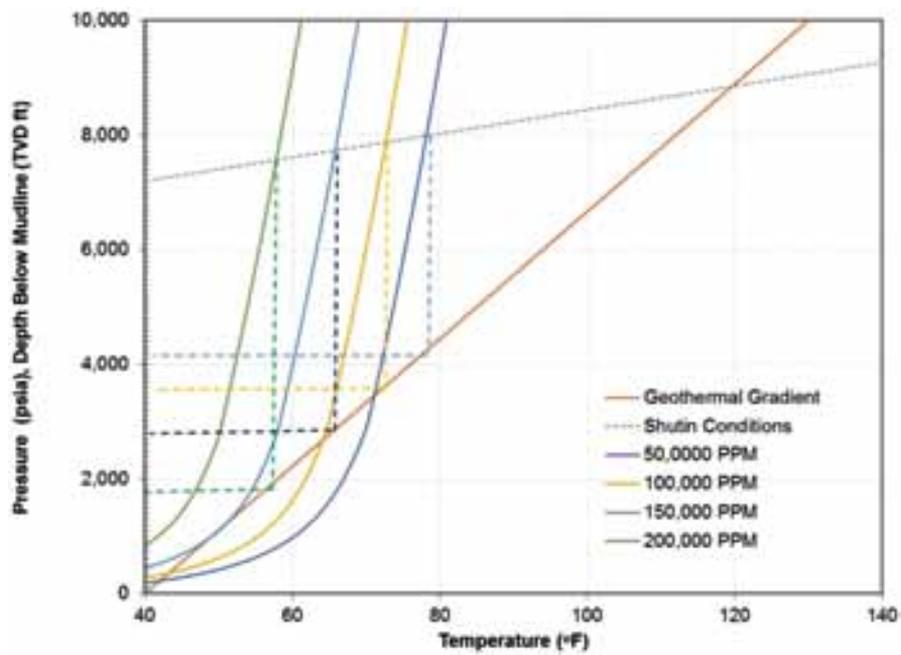


Figure 6—SCSSV placement location based on produced water salinity

Table 1—Asphaltene onset pressure variations

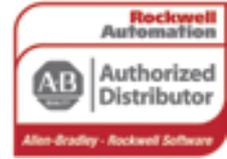
Method	Depressurization1	Depressurization2	Refractive Index1	Refractive Index2
Oil A	12,000	13,500	Not done	Not done
Oil B	13,000	Not done	6,500	10,000
Oil C	12,500	Not done	6,000	10,000

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# Drilling Fluids Automix

By

Vidar Hestad, Cameron, A Schlumberger Company; Arild Gulbrandsen, M-I SWACO, A Schlumberger Company

**A**bstract  
Two Schlumberger companies, Cameron and M-I SWACO, joined efforts to provide market with a drilling fluid optimization system to be used during drilling operations. Cameron delivers a complete remote-controlled and automatic drilling fluids mixing system, while M-I SWACO's technology facilitates continuous real-time measurement, analysis and optimization of mud properties. Today mud samples are measured every 6 hours or more frequently, depending on the conditions in the well. The properties are then adjusted for the most part manually, based on a mud engineer's practice.

The Cameron Automix system comprises mechanized equipment and a robot for addition of chemicals into the drilling fluid, and works in concert with the M-I SWACO RheoProfiler instrument, which measures and analyzes drilling fluid properties in real time. Schlumberger (SLB) algorithms, designed to care for the known wellbore situations, automatically create optimal recipes for the chemicals to be mixed into the drilling fluid.

The synergies between M-I SWACO's core competence in fluids and RheoProfiler technology and Cameron's competence in software and mixing equipment, result in a unique method / system of continuous stabilization and control of the wellbore through drilling fluid optimization.

With the focus on a fully autonomous 'closed-loop' drilling rig, the spotlight is strongly directed on the drill floor activities and their automation. The main goal of SLB, in terms of automation and closedloop activities, is to improve the primary well barrier, keep well conditions under control, and rig safe. A combination of each company's strengths, Automix and RheoProfiler can play an essential part in moving the drilling industry towards the same philosophy of fully automated and intelligent systems. The entire drilling operation needs to be viewed as one system, with

one organization working towards a common goal, reducing exploration cost without compromising safety. However, there will always be a need for the mud engineer on board. Less visible in the general hype around automation and more efficient drilling operations, is the importance of optimized properties of the mud in the drilling process. Safety during drilling, better well bore, economy or producing reservoir are just a few of the benefits of the SLB solution.

## Introduction

A successful well has maximum productivity with minimum development cost, and no harm to personnel, environment and material. The drilling fluid is an expensive asset with immediate exposure to valuable well production zone, and it is our main barrier to protect wellbore and prevent influx from formation.

Continuous standardized monitoring and maintenance of this barrier is critical.

The aim of measuring and mixing drilling fluid is to get full control of what is going into the well and what is coming out of the well. Based on the difference, other measures from the well, geological data and maps well parameter can be identified and well model updated. From the updated well model theoretical best suited fluid is defined and used to calculate properties correction needed at current position in the well.

The correction needed is then added as a recipe to the mixing system which automatically correcting the drilling fluid properties to desired values.

Current measuring procedure and quality assurance is very often limited to four time-consuming manual tests per day, with executing engineer completing a report template which was initially presented decades ago. While we see in contrast to manual sampling, the inline measurements we aim performing are done continuously by the same procedure each time and hence give more frequent and uniform update

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of the well condition. This enables an updated well model and fast response to unpredicted situations.

The history of drilling fluids is only around 100 years with the use of additives like barite for mud weight (MW) and bentonite for viscosity, however before this introduction of additives, water or natural mud with clay was used as drilling fluid. Modern drilling fluids can be divided into more types, like oil-based mud (OBM), water-based mud (WBM) and synthetic based mud (SBM) and of course several blends of each type.

This development of drilling fluids has been considerable over the last decades, so good quality diagnostic of current drilling fluid has become more important and can now be made with less input. This will be further supported by near continuous logging of such, with live trend analysis to improve decision making.

### The way to new technology

Intelligent Fluids Monitoring (IFM) is the business name of real-time fluids monitoring and processing system within M-I SWACO.

IFM combines the knowledge and competence within SLB Drilling Solutions (DS), together with the experience and know-how of installing, running and maintaining equipment from SLB Environmental Solutions (ES). In addition, it involves SLB Geoservice (GSS) by having a close interaction between the drilling fluids engineer and the GSS data engineer.

M-I SWACO has spent years evaluating and developing sensors for remote and automated testing of drilling fluids. This process has involved evaluation of several suppliers, technologies, trials, elimination and selection. In an effort to fulfill current drilling fluid report template, several initial technologies proved too complex and supplier dependent. A decision was made to hold development and utilize learning to approach the challenge with simpler and more robust solutions, with minimum sensors providing sufficient data to provide good diagnostic of current oil based drilling fluids.

The water content meter, WCOM was continued from initial development and the Rheoprofiler was developed, trialed and qualified with major clients in Norway, including Statoil. Rheoprofiler MK-I includes automated FANN35 with heating to provide API 50 degC standard rheology test, including gels. Rheoprofiler MK-II further includes cooler and density measurement and hence can provide rheology and density at vast ranges of temperatures. This is important for correct input into simulations and to give ability to evaluate temperature coefficient / expansion which can further help indicate water content.

The WCOM gives relative water concentration and it is excellent for monitoring changes in water concentration in oil based fluids. This is particularly important for remote management drilling fluid and pit utilization during displacement and / or

circulating spacers, and to indicate any water influx.

The Rheoprofiler MKII and WCOM provide sufficient data to enable a drilling fluid engineer at centralized location to make a good diagnosis on drilling fluid quality in remote areas, and it enables good decision making. It will also enable cross training to further improve utilization of personnel in remote areas.

Both can be installed within an automated flow loop which feed its measuring chamber. Communication between any flow loop and Rheoprofiler is simple programmable logic. Same apply for WCOM.

Most mud additive and mixing systems are either completely manual or a mix of automated equipment.

Operators exposed to the chemical additives during mixing operations has been subject of great HSE concern during the last decade. Cameron has delivered dust free sack cutting machines, but when handling the operators are handling additives and its packaging they get exposed to chemicals. To minimize operator's exposure to chemicals and free their capacity, we decided to design a robotized mixing system.

Below we see different alternatives available on the market from Cameron.

When analyzing the mixing and additive process with regards to automation and remote control, the modern high-end mixing system process can be portrayed as the one shown in the figure below.

We have mostly delivered systems with high level of automation. These systems are characterized by a remote-controlled mixing process with accurate dosing of liquid additives. Big bag units have weight control indication and a VFD-dosing screw conveyor distributing additives from big 1000 ltr bags. The small day-/surge tanks are remotely controlled, have weight control function and a VFD-dosing cell feeder on the outlet. With the sack cutting machine we can remotely control dosing of chemicals from smaller sacks into the mixing hopper(s). However, additives from small sacks require an operator to insert the sacks into the sack slitting machine. This can be a time-consuming task that hinder other areas/tasks to be maintained.

The control system can run an Auto-Density sequence when we include a density measurement device (nuclear, coriolis, ultrasound, microwave, etc.) as long as the surge tanks holding barite has a dosing control as described.

Increased automation of the drilling fluid process The missing piece in figure 3 of total an automated and remote-controlled mixing process are a solution for the small sack additives. So, we decided to remove the operator from this task as well, and introduced a robot, called Automatic Sack Handling (ASH) robot, to care for this job. We now have a complete automated and remote-controlled mixing system called the AutoMix.

The ASH robot is an autonomous machine programmed to

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perform the following functions:

- Scan sacks on pallet placed on lifting table and create a picking pattern.
- Lift sacks from pallet and cut and empty them in the new sack cutter.

The ASH is driven by electrical servo motors and vacuum pumps. Control of the machine is achieved by means of a computer, a PLC and a RCU interconnected with Ethernet, Profibus and IO-cables.

The logistics still needs be done by operator, to care for the AutoMix to have additive materials available.

After using a truck to place a pallet with sacks on the lifting table inside the robot cell, the operator secures the cell and starts the mixing program. The pallet is scanned to recognize where the sacks are placed and the sack most convenient to lift is picked up. It moves the sack to the sack cutter and cuts open and empties the sack.

The whole system is comprised of a palletizing robot, a vacuum gripper, a vacuum pump, safety fence, scanning system, lifting table and control cabinets for the robot and the embedded scanning system.

The system can be further expanded to incorporate inventory keeping by means of RFID and, in the future, sack magazine and complete, automated warehouse control directly linked to the IFM system to automatically mix mud with the correct properties. Our ASH has been in operation for three years in an onshore mixing factory in Norway.

The development of new sensors and real-time data acquisition technology for drilling and completion fluids, opens the possibility for more advanced interpretation of existing data. We are still learning how IFM opens new and qualitatively different measurements, and how this can contribute to improved understanding of drilling parameters. M-I SWACO recognizes the existing demand among operators to move in a direction of less personnel on board and to improve performance by implementing automated operations. Current manual sampling techniques often provides data with insufficient quality and frequency. The measurement tools and the industry regulations which dictate their usage are evolving with the industry. The development of software and improved data transfer like WITSML has opened new possibilities for IFM. Automated instruments with high frequency sampling modes will provide useful data trends which can be used to improve response time and decision quality and thereby reduce Non-Productive Time (NPT).

Implementing real time monitoring of essential drilling fluid parameters and the presentation of those trend analyses along with other drilling parameters will provide improved opportunities to optimize treatment of the drilling fluid system; reduced cost and improved efficiency. The trends will compliment hydraulic simulations and observations

currently run from rig or onshore. The scope for further utilization of these signals will also be extended by integrating the real-time parameters directly into software like PressPro RT, Virtual Hydraulics (VH), Virtual CF, and Optibridge. The synergy effect of combining this existing software with real-time data will improve the control of drilling fluid parameters and the overview of the general drilling process.

Accurate real-time fluids monitoring will allow offshore and onshore experts to recognize, understand and react to changes in the most important drilling parameters. Due to the reduced lag time for measurements and the continuous flow of data IFM will also improve the understanding of differences in performance between laboratory and field work. The reduced time required for the offshore engineers in the rig lab will release time for key personnel to spend on interpretation of data and trend analysis rather than spending time on manual analysis.

IFM will provide improved control of solids control equipment efficiency by accurate solids content and particle size distribution measurements. New solids control modules will be added to existing software to support interpretation and recommend changes for improved solids control. Slurrification and re-injection of waste materials from the drilling process will also benefit from improved real-time control of viscosity, injection pressures and solids analysis. The current manual process involves the CRI and slurrification operator to take a sample to the offshore mud lab. IFM installation and real-time monitoring on M-I SWACO's fluid plant will enable a new level of quality control for liquid mud orders. The real-time data will be available for both M-I SWACO, rig and base personnel via suitable graphical interfaces.

## QHSE

Liberating personnel from having to do manual drilling fluid analysis will reduce their exposure to test chemicals, mist and vapors in the mud process area (MPA), pump room and mud lab. This equipment will provide a step change in the offshore crews work environment. Accurate monitoring of fluid parameters will also allow for a more precise addition of chemicals and reduce the exposure for personnel while maintaining fluid properties or mixing new fluids. From an M-I SWACO point of view, IFM will contribute to that we as a company can improve our service delivery both from a fluid quality and engineering standpoint. We will be able to ensure higher quality of the fluid and can use the experience from the continuous flow of the data to develop both existing and new systems. IFM will also help us better understand what is happening in the well and link it to the drilling performance. Having real-time data will contribute



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to reduce the response time significantly. This will result in a much more proactive service. Today we experience drilling challenges and then we use drilling fluid data and samples to analyze afterwards. With IFM we will be able to detect deviation early and react immediately. This will reduce both direct and indirect NPT.

Some examples of potential reduction in NPT are:

- Small water influx detected by water content measurement as early indication of bigger influx, leakage of water into flow line etc.
- MW/temperature correlation to avoid adding premix or barite when an MW change is due to changes in temperatures.
- Combining different equipment as rheology, MW/temp and solids analysis to evaluate hole cleaning real time to understand and optimize simulation models for hole cleaning and therefore avoid stuck pipe, pack off etc.

To take out the full synergy the equipment needs to be integrated with the people and processes. An integrated operation center, will then be able to make and execute better and quicker decisions. The abovementioned advantages will improve the quality of all critical drilling operations. Operations like Managed Pressure Drilling, drilling of wells with narrow operational windows and formations strengthening projects, extended reach wells, drilling through loss zones etc. will all benefit from improved data quality, higher test frequency and available time for well site engineers to focus on specific problem solving in the ongoing drilling process. A flow loop which ensures a continuous flow of representative fluids for testing and the flexibility to sample fluids from various points is of paramount importance for meaningful tests. MI SWACO design and optimized a flow loop to ensure ideal sampling conditions for all test instruments.

Installation of a flow loop for sampling of fluid data and data transmission which includes important on shore personnel in evaluation processes enables a rapid expansion of sensors which will enhance the data quality further.

## Conclusion

The drilling equipment on most rigs has the potential to drill at a higher rate than today but achieving this requires a new mindset on all parties involved in drilling operations. Studies has shown a significant increase in rate of penetration (ROP) by automatically controlling the weight on bit (WOB), rotary speed and flow/pressure control of the drilling fluid (pump rates and mud density). One of the challenges for this technology is the changing surroundings of the drill bit. It experiences different rock formations (lithology) that requires different settings of the parameters above in order to:

- Reduce excessive wear on drill bit

- Sustain proper hole cleaning
- Avoid lost circulation
- Maintain wellbore integrity

For many years, onshore industries have used process analytical technology (PAT) to improve efficiency, quality and capacity of their manufacturing processes. Labor intensive jobs have been removed by introducing robots, making the work environment safer and healthier while reducing operational cost and improving the competitiveness of the business.

IFM and AutoMix can play an essential part in moving the drilling industry towards the same philosophy of fully automated and intelligent systems. The entire drilling operation needs to be viewed as one system with one organization working towards a common goal; reducing exploration cost without compromising safety.

### **RheoProfiler and AutoMix can provide the drilling processes with:**

- Live drilling fluid density (MWMT)
  - Give superior control over mud pumped into a well with a narrow drilling window and during managed pressured drilling (MPD)
  - Automated mud mixing process without human intervention. Reduce labor cost, exposure to chemicals and provide better utilization of drilling fluid chemicals (not adding more than required).
  - Increase safety by not allowing tripping due to low mud weight (well barrier) avoiding kick.
- Water Influx (WCOM)
  - Instant knowledge of water influx (WCOM)
  - Take immediate action to prevent diluting of drilling fluids and thereby changing its properties or polluting valuable water source.
- Excellent control of the rheology profile on the drilling fluid entering the wellbore.
  - Improved control of the drilling fluid during horizontal drilling, prevent stuck pipe by improving hole cleaning and prevent cuttings from settling during tripping.
- Remove the presence of a mud engineer, geologist and mud logger on site.
  - Enable a highly experienced team to monitor several drilling locations real time at a remote location, reducing cost and improving safety.
  - Use data from similar formations to define set points on WOB, rotary speed, mud flow and drilling fluid properties to increase ROP.
  - Add chemicals to the drilling fluid by touch of a button. The AutoMix and RheoProfiler can be retrofitted on both on- and offshore drilling rigs, enabling them to improve efficiency and reduce cost without compromising safety during oilfield exploration.

Our goal is to produce real-time data allowing faster, more accurate decision to further optimize the drilling process. Autofluids instrumentation provides information to make informed decisions for key personnel and frees up time for the onsite fluids expert from regimented laboratory work, thus allowing him/her more time to focus on logistics and operations as well as improving HSE by minimizing exposure to laboratory chemicals.

Accurate and reliable fluid weight corrected for temperature will increase safety in drilling situations with narrow drilling margins and frees up the derrickman's time by removing the need for measuring fluid weight every 15min. It also greatly improved data confidence, as accurate measuring of mud weight is highly dependent on the procedures and methods of the operator. By using IFM equipment, this source for error is removed. By utilizing all the capabilities of IFM,

the fluid engineers onsite will have tools at their disposal to produce better displacements, minimizing waste, cost and rig time used.

Automation will also release time for the offshore engineers to more actively participate and advice in ongoing drilling operations. A survey on the Gullfaks platforms in 2010 revealed that the mud engineer is occupied for 2 1/2 - 5 1/2 hrs. per 12 hrs. shift in the lab depending on type of operation and fluid system. By breaking down the time spent on various tasks it was found that by introducing automated mud monitoring the total time occupied in the lab could be reduced by +/- 80%, or 2 - 4 1/2 hrs. per shift. This means more time available for analytically evaluations and of course all other work. Therefore, we as a company have such a high commitment to develop equipment for automatic fluid analyses.



Figure 1—Rheoprofiler Mk-1 WCOM



Figure 2—All manual cutting, with knife Semi-automatic cutting, with dust free cutter Fully automated robot cutter

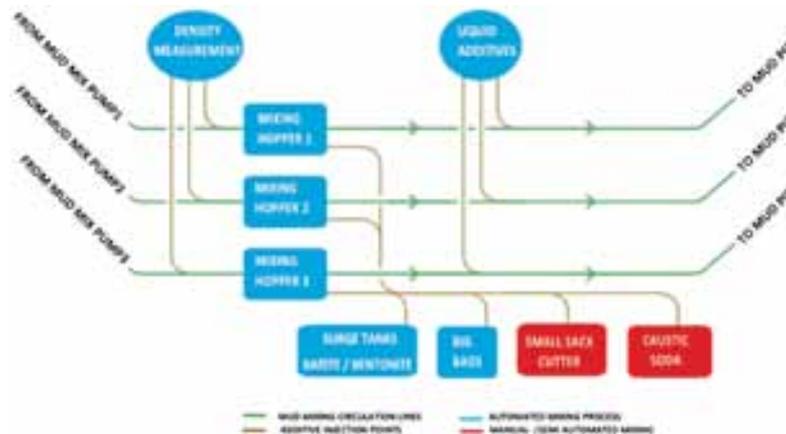


Figure 3—Modern high-end mixing system where only two areas are not automated

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# ***Lubricants Market and Technology***

Petroleum Today magazine inaugurates new chapter for lubricants & lube oil industry which will cover the lubricants industry, the market size , technology advancement in Egypt and worldwide.

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# LUBE TIPS

*Lube-Tips is a unique informational resource selected to give petroleum today readers an insider's grasp of lubrication and lubricants. Each issue, offers tips and facts intended to provide mind-opening insights and take the mystery out of machinery lubrication & this issue it was selected to shed more light on the global industry facts in a generic way.*

## Market Overview

Lubricants are vital for the proper functioning of machines. They are used to reduce wear and friction between surfaces in close proximity and that move relative to each other. They are usually in liquid, semi-fluid, or in solid state. Superior-quality lubricants possess various characteristics such as a high viscosity index, high level of thermal stability, low freezing point, and high boiling point. These features help reduce friction between surfaces of machine parts, reduce the rate of wear and increase operational efficiency. They act as a cooling fluid, and remove any residual deposition over mechanical parts, thereby increasing their operating lifespan.



*The global lubricants market valued USD 89.8 billion in 2016, and is estimated to reach approximately USD 102.6 billion by 2021, projecting a Compound Annual Growth Rate "CAGR" of 2.7% during the forecast period 2016 - 2021.*

The global lubricants market, by stock type, can be broadly segmented into bio-based lubricants, mineral oil lubricants, synthetic lubricants, and greases. The mineral oil lubricants segment accounted for the highest share in the global lubricants

market in 2015. However, it is expected to be the slowest growing product segment during the forecast period, with shifting consumer preference towards synthetic and bio-based lubricants. The market has also been divided according to product type into: engine oil (Light motor vehicle engine oil & heavy-duty motor vehicle engine oil), transmission & hydraulic fluids (industrial hydraulic fluids, automatic transmission fluids, and others), metalworking fluids (Emulsifiable oil, straight oil, synthetic oil,

semi-synthetic oil), general industrial oils (turbine oil, compressor & refrigeration oil, others), gear oil (vehicle & equipment gear oil, industrial gear oil), greases (vehicle & equipment greases, industrial greases), rubber process oil, white oil, electrical oil and others.

Lubricants are increasingly used in various commercial and industrial sectors, owing to their previously mentioned functions and advantages. The market is also segmented by end-user industry into power generation



(industrial, municipal), transportation (passenger vehicles, commercial vehicles, aerospace, marine, and railways locomotives), construction, food & beverage, metallurgy & metalworking, mining, oil & gas and others.

The market has been segmented geographically by Asia-Pacific (China, India, Japan, South Korea, ASEAN countries and rest of Asia-Pacific), North America (United States, Canada, Mexico, rest of North America), Europe (Germany, United Kingdom, Italy, France, Nordic Countries, Russia, rest of Europe), South America (Brazil, Argentina, Venezuela, Colombia, rest of South America), and Middle-East & Africa (Saudi Arabia, South Africa, Qatar, United Arab Emirates, rest of Middle-East & Africa). Asia-Pacific holds the highest market share by region, and the global lubricants market is only expected to grow significantly faster than North America & Europe during the forecast period.

The rapid industrialization in (Brazil, Russia, India and China) BRIC nations and the increasing demand of automotive

globally are the major reason for driving the market of lubricants. Moreover, stringent environmental regulations by government to use lubricants for better efficiency have also increased the demand of lubricant products. The market has few restraints; volatility in raw material prices and high prices of synthetic & bio-based lubricants among others.

Opportunities & Major Players Industrial growth in the Middle East & African region, the continuous developments in synthetic and bio-based lubricants, and significant increase in the demand for re-refined lubricants will offer major growth opportunities for growth for lubricant manufacturers during the forecast period.



*“Major players for lubricants products include big global & local manufacturers are Royal Dutch Shell plc., ExxonMobil Corp., BP plc., Chevron Corp., Total S.A., PetroChina, Sinopec Corp., ITW group, ConocoPhillips Co., Bharat Petroleum Corporation, among others.”*

### Demand And Supply Forecasts

For the past 20 years, global lubricant demand has closely tracked global GDP growth, but offset by about 3.8 percent. Using the International Monetary Fund’s 5-year GDP forecast should provide a reasonable estimate of future global lubricants growth. Thus, we should expect moderate declines in 2015 and 2016, easing in 2017 and weak expansion thereafter, as economies and GDP struggle to rebound. In other words, more of the same.”

In recent years, lubricant demand has been held back by a weak global economy. Since 2011, succeeding global GDP forecasts have dropped, and the 1.7 percent cumulative reduction for 2015 correlates to about a 600,000 ton loss in lubricant demand and 500,000 ton lower demand for 2016.

Not all regions are experiencing the same rate of growth or decline. Organization for Economic Cooperation and Development countries in Europe and North America will see declines of 1.0 to 1.5 percent per year. “Robust growth is still expected in the emerging economies of Asia, the Middle East and Africa. South America is being held back by the very weak economies of Brazil, Venezuela and Argentina.

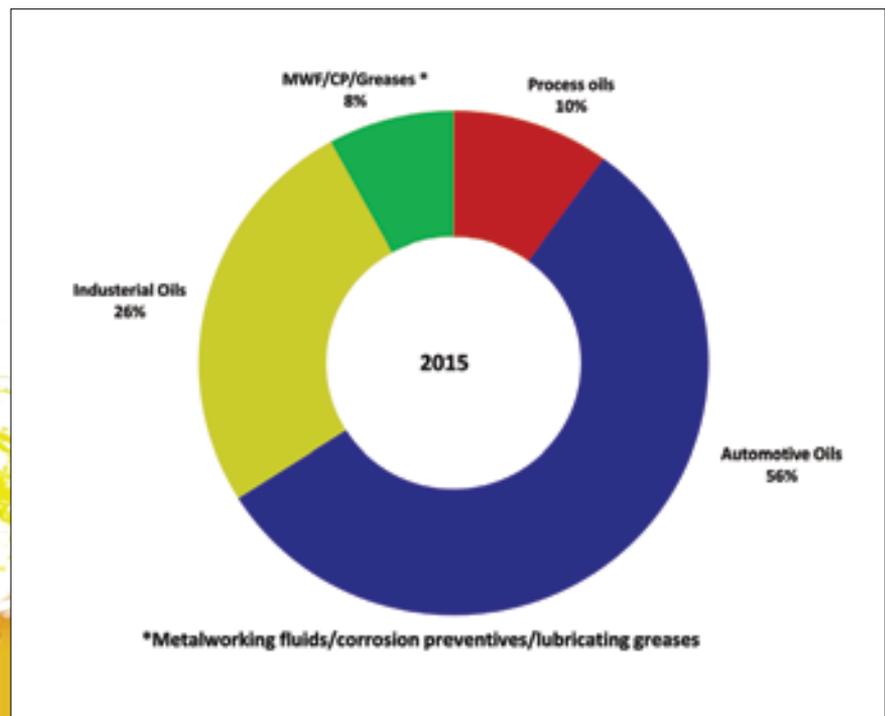


Chart-1 Global Lubricant Market

By 2020, almost one-half of global lubricant demand will come from Asia Pacific. In contrast, Europe, including Russia, will consume only about one-sixth of total production.

**The Lubricants Industry**

Worldwide, there are 1380 lubricant manufacturers ranging from large to small. On one hand there are vertically-integrated petroleum companies whose main business objective is the discovery, extraction and refining of crude oil. Lubricants account for only a very small part of their oil business. At present, there are about 180 such national and multinational oil companies engaged in manufacturing lubricants.

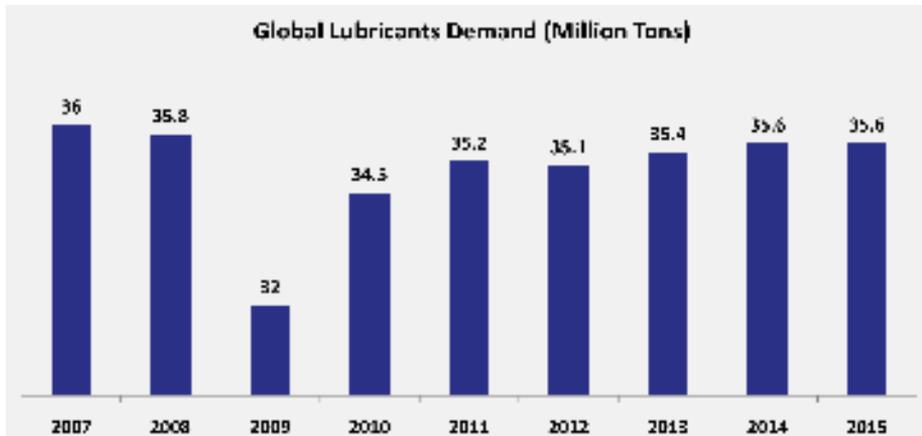
The 1200 independent lubricant companies mainly concentrate on the manufacturing and marketing of lubricants and view lubricants as their core business. While the large, integrated companies focus on high-volume lubricants such as engine, gear and hydraulic oils, many independent lube companies concentrate on specialties and niche business, where apart from some tailor-made lubricants, comprehensive and expert customer service is part of the package.

The top 1% of the world’s manufacturers of finished lubricants (of which there are more than 1380) account for more than 60% of global sales; the other 99% share less than 40 %.

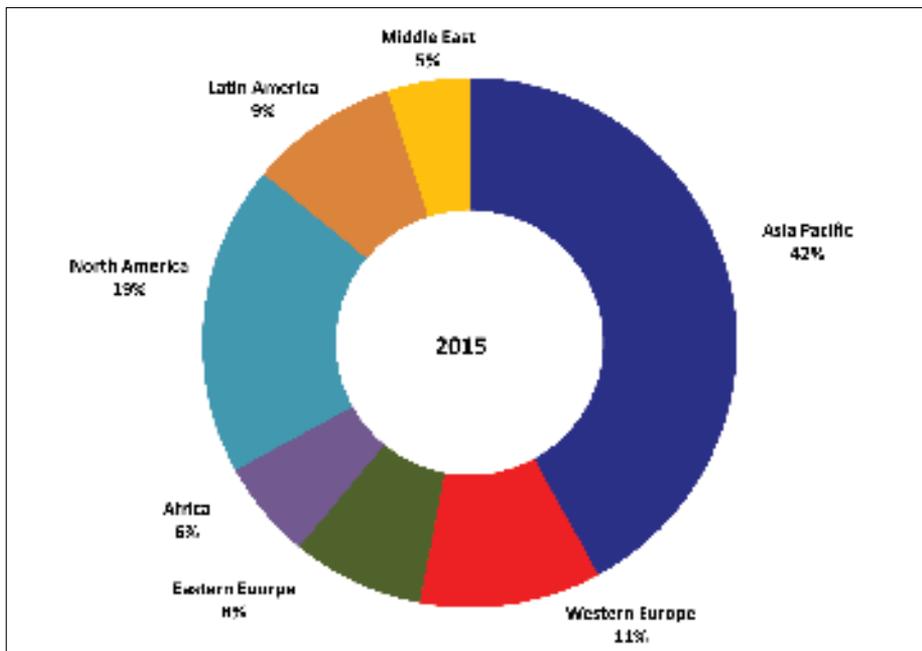


*Lubricant manufacturers invest between 1 and 5% of their sales in research and development.*

In the next issues the grasp will be extended to cover product types of engine oil, transmission & hydraulic fluids, metalworking fluids, general industrial oils, gear oil , greasesrubber process oil, white oil, electrical oil and others.



**Chart-2 Development global lubricants demand**



**Chart-3 Regional Lubricants Demand Breakdown**



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# Industry At A Glance

by

**Ali Ibrahim**

**Table (1)**

World Crude oil Supply.\*  
Supply (million barrels per day)

	U.S (50states)	OECD <sup>(1)</sup>	North sea <sup>(2)</sup>	OPEC <sup>(3)</sup>	OPEC <sup>(4)</sup>	world
Jun-17	15.40	27.00	3.30	39.60	37.90	98.30
Jul-17	15.60	27.20	3.40	39.90	38.30	99.00
Aug-17	15.40	27.10	3.40	39.80	38.10	98.60
Sep-17	15.40	26.80	3.50	39.70	38.10	98.30
Oct-17	15.50	27.40	3.60	39.50	37.80	98.60
Nov-17	16.75	27.00	3.50	38.40	36.70	97.20
Dec-17	16.45	27.76	4.31	39.17	37.50	98.00
Jan-18	16.36	28.19	4.71	39.36	37.70	98.80
Feb-18	16.72	28.73	4.77	39.26	37.60	98.80
Mar-18	17.16	28.68	4.47	39.42	37.85	98.64
Apr-18	17.24	29.19	4.56	39.34	37.78	99.48
May-18	17.30	28.84	4.23	38.94	37.37	99.30
Jun-18	17.65	29.37	4.45	38.93	37.45	100.02
Jul-18	17.73	29.32	4.62	39.25	37.70	100.29

Source EIA

\* «Oil Supply» is defined as the production of crude oil (including lease condensate) Natural gas plant liquids, and other liquids, and refinery processing gain.

NA = no data available

- (1) OECD = Organization for Economic Cooperation and Development: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Slovakia, South Korea, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States.
- (2) North Sea includes offshore supply from Denmark, Germany, the Netherlands, Norway, and the United Kingdom
- (3) OPEC = Organization of Petroleum Exporting Countries: Algeria, Angola, Ecuador, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, the United Arab Emirates, and Venezuela.
- (4) OPEC = Organization of Petroleum Exporting Countries doesn't include Angola.

**Table (2)**

World crude oil production. ( Million Barrels Per day )

	Libya	Sudan	Egypt	OPEC(1)	Persian Gulf(2)	North Sea(3)	World
Jun-17	0.85	0.15	0.68	39.6	24.7	3.3	98.3
Jul-17	1.01	0.15	0.68	39.9	24.7	3.4	99.1
Aug-17	0.86	0.15	0.68	39.8	24.7	3.4	98.6
Sep-17	0.93	0.15	0.66	39.7	24.8	3.5	98.3
Oct-17	0.96	0.15	0.66	39.5	24.6	3.6	98.6
Nov-17	0.98	0.15	0.66	39.2	24.5	4.1	98.5
Dec-17	0.92	0.15	0.65	39.2	24.5	4.3	98.0
Jan-18	1.01	0.12	0.63	39.4	24.6	4.7	98.8
Feb-18	0.98	0.12	0.63	39.3	24.6	4.80	98.8
Mar-18	0.99	0.12	0.63	39.4	24.5	4.5	98.6
Apr-18	1.01	0.12	0.63	39.3	24.5	4.6	99.5
May-18	0.99	0.12	0.63	38.9	24.6	4.2	99.3
Jun-18	0.75	0.12	0.63	38.9	25.0	4.4	100.0
Jul-18	0.64	0.12	0.63	39.3	25.3	4.6	100.3

Source EIA

1 OPEC: Organization of the Petroleum Exporting Countries: Algeria, Angola, Ecuador, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, the United Arab Emirates, and Venezuela.

2 The Persian Gulf countries are Bahrain, Iran, Iraq, Kuwait, Qatar, Saudi Arabia, and the United Arab Emirates. Production from the Kuwait-Saudi Arabia Neutral Zone is included in Persian Gulf production.

3 North Sea includes the United Kingdom Offshore, Norway, Denmark, Netherlands Offshore, and Germany Offshore.

**Table (3)**

International petroleum consumption

Million Barrels Per Day

	OECD <sup>(1)</sup>	U.S (50 States)	Canada	Europe	Japan	Non-OECD	China	Other Non-OECD	World
Jun-17	47.46	20.49	2.43	14.43	3.39	51.78	12.95	19.87	99.25
Jul-17	47.87	20.59	2.44	14.60	3.57	50.99	12.60	19.94	98.86
Aug-17	47.53	20.27	2.48	14.35	3.68	51.43	12.56	20.06	98.96
Sep-17	46.98	19.58	2.44	14.85	3.63	51.55	12.75	19.81	98.54
Oct-17	46.94	19.81	2.42	14.57	3.65	51.56	12.60	19.43	98.50
Nov-17	47.20	19.90	2.41	13.90	4.23	51.30	12.98	19.35	98.98
Dec-17	47.80	20.08	2.43	13.87	4.50	51.37	13.34	19.06	99.18
Jan-18	46.64	19.98	2.33	13.48	4.27	51.52	13.87	18.84	98.15
Feb-18	48.15	19.95	2.44	14.42	4.52	52.74	14.24	19.11	100.89
Mar-18	47.83	20.57	2.24	14.35	4.03	51.93	13.90	18.93	99.76
Apr-18	46.46	19.94	2.16	14.12	3.60	52.13	13.90	19.13	98.59
May-18	46.61	20.36	2.36	14.04	3.35	52.07	13.58	19.11	98.68
Jun-18	47.24	20.29	2.45	14.55	3.31	53.43	13.83	20.03	100.67
Jul-18	47.91	20.59	2.46	14.71	3.53	52.67	13.38	19.87	100.58

Source EIA

(1) OECD = Organization for Economic Cooperation and Development: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Slovakia, South Korea, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States.

**Table (4)** Egypt Rig Count per Area

Area	Mar-18	Apr-18	May-18	Jun-18	Jul-18
<b>Gulf of Suez</b>	11	9	11	10	10
<b>Mediterranean Sea</b>	4	4	4	5	5
<b>Western Desert</b>	69	69	70	70	70
<b>Sinai</b>	14	13	13	15	15
<b>Eastern Desert</b>	8	5	6	6	5
<b>Delta</b>	3	4	2	3	3
<b>Total</b>	109	104	106	109	108

Source Petroleum Today

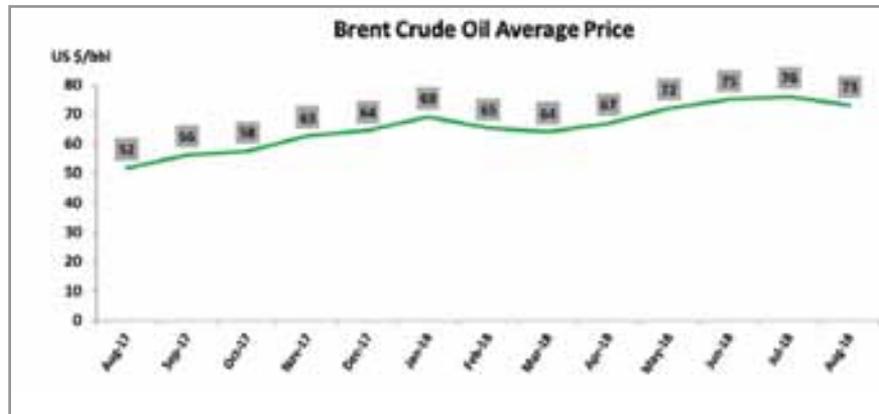
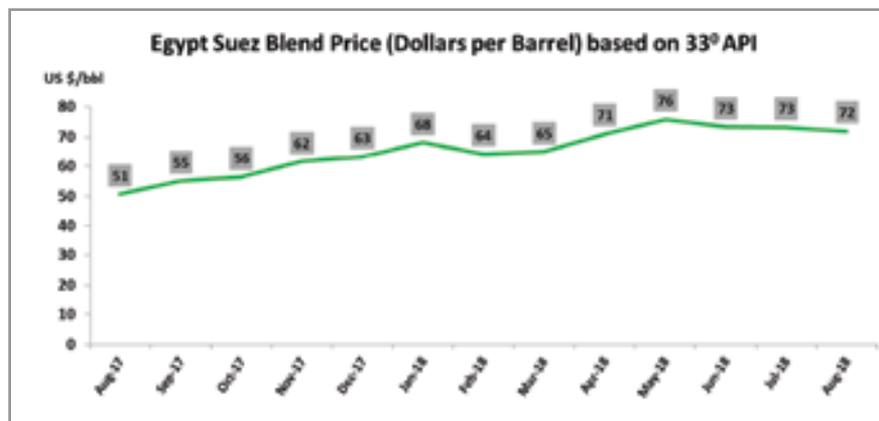


Fig. (1) Brent Crude Oil Price US \$ per BBL



Fig. (2) Natural Gas Prices US \$ Per MMBTU



Source EIA Fig. (3) Egypt Suez Blend Price (Dollars per Barrel) based on 33° API

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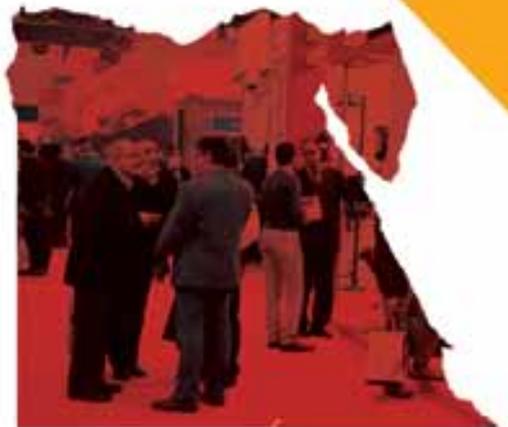
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## بتروناس ومصر للبترول يوقعان مذكرة تفاهم للتعاون في انتاج الزيوت المتخصصة



وقعت شركتى مصر للبترول وبتروناس الماليزية مذكرة تفاهم بهدف التعاون في إنتاج وتسويق الزيوت المتخصصة من خلال استغلال الطاقة الإنتاجية الفائضة بمجمع خلط الزيوت المملوك لشركة مصر للبترول بمنطقة العامرية بمحافظة الأسكندرية لإنتاج ٢٠ الف طن سنوياً من الزيوت عالية الجودة وتسويقها داخل مصر وخارجها من خلال التصدير لأسواق الدول الإفريقية .

وقع المذكرة كل من المحاسب حسين فتحى رئيس شركة مصر للبترول و السيد جوسيبى داي أريجو الرئيس التنفيذي لمجموعة شركات بتروناس العالمية لزيوت التشحيم ( بي إل إى ) .

وأوضح رئيس شركة مصر للبترول أن مذكرة التفاهم تعد خطوة في مجال تكوين شركة مشتركة بين الجانبين تقوم على استغلال فائض الطاقة الإنتاجية بمجمع الشركة في العامرية

بالتعاون مع قطاع البترول والعمل في مصر التي تعد ركيزة أساسية لتعزيز مكانتها الاستثمارية على مستوى شمال افريقيا والشرق الأوسط خاصة مع توافر مقومات النجاح وفى مقدمتها سوق محلى واسع يضم كافة التسهيلات الإنتاجية والامكانيات الفنية

والتكنولوجيات المتقدمة لشركة بتروناس في انتاج كميات من زيوت التشحيم المتخصصة التي لا يتم انتاجها محلياً ويتم استيرادها من الخارج وذلك بواقع ٢٠ الف طن سنوياً زيوت درجة أولى و ١٠ الاف طن سنوياً من زيوت محركات الديزل ومن جانبه أشار أريجو إلى أن الشركة مهتمة

## أرباح إكسون موبيل الفصلية تقفز ١٨٪ بفعل ارتفاع أسعار النفط



## أرباح توتال تقفز في الربع ٢/ لتسجل ٣,٦ مليار دولار

حققت شركة النفط والغاز الفرنسية العملاقة توتال نتائج أفضل من المتوقع للربع الثاني من العام بفضل مستوى قياسي جديد لإنتاج النفط وارتفاع أسعار الخام الأمر الذي مكنتها من رفع مستوى أهدافها للإنتاج والوفورات في ٢٠١٨ .

وقالت المجموعة الفرنسية إن صافي الربح المعدل صعد ٤٤ بالمئة في الربع الثاني ليصل إلى ٣,٦ مليار دولار بينما توقع المحللون ٣,٤ مليار دولار. وزاد إنتاج النفط ٨,٧ بالمئة إلى ٢,٧١٧ مليون برميل من المكافئ النفطي يوميا وهو أعلى مستوى على الإطلاق لربع سنة وذلك بفضل الإتمام المبكر لصفقة ميرسك أويل وبدء تشغيل عدة مشاريع مثل يامال للغاز الطبيعي المسال في روسيا وموهو نورد في الكونجو.

رفعت توتال أيضا هدفها لنمو إنتاج النفط إلى سبعة بالمئة في ٢٠١٨ من ستة بالمئة سابقا متوقعة دفعة قوية من بدء تشغيل مشاريع في أنجولا ونيجيريا وأستراليا.

قالت إكسون موبيل، أكبر شركة إنتاج نفط مدرجة في العالم، إن أرباحها الفصلية قفزت ١٨ بالمئة مع تبيد ارتفاع أسعار الخام لأثر انخفاض الإنتاج.

وحققت الشركة ربحا صافيا قدره ٣,٩٥ مليار دولار في الربع الثاني من العام، أو ما يعادل ٩٢ سنتا، للسهم مقارنة مع ٣,٢٥ مليار دولار، أو ما يعادل ٧٨ سنتا للسهم، في الفترة نفسها قبل عام. وانخفض إنتاج الشركة سبعة بالمئة إلى ٣,٦ مليون برميل من المكافئ النفطي يوميا.

## أرباح بي.بي ٢,٨ مليار دولار في الربع ٢/ متجاوزة التوقعات

أعلنت بي.بي أن أرباح الربع الثاني من العام بلغت ٢,٨ مليار دولار بما يعادل أربعة أمثال ما حققته العام الماضي بفضل ارتفاع أسعار النفط. وتجاوز صافي الربح التوقعات البالغة ٢,٧ مليار دولار وفقاً لاستطلاع لآراء المحللين نشرته الشركة نفسها. وبلغت الأرباح ٠,٧ مليار دولار قبل عام ٢,٦ مليار في الربع الأول. وارتفع إنتاج النصف الأول إلى ٣,٦٦٢ مليون برميل من المكافئ النفطي يوميا، شاملا روسنت، مقارنة مع ٣,٥٤٤ مليون برميل يوميا قبل سنة.



### خالدة تنجح في تحقيق ١٦ كشفاً بترولياً جديداً خلال العام ٢٠١٧/٢٠١٨

قال المهندس خالد مواهى رئيس خالدة للبترول ان الشركة نجحت من خلال التعاون المثمر بين قطاع البترول والشريك الأجنبي المتمثل في شركة أباتشى الأمريكية في تحقيق ١٦ كشفاً بترولياً، وأنه تم حفر ٥٩ بئراً (٤٩ بئراً منتجة للزيت الخام و٧ آبار منتجة للغاز و٢ آبار لحقن المياه)، كما تم تنفيذ ١٥٢ عملية إعادة إكمال آبار، بالإضافة إلى إكمال ٢٤ بئراً استكشافياً، وهو ما ساهم في تحقيق خطة إنتاج الشركة من الزيت الخام بنسبة ١١٠٪ وإنتاج الغاز الطبيعي بنسبة ٩٩٪ والمنتجات بنسبة ٩٢٪ والبوتاجاز بنسبة ٧٧٪.

جاء ذلك خلال رئاسة وزير البترول لأعمال الجمعية العامة لشركة خالدة للبترول لإعتماد نتائج أعمالها للعام المالي ٢٠١٧/٢٠١٨ بحضور المهندس محمد سعفان وكيل أول وزارة البترول والجيولوجي أشرف فرج وكيل الوزارة للإتفاقيات والإستكشاف والمهندس عابد عزالرجال الرئيس التنفيذي لهيئة البترول والمهندس أسامة البقلى رئيس الشركة القابضة للغازات الطبيعية ( إيجاس ).

### اباتشى تخطط لاستثمار مليار دولار سنويا في قطاع البترول المصري

أكد رئيس شركة أباتشى العالمية جون كريستمان رغبته في تكوين فريق عمل مشترك لإعداد خطة عمل لمدة ٥ سنوات قادمة تشمل برامج الاستكشاف والحفر وحجم استثماراتها والإنتاج المتوقع باستخدام أحدث التكنولوجيات في صناعة البترول والغاز، مشيراً إلى أنه من المخطط بدء العمل في منطقة الامتياز الجديدة " شرق بحرية" بالصحراء الغربية والتي أسندت للشركة مؤخراً وتم توقيع إتفاقيتها، وذلك فور الانتهاء من الإجراءات والتصاريح اللازمة لبدء أعمال برنامج الحفر الطموح في هذه المنطقة باستخدام حفارين، وأوضح أنه من المخطط أن تصل استثمارات أباتشى في مصر إلى حوالى مليار دولار سنوياً بما يعكس ما تمثله مصر من أهمية بالنسبة لأباتشى، مشيراً إلى أنه جارى دراسة مناطق جديدة للتقدم في المزادات التي سيتم طرحها وذلك في ضوء الاحتمالات البترولية المرتفعة التي تتميز بها مناطق مصر البترولية.

جاء ذلك خلال استقبال المهندس طارق الملا وزير البترول لوفد رفيع المستوى من شركة أباتشى العالمية ضم كلا من السيد جون كريستمان الرئيس التنفيذي لشركة أباتشى العالمية و نائبه ستيف راينى والرئيس المالى وجرايدى ابلس نائب الرئيس الاقليمي للعمليات، وديفيد تشى نائب الرئيس الأقليمي ومدير عام أباتشى مصر



### ايبكس مصر تبدأ حفر عدد من الآبار فى شرق ملىحة وغرب بدرالدين العام القادم



بحث المهندس طارق الملا وزير البترول والثروة المعدنية مع توم ماهر رئيس شركة ايبكس مصر بحضور وفد من شركة بلووتر إنرجى موقف العمل فى منطقتى الامتياز التى فازت بهما شركة ايبكس للبحث عن البترول والغاز فى منطقتى جنوب شرق ملىحة بالصحراء الغربية وغرب بدرالدين تمهيداً لحفر عدد من الآبار خلال العام القادم.

وأشار رئيس شركة ايبكس أن الشراكة مع شركة بلووتر إنرجى فنيا ومالياً سيسهم فى دعم نشاط ايبكس فى منطقتى الامتياز خاصة وأن شركة بلولها سابق خبرة متميز فى مجال الاستكشاف والإنتاج فى منطقة بحر الشمال وتعد اضافة لانشطتها.

وأكد الملا أن استراتيجية الوزارة ماضية فى تشجيع جذب الشركات العالمية واستثمار مناخ الاستقرار والاحتمالات البترولية الجيدة فى مصر من أجل استكشاف ثروات مصر البترولية وزيادة الاحتياطيات والإنتاج من الزيت الخام والغاز الطبيعي، كما تم بحث الخطوات التنفيذية التى تمت لتحويل مصر لمرکز اقليمى للطاقة وطبيعة عمل الجهاز التنظيمى لسوق الغاز.

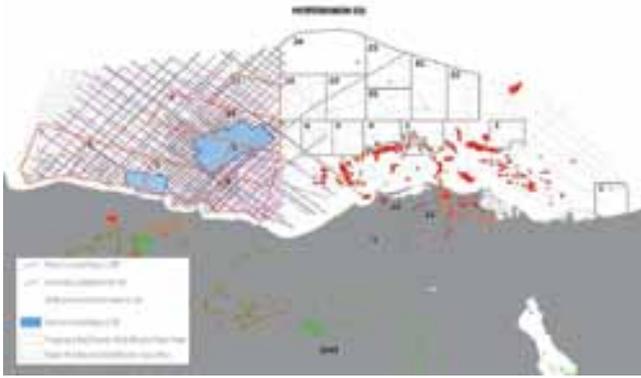
## مصر تنشئ بوابة الكترونية بترولية للترويج للفرص الاستثمارية

عالمياً لهذه الأنشطة وفق مفاهيم عصرية متطورة بما يساهم في جذب وتنويع الاستثمارات الأجنبية في هذه الأنشطة لزيادة الاحتياطيات والإنتاج من البترول والغاز والتي تأتي في إطار مشروع تطوير وتحديث قطاع البترول الجارى تنفيذه حالياً.

جديدة للترويج للفرص الاستثمارية في مجال البحث والاستكشاف على غرار ما يتم تطبيقه في كبرى الدول المنتجة عالمياً بما يمكن من تعظيم قيمة البيانات الفنية الخاصة بأنشطة البحث والاستكشاف والإنتاج وتطويرها والترويج والتسويق

بدأت مصر في تنفيذ مشروع بوابة مصر للبحث والاستكشاف والإنتاج والتي تم اتخاذ الخطوات اللازمة للبدء في انشاءها من خلال توقيع 4 مذكرات تفاهم مع شركات عالمية متخصصة لإنشاء بنك معلومات رقمي وخريطة استثمارية

## فرص استثمارية جديدة للبحث والاستكشاف بالبحر الأحمر وغرب المتوسط



أكد المهندس طارق الملا وزير البترول والثروة المعدنية ان الوزارة تعمل حالياً من خلال مشروع تطوير وتحديث قطاع البترول على زيادة الفرص الاستثمارية المتاحة في مجال البحث عن البترول والغاز وتكثيف الجهود الرامية إلى التوسع في طرح مناطق استكشافية جديدة تحظى بإحتمالات واعدة وخاصة المناطق الاستكشافية البكر كالبحر الأحمر وغرب المتوسط وجعلها مؤهلة لبدء عمليات البحث والإستكشاف لأول مرة

وأكد الملا أنه سيتم طرح مزايده عالمية لأول مرة نهاية العام الجارى للبحث عن البترول والغاز بمنطقة البحر الأحمر في ضوء نتائج مشروع المسح السيزمي الذي تم تنفيذه بالمنطقة بالتعاون مع شركة ويسترن جيكو شلمبرجير ، كما شدد على ضرورة الإسراع بتنفيذ مراحل مشروع المسح السيزمي بمنطقة خليج السويس والذي يعتبر من المشروعات بالغة الأهمية لتقييم الفرص المتاحة في هذه المنطقة التي تعد من أعرق مناطق الإنتاج البترولى للزيت الخام في مصر .

## شباب بترول يدير أحدث وأكبر معمل لتحليل عينات الغاز الطبيعي بحقل ظهر



بدأت شركة بترول أعمال التشغيل التجريبي لأكبر وأحدث معمل تحاليل عينات غاز طبيعي في مصر والمقام بحقل ظهر لتنفيذ كافة عمليات تحاليل الغاز والمياه والمنتجات والكبريت المنتج من الحقل.

ويعد المعمل الثانى من نوعه عالمياً بمنطقة إنتاج شركة إينى الإيطالية يعطى القياسات الصحيحة للغاز الطبيعي والسوائل المصاحبة التي يتم على أساسها حساب المعايير والنسب المسموح بها، حيث أن الغاز منتج لأبد من التأكد قبل ضخه في الشبكة القومية للغازات الطبيعية من مطابقته للمواصفات الفنية والمعايير القياسية المعتمدة والتي لا يمكن الحيود عنها.

والمعمل عبارة عن جزئين الأول لتحليل الغاز والثانى لتحليل السوائل المصاحبة ويديره مجموعة من شباب وكوادر قطاع البترول مدربون جيداً داخلياً وخارجياً وقادرون على استيعاب المعمل بتقنياته الحديثة وتشغيله، وتؤكد ذلك نتائج التشغيل التجريبي للمعمل .

## قارون تحضر ٢٥ بئر جديد ونتاجها يرتفع الى ٣٣ ألف برميل زيت يوميا

وأضاف ان مواكبة التكنولوجيات الجديدة فى مجالات الحفر والإنتاج ساهم في ترشيد وتخفيض التكاليف في حقول قارون موضحاً أنه تم تطبيق تكنولوجيا جديدة لحفر الآبار في منطقة بنى سويف غرب النيل مما أدى الى تخفيض التكاليف الى جانب نجاحها في استخدام التكنولوجيات الحديثة التي ساهمت في ترشيد الانفاق بشكل ملموس على وسائل الرفع الاصطناعى في الآبار والمواد الكيماوية المستخدمة في معالجة الزيت وفي مجال تبطين المواسير

صرح المهندس أشرف عبد الجواد رئيس شركة قارون للبترول ان إجمالي الانفاق الاستثمارى للشركة ارتفاع نحو ٢٠٦ ملايين دولار خلال العام وانه تم حفر ٢٥ بئراً جديدة والتي أسهمت في تحقيق زيادة قدرها ٤٩٠٠ برميل زيت في الإنتاج اليومي من حقول قارون بنهاية يونيه ٢٠١٨ ، موضحاً أن اجمالى الإنتاج السنوى بلغ على مدار العام نحو ١٢ مليون برميل زيت بمتوسط حوالى ٣٣ ألف برميل زيت يوميا، كما تم إضافة نحو ١٢ مليون برميل للإحتياطي المؤكد من الزيت الخام بزيادة نسبتها ٧٪ عما تم انتاجه على مدار العام.

## مصر توقع ٥ اتفاقيات بترولية جديدة باستثمارات ٢٠٤ مليون دولار

الرامية لزيادة الإنتاج ودعم الشركات الوطنية العاملة في مجال البحث والاستكشاف. والاتفاقية الخامسة مع هيئة البترول وشركات كايرون وأوشينير وصحارى بمنطقة شمال الزعفرانة بخليج السويس

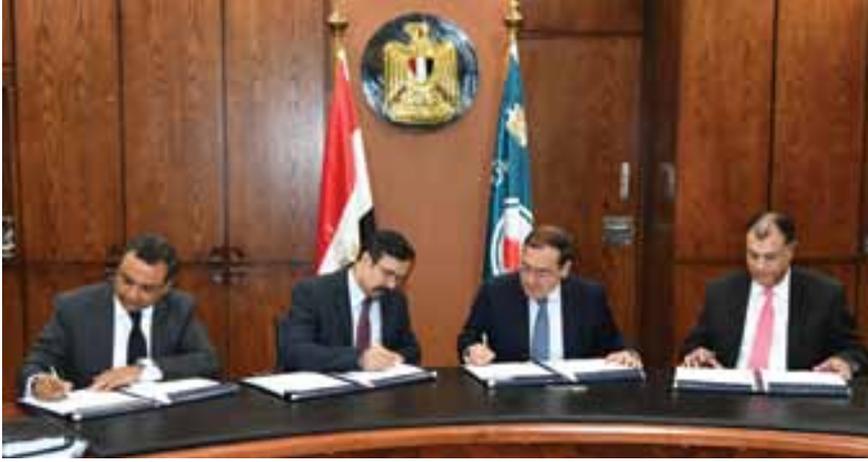
(نيدوكو) لحفر ٤ آبار بإجمالى استثمارات ٢٢,٥ مليون دولار. الاتفاقية الرابعة مع الشركة العامة للبترول بمنطقة سيناء " سدر وعسل ومطارمة وكريم " لتحسين إنتاجها في إطار خطط قطاع البترول

وقعت وزارة البترول والثروة المعدنية ٥ اتفاقيات بترولية جديدة للبحث عن البترول والغاز الطبيعي في مناطق البحر المتوسط والصحراء الغربية ودلتا النيل سيناء وخليج السويس باستثمارات حوالى ٢٠٤,٢ مليون دولار و ٥٨,٥ مليون دولار منح .

الاتفاقية الأولى مع شركتى إيجاس وثروة للبترول وشركة إينى الإيطالية بمنطقة نور البحرية بالبحر المتوسط لحفر بئرين بإجمالى استثمارات ١٠٥ مليون دولار.

الاتفاقية الثانية مع هيئة البترول وشركتى إينى الإيطالية وينا نافتا بلين الكرواتية بمنطقة رأس قطارة بالصحراء الغربية لحفر ٩ آبار بإجمالى استثمارات ١١,٧ مليون دولار .

الاتفاقية الثالثة مع هيئة البترول وشركتى إينى الإيطالية وبي بى البريطانية بمنطقة دلتا النيل



والغازات الطبيعية فى تراكيب جيولوجية جديدة لتؤكد أن الصحراء الغربية لازالت منطقة واعدة مما يشجع على جذب شركات البترول العالمية لضخ استثمارات جديدة، مشيراً إلى أن استخدام المسح السيزمى بالتكنولوجيات الحديثة سيحدث تطورات هامة في عمليات استكشاف البترول والغاز بما يعظم الإنتاج والاحتياطيات.

وأضاف الملا أن إجمالى إنتاج منطقة الصحراء الغربية حالياً يُمثل ٥٧٪ من إجمالى إنتاج مصر من الزيت الخام، مشيراً إلى أن الفترة القادمة ستشهد نمواً كبيراً في منطقة الصحراء الغربية نتيجة سرعة وضع الاكتشافات الجديدة على خريطة الإنتاج باستخدام البنية الأساسية المتاحة بالمنطقة من شبكات خطوط أنابيب ومصانع معالجة، فضلاً عن انخفاض تكلفة الإنتاج وارتفاع جودة الزيت الخام الذى يضاهاى أجود أنواع الزيت الخام على المستوى العالمى.

## الصحراء الغربية تنتج ٥٧٪ من إنتاج مصر من الزيت الخام

أعمال البحث والاستكشاف باستخدام أحدث التكنولوجيات وطرق الحفر الحديثة وذلك في إطار برنامج تحسين أداء أنشطة إنتاج البترول والغاز ضمن مشروع تطوير وتحديث قطاع البترول، وهو ما أسفر عن تحقيق عدة اكتشافات للزيت الخام

اعلن المهندس طارق الملا وزير البترول والثروة المعدنية أن هناك برنامج عمل متكامل يتم تنفيذه حالياً لزيادة إنتاج الصحراء الغربية من ثروات مصر البترولية من خلال طرح المزايدات العالمية وتوقيع اتفاقيات بترولية جديدة لتكثيف





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## منح المنطقتين الشرقية والدلتا بشركة جاسكو .... شهادة نظام إدارة الطاقة أيزو ٥٠٠٠١

توافقاً مع رؤية مصر للتنمية المستدامة والتي تؤكد على ضرورة ترشيد الطاقة مما يؤدي لدعم الإقتصاد الوطني والحفاظ على الموارد الضرورية لإحداث التنمية الاقتصادية المنشودة ، واستكمالاً للدور الفعال الذي تقوم به شركة جاسكو للحفاظ على الموارد البشرية وترشيد الطاقة قامت الإدارة العامة لحماية البيئة بتكوين فريق عمل على درجة عالية من الكفاءة لتأهيل المنطقتين الإقليميتين الشرقية والدلتا للتوافق مع متطلبات المواصفة القياسية أيزو(٥٠٠٠١) وبفضل الله وبعد عمل دؤوب وتعاون فرق الطاقة بمناطق القناة ،السويس،البحر الأحمر،طلخا،شبهشير، دمياط تم منح المنطقتين الشرقية والدلتا شهادة نظام إدارة الطاقة أيزو(٥٠٠٠١) والذي يعد خطوة هامة نحو رفع القدرات المؤسسية لشركة جاسكو ودعم وتحسين قدرات نظم الإدارة بالشركة، وتظل جاسكو دائماً سباقة في كل ما هو من شأنه الحفاظ على الموارد وترشيد الطاقة بفضل أبنائها المخلصين.





**SAHARA INTEGRATED (SI)** has all the technical staff, processes, tools, resources and project management expertise required for field management from exploration through abandonment. By awarding the management of turnkey projects to SI, investors and operating companies can fully benefit from the company's integration of services & products.



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